3.9 Summary Report of Residual Chlorine Control in “FMRP” (Action S6)

Summary of OJT activity about residual chlorine control
In iron and manganese removal process

1. Purpose of OJT about chlorine control in iron and manganese removal process

Improvement of implementation capacity regarding operation and control of chlorination process

2. Target of achievement by OJT activity

2-1 Improvement of stability and suitability of residual chlorine concentration of treated water

1) Stable residual chlorine of clarified water in suitable concentration

2) Stable residual chlorine of filtered water in suitable concentration

3) Stable residual chlorine of transmission water in suitable concentration

2-2 Improvement of water quality about color of water

1) Supplying of transmission water to the network from FMRP without color

2-2 Improvement of O&M activity

1) Effective chlorine dosing

2) Proper chlorine dosing rate

3) Routine work of water quality analysis about residual chlorine by proper frequency

4) Effective utilizing of water quality analysis record about residual chlorine

5) Control activity about residual chlorine with control target of treated water

6) Supplying of safety and comfortable water with high reliability to the network

2-3 Improvement of O&M capacity

1) Capacity to monitor residual chlorine of treated water

2) Capacity to control the chlorinator to demanded flow rate of chlorine

3) Capacity to set up and modify a required dosing rate of chlorine

2-4) Improvement of operating cost about chlorine dosing

1) Proper consumption of chlorine

As the result of above, if possible achievement of the reduction of chlorine consumption weight

2. Method

2-1 Confirmation and check of the current condition of residual chlorine control

1) Confirmation by records of water quality analysis about break-point and residual chlorine

1-1) Frequency of analysis in a day and water sampling method

1-2) Validity and availability of recorded values

1-3) Utilizing of analysis records to the plant operation

2) Confirmation of knowledge of laboratory staffs about residual chlorine control

2-1) Kind of residual chlorine and feature of each

2-2) Residual chlorine to be maintained in usual operation of FPRP

2-3) Residual chlorine concentration to be kept of transmission water from FMRP

2-4) Assessment of consumption of residual chlorine in iron and manganese removal process

2-5) Treatment targets about residual chlorine in iron and manganese removal process

2-6) Residual chlorine concentration to be kept of transmission water at final tap in the network

2-7) Regulations or law about residual chlorine in Egypt

2-8) Letters or documents on above regulations or law
2-9) Functions of components in FMRP
2-10) Mechanism of iron and manganese removal from well water
2-11) Function of chlorination in iron and manganese removal process

3) Confirmation of current operation about control of dosing flow rate by chlorinator
3-1) Communication between laboratory team and operation team
3-2) Procedures for control operation of chlorinator when chlorine dosing flow rate should be changed
3-3) Utilizing of records of raw water flow rate to control of the chlorine dosing flow rate
3-4) Procedures to calculation of dosing flow rate of chlorine
3-5) Frequency of change of chlorine dosing flow rate in a day
3-6) Procedures for control of residual chlorine concentration in iron and manganese removal process
3-7) Use of break-point test results for set-up of pre-chlorine dosing rate
3-8) Consumption of residual chlorine in iron and manganese removal process
3-9) Frequency of complains from customers by supplying of colored water
3-10) Water quality of well water and filtered water

2-2 Lectures about control procedures for residual chlorine in water treatment process
1) Importance of free residual chlorine and effectiveness over disinfection of potable water
2) Necessity of water analysis about not only total residual chlorine but free residual chlorine
3) Criteria of residual chlorine concentration of potable water by WHO guideline
4) Functions of components in FMRP
5) Mechanism of iron and manganese removal from well water
6) Function of chlorination in iron and manganese removal process
7) Necessity of control activity of residual chlorine concentration in iron and manganese removal process
5) Achievements by control activity of residual chlorine concentration in iron and manganese removal process
6) Functions of chlorine dosing and post-chlorine dosing
7) Relation between pre-chlorine dosing rate and post-chlorine dosing rate
8) Required activities to control of residual chlorine concentration in iron and manganese removal process
9) Required records to control of residual chlorine concentration in iron and manganese removal process
10) Affects of water quality of combined well water to iron and manganese removal
11) Procedures for control of residual chlorine in iron and manganese removal process

2-3. OJT about residual chlorine control
1) Set-up the treatment targets of residual chlorine about filter inlet water, filtered water and transmission water
2) Taking records of residual chlorine under operation condition in the current for 3 days
3) Taking records of raw water flow rate for 3 days
4) Analysis about 3-days records of operation

Differences between the target treatment value and actual records
Study about variation of residual chlorine concentration in 5 days
Study about differences between residual chlorine of clarified water and filtered water
Study about relation between beak-point test results, pre-chlorine dosing rate and residual chlorine of clarified water
Study about relation between chlorine dosing rate and residual chlorine of filtered water and generating of colored water in the network
Calculation of consumption of residual chlorine in treatment process
Study about causes of found differences

6) Focusing to required reviews about modification of current operation conditions
7) Implementation of operation under condition of reviewed operation and taking of records for 5days
8) Same as above 4) to 7)
9) Setting the criteria for winter season about control of residual chlorine

2-4.OJT by expert about residual; chlorine control in FMRP to CP of H/Q and CP in model facility

Facility name	Date of OJT	OJT
Qenayate FMRP	29/Oct/2008	Lecture to H/Q CP from expert
	30/Oct/2008	Lecture to H/Q CP from expert
	04/Nov/2008	Investigation about current condition
	05/Nov/2008	Data collection start
	10/Nov/2008	Data analysis
	12/Nov/2008	Lecture to site CP from H/Q CP
	13/Nov/2008	Lecture to site CP from H/Q CP
	20/Nov/2008	Lecture to site CP from H/Q CP
	20/Jan/2009	Data analysis
	25/Jan/2009	Data analysis

Attendance of OJT about residual chlorine control in FMRP

Facility name	Date of OJT	H/Q CP team	Site CP team
	30/Oct/2008	Mr.Sharfi Ms.Heba Mr.Abd Allah	
	04/Nov/2008	Mr.Sharfi Ms.Heba Mr.Abd Allah	Mr.Attia Goda(Sector manager) Mr.Adel (Plant manager) Mr.Said Seyam (Supervisor) Mr.Saleem(Technitian Ms.Mona(Chemist)
	04/Nov/2008	Mr.Sharfi Ms.Heba	Mr.Attia Goda(Sector manager) Mr.Adel (Plant manager)

		Mr.Abd Allah	Mr.Said Seyam (Supervisor)
	10/Nov/2008	Mr.Sharfi Ms.Heba Mr.Abd Allah	Mr.Attia Goda Mr.Adel (Plant manager) Mr.Said Seyam (Supervisor) Mr.Saleem(Technitian Ms.Mona(Chemist)
	12-13/Nov/2009	Mr.Sharfi Ms.Heba Mr.Abd Allah	Mr.Attia Goda(Sector manager) Mr.Adel (Plant manager) Mr.Said Seyam (Supervisor) Mr.Saleem(Technitian
	20/Nov/2008	Mr.Sharfi Ms.Heba Mr.Abd Allah	Mr.Attia Goda(Sector manager) Mr.Adel (Plant manager) Mr.Said Seyam (Supervisor) Mr.Saleem(Technitian
	20/Jan/2008	Mr.Sharfi Ms.Heba Mr.Abd Allah	Mr.Noglan (Plant manager)
	25/Jan/2008	Mr.Sharfi Ms.Heba Mr.Abd Allah	Mr.Noglan (Plant manager)

2-5 Achievements by OJT about residual chlorine control as applying SOP to O&M activities on site

1) Water quality analysis about residual chlorine in treatment process has been conducted as one of the routine work of monitoring activity in FMRP model facility.
2) From October-2008, residual chlorine to monitor has been changed to free residual chlorine from total residual chlorine in FMRP model facility.
3) By implementation of control activity of residual chlorine, residual chlorine of filter inlet water and filtered water has been in stable condition.
4) By implementation of control activities of residual chlorine, operation on control of chlorine flow rate was improved as reliable adjustment handling of the chlorinator.
   While residual chlorine control was not performed, when a well water flow rate was changed, the chlorine dosing flow rate was not changed into a considerable amount in many cases.
5) By above achievement, frequency of generation of colored supplying water to the network decreased and under the present status of operation, there is almost no customer complaint.
   Before improvement of operation: Frequency of customer complaints 20 times/month
   After improvement of operation: Frequency of customer complaints 1 time/month
6) By above achievement, O&M capacity regarding for the residual chlorine control of H/Q CP team and model facility CP team has been improved as following
   6-1) Capacity to associate the following factors when monitoring is carried out
      Residual chlorine concentration of filter inlet water, filtered water, water in the network
      set value of dosing flow rate of chlorinator, working numbers of well water

5-2) Capacities to perform a calculation of required chlorine dosing flow rate
5-3) Capacity to set a proper dosing rate of chlorine based on collected records
5-4) Capacity to modify a dosing rate of chlorine based on collected records
5-5) Capacity to consider required dosing rate according to seasonal change of chlorine demand
5-6) Capacity to consider that residual chlorine concentration is proper or not based on collected records.
5-7) Capacities to perform analysis and evaluations of effectiveness of chlorine dosing

2-8.Appendix

1) SOP documents regarding residual chlorine control activity
2) Records for reference

OJT scenario

Theme: Control procedures for control of free chlorine residual in Fe/Mn removal plant

30/10/2008

A.-Confirmation of current operation condition

1. Confirmation of current operation condition on water quality analysis and facility operation

   Is the measured value of chlorine residual free chlorine residual?

   What is the reason for using free chlorine residual or total chlorine residual?

   Is the chlorine residual of filter inlet water measured and how much is the value?

   Is the control target of chlorine residual in each process set up and how much is the value?

   When actual measurement shift from control target value, what kind of actions are taken?

   When the combination of the well to operate is changed, is the chlorine dosing rate changed?

   Is the combination of the well operated based on what decided?

   Is quantity of well water to be treated constant?

   How much is there any concentration of free chlorine residual approximately?

   Are there any data of the removal characteristics of manganese after filter washing?

2. Confirmation of water quality of well water and filtered water in operation condition of before and after replacing of filter media

   The characteristics of differences and differences itself of water quality before and after replacing of filter media

   Comparison with water standard

   Comparison with chlorine residual of filtered water

3. Confirmation of chlorine dosing rate in current operation
4. Confirmation of dosing point of chlorine
5. Confirmation of condition of filter media in the current condition

   (Confirmation of condition of filter media at the time of replacing, if filter media is available)
6. Measurement of free chlorine residual of aeration treated water
7. Measurement of free chlorine residual and turbidity of filter inlet water and filtered water

B-The target of OJT and how to advance OJT

1. Study on characteristics of water quality of well water
2. Study on chlorine demand for well water
3. Study on the difference in the oxidation force of free chlorine residual and combined chlorine residual
4. Study on effects which free chlorine residual in filter inlet water exerts on the oxidation force and life of filter media
5. Study on importance of maintaining the oxidation force

6. Study on the necessity for monitoring of free chlorine residual in each treatment process
7. Study on the procedures for control of chlorine residual and setting of chlorine dosing rate
8. A control action is actually performed and record is taken for the result
9. The effectiveness of removal of iron and manganese is checked

C-OJT scenario

1. Study on characteristics of water quality of well water

1-1.Characteristics of well water quality are arranged and explained

Contained iron, manganese, ammonia

Chlorine demand and pH

1-2.Consider the effect factors given to chlorine dosing rate and free chlorine residual of filtered water

With what kind of contained matter in well water is the dosed chlorine consumed how much?

In which process is the dosed chlorine consumed how much by what?

Just to make sure, the following is checked.

Calculation of chlorine dosing flow rate form dosing rate and flow rate of well water

Setting of dosing flow rate of chlorinator

1-3. Consider that data on above 1-2 is available or not in the plant.

1-4.When data is not available in the plant, required chlorine residual is measured

2. Study on chlorine demand for well water

Is chlorine demand for well water measured? Measurement frequency?

Does chlorine demand have a difference by a well?

Is chlorine demand unnecessary because of chlorine dosing rate setting out?

3. Study on the difference in the oxidation force of free chlorine residual and combined chlorine residual

Utilize material used for OJT of WTP

4. Study on effects which free chlorine residual in filter inlet water exerts on the oxidation force and life of filter media

The mechanism of manganese removal by manganese sand is explained plainly

If free chlorine residual is not available in filter inlet water, what will happen?

Why isn't effective in combined chlorine residual?

How much amount of free chlorine residual is required for oxidation by manganese sand?

5. The necessity for keeping of oxidation force of manganese sand is got to know
6. The necessity for monitoring of free chlorine residual concentration in each treatment process

Monitoring of free chlorine residual is that not only filtered water but filter inlet water is required

The relation between a chlorine dosing rate and free chlorine residual of filter inlet water is investigated

The relation between free chlorine residual of filter inlet water and filtered water

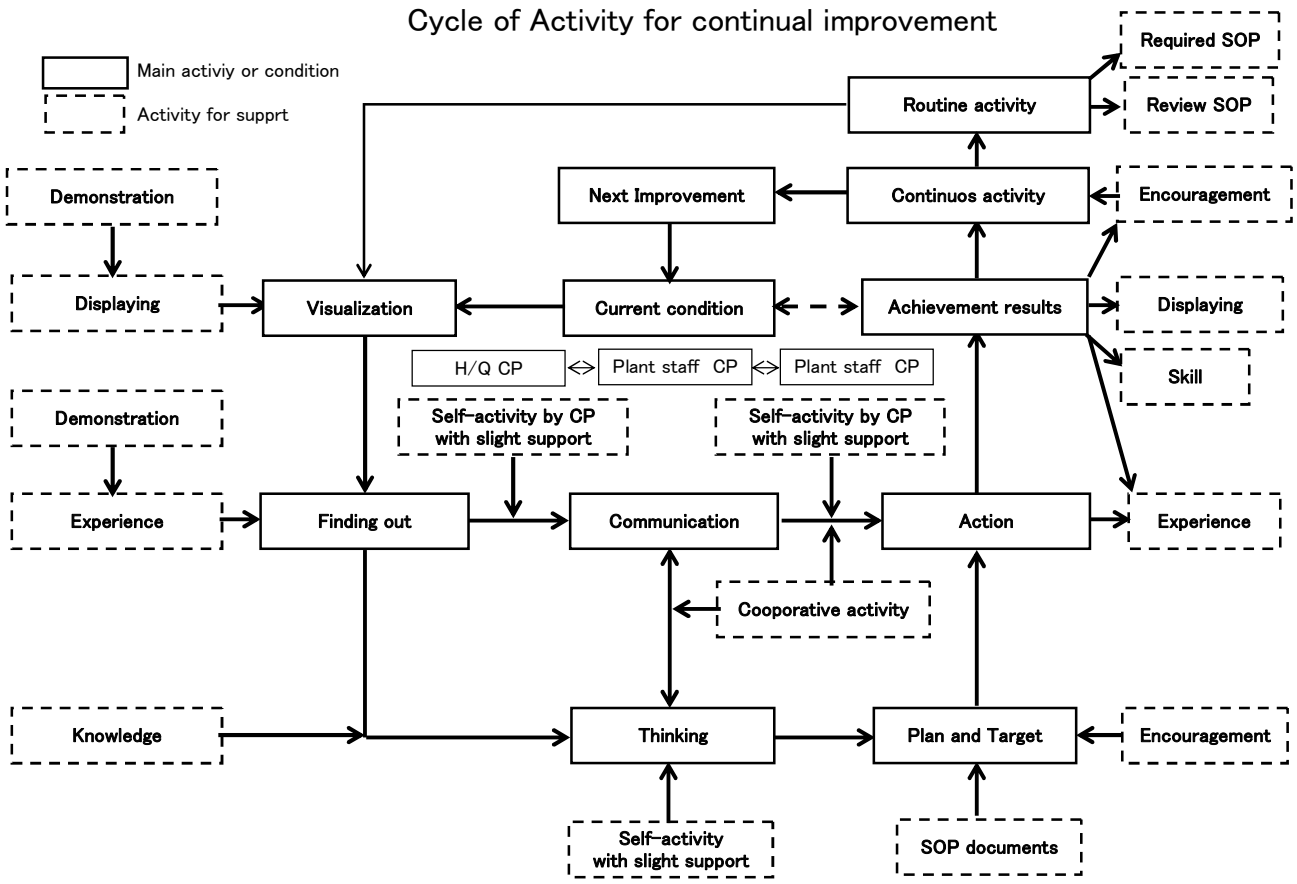
7. Control procedures for residual chlorine and setting up procedures of chlorine dosing rate are got to know

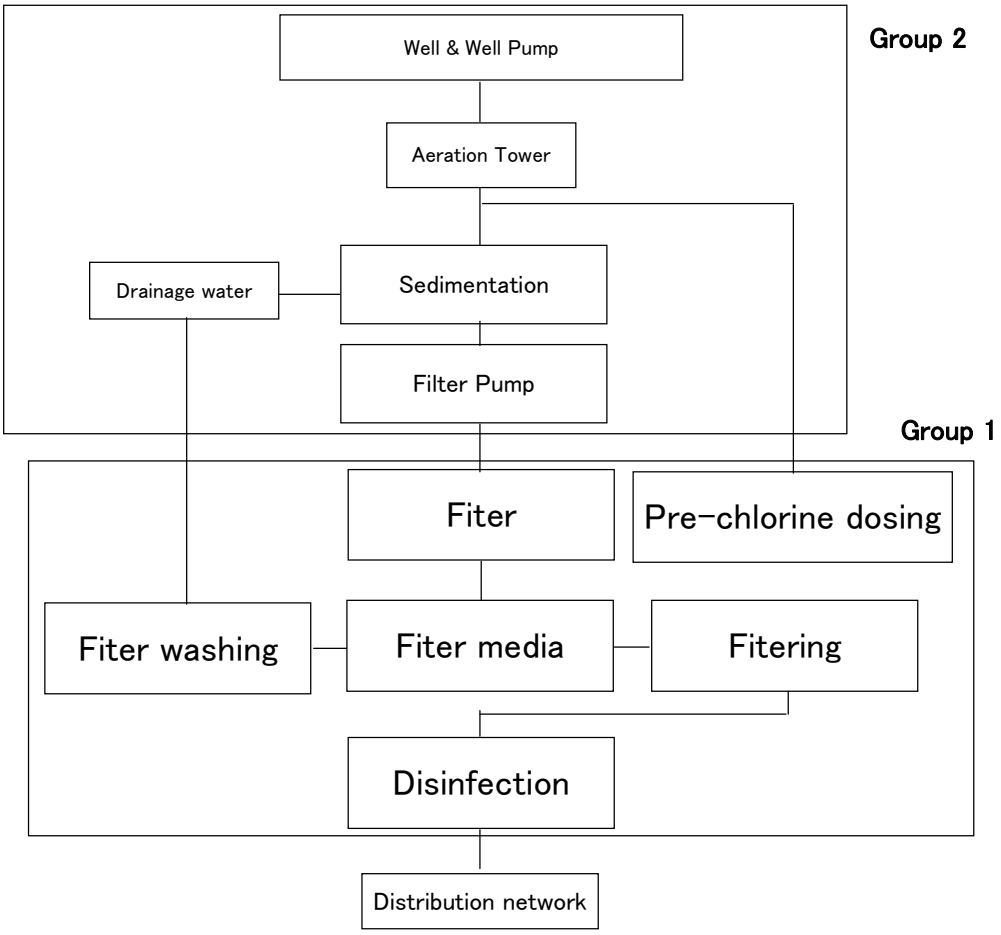
   The flowcharts for water treatment plant is utilized modifying it partially

8. A control action is actually performed and record is taken for the result

   The unified recording sheet is prepared

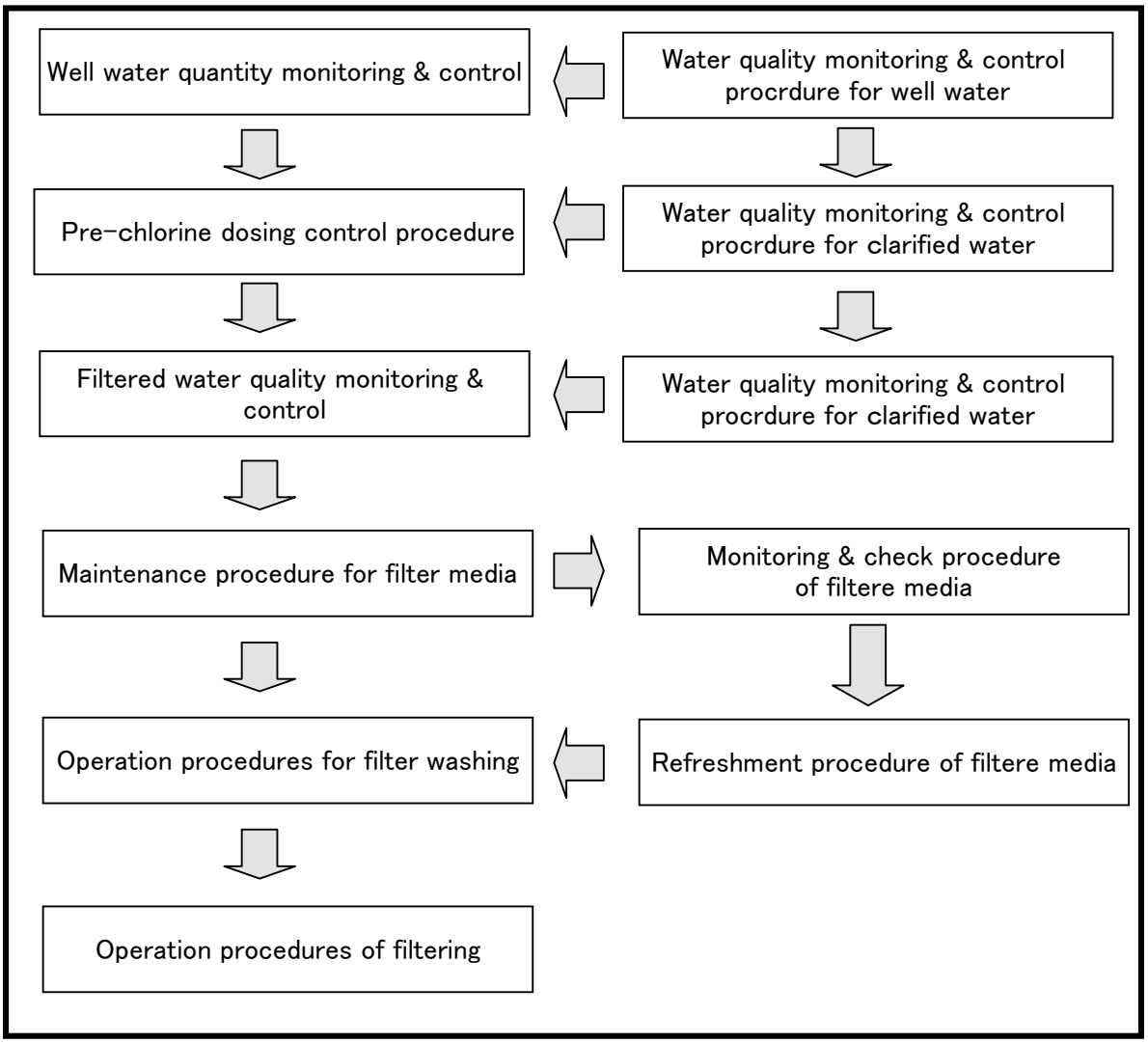
   (The partial modification of the current recording sheet is carried out)


Cycle of Activity for continual improvement
Main activiy or condition
Activity for supprt
Required SOP
Routine activity
Review SOP
Demonstration
Next Improvement
Continuos activity
Encouragement
Displaying
Visualization
Current condition
Achievement results
Displaying
H/Q CP
Plant staff CP
Plant staff CP
Skill
Demonstration
Self-activity by CP with slight support
Self-activity by CP with slight support
Experience
Finding out
Communication
Action
Experience
Cooporative activity
Knowledge
Thinking
Plan and Target
Encouragement
Self-activity with slight support
SOP documents

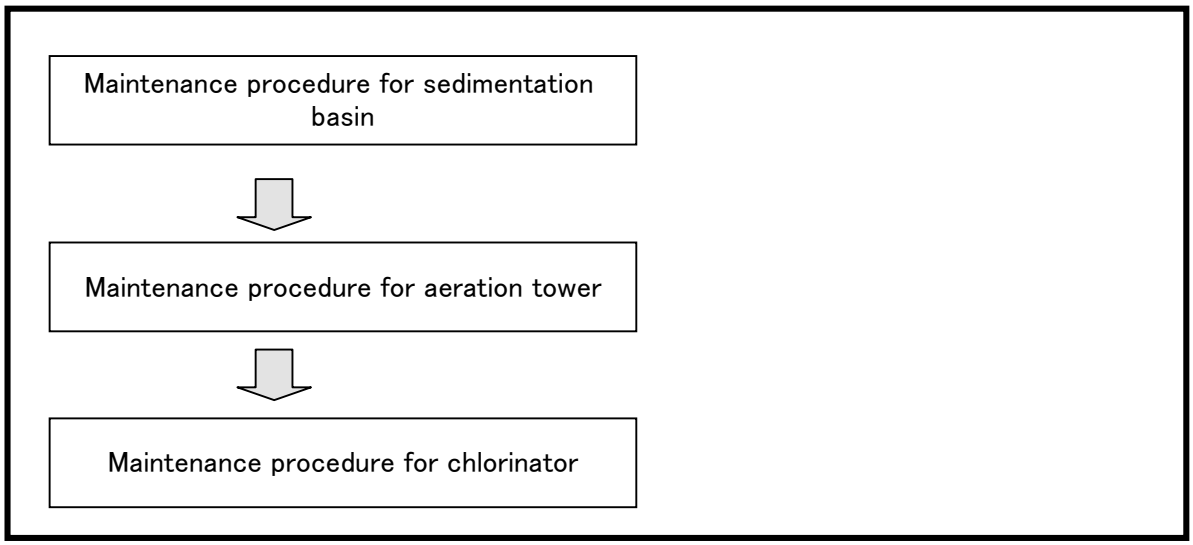

Group 2
Well & Well Pump
Aeration Tower
Drainage water
Sedimentation
Filter Pump
Group 1
Fiter
Pre-chlorine dosing
Fiter washing
Fiter media
Fitering
Disinfection
Distribution network

Steps for OJT activities for FMRP

Group 1

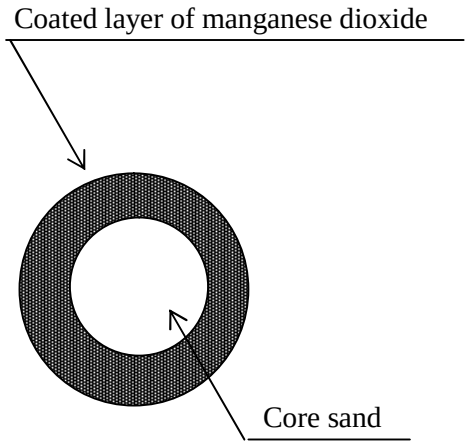


Group 2



Manganese removal by manganese sand

Manganese Sand: Filter media with coated on surface from manganese dioxide and it is used as contact filter media



The reaction at condition of manganese sand and manganese in the water

1. The surface of manganese sand contacts the water having contained manganese
2. The manganese contained in the water oxidized by free residual chlorine with manganese sand
3. The oxidation force of residual chlorine with manganese sand is lost
4. Manganese sand and the free residual chlorine contained in the water contact
5. The oxidation force of free residual chlorine with manganese sand is recovered
6. Manganese sands work as catalyst in the process of manganese removal by manganese sand contact filtration.

Remarks

1. When there is not enough free residual chlorine concentration in the filter inlet water, the surface coated layer of manganese sand will be damaged and exfoliated. As a result, function as manganese sand is lost.

   Hence, it is required sufficient free residual chlorine for the filter inlet water to oxidize manganese by manganese sand.
2. It is desirable to keep free residual chlorine of filtered water around 0.3 mg/l.
3. Depending on the manganese content in filtered water, a high concentration of free residual chlorine causes colored water.

   Hence, in order to prevent generation of the colored water of filtered water, implementation of free residual chlorine control of filtered water is required.
4. In order to carry out free residual chlorine control of filtered water, chlorine dosing rate must be controlled by predicting change of the free residual chorine in iron and manganese removal process.
5. In order to predict change of the free residual chorine in iron and manganese removal process, the value of the free residual chlorine in each process must be monitored in the plant.

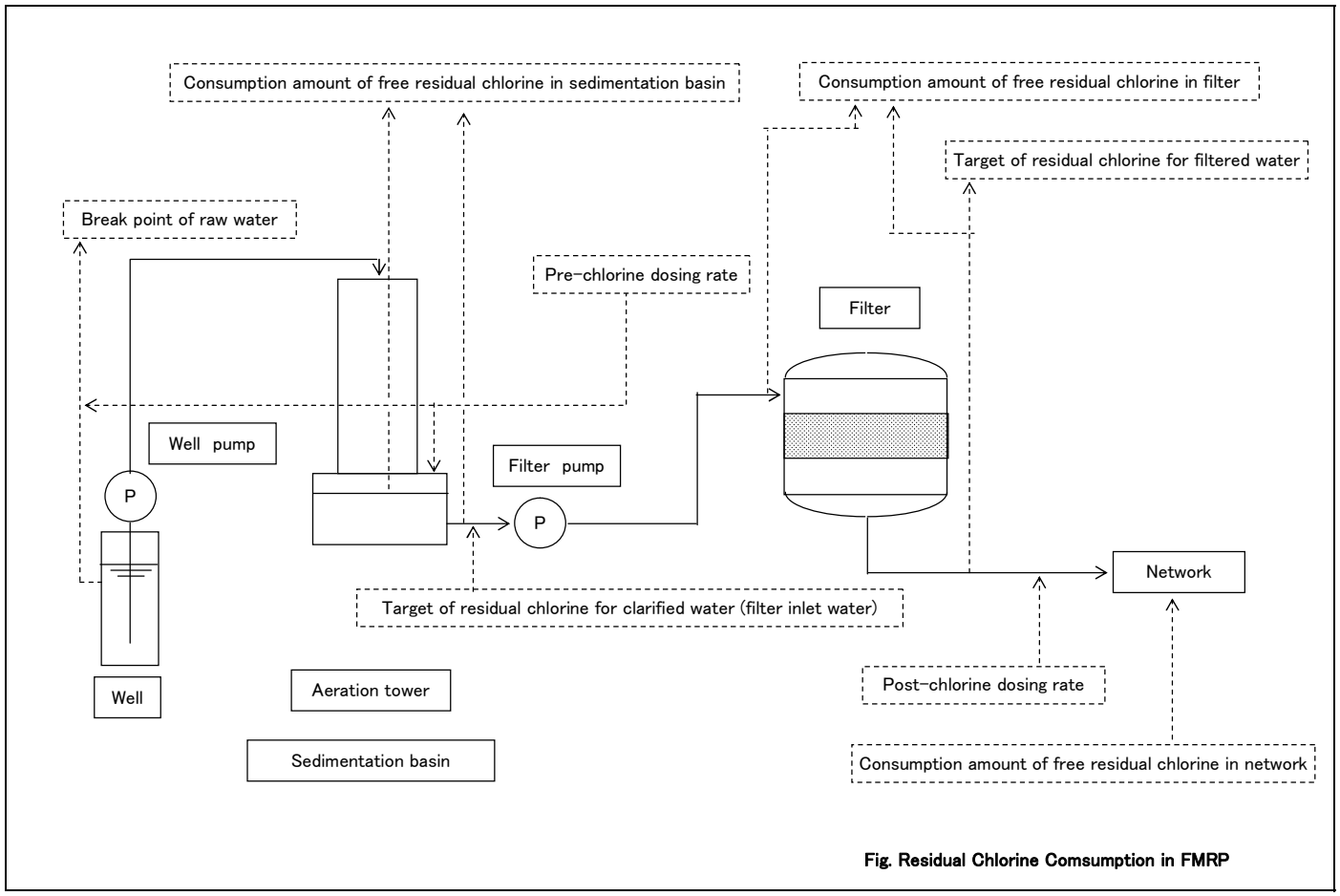


Fig. Residual Chlorine Comsumption in FMRP

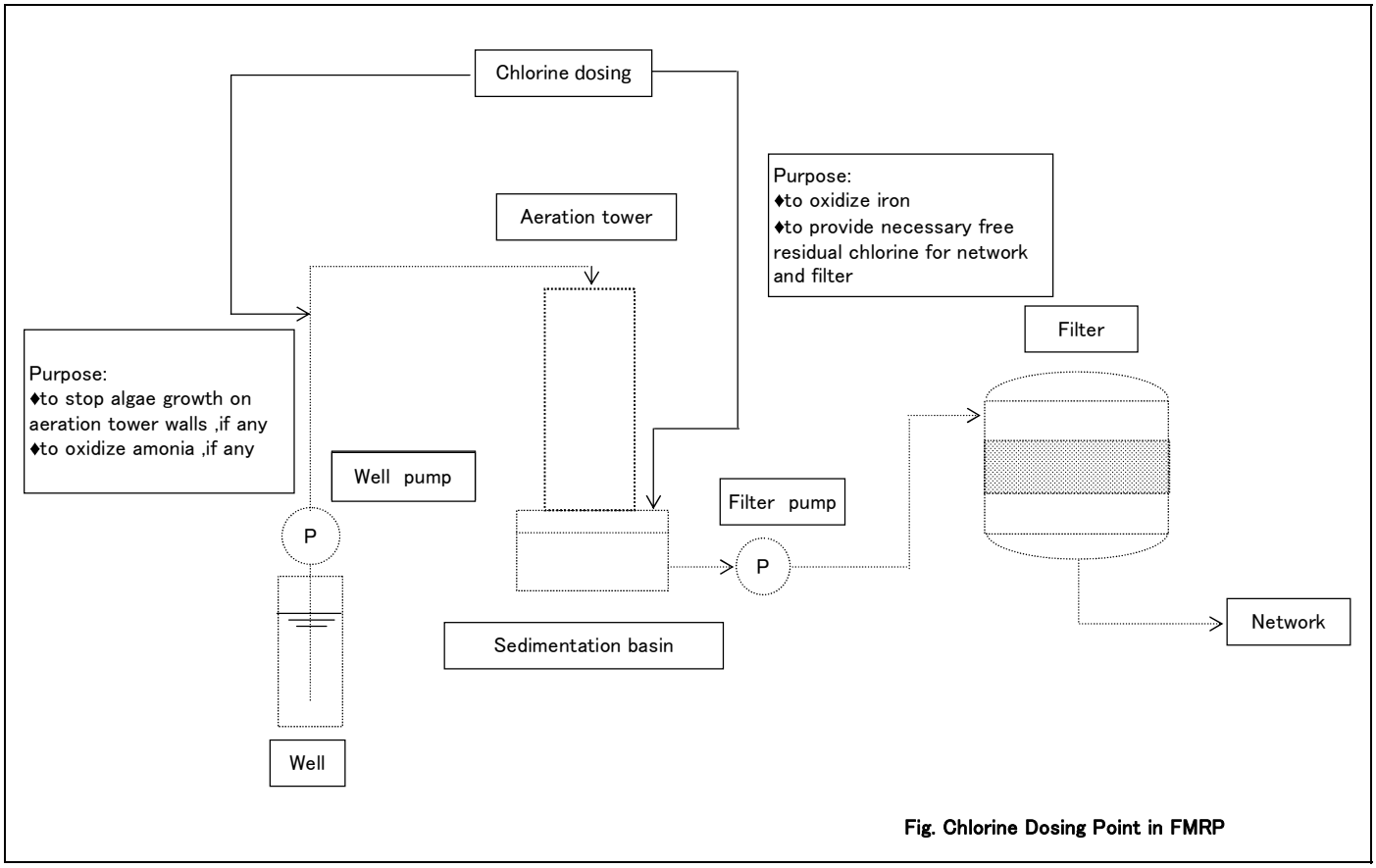


Fig. Chlorine Dosing Point in FMRP

Report

About

Qenaiat Iron & Manganese removal plant

First visit

3/11/2008

During the visit to Qenaiat Iron & Manganese removal plant today 3/11/2008 and our observation for filter backwashing and the discussion with the operating staff and lab chemist we found the following:

1. filter backwashing is automatic through PLC based on time running for the filter and backwash cycle is pre determined as 8 minutes for backwashing, 5 minutes for rewash and 2 minutes for filter media stabilization
2. chlorine is added in the inlet pipe in the oxidization tower only
3. chlorine dose in kg/hour is fixed regardless of water quantity
4. no flow meter installed for measuring plant output

samples for water during backwashing had been taken for turbidity and free chlorine measurement

The preliminary reaction for the plant operation cab be summarized as following :

- Generally the plant after rehabilitation are good and facilities provided are suitable to produce good water but;
    - Study required to control the residual chlorine after the tower in order to satisfy the requirement of development and activate the manganese sand inside the filter
    - Backwash cycle are required to be discussed with the plant designer based on the results of turbidity measures for backwashed water
    - Running time for filter needs to be discussed the plant designer to be based on deferential pressure as a measure for backwashing rather than timings
    - Date record and analysis for water quantity, quality, chlorine consumption, and residual chlorine are required
    - Try to change the dosing point for chlorine and record the results are required.
    - Flow measuring and chlorine dose control based on water production are necessary .

Report

About

Qenaiat Iron & Manganese removal plant

Second visit

6/12/2008

During the this visit to qenaiat Iron & Manganese removal plant today 6/12/2008 in the presence of "**Calligan"** representative two subjects had been discussed:

1. Change filter backwashing is automatic through PLC regime from time based to deferential pressure based
2. Change time sequence for backwashing and rewash cycle based on water turbidity
3. try to make one filter running for 36 hours instead of 24 houres

1- **Change filter backwashing is automatic through PLC regime from time based to deferential pressure based**

The representative promised to study and give an offer to change the system since it need some changes an additional supplies

2- **Change time sequence for backwashing and rewash cycle based on water turbidity**

It is generally accepted but it does need repeat of washing cycle and measuring of turbidity in frequent bases to reach to the optimum time for backwashing and rewash time

3- **try to make one filter running for 36 hours instead of 24 houres**

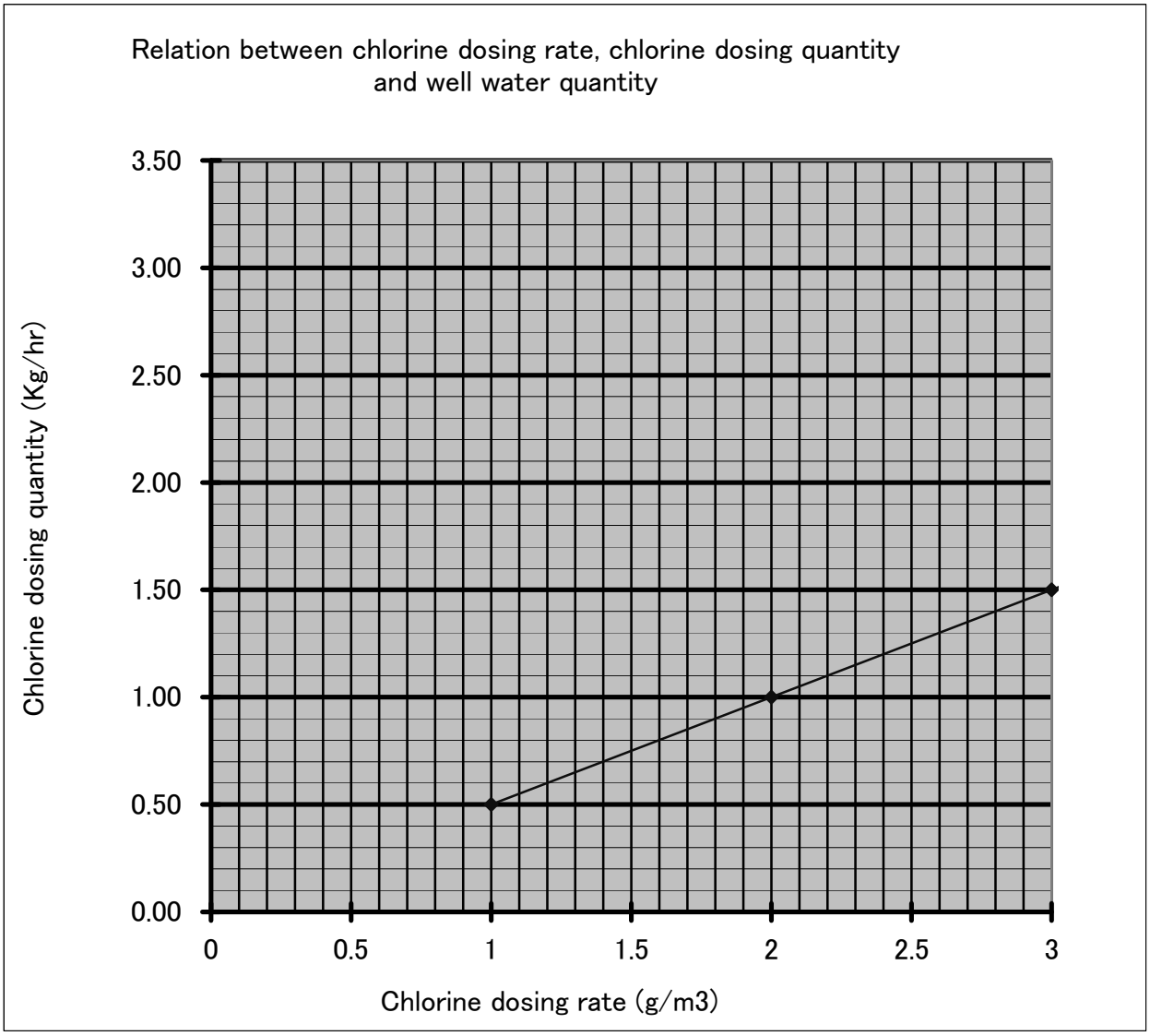
It is accepted under condition that water quality shall be monitored in the additional 12 hours and filter washing shall be compared to the other two filters

chlorine dosing for Iron and Manganeze plant

well water flow rate	Q	l/sec
Dosing rate of chlorine	A	g/m^3
Dosing quantity of chlorine	S	kg/hr

S(kg/hr) = Q (l/sec) × 60 × 60 × 1/1000 × A (g/m3) × 1/1000

	S40	S80	S120
0.50	72.00	144.00	216.00
1.00	144.00	288.00	432.00
1.50	216.00	432.00	648.00
2.00	288.00	576.00	864.00
2.50	360.00	720.00	1080.00
3.00	432.00	864.00	1296.00

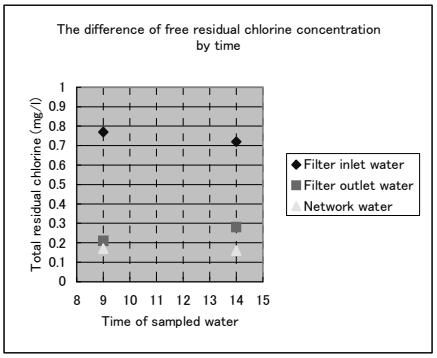


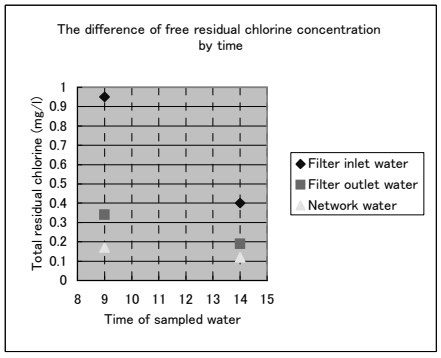
Monitoring results on residual chlorine concentration of Fe/Mn removal plant in Qenayate

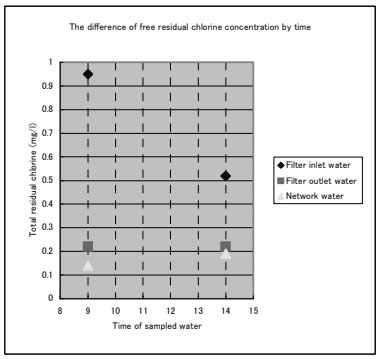
1 The difference of free residual chlorine concentration by time

(mg/l)

Free resdidual chlorine	Day-1-Nov.		Day-2-Nov.		Day-2-Nov.	
	9:00	14:00	9:00	14:00	9:00	14:00
	9	14	9	14	9	14
Filter inlet water	0.77	0.72	0.95	0.4	0.95	0.52
Filter outlet water	0.21	0.28	0.34	0.19	0.22	0.22
Network water	0.17	0.16	0.17	0.12	0.14	0.19
	N0.2 & 6 wells		N0.1& No.5 wells		N0.2 & 6 wells	



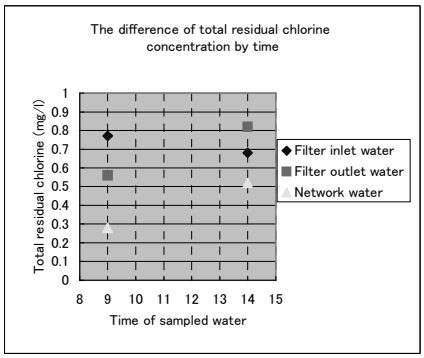


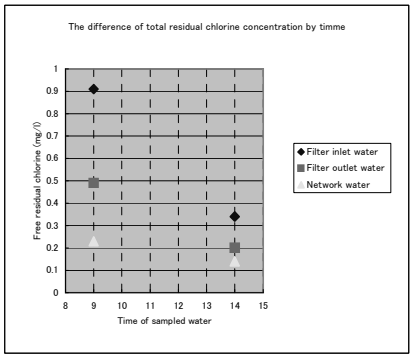


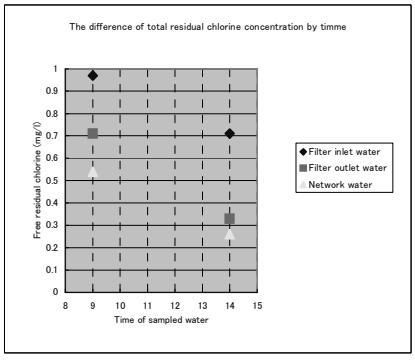
2 The difference of total residual chlorine concentration by time

(mg/l)

Total resdidual chlorine	Day-1-Nov.		Day-2-Nov.		Day-2-Nov.	
	9:00	14:00	9:00	14:00	9:00	14:00
	9	14	9	14	9	14
Filter inlet water	0.77	0.68	0.91	0.34	0.97	0.71
Filter outlet water	0.56	0.82	0.49	0.2	0.71	0.33
Network water	0.28	0.52	0.23	0.14	0.54	0.26
	N0.2 & 6 wells		N0.1& No.5 wells		N0.2 & 6 wells	



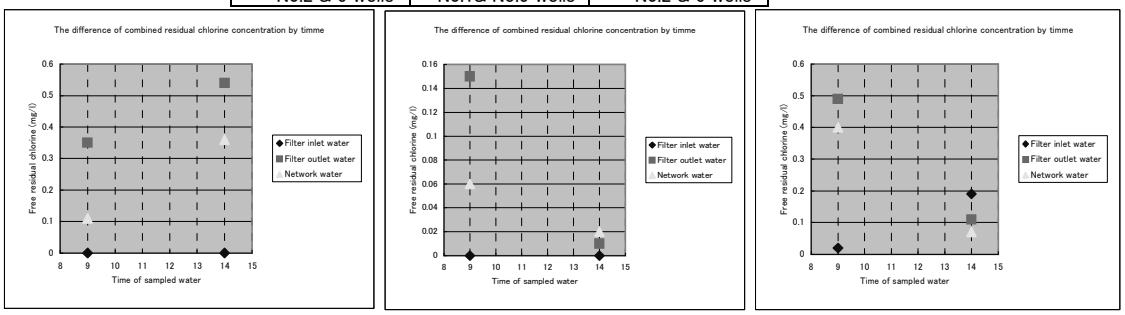




3 The difference of combined residual chlorine concentration by time

(mg/l)

Combined resdidual chlorine	Day-1-Nov.		Day-2-Nov.		Day-2-Nov.	
	9:00	14:00	9:00	14:00	9:00	14:00
	9	14	9	14	9	14
Filter inlet water	0	0	0	0	0.02	0.19
Filter outlet water	0.35	0.54	0.15	0.01	0.49	0.11
Network water	0.11	0.36	0.06	0.02	0.4	0.07
	N0.2 & 6 wells		N0.1& No.5 wells		N0.2 & 6 wells	



4 Comparison of free residual chlorine and tatal residual chlorine

(mg/l)

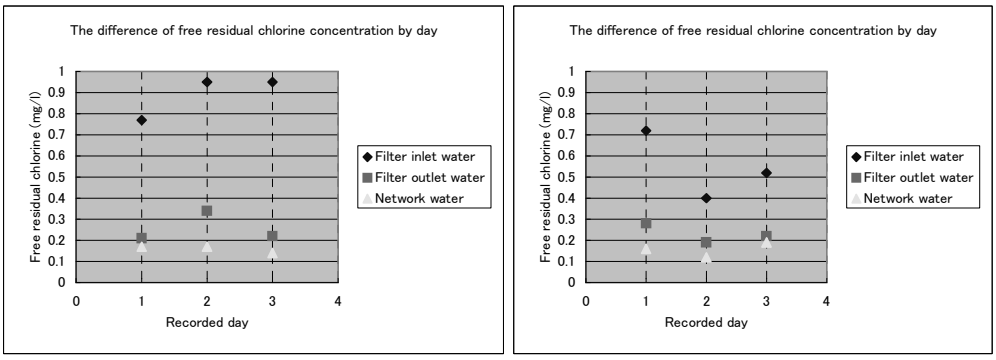
Free resdidual chlorine	Day-1-Nov.		Day-2-Nov.		Day-2-Nov.		
	9:00	14:00	9:00	14:00	9:00	14:00	
Filter inlet water	0.77	0.72	0.95	0.4	0.95	0.52	Free
	0.77	0.68	0.91	0.34	0.97	0.71	Total
Filter outlet water	0.21	0.28	0.34	0.19	0.22	0.22	Free
	0.56	0.82	0.49	0.2	0.71	0.33	Total
Network water	0.17	0.16	0.17	0.12	0.14	0.19	Free
	0.28	0.52	0.23	0.14	0.54	0.26	Total
	N0.2 & 6 wells		N0.1& No.5 wells		N0.2 & 6 wells		

5 The difference of free residual chlorine concentration by day

(mg/l)

Free resdidual chlorine	Day-1	Day-2	Day-3	Day-1	Day-2	Day-3
	9:00	9:00	9:00	14:00	14:00	14:00
	1	2	3	1	2	3
Filter inlet water	0.77	0.95	0.95	0.72	0.4	0.52
Filter outlet water	0.21	0.34	0.22	0.28	0.19	0.22
Network water	0.17	0.17	0.14	0.16	0.12	0.19
	2&6	1&5	2&6	2&6	1&5	2&6

Day-1	Day-2	Day-3
N0.2 & 6 wells	N0.1& No.5 wells	N0.2 & 6 wells

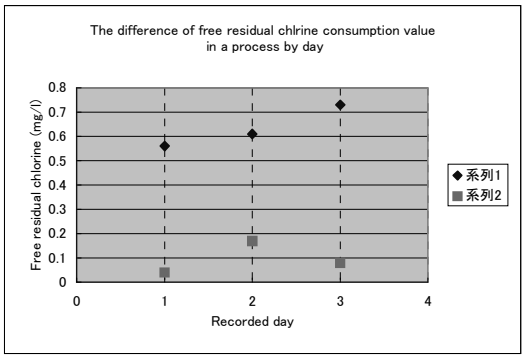


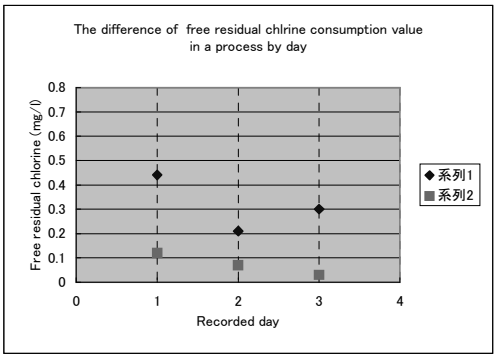
6 The chorine consumption value in a process

Chlorine consumption

(mg/l)

	Free resdidual chlorine 9:00 AM				Free resdidual chlorine 14:00			
	Day-1	Day-2	Day-3	Ave.	Day-1	Day-2	Day-3	Ave.
Filter	0.56	0.61	0.73	0.63	0.44	0.21	0.3	0.32
Network	0.04	0.17	0.08	0.10	0.12	0.07	0.03	0.07



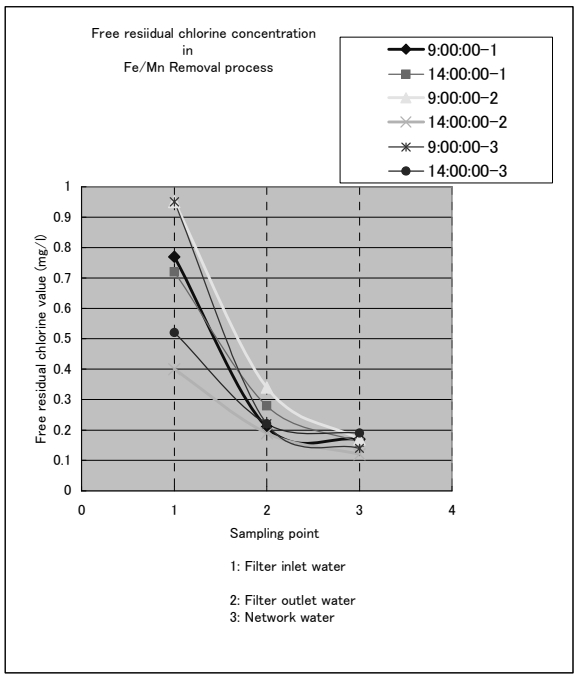


7 Change trend of free residual chlorine in Fe/Mn removal process

7-1 Data of 3 days

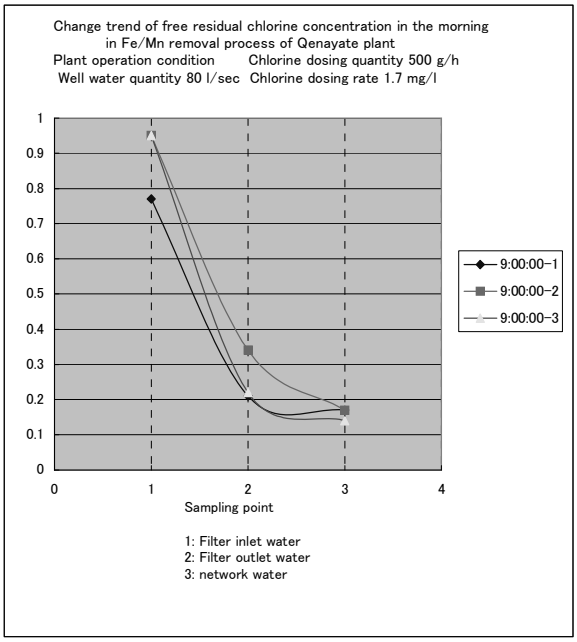
(mg/l)

	Filter inlet water	Filter outlet water	Network water
9:00:00-1	0.77	0.21	0.17
14:00:00-1	0.72	0.28	0.16
9:00:00-2	0.95	0.34	0.17
14:00:00-2	0.4	0.19	0.12
9:00:00-3	0.95	0.22	0.14
14:00:00-3	0.52	0.22	0.19



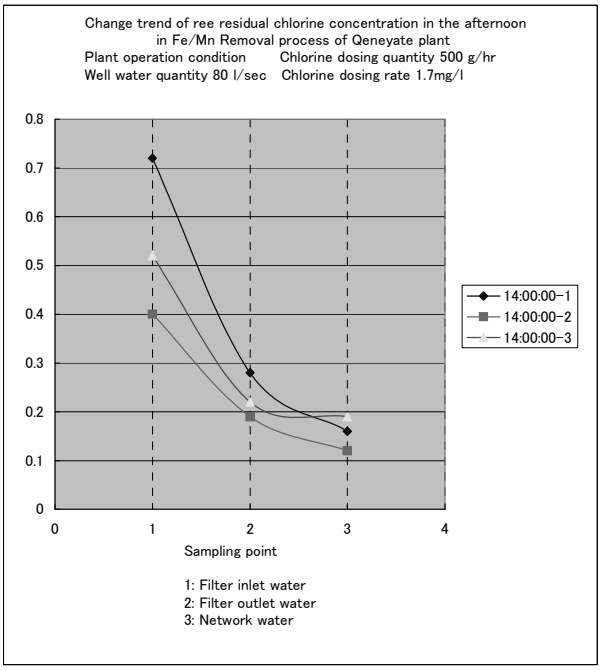
7-2 Data at 14:00 of each day

	Filter inlet water	Filter outlet water	Network water
9:00:00-1	0.77	0.21	0.17
9:00:00-2	0.95	0.34	0.17
9:00:00-3	0.95	0.22	0.14



7-3 Data at 14:00 of each day

	Filter inlet water	Filter outlet water	Network water
14:00:00-1	0.72	0.28	0.16
14:00:00-2	0.4	0.19	0.12
14:00:00-3	0.52	0.22	0.19



Quenayate

Dosing rate	1.75	mg/l
Residual chlorine after aeration	0.24	mg/l
Consumption during aeration	1.51	mg/l

			Reauired chlorine to oxidation		Estimated required chlorine	
Iron contain in well water	0.15	mg/l	0.3	mg/l	0.045	mg/l
Manganese contain in well water	0.32	mg/l	0.4	mg/l	0.128	mg/l
Ammonia contain in well water	0.02	mg/l	7.6	mg/l	0.152	mg/l
Algae affect (estimated)					0.1	mg/l
Other contained element to be oxidised					0.1	mg/l
Total chlorine consumption by oxidation					0.525	mg/l

Chlorine consumption during aeration	0.985	mg/l

After change the chlorine dosing point from before aeration to after aeration By calculation	0.765	mg/l

Set up dosing rate of chlorine for trail	1.0~1.2	mg/l

Data of El Seds:

Usually chlorine is dosed into the reservoir located after aeration tower

			Reauired chlorine to oxidation		Estimated required chlorine	
Iron contain	0.5	mg/l	0.3	mg/l	0.15	mg/l
Manganese contain	1.2	mg/l	0.4	mg/l	0.48	mg/l
Ammonia contain	0.2	mg/l	7.6	mg/l	1.52	mg/l
Total chlorine consumption by oxidation					2.15	mg/l

Chlorine dosing flow rate	750	g/h
Well water flow rate	288	m3/h
Dosing rate by calculation	2.6	mg/l

Calculated difference between dosed chlorine and chlorine to be oxidised	0.5	mg/l

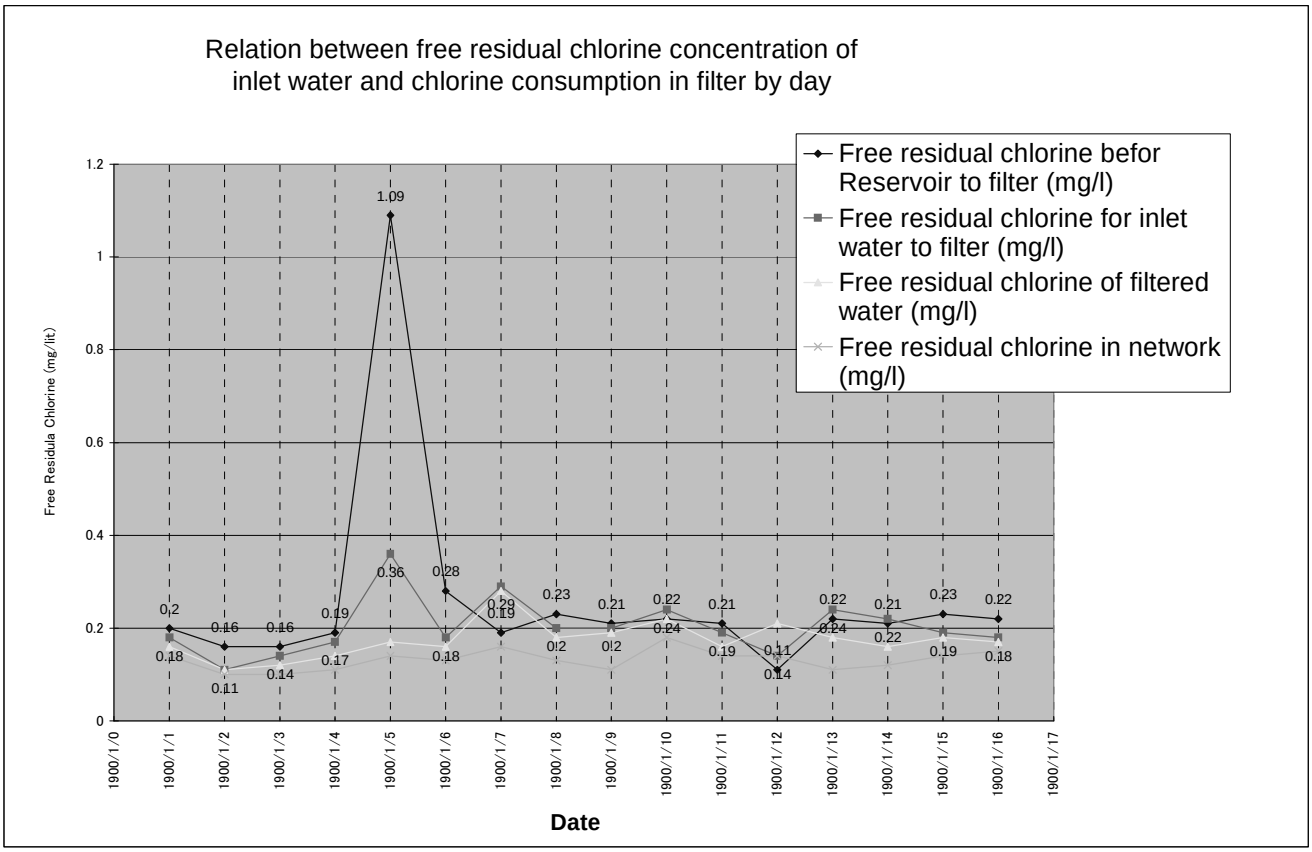
Measured total residual chlorine concentration of treated water	0.8	mg/l

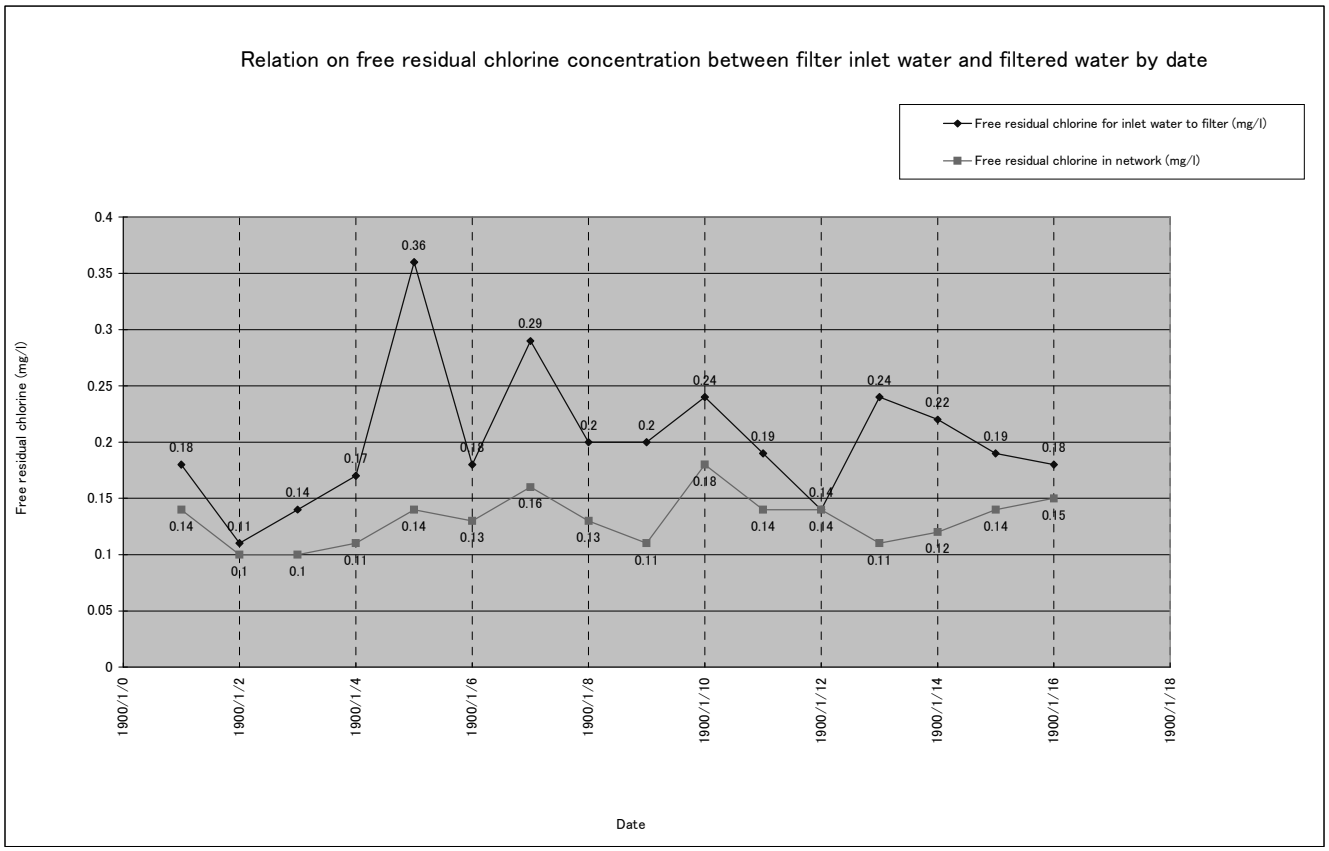
Chorine , Raw Water and Treated Water Production from Oct., to Nov.,

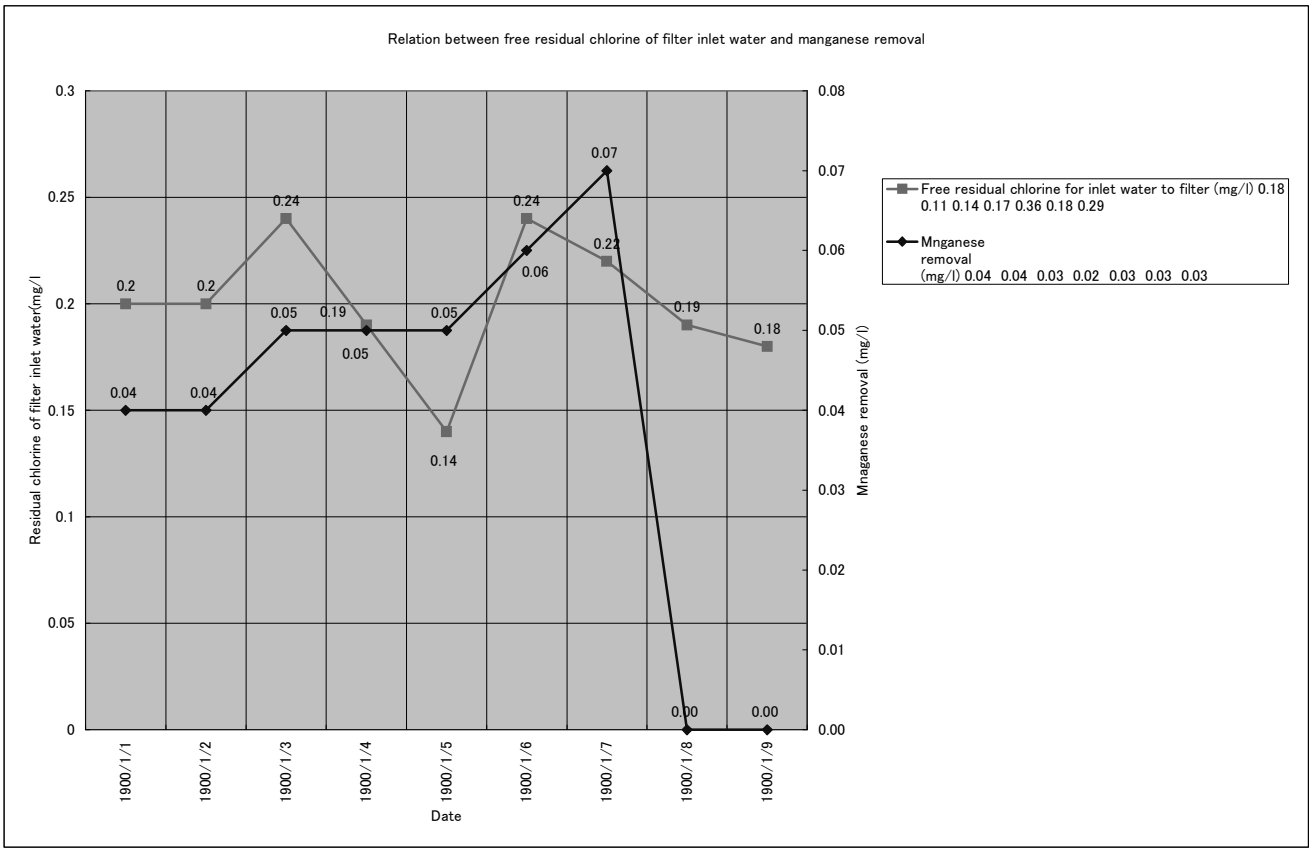
Date	Well Water Quantity (lit/sec.)	Treated Water Quantity (lit/sec.)	chlorine Dosing Quantity (kg/hr.)	chlorine Dosing rate (mg/l)	Free residual chlorine befor Reservoir to filter (mg/l)	Free residual chlorine for inlet water to filter (mg/l)	Free residual chlorine of filtered water (mg/l)	Free residual chlorine in network (mg/l)	color of water	Iron in well water	Iron befor filter	Iron in filtered water	(Mn) in well water	Mn befor filter	(Mn) in filtered water
22-11-2008	80	70	500	1.75	0.2	0.18	0.16	0.14	no color	0.36		0.09	0.4		0.36
23-11-2008	80	70	500	1.75	0.16	0.11	0.11	0.1	no color	0.38		0.12	0.34		0.3
24-11-2008	80	70	500	1.75	0.16	0.14	0.12	0.1	no color	0.38		0.1	0.36		0.33
25-11-2008	80	70	500	1.75	0.19	0.17	0.14	0.11	no color	0.26		0.08	0.38		0.36
26-11-2008	80	70	500	1.75	1.09	0.36	0.17	0.14	no color	0.36		0.1	0.34		0.31
27-11-2008	80	70	500	1.75	0.28	0.18	0.16	0.13	no color	0.28		0.09	0.38		0.35
29-11-2008	80	70	500	1.75	0.19	0.29	0.28	0.16	no color	0.36		0.08	0.38		0.35
2008/1/12	40	70	250	1.75	0.23	0.2	0.18	0.13	no color	0.36		0.09	0.36		0.32
2008/2/12	80	70	500	1.75	0.21	0.2	0.19	0.11	no color	0.41		0.1	0.35		0.31
2008/3/12	80	70	500	1.75	0.22	0.24	0.22	0.18	no color	0.35		0.08	0.4		0.35
2008/4/12	80	70	500	1.75	0.21	0.19	0.16	0.14	no color	0.36		0.08	0.4		0.35
2008/5/12	80	70	500	1.75	0.11	0.14	0.21	0.14	no color	0.28		0.19	0.38		0.33
2008/6/12	80	70	500	1.75	0.22	0.24	0.18	0.11	no color	0.35		0.1	0.38		0.32
2008/7/12	80	70	500	1.75	0.21	0.22	0.16	0.12	no color	0.28		0.1	0.07		
2008/8/12	80	70	500	1.75	0.23	0.19	0.18	0.14	no color	0.22		0.08			
2008/9/12	80	70	500	1.75	0.22	0.18	0.17	0.15	no color	0.19		0.07			
Average						0.20		0.13							

Date	Chlorine consumption in the filtering process (mg/l)	Actual Dosing Rate of Chlorine (mg/l)
22-11-2008	0.02	1736.11
23-11-2008	0	1736.11
24-11-2008	0.02	1736.11
25-11-2008	0.03	1736.11
26-11-2008	0.19	1736.11
27-11-2008	0.02	1736.11
29-11-2008	0.01	1736.11
2008/1/12	0.07	1736.11
2008/2/12	0.09	1736.11
2008/3/12	0.06	1736.11
2008/4/12	0.05	1736.11
2008/5/12	0	1736.11
2008/6/12	0.13	1736.11
	0.1	1736.11
	0.05	1736.11
	0.03	1736.11
Average		1736.11

Date	Mnganese removal (mg/l)
22-11-2008	0.04
23-11-2008	0.04
24-11-2008	0.03
25-11-2008	0.02
26-11-2008	0.03
27-11-2008	0.03
29-11-2008	0.03
2008/1/12	0.04
2008/2/12	0.04
2008/3/12	0.05
2008/4/12	0.05
2008/5/12	0.05
2008/6/12	0.06
2008/7/12	0.07
2008/8/12	0.00
2008/9/12	0.00


Relation between free residual chlorine concentration of inlet water and chlorine consumption in filter by day
Free residual chlorine befor Reservoir to filter (mg/l)
Free residual chlorine for inlet water to filter (mg/l)
Free residual chlorine of filtered water (mg/l)
Free residual chlorine in network (mg/l)
Free Residula Chlorine (mg/lit)
Date


Relation on free residual chlorine concentration between filter inlet water and filtered water by date
Free residual chlorine for inlet water to filter (mg/l)
Free residual chlorine in network (mg/l)
Free residual chlorine (mg/l)
Date


Relation between free residual chlorine of filter inlet water and manganese removal
Residual chlorine of filter inlet water(mg/l
Mnaganese removal (mg/l)
Date
Free residual chlorine for inlet water to filter (mg/l) 0.18 0.11 0.14 0.17 0.36 0.18 0.29
Mnganese removal (mg/l) 0.04 0.04 0.03 0.02 0.03 0.03 0.03
0.3
0.25
0.2
0.15
0.1
0.05
0
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
0.2
0.2
0.24
0.19
0.14
0.24
0.22
0.19
0.18
0.04
0.04
0.05
0.05
0.05
0.06
0.07
0.00
0.00
1900/1/1
1900/1/2
1900/1/3
1900/1/4
1900/1/5
1900/1/6
1900/1/7
1900/1/8
1900/1/9

3.10 Operation and Maintenance Plan for WTPs (Action S8)

O&M Plan

For

Water Treatment Plant

(The first step version)

SHAPWACO

H/Q Team and MF Team of Abbssa Water Treatment Plant
JICA Expert team

February-2009

5 – Staffing and Training (first step version)

- Organization Chart and Staff Allocation
  - ✧ Task Classification
  - ✧ Job Descriptions
- Training
  - ✧ SOP training
  - ✧ PC training

Note: SOP documents including Water Quality Control Program prepared in the Project will be referred to Chapters 2, 3 and 4.
"First step version" means collection of available information and compilation for improvement in the next O&M plan.

This O&P plan is the document as the first step version and the above all contents are not included in this plan. The all contents for O&M plan should be prepared in 2009. The prepared plan will be utilized for O&M activities at pleasure and documents for the content should be revised and added as needed.

Preface

O&P Plan should be developed by public water supplier to provide a written source of material that can be easily referred to guideline in operating water supply system.

O&M Plan will be a valuable reference tool for the operating personnel because standard operating procedures for the system and guidelines for start-up and emergency situation will beat their fingertips. The O&M Plan will also provide a ready reference for all equipment data which is necessary for performing normal maintenance and for ordering replacement parts and supplies. It will be an organized system for keeping records of the operation of the system. These records are useful for monthly and annual reports, as supporting documentation of proper operation , and to support the needs for replacement or upgrading of treatment facilities.

In SHAPWACO, SOPs for water supply facilities have been prepared for selected model facilities and the SOPs are applying to major activities in the water treatment process for the model facilities
Descriptions about facility component, operation criteria, operation procedures and so are included in SOPs. However, overall plan of O&M activities for the water supply facility are not included in SOPs. The O&M Plan should be necessary to compensate the starved description area in SOPs about planned activities and schedule of activities and so on.
SOPs and O&M Plan is a couple of the essential documents for water supply staffs.

O&M Plan contents were discussed by H/Q team and MF team of Abbassa WTP and proposed the contents as following.

"Operation & Maintenance Plan Contents for Abbasa WTP"

1 – Description of the Facility

- Overview
- Regulations
- **O&M Targets of the Facility**
- Equipment List

2 – Start-up and Normal Operating Procedures,
Records and Reporting, and Quality Control

3 – Emergency Plan

4 – Planned Maintenance Program (first step version)

- Long term (Five-year) Plan
- Annual Maintenance Plan
- Equipment Data Base
  - ✧ Basic Equipment List
  - ✧ Individual Equipment List with a numbering system
  - ✧ Equipment Record Cards

Ⅰ. Operation Plan

Ministry of Health
Central department for Environmental Affairs

Date: 21/10/2007

Decree Number 458 for the year 2007 by Ministry of health

1. Criteria & specifications for potable water

Limits for the criteria and specifications of the potable and domestic water

1-Natural Parameters:

Parameter	Maximum allowable limit
Color	Nil (nonexistent)
Taste	Acceptable
Odor	Nil (nonexistent)
Turbidity	1 unit (NTU)
PH-value	6.5-8.5

2-Inorganic materials which affect the taste and the domestic uses:

Parameter	Maximum allowable limit (mg/lit)
Total Dissolved Solids at 120 C° (TDS)	1000
Total hardness as CaCo	500
Calcium hardness as CaCo3	350
Magnesium hardness	150
Sulfates SO4	250
Chlorides Cl.	250
Iron (Fe)	0.3 mg/l
Manganese (MN)	0.4 mg/l
Copper (Cu)	2.0
Zinc (Zn)	3.0
Sodium (Na)	200
Aluminum (Al)	0.2

3- Chemical substances which affect on general health:
a) Inorganic materials

Parameter	Maximum allowable limit (mg/lit.)
Lead (Pb)	0.01
Mercury (Hg)	0.001
Arsenic (As)	0.01
Cyanide (Cn)	0.05
Cadmium (Cd)	0.003
Selenium (Se)	0.01
Chromium (Cr)	0.05
Ammonia as NH3	0.5
Nitrates as NO3	45
Nitrites as NO2	0.2
Fluorides F	0.8
Antimony Sb	0.02
Barium Ba	0.7
Boron B	0.5
Nickel Ni	0.02
Molybdenum Mo	0.07

b) Organic materials

Parameter	Maximum allowable limit(mg/lit)
Alchlor	0.02
Aldicarb	0.01
Dialdrin/Aldrin	0.00003
Atrazinc	0.002
Bentazon	0.03
Carbofuran	0.007
Chlordan	0.0002
Chlprtoruion	0.03
D.D.T	0.001
1,2 Dibromo 3chloropropance(DBCP)	0.001
2,4 Dichlorophenoxyyacetic acid (2,4 D)	0.03
1,2 Dichloropiopanc (1,2-DCP)	0.02
Hexachlorobenzene Isoproturon lindane	0.001
MCPA (Methychlorophenoxyacetic acid)	0.002
Methoxchlor	0.02
Metolachlor	0.01
Molinate	0.006
Pendimethalin	0.02
Pentachlorophenol	0.009
Permethrin	0.02
Propanil	0.02
Smazine	0.002

Trifluralin	0.02
4,2 D B	0.09
2,4 Dichloroprop	0.01
Fenoprop	0.009
Mecoprop	0.01
2,4,5, T	0.009

Other organic materials:

Tributalyltin Oxide	0.002
Phenol	0.002
Monochloramine	0.3
Di and Trichloramine	0.005
Bromate	0.01
Chlorate	0.7
2,4,6 Trichlorophenol	0.2
Trihalomethanses	0.1
Dichloroacetate	0.05
Trichloroacetate	0.1
Trichloroacetaldehyde	0.01

4- Microbiological Criteria:

a- Total bacteria count

By the Poured plate method
(1) At37^{o} for 24 hours not exceeding 50cell/cm^{3}
(2) A 22^{o} for 48 hours not exceeding 50cell/cm^{3}

b- Pollutants:

1- Total coliform
95 % from the samples checked during the year must be free of any coliform bacteria in 100cm^{3} of the sample.
The sample must not contain more than 3 cell/100cm^{3} conditioned that this case has to be repeated in two consequent samples from the same source.
2- Fecal coliform
All samples must not contain any fecal coliform
3-Fecal Streptococci
All samples must not contain any fecal Streptococci

c- Biological check:

During the checking the water microscopically it must not contain Protozoa, all kinds of worms causing diseases.
Microsetin should not be more than 1 microgram/L. This analysis will be applied in case that green algae appears.
.

5- Radiation substances:
Derivatives from Alfa type (A) 0.1 Bicocurri /l
Derivatives from Beta type (B) 1.0 Bicocurri /l

Health of Ministry
Protective affairs undersecretary

Criteria and specifications for the potable and domestic use water which admitted by high water committee in 26/2/1995

1-Natural Parameters:

Parameter	Maximum allowable limit
Color	20-30 as a maximum limit using platinum cobalt
Taste	Accepted
Odor	Nonexistence
Turbidity	5 NTU for surface water 10 NTU for ground water
PH-value	6.5-9.2

2-Inorganic materials which affect the taste and the domestic uses:

Parameter	Maximum allowable limit
Dissolved salts at 120m	1200mg/l
Iron (Fe)	0.3 mg/l for surface water 1.0 mg/l for ground water
Manganese (MN)	0.1 mg/l for surface water 0.5 mg/l for ground water
Copper (Cu)	1.0 mg/l
Zinc (Zn)	5.0 mg/l
Total hardness as CaCo	500mg/l
Calcium (Ca)	200mg/l
Magnesium (Mg)	150mg/l
Sulphates (So4)	400mg/l
Chlorides (Cl)	500mg/l
Sodium (Na)	200mg/l
Aluminum (Al)	0.2mg/l
Calcium ions balance	±0.1

3- Chemical substances which affect on general health:
a) Inorganic materials

Parameter	Maximum allowable limit
Lead (Pb)	0.05mg/l
Arsenic (As)	0.05mg/l
Cyanide (Cn)	0.05mg/l
Cadmium (Cd)	0.005mg/l
Selenium (So)	0.01mg/l
Mercury (Hg)	0.001mg/l
Chromium (Cr)	0.05mg/l
Nitrates	10mg/l
Nitrites	0.005mg/l
Fluorides	0.8mg/l

b) Organic materials
1- Pesticides

Parameter	Maximum allowable limit(micro gram/l)
Alchlor	20
Aldicarb	10
Dialdrin/Aldrin	0.03
Atrazinc	2

Bentazon	30
Carbofuran	5
Chlordanc	0.2
Chlprtofuion	30
D.D.T	2
1.2 Dibromo chloropropance	1
4.2 D	30
1.2 Dichloropiopanc	20
Hexachlorobenzene Isoproturon lindane	20
MCPA (chlorophenoxy)	1
Methoxchlor	9
Metolachlor	2
Molinate	2
Pendimethalin	20
Pentachlorophenol	10
Permethrin	6
Propanil	20
smazine	9
Trifluralin	20

2- Chlorophenoxy herbicides other than 4.2 D and MCPA

4.2 D B	90
2.4 Dichloroprop	100
Fenoprop	9
Mecoprop	10
2,4,5, T	9

3- Other organic materials:

Tributalyltin Oxide	2
Phenol	2

Disinfectants and disinfectants by product

Monochloramine	3
Diand Trichloramine	5
Bromate	25
Chlorite	200
Triglorophonal	200
Trihalomethanses	100

Chlorinated Acctic acids

Dichloro acctic acid	50
Trichloro acctic acid	100
Trichloro acctadhyde	10

Halogenated acetonitriles

Dichloro acctonitrile	90
Dibromo acctonitrile	100
Trichloro acctonitrile	1
Cyanogen Chloride	70

Chlorinated Alkanes

Carbon tetrachloride	2
Dichloromethane	20
1,2 Dichloroethane	30
1,1,1 trichloroethane	200

Chlorinated Ethanes

Phenyl chloride	5
1,1 Dichloroethane	30
1,2 Dichloroethane	50
TriChloroethane	70
Tetrachloroethane	40
Total Hydrocarbons as Toluene	100
Benzene	10
Benzopyrine	0.7

Chlorinated Benzenes

Monochlorobenzene	300
1.2 Dichlorobenzene	1000
4.1 Dichlorobenzene	300
Trichlorobenzene	20
Di (Ethylhexyl) adipate	80
Di (Ethylhexyl) phthalate	8
Acrylimide	0.5
Hyperchlorohydrane	0.4
Hexachlorobutadiene	0.6
Edetic acid (EDTA)	200
Nitrilotriacetie	200

4- Microbiological Criteria:
a- Total bacteria count

By the Poured plate method
(1) at 37° for 24 hours not exceeding 50cell/cm^3
(2) at 22° for 48 hours not exceeding 50cell/cm^3

b- Pollution evidences:

1- Total coliform
95 % from the samples checked during the year must be unoccupied by any coliform bacteria in 100cm^3 from the sample.
The sample must not contain more than 3 cell/100cm^3 conditioned that this case has to be repeated in two consequent samples from the same source.
2- Fecal coliform
All samples must not contain any fecal coliform
3-Fecal Streptococci
All samples must not contain any fecal Streptococci

c- Biological check:

During the checking the water microscopically it must not contain Protozoa ,all kinds of worms causing diseases and bluegreen algae.

5- Radiation substances:
Derivatives from Alfa type (A) 0.1 microcurri /l
Derivatives from Beta type (B) 1.0 microcurri /l

2. Equipment List

List of facility inventory Abbassa WTP

name of equipment		name of facility	Nos.	year of constructed	additional contruction	maintainance record: repair	repair	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1 Intake raw water basin	1-1	Intake raw water basin	2	1957~2004						local~German	
	1-2	screen	8	1957~2004						local	
	1-3	Crane	1	2004						Tcheek	
		number of lines for old intake	2								1000mm diameter
	1-4	number of lines for new intake	3								600mm diameter
2 Raw water reservour	2-1	Raw water reservour	2	1957~2004						local~German	
	2-2	Screen	6	2000~2004						local~German	
	2-3	Crane	1	2004						local	
3 Raw water pump	3-1	Raw water storage basin		1957~1994~2004						local	
	3-2	Raw water pump -type1									
		motor	4	1959						German	
		pump	4	1959						German	
		pressure guage									
	3-3	Raw water pump -type2									
		motor	5	1994						Tcheek	
		pump	5	1994						Tcheek	
		pressure guage									
	3-4	pipings & valves	12	1957~1994		repair		replaced		German+Tcheek	
4 Receiving well	4-1	Receiving well	2	1994						local	
	4-2	Flush mixer	4	1994						local	
		drive unit	4	1994						local	
		common base	4	1994						local	
		shaft & paddle	4	1994						local	
	4-3	Raw water flowmeter									
5 Flocculation basin	5-1	Flocculation basin	7	1959~1994						local	
	5-2	flocculator	7	1959~1994						local	
		drive unit	22	1959~1994						local	
		common base	28	1959~1994						local	
		shaft & paddle	28	1959~1994						local	
6 Sedimentasion basin	6-1	Sedimentasion basin	7	1959~1994						local	
	6-2	sludge collector	7	1959~1994						local	
		drive unit	7	1959~1994						German	
		common bases	7	1959~1994						German	
		shaft	7	1959~1994						German	
		collector blade unit	14	1959~1994						German	
7 Sludge drainage	7-1	drainage pump									
		motor	6	1959~1994						German	
		pump	6	1959~1994						German	
		pressure guage	0								
	7-2	pipings & valves	15	1959~1974						German	
8 Rapid sand filter	*8-1	rapid sand filter basin	28	1994							
*Marked items should be described on each filter.	*8-2	composition of filter layer	4						in intervals	local	the depth for the filter medium is 160cm(15cm sand and 45 cm gravel)
		gravel 1	1						in intervals	local	32~64mm3 gravel depth 20cm
		gravel 2	1						in intervals	local	8~16mm3 gravel depth 20cm
		gravel 3	1						in intervals	local	2~4mm3 gravel depth 6cm
		sand 1	1						in intervals	local	0.6~1.5mm3 gravel depth 1.15m

name of equipment		name of facility	Nos.	year of constructed	additional contruction	maintainance record: repair	repair	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	*8-3	operation desk	12,16	1959~1994						German	
	8-4	type of underdrain									
	8-5	backwash pump	3	1994						German	
		motor	3	1994						German	
		pump	3	1994						German	
		pressure guage	0								
	8-6	air blower for air wash	2+2	1959~1994						German	
		motor	2+2	1959~1994						German	
		pump	2+2	1959~1994						German	
		air storage tank	1	1994						German	
	*8-7	pipings & valves	168	1959~1994						local	
9 clear water reservour	9-1	clear water reservour	6	1959~1994						local	
	9-2	pipings & valves	4	1959~1994						local	
	9-3	other auxiliary	0								
10 Alum dosing facility	10-1	alum storage yard	1							local	
	10-2	alum solution tank	2	1994						local	
	10-3	liquid alum receiver tank	3	1959						local	
	10-4	agitator of solution tank	2	1959						local	
	10-5	alum dosing pump type1	0								
	10-6	alum dosing pump type2	0								
	10-7	Level guage for solution tank	4	1959						German	
	10-8	pressure guage	0								
	10-9	backpressure valve	2	1959						German	
	10-10	relief valve	0								
	10-11	strainer	0								
	10-12	pipings & valves	6	1959						German	
11 chlorination facility	11-1	cylinder storage base	1	1994						local	
	11-2	weighing scale for chlorine gas									
	11-3	leakage detector	1	1994						local	
	11-4	cylinder changeover devise	1	1994						local	
	11-5	pressure guage for chlorine gas	2	1994						local	
	11-6	chlorine gas filter	1	1994						Tcheek	
	11-7	Pre-chlorinator	2	1994						Tcheek	
	11-8	Intermediate chlorinator	0								
	11-9	post chlorinator	2	1959~1994						Tcheek	
	11-10	injector unit for pre.chlorinator	1	1994						Tcheek	
	11-11	injector unit for int. chlorinator									
	11-12	injector unit for post chlorinator	2	1959~1994						Tcheek	
	11-13	pipings & valves	1	1959~1994						local	
	11-14	water booster pump for chlorination									
		motor	4	1994						Tcheek	
		pump	4	1994						Tcheek	
		pressure guage	1	1994						Tcheek	
		pipings & valves	8	1994						Tcheek	
	11-15	chlorine gas neutralization system	1	1994						German	
		1) caustic soda solution pump	2	1994						German	
		motor	2	1994						German	

List of facility inventory　　Zagazig WTP

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1	Intake raw water basin	1-1	Intake raw water basin	1	1994					in intervals	local	three local manual valves
		1-2	screen	3	2000				do		local	
		1-3	Crane	0								
		1-4	number of lines for old intake	1								600mm diameter
		1-5	number of lines for new intake	3								500mm diameter
2	Raw water reservour	2-1	Raw water reservour	1								
		2-2	Screen	0								
		2-3	Crane	0								
3	Raw water pump	3-1	Raw water storage basin	1	1994						local	
		3-2	Raw water pump -type1									
			motor	3	1994		periodically maintenance				tcheek	38 kilowatt
			pump	3	1994		periodically maintenance				tcheek	
			pressure guage	3	1994						Roman	
		3-3	Raw water pump -type2									
			motor	2	1994		periodically maintenance				tcheek	21 kilowatt
			pump	2	1994		periodically maintenance				tcheek	
			pressure guage	10	1994							
		3-4	pipings & valves	5	1994							
4	Receiving well	4-1	Receiving well	1	1994							
		4-2	Flush mixer	1	1994							
			drive unit	1	1994						Italy	
			common base	1	1994						Italy	
			shaft & paddle	1	1994		periodically maintenance		do		Italy	
		4-3	Raw water flowmeter	1	2005							
5	Flocculation basin	5-1	Flocculation basin	2	1994							
		5-2	flocculator	2	1994						Italy	
			drive unit	2	1994		periodically maintenance				Italy	
			common base	2	1994						Italy	
			shaft & paddle	2	1994						Italy	
6	Sedimentasion basin	6-1	Sedimentasion basin	2	1995					in intervals	local	
		6-2	sludge collector	2	1995					in intervals	local	
			drive unit	2	1995					in intervals	Italy	
			common base	0							Italy	
			bridge	2	1995					in intervals	Italy	
			cllector blade unit	2	2000						Italy	
7	Sludge drainage	7-1	drainage pump	2	2000						France	
			motor	2	2000						France	110 kilowatt
			pump	2	2000						France	
			pressure guage	2	2000						France	

name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		pump	2	1994						German	
		attched parts	0								
		pipings & valves	4	1994						local	
chlorination facility	2)	exhaust fan									
		motor	12	1994						Tcheek	
		fan	12	1994						Tcheek	
		attched parts	0								
		pipings & valves	0								
	3)	caustic soda solution tank									
		coastic soda solution									
		solution tank	1	1994						Tcheek	
	4)	reaction & absorption tower	1	1959-1994							
drainage facility	12-1	drainage basin									
	1)	drainage basin									
	2)	drainage pump									
		motor									
		pump									
	3)	pipings & valves									
	12-2	sludge drainage basin									
	1)	sludge drainage basin									
	2)	sludge thickner									
		drive unit									
		common base									
		bridge									
		cllector blade unit									
	3)	drainage pump									
		motor									
		pump									
		pipings & valves									
Treated water pump	13-1	pump -type1									
		motor	4	1959						German	
		pump	4	1959						German	
		pressure guage									
	13-2	pump -type2									
		motor	2	1994						Tcheek	
		pump	2	1994						Tcheek	
		pressure guage									
		out going transmission line	4								800mm cast iron main to Abu Hamad-900mm steel coated main to Zagazig-600mm asbestos main to Faqus-600mm asbestosmain to Bilbais city
Stand-by generator	14-1	generator	1	1994		repaired				Tcheek	to prevent ground water leakage and prevent mix the oil with water
	14-2	oil tank	1	1994		repaired				Tcheek	
	14-3	battery	1	1994		repaired				Tcheek	
Electrical switch board	15-1	for Raw water pump	2	1959-1994						German+Tcheek	
	15-2	for Flush mixer	4	1994						Tcheek	
	15-3	for Flocculater	22	1959-1994						German+Tcheek	
	15-4	for Sludge collector	5	1959-1994						German+Tcheek	

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		7-2	pipings & valves	3	2000						local	
8	Rapid sand filter	*8-1	rapid sand filter basin	6	2000					in intervals	local	
	*Marked items should be described on each filter.	*8-2	composion of filter layer									
			sand 1	1	2000					in intervals	local	0.9mm-1.2mm
			sand 2	1	2000					in intervals	local	1.2mm-1.5mm
			sand 3	1	2000					in intervals	local	1.5mm-2.5mm
			gravel 1	1	2000					in intervals	local	2.5mm-3.5mm
			gravel 2	1	2000					in intervals	local	3.5mm-7mm
		*8-3	operation desk	6	2000					in intervals	local	
		8-4	type of underdrain							in intervals		gravity flow
		8-5	backwash pump									
			motor	2	2000						tcheek	125 kilowatt
			pump	2	2000						tcheek	
			pressure guage	2							Roman	
		8-6	air blower for air wash									
			motor	2	2000						France	90 kilowatt
			blower	2	2000						France	
			air storage tank	1	2000						local	
		*8-7	pipings & valves	3	2000						local	
9	clear water resorvour	9-1	clear water resorvour	2	1994						local	each the capacity is 7000m3
		9-2	pipings & valves	4	1994						local	
		9-3	other auxiliary	2	1994						Italy	2 sample pumps
10	Alum dosing facility	10-1	alum storage yard	1	1994						local	
		10-2	alum solution tank	0								
		10-3	liquid alum receiver tank	3	2000					monthly	local	
		10-4	agitator of solution tank	the liquid alum reciver & the agitator of solution is the same								
		10-5	alum dosing pump type1	3	1994						Italy	
		10-6	alum dosing pump type2	0								
		10-7	Level guage for solution tank	3	1994						local	
		10-8	pressure guage	3	2000						Italy	
		10-9	backpressure valve	4	2000						Italy	
		10-10	relief valve	1	2000				do		local	
		10-11	strainer	0								
		10-12	pipings & valves	8	2000						local	
11	chlorination facility	11-1	cylinder storage base	2	2000						local	
		11-2	copper tube for chlorine gas	8	2000				do		local	
		11-3	auxiliary valves	0								
		11-4	cylinder changeover devise	1	2000						local	
		11-5	pressure guage for chlorine gas	2	2000						Italy	
		11-6	chlorine gas filter	2	2000						Italy	
		11-7	Pre-chlorinator	2	2000						Italy	one of them is not working
		11-8	Intermediate chlorinator	0								
		11-9	post chlorinator	2	2000						Italy	one of them is not working
		11-10	injector unit for pre chlorinator	1	2000						Italy	
		11-11	injector unit for int. chlorinator	0								
		11-12	injector unit for post chlorinator	1	2000						Italy	
		11-13	pipings & valves	0								

name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	15-5	for Bachwash pump	3	1994						Tcheek	
	15-6	for Air wash pump	5	1959-1994						German+Tcheek	
	15-7	forAlum solution tank agitator	2	1959						German	
	15-8	for Alum solution dosing pump	4	1994						Tcheek	
	15-9	for chlorinator	0								
	15-10	for booster pump for chlorinator	0								
	15-11	for coasitc pump	2	1994						Tcheek	
	15-12	for exhaust fan	12	1994						Tcheek	
	15-13	for distribution pump	0								
	15-14	for treated water pump	0								
	15-15	for drainage pump	0								
	15-16	for sludge drainage pump	0								
	15-17	for sludge thickner	0								
	15-18	for Stand by generator	0								
	15-19	for Crane	6	1959-1994						Tcheek	
	15-20										
	15-21										
	15-22										
	15-23										
	15-24										
	15-25										
Transformer	16-1	transformer 1	2	1959						German	
	16-2	transformer 2	2	1994						Tcheek	
	16-3	transformer 3	2	1994						Tcheek	
Chemical laboratory	17-1	Chemical laboratory	1	1959							
	17-2										
	17-3										
Maintainance equipment	18-1	Moving trucks	2	1994				replaced		local	ABB1
	18-2	Workshop equipment	1	1957				replaced		England+local	Big Lathers & equipments
Safety equipment	19-1	Emergency device for cholorine gas									
	19-2										
	19-3										
	19-4										
	19-5										

List of facility inventory　　Kafr Saqr WTP

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1	Intake raw water basin	1-1	Intake raw water basin	1	1999						Arab contractor	
		1-2	screen	2								
		1-3	Crane	0								
		1-4	number of lines for intake	3							Arab contractors	
2	Raw water reservour	2-1	Raw water reservour	1	1999							
		2-2	Screen	0								
		2-3	Crane	0								
3	Raw water pump	3-1	Raw water storage basin								Arab contractors	
		3-2	Raw water pump -type1	4	1999						Sigma	
			motor	4	1999						ZSE MEZ	
			pump	4	1999						Sigma	
			pressure guage	4	1999							
		3-3	Raw water pump -type2	2	1999						Sigma	
			motor	2	1999						ZSE MEZ	
			pump	2	1999						Sigma	
			pressure guage	2	1999							
		3-4	pipings & valves	2*12	1999							
4	Receiving well	4-1	Receiving well	1	1999						Arab contractors	
		4-2	Flush mixer	6	1999						Sigma	
			drive unit	6	1999						Sigma	
			common base	6	1999						Sigma	
			shaft & paddle	2*6	1999						Sigma	
		4-3	Raw water flowmeter	1	1999						ZPA Trutnov	
5	Flocculation basin	5-1	Flocculation basin	6	1999						Arab contractors	
		5-2	flocculator	36	1999						Sigma	Hint:There are some cards to record maintance repairing
			drive unit	36	1999						Sigma	
			common base	36	1999						Sigma	
			shaft & paddle	2*36	1999						Sigma	
6	Sedimentasion basin	6-1	Sedimentasion basin	6	1999						Arab contractors	
		6-2	sludge collector	12	1999						ZPA Pecky	
			drive unit	12	1999						ZPA Pecky	
			common base	6	1999						ZPA Pecky	
			bridge	6	1999						ZPA Pecky	
			cllector blade unit	12	1999						ZPA Pecky	
7	Sludge drainage	7-1	drainage pump	2	1999							The pump is compacted with motor
			motor	0							FLYGT	
			pump	0								
			pressure guage	0								
		7-2	pipings & valves	2*2	1999							
8	Rapid sand filter *Marked items should be described on each filter.	*8-1	rapid sand filter basin	14	1999						Arab contractors	
		*8-2	composion of filter layer									
			gravel		1999							40 cm thickness
			sand		1999							115 cm thickness
		*8-3	operation desk	1								
		8-4	type of underdrain									Mblocks

ZAGAZIG WTP

name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	11-14	water booster pump for chlorination									
		motor	2	2000						Italy	3killowatt for pre & 1.5 for post chlorination
		pump	2	2000						Italy	
		pressure guage	2	2000						Italy	
		pipings & valves	0								
	11-15	clorine gas neutralization system									
	1)	coastic soda solution pump									
		motor	2	2000						Italy	4.5kilowatt
		pump	2	2000						Italy	
		attched parts	exist								
		pipings & valves	3	2000						local	
chlorination facility	2)	exhaust fan									
		motor	2	2000						Italy	1kilowatt
		fan	2	2000						Italy	
		attched parts	exist								
		pipings & valves	0								
	3)	caustic soda solution tank									
		coastic soda solution									
		solution tank	1	2000						local	
	4)	reaction & absorption tower	1	2000						local	
12 drainage facility	12-1	drainage basin									
	1)	drainage basin									
	2)	drainage pump									
		motor									
		pump									
	3)	pipings & valves									
	12-2	sludge drainage basin									
	1)	sludge drainage basin									
	2)	sludge thickner									
		drive unit									
		common base									
		bridge									
		cllector blade unit									
	3)	drainage pump									
		motor									
		pump									
		pipings & valves									
13 Treated water pump	13-1	pump -type1									
		motor	3	1994						tcheek	
		pump	3	1994						tcheek	
		pressure guage	6	2000						Roman	
	13-2	pump -type2									
		motor	2	1994						tcheek	
		pump	2	1994						tcheek	
		pressure guage	4	2000						Roman	

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		8-5	backwash pump	2	1999						Sigma	
			motor	2	1999						ZSE MEZ	
			pump	2	1999						Sigma	
			pressure guage	0								
		8-6	air blower for air wash	2	1999						Sigma	
			motor	2	1999							
			blower	2	1999							
			air storage tank	0								
		*8-7	pipings & valves	2+4								
9	clear water resorvour	9-1	clear water resorvour	1							Arab contractors	
		9-2	pipings & valves	2*4								
		9-3	other auxiliary									
10	Alum dosing facility	10-1	alum storage yard	1	1999							
		10-2	alum solution tank	3	1999							
		10-3	liquid alum receiver tank	0								
		10-4	agitator of solution tank	6	1999							
		10-5	alum dosing pump type1	2	1999						HAUKE	
		10-6	alum dosing pump type2	2	1999						HAUKE	
		10-7	Level guage for solution tank	1	1999						HAUKE	
		10-8	pressure guage	1	1999							
		10-9	backpressure valve									
		10-10	relief valve	1	1999							
		10-11	strainer	1	1999							
		10-12	pipings & valves									
11	chlorination facility	11-1	cylinder storage base	30	1999							
		11-2	lead tube for chlorine gas	2	1999							For one feeding side
		11-3	auxiliary valves									
		11-4	cylinder changeover devise	1	1999						WALLACE & TIERNAN	
		11-5	pressure guage for chlorine gas									
		11-6	chlorine gas filter	2	1999						WALLACE & TIERNAN	
		11-7	Pre-chlorinator	2	1999						WALLACE & TIERNAN	
		11-8	Intermediate chlorinator									
		11-9	post chlorinator	2	1999						WALLACE & TIERNAN	
		11-10	injector unit for pre chlorinator	2	1999						WALLACE & TIERNAN	
		11-11	injector unit for int. chlorinator									
		11-12	injector unit for post chlorinator	2	1999						WALLACE & TIERNAN	
		11-13	pipings & valves									
		11-14	water booster pump for chlorination	4	1999						Sigma	
			motor	4	1999						Sigma	
			pump	4	1999						Sigma	
			pressure guage									
			pipings & valves	2*8	1999							
		11-15	clorine gas neutralization system	1	1999						Sigma	
		1)	coastic soda solution pump	2	1999						Sigma	
			motor	2	1999							
			pump	2	1999							

ZAGAZIG WTP

name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		out going transmission line	2								400 & 800mm diameter
14 Stand-by generator	14-1	generator	1	2000						USA	1.6 megawatt
	14-2	oil tank	1	2000						USA	
	14-3	battery	4	2006				do		local	12 volt
15 Electrical switch board	15-1	for Raw water pump	1	1994						local	70 ampere American General selector key
	15-2	for Flush mixer	1	1994						local	50 ampere American General selector key
	15-3	for Flocculater	1	1994						local	12 ampere American General selector key
	15-4	for Sludge collector	1	1994						local	200 ampere American General selector key
	15-5	for Bachwash pump	1	1994						local	250 ampere American General selector key
	15-6	for Air wash pump	1	1994						local	200 ampere American General selector key
	15-7	forAlum solution tank agitator	1	1994						local	50 ampere American General selector key
	15-8	for Alum solution dosing pump	1	1994						local	18 ampere American General selector key
	15-9	for chlorinator	1	1994						local	12 ampere American General selector key
	15-10	for booster pump for chlorinator	1	1994						local	25 ampere American General selector key
	15-11	for coasitc pump	1	1994						local	25 ampere American General selector key
	15-12	for exhaust fan	1	1994						local	12 ampere American General selector key
	15-13	for distribution pump	1	1994						local	
	15-14	for treated water pump	1	1994						local	
	15-15	for drainage pump									
	15-16	for sludge drainage pump	1	1994						local	200 ampere
	15-17	for sludge thickner	0								
	15-18	for Stand by generator	1	1994						local	2000 ampere
	15-19	for Crane	1	1994						local	50 ampere
	15-20										
	15-21										
	15-22										
	15-23										
	15-24										
	15-25										
16 Transformer	16-1	Egyptian ALMACO	2	1994						Egypt	2000KVA
	16-2										
	16-3										
17 Chemical raboratory	17-1		1								
	17-2										
	17-3										
18 Maintainance equipment	18-1	Moving trucks									
	18-2	Workshop equipment	5								Lather,stripper,drill in a tree shape,drill,grinding wheel stone
19 Safety equipment	19-1	Emergency device for cholorine gas	4								
	19-2										
	19-3										
	19-4										
	19-5										

List of facility inventory　　New Faqus

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1	Intake raw water basin	1-1	Intake raw water basin	1	1995					in intrvals	local	3 manual local valves
		1-2	screen	12	1995					in intrvals	local	2 (blanco) not exist
		1-3	Crane	2	1995		not working		do not	in intrvals	local	
		1-4	Number of lines for the intake	2								600mm diameter
2	Raw water reservour	2-1	Raw water reservour	1	1995					in intrvals	local	1000m3 concrete
		2-2	Screen	0								
		2-3	Crane	0								
3	Raw water pump	3-1	Raw water storage basin	the raw water reservoir								
		3-2	Raw water pump -type1									
			motor	4	1990		periodically maintenance			in intrvals	Tcheek	
			pump	4	1990		periodically maintenance			in intrvals	Tcheek	
			pressure guage	8	1990		not working		not working	in intrvals	Tcheek	
		3-3	Raw water pump -type2	0								
			motor	0								
			pump	0								
			pressure guage	0								
		3-4	pipings & valves	9	1990		greasing			in intrvals	Tcheek	8 suction,thrust valves & 1000mm pipe
4	Receiving well	4-1	Receiving well	1	1995					do not	local	concrete
		4-2	Flush mixer	3	1990		gear box			in intrvals	Tcheek	
			drive unit	3	1990		gear box			in intrvals	Tcheek	
			common base	3	1995					in intrvals	local	
			shaft & paddle	3	1995					in intrvals	local	
		4-3	Raw water flowmeter	1	1990		not working			in intrvals	Tcheek	Fenchoury
5	Flocculation basin	5-1	Flocculation basin	3	1995					in intrvals	local	
		5-2	flocculator	3	1995					in intrvals	local	
			drive unit	24	1990				need to repla	in intrvals	Tcheek	need to change the paddles & repaint
			common base	24	1995					in intrvals	local	
			shaft & paddle	24	1995				need to repla	in intrvals	local	
6	Sedimentasion basin	6-1	Sedimentasion basin	3	1995					in intrvals	local	concrete
		6-2	sludge collector	3	1995					in intrvals	local	concrete type gravity flow
			drive unit	24	1990					in intrvals	Tcheek	18 for slow mixer,3 flush mixer & 3 brid
			common base	24	1995					in intrvals	local	
			bridge	3	1995					in intrvals	local	
			collector blade unit	3	1995					in intrvals	local	
7	Sludge drainage	7-1	drainage pump									
			motor	2	1990					in intrvals	swedish	
			pump	2	1990					in intrvals	swedish	
			pressure guage	2	1995					in intrvals	local	1.8 bar
		7-2	pipings & valves	10	1990					in intrvals	Tcheek	7 valves,suction & thrust lines
8	Rapid sand filter	*8-1	rapid sand filter basin	8	1995					in intrvals	local	supply sand with 1m depth
	*Marked items should	*8-2	composion of filter layer	4	1999					in intrvals	local	the depth for the filter meduim is 160cm(115cm sand and 45 cm gravel)
	be described on each		gravel 1	1	1999					in intrvals	local	32-64mm3 gravel,depth 20cm

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	filter.		gravel 2	1	1999					in intrvals	local	8-16mm3 gravel,depth 20cm
			gravel 3	1	1999					in intrvals	local	2-4mm3 gravel,depth 5cm
			sand 1	1	1999					in intrvals	local	0.6-1.5mm3 gravel,depth 1.15m
			sand 2	0								
			sand 3	0								
		*8-3	operation desk	8	1995						local	control air valves
		8-4	type of underdrain	by gravity flow								
		8-5	backwash pump									
			motor	2	1991						Tcheek	110 KW power
			pump	2	1991						Tcheek	415 l/sec flow rate
			pressure guage + suction	4	1995						local	1.8 bar suction,1.6 bar thrust
		8-6	air blower for air wash									
			motor	2	1991						German	755 KW power
			blower	2	1991						France	2700m3/hr flow rate
			air storage tank	1	1995						local	2m3 capacity,3 horse power with press
		*8-7	pipings & valves	8	1995						local	0.5" pipes,0.5" valves
9	clear water resorvour	9-1	clear water resorvour	2	1995						local	4000m3/750m3 capacity
		9-2	pipings & valves	5	1995						Tcheek	4 valves+1piping line 1200mm
		9-3	other auxiliary	0								
10	Alum dosing facility	10-1	alum storage yard	1	1995						local	concrete and far from the field
		10-2	alum solution tank	0								
		10-3	liquid alum receiver tank	3	1995					in intrvals	local	concrete
		10-4	agitator of solution tank	3	1995					in intrvals	local	concrete
		10-5	alum dosing pump type1	1	1995					in intrvals	Fenland	
		10-6	alum dosing pump type2	0	1995					in intrvals	Fenland	
		10-7	Level guage for solution tank	3	1995					in intrvals	Tcheek	
		10-8	pressure guage	2	1995					in intrvals	Tcheek	
		10-9	backpressure valve	2	1995					in intrvals	Tcheek	
		10-10	relief valve	2	1995					in intrvals	Tcheek	
		10-11	strainer	2	1995					in intrvals	Tcheek	
		10-12	pipings & valves	12	1995						Tcheek	3 valves1",3 valves2",3 pipes 50mm,1 pipe 100mm, 1pipe 40mm
11	chlorination facility	11-1	cylinder storage base	2	1995						Tcheek	need to be replaced
		11-2	copper tube for chlorine gas	4	2001						local	
		11-3	auxiliary valves	8	1995						German	exist in the cylinders room
		11-4	cylinder changeover devise	1	1995						German	
		11-5	pressure guage for chlorine gas	1	1995						German	
		11-6	chlorine gas filter	2	1991						German	
		11-7	Pre-chlorinator	2	1991						local	
		11-8	Intermediate chlorinator	0								
		11-9	post chlorinator	2	1991						local	
		11-10	injector unit for pre chlorinator	1	1991						local	
		11-11	injector unit for int. chlorinator	0								
		11-12	injector unit for post chlorinator	1	1991						local	
		11-13	pipings & valves	8	1991						local	4 valves4",4 valves1.5",pvc pipes 1.5" and 2"
		11-14	water booster pump for chlorination									
			clorine									start line 2" & end line 1.5"

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
			attched parts	2	1999							
			pipings & valves	2*4	1999							
	chlorination facility	2)	exhaust fan	4	1999						Czchoslovakia	2 stonewave fans & 2 low pressure fans
			motor	4	1999							
			fan	4	1999							
			attched parts									
			pipings & valves	2*4	1999							
		3)	caustic soda solution tank	1	1999						Arab contractors	
			coastic soda solution	25%	1999							
			solution tank	1	1999							
		4)	reaction & absorption tower									
12	drainage facility	12-1	drainage basin									
		1)	drainage basin									
		2)	drainage pump									
			motor									
			pump									
		3)	pipings & valves									
		12-2	sludge drainage basin									
		1)	sludge drainage basin									
		2)	sludge thickner									
			drive unit									
			common base									
			bridge									
			cllector blade unit									
		3)	drainage pump									
			motor									
			pump									
			pipings & valves									
13	Treated water pump	13-1	pump -type1	4	1999						Sigma	
			motor	4	1999						ZSE MEZ	
			pump	4	1999						Sigma	
			pressure guage	4	1999							
		13-2	pump -type2	2	1999							
			motor	2	1999							
			pump	2	1999							
			pressure guage	2	1999							
			out going transmission line	1								1000mmdiameter pre-stressed
14	Stand-by generator	14-1	generator	3	1999						Dorman	
		14-2	oil tank									
		14-3	battery	1	1999							
15	Electrical switch board	15-1	for Raw water pump	13	1999						MEMICO	for all raw water pumps
		15-2	for Flush mixer	10	1999						MEMICO	
		15-3	for Flocculater	10	1999						MEMICO	
		15-4	for Sludge collector	6	1999						MEMICO	
		15-5	for Bachwash pump	2	1999						MEMICO	
		15-6	for Air wash pump	1	1999						MEMICO	
		15-7	forAlum solution tank agitator	2	1999						MEMICO	
		15-8	for Alum solution dosing pump	2								

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		15-9	for chlorinator	2								
		15-10	for booster pump for chlorinator	1	1999						MEMICO	
		15-11	for coasitc pump	2	1999						MEMICO	
		15-12	for exhaust fan	2	1999						MEMICO	
		15-13	for distribution pump	0								
		15-14	for treated water pump	13	1999						MEMICO	for all treated water pumps
		15-15	for drainage pump	0								
		15-16	for sludge drainage pump	6	1999						MEMICO	for two pumps
		15-17	for sludge thickner	0								
		15-18	for Stand by generator	5	1999						MEMICO	for three generators
		15-19	for Crane	2	1999						MEMICO	for one crane only
		15-20										
		15-21										
		15-22										
		15-23										
		15-24										
		15-25										
16	Transformer	16-1	2.5 Megawatt-11/3.3KV	2	1999						MEMICO	
		16-2	2 megawatt-11/0.4KV	2	1999						MEMICO	
		16-3										
17	Chemical raboratory	17-1		1	1999							
		17-2										
		17-3										
18	Maintainance equipment	18-1	Moving trucks	0								
		18-2	Workshop equipment	4	1999						MEMICO	
19	Safety equipment	19-1	Emergency device for cholorine gas	1	1999						MEMICO	
		19-2										
		19-3										
		19-4										
		19-5										

List of facility inventory　　Old Faqus WTP

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1	Intake raw water basin	1-1	Intake raw water basin	1	1989			winter		weekly	Egypt	
		1-2	screen	1	1989	wire net					Egypt	wire net
		1-3	Crane	0								Don't exist
		1-4	number of lines for new intake	1								300mm diameter and far from the station 6 km
2	Raw water reservour	2-1	Raw water reservour	0								
		2-2	Screen	0								
		2-3	Crane	0								
3	Raw water pump	3-1	Raw water storage basin	1	1932			winter		weekly	local	
		3-2	Raw water pump -type1								Egypt	120l/sec
			motor	2							Russia	75hp – 380V – 3phases
			pump	1				winter			Egypt	Wayler Fred 60l/sec
			pressure guage	0								Don't exist
		3-3	Raw water pump -type2									120l/sec
			motor	1							Russia	75hp – 380V – 3phases
			pump	1							Egypt	Wayler Fred 60l/sec
			pressure guage	0								Don't exist
		3-4	pipings & valves	4	1995						local	suction & thrust
4	Receiving well	4-1	Receiving well	0								Don't exist
		4-2	Flush mixer	0								
			drive unit	0								
			common base	0								
			shaft & paddle	0								
		4-3	Raw water flowmeter	0								Don't exist
5	Flocculation basin	5-1	Flocculation basin	1	1977							
		5-2	flocculator	1	1977		fan	do		monthly	Egypt	
			drive unit	0								
			common base	0								
			shaft & paddle	0								
6	Sedimentasion basin	6-1	Sedimentasion basin	2	1932			winter		weekly	local	
		6-2	sludge collector	0								Don't exist
			drive unit	0								Don't exist
			common base	0								Don't exist
			bridge	0								Don't exist
			cllector blade unit	0								Don't exist
7	Sludge drainage	7-1	drainage pump	0								Don't exist
			motor	0								Don't exist
			pump	0								Don't exist
			pressure guage	0								Don't exist
		7-2	pipings & valves	2	1932/1977	maintance						for sludge drainage
8	Rapid sand filter *Marked items should be described on each filter.	*8-1	rapid sand filter basin	3	1932			winter		Daily	England+Egyp	one of them from1977
		*8-2	composion of filter layer									
			gravel 1									5cm size
			gravel 2									3cm size
			gravel 3									1cm size
			sand									white sand 0.2mm
		*8-3	operation desk	0								Don't exist

name of equipment	name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	motor	4	1991						Tcheek	
	pump	4	1991						Tcheek	2 pumps for pre & 2pumps for post
	pressure guage	4	1991						German	4 pressur gauges for the pre rooms & for the post rooms is not working
	pipings & valves	8	1991						local	
	11-15 clorine gas neutralization system									
	1) coastic soda solution									
	motor	2	1991						Tcheek	the system is not working
	pump	2	1991						Tcheek	the system is not working
	attched parts	0								
	pipings & valves	4	1991						local	
chlorination facility	2) exhaust fan									
	motor	2	1991						Tcheek	
	fan	2	1991						Tcheek	
	attched parts	0								
	pipings & valves	0								
	3) caustic soda solution tank									
	coastic soda solution									as the tank need 4.5 ton caustic soda a
	solution tank	1	1995					in intervals	local	concrete
	4) reaction & absorption tower	1	1995						local	
drainage facility	12-1 drainage basin									This process is not exist
	1) drainage basin									
	2) drainage pump									
	motor									
	pump									
	3) pipings & valves									
	12-2 sludge drainage basin									
	1) sludge drainage basin									
	2) sludge thickner									
	drive unit									
	common base									
	bridge									
	collector blade unit									
	3) drainage pump									
	motor									
	pump									
	pipings & valves									
Treated water pump	13-1 pump -type1									
	motor	4	1991						tchekoslovacia	
	pump	4	1991						tchekoslovacia	
	pressure guage	8	1995		not working				local	
	13-2 pump -type2									
	motor	0								
	pump	0								
	pressure guage	0								
	13-3 Outgoing transmission line	1								1200mm cast iron
Stand-by generator	14-1 generator	3	1990		not working				England	0.5MW power for each
	14-2 oil tank	3	1990		not working				England	120 l for each

name of equipment	name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	8-4 type of underdrain	0								
	8-5 backwash pump	0								Don't exist
	motor	0								Don't exist
	pump	0								Don't exist
	pressure guage	0								Don't exist
	8-6 air blower for air wash	0								Don't exist
	motor	0								Don't exist
	blower	0								Don't exist
	air storage tank	0								Don't exist
	*8-7 pipings & valves	12	1932/1977						England+Egyp	6 of them in 1932 & the rest in 1977
clear water resorvour	9-1 clear water resorvour	1	1932					in winter	local	
	9-2 pipings & valves	0								
	9-3 other auxiliary	0								
Alum dosing facility	10-1 alum storage yard	1	2004					weekly	local	
	10-2 alum solution tank	0								Don't exist
	10-3 liquid alum receiver tank	2	1932					weekly	local	cylinder wooden barrels 2m3 capacity
	10-4 agitator of solution tank	0								Don't exist
	10-5 alum dosing pump type1	0								Don't exist
	10-6 alum dosing pump type2	0								Don't exist
	10-7 Level guage for solution tank	0								Don't exist
	10-8 pressure guage	0								Don't exist
	10-9 backpressure valve	0								Don't exist
	10-10 relief valve	0								Don't exist
	10-11 strainer	0								Don't exist
	10-12 pipings & valves	2	2000						local	Exist
chlorination facility	11-1 cylinder storage base	0								Don't exist
	11-2 lead tube for chlorine gas	0								Don't exist
	11-3 auxiliary valves	0								Don't exist
	11-4 cylinder changeover devise	0								Don't exist
	11-5 pressure guage for chlorine gas	0								Don't exist
	11-6 chlorine gas filter	0								Don't exist
	11-7 Pre-chlorinator	1	2000							
	11-8 Intermediate chlorinator	0								Don't exist
	11-9 post chlorinator	1	2000							
	11-10 injector unit for pre chlorinator	1	1932							Don't exist
	11-11 injector unit for int. chlorinator	0								Don't exist
	11-12 injector unit for post chlorinator	1	1932							Don't exist
	11-13 pipings & valves	2	2000							Exist
	11-14 water booster pump for chlorination	0								Don't exist
	motor	0								Don't exist
	pump	0								Don't exist
	pressure guage	0								Don't exist
	pipings & valves	0								Don't exist
	11-15 clorine gas neutralization system	0								Don't exist
	1) coastic soda solution pump	0								Don't exist
	motor	0								Don't exist

name of equipment	name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	14-3 battery	6	1990						England	expired (12 volt,750A)
Electrical switch board	15-1 for Raw water pump	4	1991	RM-1-1				Cleaning in intrvals	local	local by Memico company for electrical & mechanical industries
	15-2 for Flush mixer	3	1992	RM2				in intrvals	local	0.4 KV
	15-3 for Flocculater	18	1993	RM2				in intrvals	local	0.4 KV
	15-4 for Sludge collector	12	1991					in intrvals		gravity drainage (butterfly valves)
	15-5 for Bachwash pump	2	1992	RM3				in intrvals	local	0.4 KV
	15-6 for Air wash pump	2	1991	RM3				in intrvals	local	0.4 KV
	15-7 forAlum solution tank agitator	6	1992	RM4				in intrvals	local	0.4 KV
	15-8 for Alum solution dosing pump	2	1993	RM4				in intrvals	local	0.4 KV
	15-9 for chlorinator	2	1990	RM3				in intrvals	local	Doublex device
	15-10 for booster pump for chlorinator	4	1992	RM1				in intrvals	local	2 start pumps & 2 end pumps
	15-11 for coasitc pump	2	1992	RM4				in intrvals	local	0.4 KV
	15-12 for exhaust fan	4	1993	RM4				in intrvals	local	2 for the tower & 2 for the chlorine store
	15-13 for distribution pump	4	1992	RM4				in intrvals	local	0.4 KV
	15-14 for treated water pump	4	1992	RM1				in intrvals	local	3.3 KV
	15-15 for drainage pump	4	1993	RM1				in intrvals	local	submerged pumps from these pumps
	15-16 for sludge drainage pump	2	1992	RM5				in intrvals	local	0.4 KV
	15-17 for sludge thickner	0						in intrvals	England	1500KVA,1.5MW
	15-18 for Stand by generator	3	1993	R1				in intrvals	Italy	RM6 for workshop
	15-19 for Crane	5	1992	RM1,RM3,RM 6,RM4,RM2						
	15-20									
	15-21									
	15-22									
	15-23									
	15-24									
	15-25									
Transformer	16-1 2.5 Megawatt transformers	2	1995	maintance under Public electric company						
	16-2 2 Megawatt transformer	2	1995							
	16-3									
Chemical raboratory	17-1 Chemical laboratory	1	1990					Cleaning in intrvals	tchekoslovacia	
	17-2 Physical laboratory	1	1990					in intrvals	tchekoslovacia	
	17-3 Bacteriology laboratory	1	1990					in intrvals	tchekoslovacia	
Maintainance equipment	18-1 Moving trucks	1	1992							to transfere employees
	18-2 Workshop equipment	3	1995					cleaning in intrvals	local	1 lather,drill,grinding wheel
Safety equipment	19-1 Emergency device for cholorine gas	2	1990					in intrvals	tchekoslovacia	Safety masks
	19-2									
	19-3									
	19-4									
	19-5									

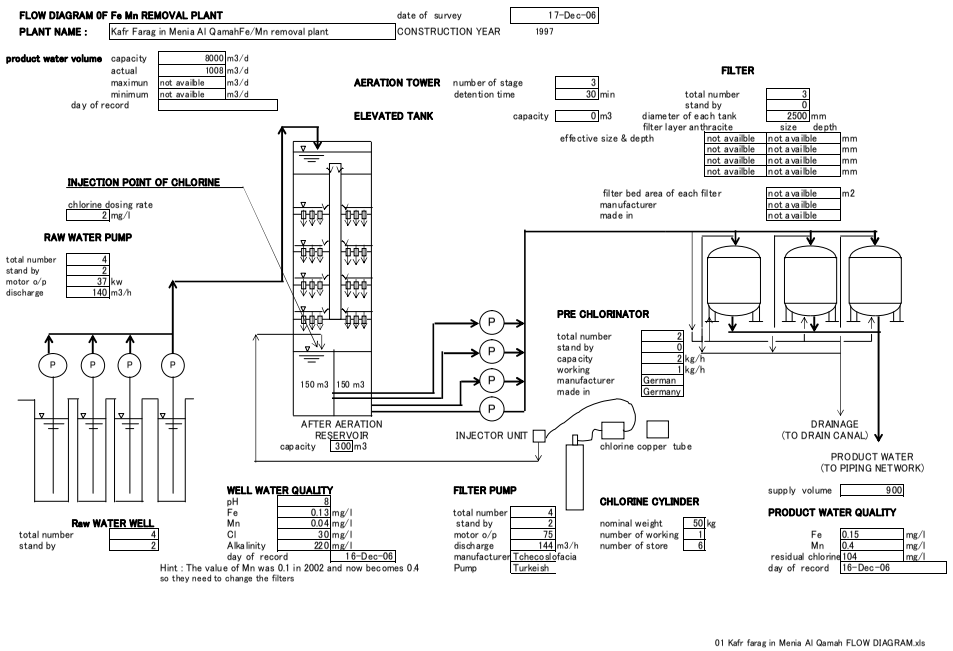
List of facility inventory　　Husseinia WTP

	name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1	Intake raw water basin	1-1	Intake raw water basin	1	2001						local	
		1-2	screen	2	2001	the whole diameter	do				local	
		1-3	Crane									
		1-4	number of lines for new intake	2								800mm diameter & salhiya branch far from Ismailia canal 11 km
2	Raw water reservour	2-1	Raw water reservour	0								
		2-2	Screen	0								
		2-3	Crane	0								
3	Raw water pump	3-1	Raw water storage basin	1	2001	do					local	suction parts
		3-2	Raw water pump -type1								France	pearings change for motor 3
			motor	4	1997		do				France	pearings change for all pumps
			pump	4	1997		do	do			France	change 3 power supply
			pressure guage	4			do				France	
		3-3	Raw water pump -type2									
			motor	0								
			pump	0								
			pressure guage	0								
		3-4	pipings & valves	11	1997						France	
4	Receiving well	4-1	Receiving well	1	2001						local	
		4-2	Flush mixer	1	1997			do			France	
			drive unit	1	1997			do			France	
			common base	1	1997			do			France	
			shaft & paddle	1	1997						France	1shaft +3 paddles
		4-3	Raw water flowmeter	1	1997						France	not working
5	Flocculation basin	5-1	Flocculation basin	2	2001					do	local	
		5-2	flocculator	2	1997						local	
			drive unit	4	1997		do				France	adding oil
			common base	4	1997						France	
			shaft & paddle		1997						France	4 shaft+8paddles
6	Sedimentasion basin	6-1	Sedimentasion basin	2	2001					do	local	twice a year
		6-2	sludge collector	4	2001					do	local	twice a year
			drive unit	2	1997		do				France	change pearings & the outter membrane for the wheels
			common base	2	1997						France	
			bridge	2	1997	do	do	do			local	change paddles membrane+artiloon(teflon)wheels
			cllector blade unit	2			do				France	slidding rings
7	Sludge drainage	7-1	drainage pump									
			motor									
			pump									
			pressure guage									
		7-2	pipings & valves	10	1997		do				France	
8	Rapid sand filter	*8-1	rapid sand filter basin	6	2001						local	
	*Marked items should be described on each filter.	*8-2	composion of filter layer	4	1999					in intrvals	local	the depth for the filter meduim is 160cm(115cm sand and 45 cm gravel)
			gravel 1	1	1999					in intrvals	local	32-64mm3 gravel,depth 20cm
			gravel 2	1	1999					in intrvals	local	8-16mm3 gravel,depth 20cm

name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		pump	0								Don't exist
		attched parts	0								Don't exist
		pipings & valves	0								Don't exist
chlorination facility	2)	exhaust fan	0								Don't exist
		motor	0								Don't exist
		fan	0								Don't exist
		attched parts	0								Don't exist
		pipings & valves	0								Don't exist
	3)	caustic soda solution tank	0								Don't exist
		coastic soda solution	0								Don't exist
		solution tank	0								Don't exist
	4)	reaction & absorption tower	0								Don't exist
12 drainage facility	12-1	drainage basin	0								Don't exist
	1)	drainage basin	0								Don't exist
	2)	drainage pump	0								Don't exist
		motor	0								Don't exist
		pump	0								Don't exist
	3)	pipings & valves	0								Don't exist
	12-2	sludge drainage basin	0								Don't exist
	1)	sludge drainage basin	0								Don't exist
	2)	sludge thickner	0								Don't exist
		drive unit	0								Don't exist
		common base	0								Don't exist
		bridge	0								Don't exist
		cllector blade unit	0								Don't exist
	3)	drainage pump	0								Don't exist
		motor	0								Don't exist
		pump	0								Don't exist
		pipings & valves	0								Don't exist
13 Treated water pump	13-1	pump -type1									
		motor	2							Austria	125hp - 3phases-380/660volt
		pump	2						one of them	Egypt	Wayler Fred 60l/sec
		pressure guage	0								Don't exist
	13-2	pump -type2									
		motor									
		pump									
		pressure guage									
		out going transmission line	1								400mm cast iron
14 Stand-by generator	14-1	generator	1	1990						swizer land	Scania Generator 200Kv
	14-2	oil tank	1	1990						swizer land	
	14-3	battery	2	1990				replaced		local	
15 Electrical switch board	15-1	for Raw water pump	2	1977				some connections		local	
	15-2	for Flush mixer	-								There is a distrubition board 8 cells
	15-3	for Flocculater	-								in the station arranged as follow;
	15-4	for Sludge collector	-								1-main board + 7 branches which are;-
	15-5	for Bachwash pump	-								4 cells for treated water pumps
	15-6	for Air wash pump	-								2 cells for raw water pumps

name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
		gravel 3	1	1999					in intrvals	local	2-4mm3 gravel,depth 5cm
		sand 1	1	1999							
		sand 2	0								
		sand 3	0		do				in intrvals	local	0.6-1.5mm3 gravel,depth 1.15m
	*8-3	operation desk	6	1997		do	do			France	change power supply,indicating lamps for meters,relays
	8-4	type of underdrain	6	2001						local	
	8-5	backwash pump									
		motor	3	1997		do				France	pearings change for motor 1
		pump	3	1997		do				France	pearings change and filling material
		pressure guage	0								
	8-6	air blower for air wash									
		motor	2	1997		do				France	pearings change for motor 2
		blower	2	1997						France	
		air storage tank	2	1997						France	
	*8-7	pipings & valves	9	1997		do				local	
9 clear water resorvour	9-1	clear water resorvour	2	2001		do			every 6 mont	local	changing the air nets
	9-2	pipings & valves	3	1997						France	
	9-3	other auxiliary	3	1997						France	level meter
10 Alum dosing facility	10-1	alum storage yard	0								
	10-2	alum solution tank	1	2001					do	local	
	10-3	liquid alum receiver tank	0								
	10-4	agitator of solution tank	1	1997						local	
	10-5	alum dosing pump type1	2	1997		do				France	change timer,diaphram and pearings
	10-6	alum dosing pump type2	0								
	10-7	Level guage for solution tank	3	1997						France	not a meter just showing data
	10-8	pressure guage	0								
	10-9	backpressure valve	0								
	10-10	relief valve	0								
	10-11	strainer	3	1997					cleaned	France	
	10-12	pipings & valves	10	1997						France	
11 chlorination facility	11-1	cylinder storage base	30	2001		do				local	fixing bases
	11-2	lead tube for chlorine gas	0								
	11-3	auxiliary valves	0								
	11-4	cylinder changeover devise	2	1997						France	
	11-5	pressure guage for chlorine gas	1	1997							
	11-6	chlorine gas filter	1	1997						France	
	11-7	Pre-chlorinator	2	1997					do		
	11-8	Intermediate chlorinator	0								
	11-9	post chlorinator	2						do		
	11-10	injector unit for pre chlorinator	2			do	do				
	11-11	injector unit for int. chlorinator	0								
	11-12	injector unit for post chlorinator	2			do	do				
	11-13	pipings & valves	6			do					maintenance for all valves
	11-14	water booster pump for chlorination									
		motor	3	1997		do				France	pearings change and filling material
		pump	3	1997		do				France	pearings change and filling material
		pressure guage	1	1997						France	

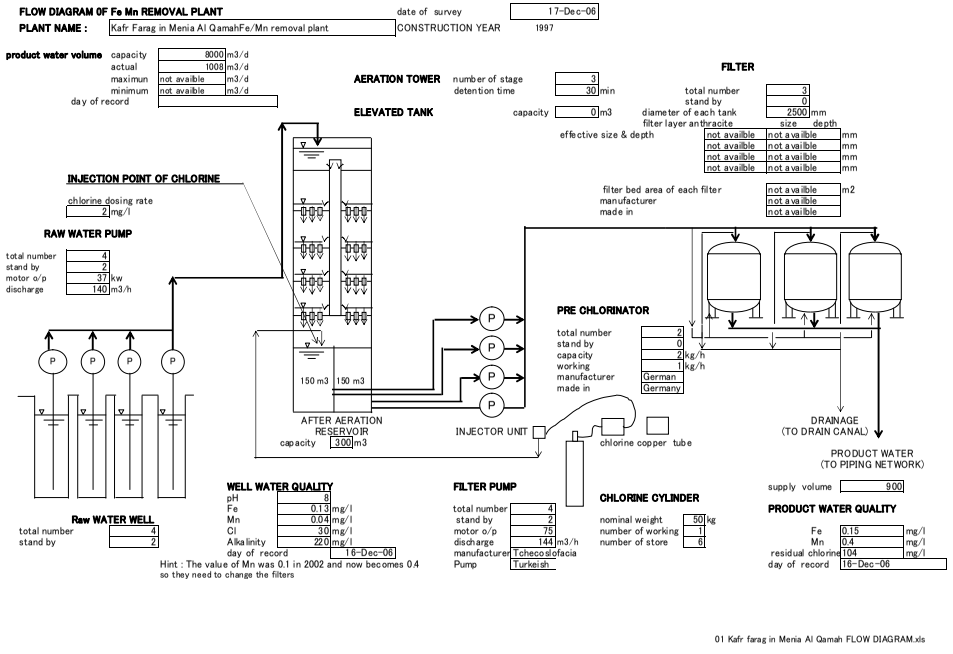
name of equipment		name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	15-7	forAlum solution tank agitator	-								1 cell for filters operation ,chlorination & lightening the station
	15-8	for Alum solution dosing pump	-								
	15-9	for chlorinator	-								
	15-10	for booster pump for chlorinator	-								
	15-11	for coasitc pump	-								
	15-12	for exhaust fan	-								
	15-13	for distribution pump	-								
	15-14	for treated water pump	4	1977				some connections		local	
	15-15	for drainage pump	-								
	15-16	for sludge drainage pump	-								
	15-17	for sludge thickner	-								
	15-18	for Stand by generator	1	1990				some connections		local	
	15-19	for Crane	-								
	15-20										
	15-21										
	15-22										
	15-23										
	15-24										
	15-25										
16 Transformer	16-1	500 KV transformer									The Public Electric Company
	16-2										
	16-3										
17 Chemical laboratory	17-1	Chemical laboratory									Don't exist
	17-2										
	17-3										
18 Maintainance equipment	18-1	Moving trucks									
	18-2	Workshop equipment									
19 Safety equipment	19-1	Emergency device for cholorine gas	4								safety masks against chlorine gas
	19-2										
	19-3										
	19-4										
	19-5										



01 Kafr farag in Menia Al Qamah FLOW DIAGRAM.xls

name of equipment	name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	pipings & valves	7	1997						France	
	11-15 clorine gas neutralization system									from starting plant operation the system not works
	1) coastic soda solution pump	3	1997						France	
	motor	3	1997						France	
	pump	3	1997						France	
	attched parts	0								
	pipings & valves	5	1997						France	
chlorination facility	2) exhaust fan									
	motor	4	1997						France	
	fan	4	1997						France	
	attched parts									
	pipings & valves									
	3) caustic soda solution tank									
	coastic soda solution	3ton							local	
	solution tank	1	1997						local	
	4) reaction & absorption tower	1	1997							
12 drainage facility	12-1 drainage basin									
	1) drainage basin									
	2) drainage pump									
	motor									
	pump									
	3) pipings & valves									
	12-2 sludge drainage basin									
	1) sludge drainage basin									
	2) sludge thickner									
	drive unit									
	common base									
	bridge									
	cllector blade unit									
	3) drainage pump									
	motor									
	pump									
	pipings & valves									
13 Treated water pump	13-1 pump -type I	4	1997						France	
	motor	4	1997							
	pump	4	1997		do					pearings change and filling material for pump 2
	pressure guage	4	1997		do					change ps for meters 2&4
	13-2 pump -type2									
	motor									
	pump									
	pressure guage									
	out going transmission line	1								1000mm cast iron main to the city Bps(22km)
14 Stand-by generator	14-1 generator	2	1997		do				England	filter change
	14-2 oil tank	2	1997		do				England	oil change
	14-3 battery	6	1997				do		local	all batteries replaced
15 Electrical switch board	15-1 for Raw water pump	1	1997		do				local	preassure reading data

FLOW DIAGRAM



01 Kafr farag in Menia Al Qamah FLOW DIAGRAM.xls

EL HUSAINIA WTP

name of equipment	name of facility	Nos.	year of constructed	maintainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
	15-2 for Flush mixer									included in the backwash board
	15-3 for Flocculater	2	1997						local	
	15-4 for Sludge collector				change phase sequence					included in the flocculator board
	15-5 for Bachwash pump	1	1997		change phase sequence				local	contactors
	15-6 for Air wash pump				do					included in the backwash board
	15-7 forAlum solution tank agitator	1	1997						local	
	15-8 for Alum solution dosing pump				do					included in agitator of alum solution board
	15-9 for chlorinator									
	15-10 for booster pump for chlorinator				do					included in the backwash board
	15-11 for coasitc pump									included in chlorine board
	15-12 for exhaust fan									included in chlorine board
	15-13 for distribution pump									
	15-14 for treated water pump	1	1997		do				local	change phase sequence
	15-15 for drainage pump	0								
	15-16 for sludge drainage pump	1	1997						local	included in treated water board
	15-17 for sludge thickner	0								
	15-18 for Stand by generator	1	1997						local	every crane relative to its station
	15-19 for Crane									
	15-20 main distrubition board	1	1997						local	
	15-21									
	15-22									
16 Transformer	16-1 22/11 KV	2	2000						local	for treated water 3 mega
	16-2 11 KV/0.4	2	2000						France	for treated water 3.15 mega
	16-3 22KV/0.4	2	2000						local	for raw water 1 mega
17 Chemical raboratory	17-1 Chemical laboratory	1								not finished yet
	17-2									
	17-3									
18 Maintainance equipment	18-1 Moving trucks									
	18-2 Workshop equipment	7	1997						France	not used
19 Safety equipment	19-1 Emergency device for cholorine gas	1							France	not working
	19-2									

FLOW DIAGRAM

FLOW DIAGRAM OF Fe Mn REMOVAL PLANT — date of survey: 17-Dec-06

PLANT NAME : Melames in Menia Al Qamah Fe/Mn Removal Plant — CONSTRUCTION Y: 2001

product water volume

	capacity	actual	maximun	minimum	day of record
	8000 m3/d	630 m3/d	not availble m3/d	not availble m3/d	

AERATION TOWER number of stage: 2; detention time: 30 min

ELEVATED TANK capacity: 0 m3

FILTER: total number: 3; stand by: 0; diameter of each tank: 2500 mm; filter layer anthracite

effective size & depth	size	depth
anthracite	not availble	mm
Mn sand	not availble	mm
gravel-1	not availble	mm
gravel-2	not availble	mm

filter bed area of each filter: not availble m2; manufacturer: not availble; made in: not availble

INJECTION POINT OF CHLORINE: chlorine dosing rate: 2 mg/l

RAW WATER PUMP: total number: 3; stand by: 2; motor o/p: 37 kw; discharge: 40 l/sec

RAW WATER WELL: total number: 3; stand by: 2

150 m3, 150 m3

AFTER AERATION RESERVOIR: capacity: 300 m3

INJECTOR UNIT

chlorine copper tube

PRE CHLORINATOR: total number: 2 alternatively; stand by: 0; capacity: 2 kg/h; working: 1 kg/h; manufacturer: German; made in: Germany

CHLORINE CYLINDER: nominal weight: 50 kg; number of working: 1; number of store: 6

DRAINAGE (TO DRAIN CANAL)

PRODUCT WATER (TO PIPING NETWORK)

supply volume: 530 m3/d

PRODUCT WATER QUALITY — day of record: 16-Dec-06

Fe	0.15	mg/l
Mn	0.4	mg/l
residual chlorine	1.4	mg/l

WELL WATER QUALITY — day of record: 17-Dec-06

pH	7.2	
Fe	1.2	mg/l
Mn	0.4	mg/l
Cl	25	mg/l
Alkalinity	2.80	mg/l

FILTER PUMP: total number: 4; stand by: 3; motor o/p: 37 kw; discharge: 50 l/sec; manufacturer: Germany; made in: German

05 MELAME~1.XLS

FLOW DIAGRAM

FLOW DIAGRAM OF Fe Mn REMOVAL PLANT — date of survey: 20-Dec-06

PLANT NAME : Abu Metanna in Diarb Nigm Fe/Mn Removal Plant — CONSTRUCTION YEAR: May-02

under construction for improvement

product water volume

	capacity	actual	maximun	minimum	day of record
	8000 m3/d	700 m3/d	1400 m3/d	700 m3/d	

AERATION TOWER number of stage: 2; detention time: 30 min

ELEVATED TANK capacity: 0 m3

FILTER: total number: 3; stand by: 0; diameter of each tank: 2500 mm; filter layer anthracite

effective size & depth	size	depth
anthracite	not availble	mm
Mn sand	not availble	mm
gravel-1	not availble	mm
gravel-2	not availble	mm

filter bed area of each filter: not availble m2; manufacturer: not availble; made in: not availble

INJECTION POINT OF CHLORINE: chlorine dosing rate: 3 mg/l

RAW WATER PUMP: total number: 3; stand by: 2; motor o/p: 30 kw; discharge: 40 l/sec

under construction

RAW WATER WELL: total number: 4; stand by: 2

150m3, 150m3

AFTER AERATION RESERVOIR: capacity: 360 m3

INJECTOR UNIT

chlorine copper tube

PRE CHLORINATOR: total number: 2; stand by: 1; capacity: 2 kg/h; working: 0.3 kg/h; manufacturer: German; made in: Germany

CHLORINE CYLINDER: nominal weight: 50 kg; number of working: 2; number of store: 6

DRAINAGE (TO DRAIN CANAL)

PRODUCT WATER (TO PIPING NETWORK)

supply volume: 640 m3/d

PRODUCT WATER QUALITY — day of record: not available

Fe	not available	mg/l
Mn	not available	mg/l
residual chlorine	not available	mg/l

WELL WATER QUALITY — day of record: 26-Oct-03

pH	8	
Fe	0.4	mg/l
Mn	0	mg/l
N-NH3	1.2	mg/l
Ca	60	mg/l
Mg	43.2	mg/l
T-HARDNESS	170	mg/l

FILTER PUMP: total number: 4; stand by: 1; motor o/p: 67 kw; discharge: 60 l/sec; manufacturer: not available; made in: not available

03 Abu Metanna in Diarb Nigm FLOW DIAGRAM.xls

FLOW DIAGRAM

FLOW DIAGRAM OF Fe Mn REMOVAL PLANT — date of survey: 17-Dec-06

PLANT NAME : Mashtool El Sooq Fe/Mn removal Plant — CONSTRUCTION Y: 1996

product water volume

	capacity	actual	maximun	minimum	day of record
	4000 m3/d	2800 m3/d	3000 m3/d	2800 m3/d	

AERATION TOWER number of stage: 2; detention time: 30 min

ELEVATED TANK capacity: 120 m3

FILTER: total number: 3; stand by: 0; diameter of each tank: 2500 mm; filter layer anthracite

effective size & depth	size	depth
400	not availble	mm
350	not availble	mm
200	not availble	mm

filter bed area of each filter: not availble m2; manufacturer: Italian; made in: Italy

INJECTION POINT OF CHLORINE: chlorine dosing rate: 1.5 mg/l

RAW WATER PUMP: total number: 4; stand by: 2; motor o/p: 60 kw; discharge: 50 l/sec

RAW WATER WELL: total number: 2; stand by: 0

150 m3, 150 m3

AFTER AERATION RESERVOIR: capacity: 300 m3

INJECTOR UNIT

chlorine copper tube

PRE CHLORINATOR: total number: 2; stand by: 1; capacity: not availa kg/h; working: not availa kg/h; manufacturer: not available; made in: not available

Sampling point

DRAINAGE (TO DRAIN CANAL)

PRODUCT WATER (TO PIPING NETWORK)

supply volume: 2600 m3/d

PRODUCT WATER QUALITY — day of record: 12/11/2006

Fe	not availa	mg/l
Mn	not availa	mg/l
residual chlorine	not availa	mg/l

WELL WATER QUALITY

pH	not available	
Fe	1.4	mg/l
Mn	1.2	mg/l
N-NH3	not availa	mg/l
Ca	not availa	mg/l
Mg	not availa	mg/l
T-Hardnes	not available	

FILTER PUMP: total numbe: 4; stand by: 2; motor o/p: 60 kw; discharge: 40 l/sec; manufactur: not available; made in: not available

CHLORINE CYLINDER: nominal weight: 50 kg; number of working: 1; number of store: 3

06 Mashtool El Sooq FLOW DIAGRAM.xls

FLOW DIAGRAM

FLOW DIAGRAM OF Fe Mn REMOVAL PLANT — date of survey: 19-Dec-06

PLANT NAME : El Adlia in Bilbais Fe/Mn removal Plant — CONSTRUCTION Y: 2001

product water volume

	capacity	actual	maximun	minimum	day of record
	2000 m3/d	1e8e m3/d	1800 m3/d	1e8e m3/d	19-Dec-06

AERATION TOWER number of stage: 2; detention time: 30 min

ELEVATED TANK capacity: 0 m3

FILTER: total number: 3; stand by: 0; diameter of each tank: 2500 mm; filter layer anthracite

effective size & depth	size	depth
not availble	not availble	mm
not availble	not availble	mm
900	not availble	mm
400	not availble	mm

filter bed area of each filter: not availble m2; manufacturer: not availble; made in: not availble

INJECTION POINT OF CHLORINE: chlorine dosing rate: 3.4 mg/l

RAW WATER PUMP: total number: 2; stand by: 0; motor o/p: 30 kw; discharge: 25 l/sec

RAW WATER WELL: total number: 4; stand by: 0

150 m3, 150 m3

AFTER AERATION RESERVOIR: capacity: 300 m3

INJECTOR UNIT

chlorine copper tube

PRE CHLORINATOR: total number: 2; stand by: 1; capacity: 1 kg/h; working: 0.5 kg/h; manufacturer: German; made in: Germany

CHLORINE CYLINDER: nominal weight: 50 kg; number of working: 1; number of store: 3

DRAINAGE (TO DRAIN CANAL)

PRODUCT WATER (TO PIPING NETWORK)

supply volume: 1000 m3/d

PRODUCT WATER QUALITY — day of record: 12/11/2006

Fe	0.05	mg/l
Mn	0	mg/l
residual chlorine	1.4	mg/l

WELL 1 WATER QUALITY — day of record: 12/11/2006

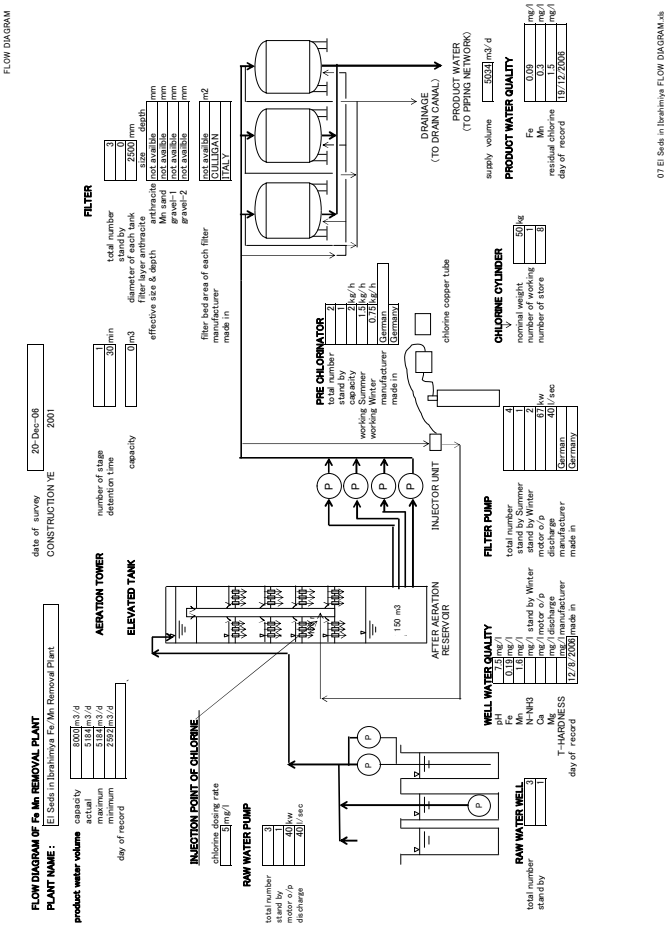
pH	7.7	
Fe	0.5	mg/l
Mn	0.4	mg/l
N-NH3	0.05	mg/l
NO2	0.02	mg/l
TDS	409	mg/l
Cl	25	mg/l
Ca	64	mg/l
Mg	19.2	mg/l
T-Hardness	240	
Alkalinity	270	
Conductivity	630	
Turbidity	65	

WELL 2 WATER QUALITY — day of record: 12/11/2006

pH	7.6	
Fe	1.2	mg/l
Mn	0.3	mg/l
N-NH3	0.1	mg/l
NO2	0.02	mg/l
TDS	263	mg/l
Cl	30	mg/l
Ca	32	mg/l
Mg	12.4	mg/l
T-Hardness	132	
Alkalinity	154	
Conductivity	411	
Turbidity	65	

FILTER PUMP: total numbe: 4; stand by: 2; motor o/p: 50 kw; discharge: 40 l/sec; manufactur: Russia; made in: Russia

04 El Adlia in Bilbais FLOW DIAGRAM.xls



3. PI Setting for Chemical Consumption in WTP

Setting indicators for optimum chemical consumption

1. Definition

1-1.Kind of available chemicals in water supply facility in model facilities

The Chemicals in following table are used in the water supply facility currently.

	Aluminum sulfate	Chlorine	Model Facility
WTP	○	○	Abbassa Zagazig
FMRP	—	○	Quenayate
BPS	—	—	Bilbeis
WPS	—	—	Aslougy

1-2.The definition of "optimum chemical consumption"

"Optimum chemical consumption" is achieved by keeping the conditions of "optimum chemical dosing"

In this report, the meaning of "Optimum chemical dosing" condition is that the treatment process is kept under follow conditions.

1) The required function for the process is achieved.

2) Chemical dosing rate is not excessive.

3) Chemical dosing rate is not shortage

1-3. Explanations about "Optimum dosing of chemicals" condition

1) The required function for the process is achieved.

Regarding aluminum sulfate (aluminum sulfate abbreviates to alum), condition of the above is explained as following

"Turbidity of clarified water is within allowance range of treatment target for turbidity of the clarified water."

Regarding chlorine, condition of the above is explained as following

"Residual chlorine of treated water is within allowance range of treatment target for residual chlorine in each treatment process."

2) The condition which is not surplus of alum dosing flow rate

And

3) The condition which is not insufficient of alum dosing flow rate

Regarding alum, conditions of above two are shown as followings

Dosing rate of alum is suitable for raw water quality and conditions such as water temp.

Dosing flow rate of alum is controlled according to change of operation status

Regarding chlorine, conditions of above two are explained as followings

Dosing rate of chlorine is suitable for raw water quality and conditions such as water temp.

Dosing flow rate of chlorine is controlled according to change of operation status

1-4. Explanations about "Optimum consumption of chemicals"

"Optimum consumption of chemicals" is set as "Estimated optimum consumption of chemicals" by evaluation result of consumption in the previous year.

1-5.Procedures for setting "Estimated optimum consumption of chemicals"

Estimation of "Optimum consumption of chemicals" is carried out according to the following procedures.

1) Estimation of raw water flow rate for the plant in the target year

1-1) Confirmation of actual record of the integrated volume of raw water and transmission water in the previous year and confirm calculation results as follows;

(A): Record of the monthly integrated volume of raw water in the previous year

(B): Record of the monthly integrated volume of transmission water in the previous year

Q-raw-y: Calculated result of the integrated volume of raw water in the previous year

(B)/(A): Calculated result of the ratio of integrated volume of raw water and transmission water

1-2) Estimation of the integrated volume of the raw water and transmission water in the target year

RP: Estimated population growth rate in the supply area

RC: Estimated increasing rate of consumption amount on the supply area

EQ-tr-y: Estimated integrated volume of the transmission water in the target yeary

EQ-raw-y: Estimated integrated volume of the raw water calculated by (B)/(A) and EQ-tr-y

1-3) Confirmation of average dosing rate of chemicals in the previous year

Confirmation of actual record of the integrated amount of chemicals (alum and chlorine) in the previous year and confirm calculation results as follows;

(F): Record of the monthly integrated amount of alum in the previous year

(G): Record of the monthly integrated amount of chlorine in the previous year

W alum-y: Calculated result of the integrated amount of alum for the previous year

W cl-y: Calculated result of the integrated amount of chlorine for the previous year

DR alum-y: Calculated result of the ration of integrated amount of alum per Q-raw-y (This figure is actual average dosing rate of alum and chlorine in the previous year)

DR cl-y: Calculated result of the ration of integrated amount of chlorine per Q-raw-y (This figure is actual average dosing rate of alum and chlorine in the previous year)

DR alum-y (g/m3) = W alum-y / Q-raw-y

DR cl-y (g/m3) = W cl-y / Q-raw-y

1-4) Estimation of average dosing rate of chemicals in the target year

Check and evaluate the value of DR alum and DR cl.

Point of check and evaluation

- Confirmation that calculated value is not usual
- Check of a the validity of dosing rate value
  - Confirmation of change of water quality
  - Treatment target of turbidity of clarified water
  - Actual average turbidity of clarified water
  - Average filter run time, and so
- Comparison with the calculated value for other facilities
- The study about possibilities of reduction of consumption amount

Based on result of check and evaluation of the value DR alum and DR cl, estimated average dosing rate of chemicals EDR alum and EDR cl should be set for the year.

EDR alum: Estimated average dosing rate of alum in the year

EDR cl: Estimated average dosing rate of chlorine in the year

(DR alum and DR cl in the year will be evaluated by compared with EDR alum and EDR cl)

1-5) Estimation of chemical consumption

EW alum-y: Estimated integrated amount of alum for the previous year
(Estimated alum consumption in the target year)

EW cl-y: Estimated integrated amount of chlorine for the previous year
(Estimated chlorine consumption in the target year)

EW alum-y = EQ-raw-y (m3) x EDR alum (g/m3)

EW cl-y = EQ-raw-y (m3) x EDR cl (g/m3)

Case study by records of ZAGAZIG WTP (Refer to attached recoding sheet)

1-1) Confirmation of actual record of the integrated volume of raw water and transmission water in the previous year and confirm calculation results

Q-raw-y = 12,099,821 (m3)

EQ-tr-y = 10864,252 (m3)

(B)/(A) = 0.9

W alum-y = 289,801.3 (kg)

W cl-y = 58,524.1(kg)

1-2) Estimation of the integrated volume of the raw water and transmission water in the target year

RP: Estimated population growth rate of the supply area

Estimation value of RP =1.2 % (Tentative value)

RC: Estimated increasing rate of consumption amount of the supply area

Estimation value of RC =2.0 % (Tentative value)

EQ-tr-y: Estimated integrated volume of the transmission water in the target year

EQ-tr-y = 10864,252 (m3) x (1+0.012+0.02) = 11,211,908 (m3)

EQ-raw-y Estimated integrated volume of the raw water calculated by (B)/(A) and EQ-tr-y

EQ-raw-y = Q-raw-y x (A)/(B)

= 11,211,908 x 1/0.9 = 12,487,015 (m3)

1-3) Confirmation of average dosing rate of chemicals in the previous year

DR alum-y = 24 (g/m3)

DR cl-y = 4.83 (g/m3)

1-4) Estimation of average dosing rate of chemicals in the target year

Evaluation of average dosing rate of chemicals in the previous year

Alum EDR alum-y = 24 (g/m3)

Evaluation result: 24 (g/m3) is reasonable.

EDR alum is set as the same value as previous year

Chlorine EDR cl-y = 4.83 (g/m3)

Evaluation result: 4.83 (g/m3) will be able to reduced by adequate residual chlorine control.

EDR cl is set as 4.3 (g/m3)

1-5) Estimation of chemical consumption in the target year

(This value is set up as amount of optimum chemical consumption in the year)

EW alum-y = EQ-raw-y (m3) x EDR alum (g/m3)

= 12,487,015 (m3) x 24 (g/m3) = **299,688(kg)**

EW cl-y = EQ-raw-y (m3) x EDR cl (g/m3)

= 12,487,015 (m3) x 4.3 (g/m3) = **53,694(kg)**

1-6) Calculation value of chemical consumption in the target year calculated by value of same dosing rate as value of 2008

Alum CW alum-y = 299,699 (kg)

Chlorine CWcl-y = 60,371 (kg)

1-7) Estimation of reduction of chemical consumption in the target year

Alum **EW alum-y** - CW alum-y = 0 (kg)

Chlorine **EW cl-y** - CWcl-y = 6,677 (kg)

Operation Records and performance indicators of ZAGAZIG WTP ,20

(C) Design Capacity 400 (l/sec)

Estimated population growth rate RP	1.2 %
Estimated increasing rate of consumption	2 %

Month	(A) Raw water quantity (m3)	(B) Transmission water quantity (m3)	(B)/(A) Availableness ratio of raw water	(D) Raw water Average (m3/d)	(E) Transmission water Average (m3/d)	Estimated transmission water	Estimated raw water quantity
January	930,669	864,120	0.93	30,022	27,875	891,772	960,450
February	652,735	610,106	0.93	23,312	21,790	629,629	673,623
March	862,439	786,119	0.91	27,821	25,359	811,275	890,037
April	921,275	798,662	0.87	30,709	26,622	824,219	950,756
May	1,108,030	994,612	0.90	35,743	32,084	1,026,440	1,143,487
June	1,169,090	1,050,016	0.90	38,970	35,001	1,083,617	1,206,501
July	1,197,198	1,050,350	0.88	38,619	33,882	1,083,961	1,235,508
August	1,291,246	1,139,240	0.88	41,653	36,750	1,175,696	1,332,566
September	1,047,480	930,960	0.89	34,916	31,032	960,751	1,080,999
October	997,029	898,537	0.90	32,162	28,985	927,290	1,028,934
November	999,500	899,960	0.90	32,242	29,999	928,759	1,031,484
December	923,130	841,570	0.91	30,771	27,147	868,500	952,670
Total in a year	**12,099,821**	**10,864,252**	**0.90**	**33,078**	**29,710**	**11,211,908**	**12,487,015**
	Q-raw-y					EQ-tr-y	EQ-raw-y

					Estimated dosing rate (g./m3)		Same dosing rate as value of 2008	
	(F)	(G)			24	4.3	24	4.83
Month	Alum dosing weight (kg)	Chlorine dosing weight (kg)	Alum consumption per raw water (g/m3)	Chlorine consumption per raw water (g/m3)	Estimated alum consumption (kg)	Estimated chlorine consumption (kg)	Caluculated alum conaumtion (kg)	Caluculated chlorine conaumtion (kg)
January	23266.7	4586.8	25.0	4.93	23,051	4,130	23,051	4,644
February	16318.4	3221	25.0	4.93	16,167	2,897	16,167	3,257
March	20389.1	4206.4	23.6	4.88	21,361	3,827	21,361	4,303
April	21633.8	4483.8	23.5	4.87	22,818	4,088	22,818	4,597
May	25900.2	5432.1	23.4	4.90	27,444	4,917	27,444	5,528
June	27755.8	5726.4	23.7	4.90	28,956	5,188	28,956	5,833
July	28027.2	5833.9	23.4	4.87	29,652	5,313	29,652	5,973
August	31205.5	6305	24.2	4.88	31,982	5,730	31,982	6,443
September	25139.5	5120.9	24.0	4.89	25,944	4,648	25,944	5,226
October	23928.7	4886.7	24.0	4.90	24,694	4,424	24,694	4,975
November	23487.5	4647.7	23.5	4.65	24,756	4,435	24,756	4,987
December	22748.9	4073.4	24.6	4.41	22,864	4,096	22,864	4,606
Total in a year	**289801.3**	**58524.1**	**24.00**	**4.83**	**299,688**	**53,694**	**299,688**	**60,371**
	W alum-y	W cl-y	DR alum-y	DR cl-y	EW alum-y	EW cl-y	CW alum-y	CWcl-y

Performance indicator : Chemical consumption per production water quantity

	2008	2009	Reduction (%)
Alum (g/m3)	26.7	26.7	0
Alum cost(LE/m3)	0.03	0.03	0
Chlorine (g/m3)	5.22	4.79	0.43
Chlorine cost(LE/m3)	0.0073	0.0067	0.0006

Estimation of reduction amount of chemical consumption in the target year

Alum (kg)	EW alum-y - CW alum-y	0
Chlorine (lg)	EW cl-y − CWcl-y	6,677

Estimation of reduction cost of chemical consumption in the target year (LE) 8,012

Unit price (LE/kg)		
	Solid alum	1.4
	Chlorine	1.2

4. PI Setting for Chemical Consumption in FMRP

Optimum consumption of chlorine

Quenayate FMRP

1. Estimation of status under adequate operation

Well water flow rate-1	70	(l/sec)	252	(m3/hr)
Working days	365	days		
Chlorine dosing rate	1.75	(mg/l)	as chlorine weight	
Chlorine dosing flow rate	0.44	(kg/hr)	as chlorine weight	
Operation time	18	hours	from 6:00AM to 12:00 PM	
Daily chlorine consumption-1	**7.94**	**(kg)**	**as chlorine weight**	
Daily water quantity-1	4536	(m3)		
Yearly water quantity-1	1,655,640	(m3)		

Well water flow rate-2	40	(l/sec)	144	(m3/hr)
Working days	365	days		
Chlorine dosing rate	1.75	(mg/l)	as chlorine weight	
Chlorine dosing flow rate	0.25	(kg/hr)	as chlorine weight	
Operation time	6	hours	from 12:00 PM to 6:00AM	
Daily chlorine consumption-1	**1.51**	**(kg)**	**as chlorine weight**	
Daily water quantity-1	864	(m3)		
Yearly water quantity-1	315,360	(m3)		

2. Estimation of consumption of chlorine under adequate operation

Total daily chlorine consumption	**9.45**	**(kg)**	**as chlorine weight**
	0.009	**(Ton)**	**as chlorine weight**
Total yearly chlorine consumptio	**3449.3**	**(kg)**	**as chlorine weight**
	3.4	**(Ton)**	**as chlorine weight**

Chlorine consumption per treated water quantity	1.75	(g/m3)	as chlorine weight

Caliculation formula for dosing flow rate of chlorine

$W(kg/hr) = Q\ (l/sec) \times 60 \times 60 \times 1/1000 \times A\ (mg/l) \times 1/1000$

Raw water flow rate	Q	(l/sec)
Dosing rate of chlorine	A	(mg/l)
Dosing flow rate of chlorine	W	(kg/hr)

3. Estimation of status under inadequate operation

Well water flow rate-1	70	(l/sec)	252	(m3/hr)
Working days	365	days		
Chlorine dosing rate	1.75	(mg/l)	as chlorine weight	
Chlorine dosing flow rate	0.44	(kg/hr)	as chlorine weight	
Operation time	18	hours	from 6:00AM to 12:00 PM	
Daily chlorine consumption-1	**7.94**	**(kg)**	**as chlorine weight**	
Daily water quantity-1	4536	(m3)		
Yearly water quantity-1	1,655,640	(m3)		

Well water flow rate-2	40	(l/sec)	144	(m3/hr)
Working days	365	days		
Chlorine dosing rate	3.5	(mg/l)	as chlorine weight	
Chlorine dosing flow rate	0.50	(kg/hr)	as chlorine weight	
Operation time	6	hours	from 12:00 PM to 6:00AM	
Daily chlorine consumption-1	**3.02**	**(kg)**	**as chlorine weight**	
Daily water quantity-1	864	(m3)		
Yearly water quantity-1	315,360	(m3)		

Total water quantity in a year 1,971,000 (m3)

4. Estimation of consumption of chlorine under inadequate operation

Total daily chlorine consumption	**10.96**	**(kg)**	**as chlorine weight**
	0.011	**(Ton)**	**as chlorine weight**
Total yearly chlorine consumptio	**4001.1**	**(kg)**	**as chlorine weight**
	4.0	**(Ton)**	**as chlorine weight**

5. Diference of the above 2 consumptions

Daily difference of consumption	**1.51**	**(kg)**	**as chlorine weight**
	0.002	**(Ton)**	**as chlorine weight**
Yearly difference of consumption	**551.9**	**(kg)**	**as chlorine weight**
	0.6	**(Ton)**	**as chlorine weight**

Unit price of chlorine	**1.4**	**(LE/kg)**
Difference of cost in a year	**773**	**(LE)**

6 Chlorine consumption per production water volume

Flow meter is not available in Qanayat FMRP

Therefore, chlorine consumption per actual production water volume cannot be calculated.

Estimation of chlorine consumption per actual production water volume is as following

Estimation of production water volume

Water volume for ackwashing and rinsing

Time of back washing	8	min
Time of rinsing	5	min
Total	13	min

Water volume for ackwashing and rinsing	54.6	m3/wash
Frequency of filter washing	1	/day
Water volume in a day for ackwashing and rinsi	54.6	m3/day
Water volume in a year for ackwashing and rinsi	19,929	m3/year
Rate of filter wash water to well wate volume	1.01	%

Estimation of production water volume in a year ####### m3/year

Estimation of chlorine consumption per estimated production water volume

Estimation of status under adequate operation	1.77	(g/m3)
Estimation of status under inadequate operation	2.05	(g/m3)

Difference 0.28 (g/m3)

For reference, chlorine consumption per well water volume is as foffowing

Estimation of status under adequate operation	1.75	(g/m3)
Estimation of status under inadequate operation	2.03	(g/m3)
Difference	0.28	(g/m3)

7 Target of PI about chlorine consumption per estimated production water volume in 2009

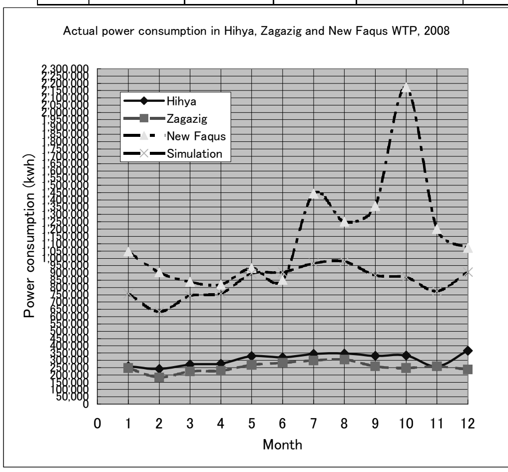
1.77 (g/m3)

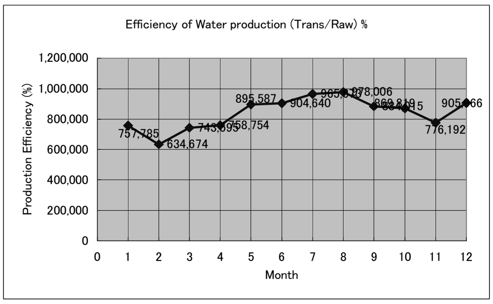
The above target will be achieved by adequate operation and control of chlorine dosing under condition of same water quality in 2008

5. PI Setting for Power Consumption

Actual record of power consumption in WTP in 2008

Capa.	400	400	1200	l/sec	
Month	Hihya	Zagazig	New Faqus	Simulation	
1	258,460	246,730	1,045,632	757,785	1.38
2	240,400	182,716	903,525	634,674	1.42
3	271,500	224,230	838,417	743,595	1.13
4	277,400	228,436	819,650	758,754	1.08
5	328,400	268,658	933,152	895,587	1.04
6	320,760	282,333	851,573	904,640	0.94
7	343,880	299,902	1,442,995	965,673	1.49
8	346,050	305,954	1,250,530	978,006	1.28
9	330,870	258,473	1,357,310	884,015	1.54
10	332,500	247,379	2,172,412	869,819	2.50
11	258,400	259,061	1,199,506	776,192	1.55
12	365,900	238,077	1,071,344	905,966	1.18
Total	3,674,520	3,041,949	13,886,046	10,074,704	1.38





Zagazig WTP

										6600	1536		528	96		8760
		Date		3-11	12/1-1/23	12/1-1/23	1/24-2/14	2/15-2/28		3-11	12/1-1/23	12/1-1/23	1/24-2/14	2/15-2/28		
		working time		0:00-0:00	8:00-20:00	20:00-8:00	0:00-0:00	8:00-20:00	20:00-8:00	0:00-0:00	8:00-20:00	20:00-8:00	0:00-0:00	8:00-20:00	20:00-8:00	
		working day		275	32	32	22	2	2	275	32	32	22	2	2	365
		Motor	hr	24	12	12	24	12	12	24	12	12	24	12	12	96
	Main load	(kw)	Q'ty	Numbers of equipment to be operated						power consumption(kwh)						power/year (kwh)
Existing	Raw water pump	38	3	2	2	1	1	2	1	501,600	29,184	14,592	20,064	1,824	912	568,176
Existing	Raw water pump	21	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Extension	Raw water pump	55	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Existing	Trensmission pump	190	3	2	2	1	1	2	1	2,508,000	145,920	72,960	100,320	9,120	4,560	2,840,880
Existing	Trensmission pump	90	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Extension	Trensmission pump	250	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Flash mixer	15	1	1	1	1	1	1	1	99,000	11,520	11,520	15,840	720	720	139,320
	Sludge collector	2.2	4	4	4	4	4	4	4	116,160	6,758	6,758	9,293	422	422	139,814
	Flocculator	7.5	8	8	8	8	8	8	8	2,880	792,000	46,080	46,080	63,360	2,880	953,280
	Alum dosing pump	7.5	3	1	1	1	1	1	1	99,000	5,760	2,880	7,920	360	360	116,280
									Sum	3,326,640	991,142	154,790	199,517	75,806	9,854	4,757,750

Estimated margin for out put of motor	0.7
Total estimated power consumption (kwr/y) (except filter washing facility)	3,330,425
Estimated power consumtion of filter washing facility (kw	53,229
Total estimated power consumption (kwr/y)	3,383,654

	Motor (kw)	Q'ty	Number to be operated	working time(min)	Numbers of filter	frequency time/day	kwh/day	kwh/year
Backwash pump	125	2	1	10	10	0.5	104.2	38,021
Blower	125	2	1	10	10	0.5	104.2	38,021
Drainage pump	110	2	1	20	1	5	183.3	611
								76,042
Estimated margin for out put of motor								0.7
Estimated power consumtion of filter washing facility (kwh/y)								53,229

Actual power consuption in Hihya WTP, 2008 (for reference) (kwh)

1	2	3	4	5	6	7	8	9	10	11	12	total (kwh/year)
258,460	240,400	271,500	277,400	328,400	320,760	343,880	346,050	330,870	332,500	258,400	365,900	3,674,520

ALUM in WTP 1/1

Optimum consumption of electrical power

Aslougy WPS

	Date		1-12		1-12				
	working time		8:00-0:00	0:00-8:00	8:00-0:00	0:00-8:00			
	working day		365	365	365	365			
	Motor	hr	16	8	16	8			
	(kw)	Q'ty	Numbers of equipment to be operated		Power consumption in a year (kwh)		power/year (kwh)	Ratio	
Main load									
Well pump	60	2	1	1	350,400	175,200	525,600	0.4878	0.976
Well pump	60	2	1	1	350,400	175,200	525,600	0.4878	
Booster pump	3	2	1	1	17,520	8,760	26,280	0.0244	0.024
							1,077,480	1.000	
					Estimated margin for out put of motor		0.7		
					Total estimated power consumption (kwr/y) (except filter washing facility)		754,236		

Power consumption in Aslougi WPS 1/1

Optimum consumption of electrical power

Qenayat FMRP

	Date		1-12		1-12				
	working time		8:00-0:00	0:00-8:00	8:00-0:00	0:00-8:00			
	working day		365	365	365	365			
	Motor	hr	16	8	16	8			
	(kw)	Q'ty	Numbers of equipment to be operated		Power consumption in a year (kwh)		power/year (kwh)	Ratio	
Main load									
Well pump	75	2	1	1	438,000	219,000	657,000	0.3000	0.540
Well pump	60	2	1	1	350,400	175,200	525,600	0.2400	
Filter pump	56	4	2	2	654,080	327,040	981,120	0.4480	0.448
Booster pump	3	2	1	1	17,520	8,760	26,280	0.0120	0.012
							2,190,000	1.000	
					Estimated margin for out put of motor		0.7		
					Total estimated power consumption (kwr/y) (except filter washing facility)		1,533,000		

Power consumption in FMRP 1/1

Optimum consumption of electrical power

Numbers of equipment to be operated are shown as default values

Bilbeis BPS

	Date		1-12		1-12				
	working time		8:00-0:00	0:00-8:00	8:00-0:00	0:00-8:00			
	working day		365	365	365	365			
	Motor	hr	10.32	13.68	10.32	13.68			
	(kw)	Q'ty	Numbers of equipment to be operated		Power consumption in a year (kwh)		power/year (kwh)	Ratio	
Main load									
Booster pump-Larg	200	2	1	0	753,360	0	753,360	0.6014	1.000
Booster pump-Small	100	2	0	1	0	499,320	499,320	0.3986	
							1,252,680	1.000	
					Estimated margin for out put of motor		0.64		
					Total estimated power consumption (kwr/y) (except filter washing facility)		801,715		

Operation schedule of booster pumps

	Quantity	Pump
Sat	100 l/sec	No.1
Sun	100 l/sec	No.2
Mon	200 l/sec	No.3
Tue	200 l/sec	No.4
Wed	100 l/sec	No.1
Thur	100 l/sec	No.2
Fri	200 l/sec	No.3

	Operating rate	Converted time in a day as hrs
Large pump	0.43	10.32
No.1 pump	0.215	5.16
No.2 pump	0.215	5.16
Small pump	0.57	13.68
No.3 pump	0.285	6.84
No.4 pump	0.285	6.84
		37.68

Operation rate

Large pump	0.429
Small pump	0.571

Actual data of power consumption

	2007	2008
1	97371	73695
2	7324	40659
3	61615	35791
4	68690	50541
5	60557	53135
6	52354	62912
7	76276	73945
8	41209	85346
9	33000	85981
10	70909	91241
11	67279	77343
12	93695	61758
	732286	794355

PI settiong about estimation of power consumption per supply water volu
Flow meter has been installed in Oct.-2008
In the present a data collection by flow meter is going on.
The above estimation value cannot be calulculated for the past data.

Power consumption in Bilbeis BSP 1/1

Componet of technical staff in Abbassa WTP in the current

	Team for Work						
Job category	P/H	Other	Laboratory	W/S	total	Others	Sedimentation basin, chmical dosing, et
Superviso & Technician	11	33	1	0	45	Laboratory	Monitoring & nalysis of water
Chemist	0	0	4	0	4	W/S	Work shop for maintenance activity
Labor	8	0	2	3	13		
Total	19	33	7	3	62		

P/H	Pump house	WTP 01, 02, 13
Others	Sedimentation basin, chmical dosing, et	WTP 03-12, WTP 14, 15
Laboratory	Monitoring & nalysis of water	WTP01, 03. 04, 05, 08, 10, 11, 12, 20
W/S	Work shop for maintenance activity	WTP 01-19

category ratio = number of worker in each joob category/total numbers of workers

	Ratio
Superviso & Technician	0.73
Chemist	0.06
Labor	0.21

Standard Manpower working hours for Abbassa WTP

sv: supervisor, tec: technician, sp/t: special technician, che: chemist, wrk: labor

No.	Equipment	Required working time for required activity period (hour) Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	Resource (jobs) sv	tec	sp/t	che	wrk	Interval	Activities
WTP01	Raw water intake	0.5		1		3	0.5	1			1	2	Daily	Check and monitoring
													Monthly	Intake gate clearing
													Yearly	Gates polishing, repair and paint
													Emergency	Disinfection
WTP02	Raw water pump/motor	8		12		as required		1	2			2	Daily	Check and monitoring
													Monthly	Greasing and stuffing box check
													Yearly	annual overall and change defect parts
WTP03	Receiving well (Distribution shaft)	0.5		1.5		2		1				1	Daily	Check water distribution and scum
													Monthly	Check valves and drain valve chamber
													Yearly	Drain, clean and disinfection
WTP04	Flocculation basin	0.5		0.5	12	48		1				1	Daily	Check flock formation and mixers
													Monthly	Oil and grease for mixers
													3-monyhs	Drain, clean and disinfection
													Yearly	Mixers repair
WTP05	Sedimentation basin	1		0.5	12	48		1				1	Daily	Check flock sedimentation and cleaning
													Monthly	Oil and grease for bridge
													3-monyhs	Drain, clean and disinfection
													Yearly	Maintenance & repair for bridge
WTP06	Sludge collector	0.5		1.5		2		1				2	Daily	check sludge telescopic valve or power unit
													Monthly	clean and maintain the telescopic valve/power unit
													Yearly	clean and maintain all valves and gates
WTP07	Sludge drainage facility	3		4		as required		1				1	Daily	monitor operation and water level
													Monthly	maintain the inlet gates
													Yearly	repair and paint gates
WTP08	Rapid sand filter	8		4 /filter		8 /filter		1				4	Daily	filter backwashing on request, monitoring
				38 filters		38 filters							Monthly	cleaning and disinfection
				152 Total		304 Total							Yearly	media backup and disinfection
WTP09	Filter washing facility	8		12		as per required		1	2			2	Daily	check and operation monitoring
													Monthly	greasing and stuffing box check
													Yearly	annual overall and change defect parts
WTP10	Clear water reservoir	3		4		240		1				1	Daily	monitor operation and water level
													Monthly	maintain the inlet gates
													Yearly	repair and paint gates,. Cleaning & disinfection
WTP11	Alum dosing facility	3		8		240 /tank		1				1	Daily	check alum injection system
						4 tanks							Monthly	clean dissolving tanks and pumps
						960 Total							Yearly	repair and paint dissolving tank walls
WTP12	Chlorination facility special technician: :chlorine handling	4		16		as per required		1		1		2	Daily	check and control dose
													Monthly	repair chlorine injection equipment
													Yearly	check and test pipes and fittings

3.10-18

Standard Manpower working hours for Quenayate FMRP

sv: supervisor, tec: technician, sp/t: special technician, che: chemist, wrk: labor

No.	Equipment	Required working time for required activity period (hour) Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	Resource (jobs) sv	tec	sp/t	che	wrk	Interval	Activities
FMR 1	Water well	0.5		3		3	0.5	1			1	1	Daily	Check water level
													Monthly	Cleaning site and sampling
													Yearly	Repair and paint
													Emergency	Disinfection
FMR 2	Well pump/motor	1		3		as required		1	1			2	Daily	check and operation monitoring
													Monthly	Greasing and stuffing box check
													Yearly	annual overall and change defect
FMR 3	Oxidation tower	5		4		120		1				1	Daily	Monitoring falling of water from the sprinkling holes in each floor
													Monthly	Cleaning
													Yearly	General Maintenance
FMR 4	Sedimentation basin	0.5		6		48		1				8	Daily	Monitoring basin level
													Monthly	Cleaning
													Yearly	General Maintenance
FMR 5	Filter	1.5		2		48		1				1	Daily	Automatic or Manual backwash
													Monthly	Disinfection according reproduction of precipitations in the filter
													Yearly	Polishing and painting filters , valves and pipes
FMR-6	Filter pump	1		3		as required		1	2			2	Daily	check and operation monitoring
													Monthly	greasing and stuffing box check
													Yearly	annual overall and change defect parts
FMR-7	Chlorination facility special technician: :chlorine handling	4		16		as required		1		1			Daily	check and control dose
													Monthly	repair chlorine injection equipment
													Yearly	check and test pipes and fittings
FMR-8	Drainage facility	0.5		2		4		1				1	Daily	drainage point
													Monthly	cleaning
													Yearly	check and test pipes and fittings
FMR-9	Piping and valves	1		6		144		1				2	Daily	check all valves
													Monthly	greasing and stuffing box check
													Yearly	polish and repaint all valves
FMR-10	Instrumentation	1		2		as required		1				1	Daily	check instruments functions
													Monthly	check measured data
													Yearly	recalibration all instruments
FMR-11	Electrical power supply	1		6		184		1		1		1	Daily	check and operation monitoring
													Monthly	repair and adjust all relays
													Yearly	measuring transformer oil properties
FMR-12	Laboratory	4		6		24		1			1		Daily	samples collection, check and fix dose
													Monthly	evaluate all analysis results
													Yearly	calibrations and annual lab requirement
FMR 13	Diesel generator	1		3		8		1	2			2	Daily	check machine condition
													Monthly	run at full load
													Yearly	annual overall and change defect parts
	Total	22	0	62	0	583	0.5	13	5	2	2	22		
	Frequency	365	52	12	4	1								
	Total hours in a year (hrs)	8,030	0	744	0	1166	← Extra working hours shall be added as per required works.(estimated factor: 2.0)							
	Gross hours in a year (hrs)	9,940												
	Ratio of O&M activity	0.6	(estimated factor of ratio of O&M activity/whole activity in the plant)											
	Gross hours in a year (hrs)	16,567												

vs.: supervisor, tic: technician, sp/t: special technician, chef: chemist, work: labor

No.	Equipment	Required working time for required activity period (hour) Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	Resource (jobs) vs.	tic	sp/t	chef	work	Interval	Activities
WTP13	Transmission pump	8		12		as per required		1	2			2	Daily	check and operation monitoring
													Monthly	greasing and stuffing box check
													Yearly	annual overall and change defect parts
WTP14	Drainage facility	8		12		as per required		1	2			2	Daily	check and operation monitoring
													Monthly	greasing and stuffing box check
													Yearly	annual overall and change defect parts
WTP15	Piping and valves	2		6		144		1				4	Daily	check all valves
													Monthly	greasing and stuffing box check
													Yearly	polish and repaint all valves
WTP16	Monitoring room and instrumentation	1		2		as per required			1			1	Daily	check instruments functions
													Monthly	check measured data
													Yearly	recalibration all instruments
WTP17	Electrical power supply	1		6		184		1	2			2	Daily	check and operation monitoring
													Monthly	repair and adjust all relays
													Yearly	measuring transformer oil properties
WTP18	Diesel generator	1		3		8		1	1			2	Daily	check machine condition
													Monthly	run at full load
													Yearly	annual overall and change defect parts
WTP19	Crane facility special technician: : crane driver	1		3		6		1				2	Daily	check crane conditions
													Monthly	oiling and greasing bearings
													Yearly	annual check for gears and wires
WTP20	Laboratory	8	10		12	144			1		1	1	Daily	samples collection, check and fix dose
													Weekly	do complete samples analysis
													Monthly	evaluate all analysis results
													Yearly	calibrations and annual lab requirement
WTP21	Coordination with booster pump station	1	2			8		1		1			Daily	coordinate with boosters related
													Monthly	check flow and pressure meters
													Yearly	maintain flow and pressure meters
	Total	71	12	299	36	2391	0.5	19	13	2	2	36	72	
	Frequency	365	52	12	4	1		0.3	0.2	0	0	0.5		
	Total hours in a year (hrs)	25,915	626	3,588	144	7173	← Extra working hours shall be added as per required works. (Estimated factor: 3)							
	Gross hours for O&M work	37,446	(hrs)	Estimation of total working hours limited only to O&M work										
	Ratio of O&M activity	0.6		Factor of ratio to estimate whole work hours in the plant										
	Gross hours for whole works	62,410	(hrs)	Estimation of whole working hours in the plant										

No.	Equipment	Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	sv	tec	sp/t	che	wrk	Interval	Activities

Componet of technical staff in the current in Bilbeis BPS

Job category	worker No.
Technician	3
Chemist	0
Labor	6
Total	9

No.	Equipment	Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	sv	tec	sp/t	che	wrk	Interval	Activities

Componet of technical staff in the current in Quenayate FMRP

Job category	worker No.
Technician	3
Chemist	2
Labor	2
Total	7

Standard Manpower working hours for Aslougy WPS

sv: supervisor, tec: technician, sp/t: special technician, che: chemist, wrk: labor

		Required working time for required activity period (hour)						Rresource (jobs)						
No.	Equipment	Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	sv	tec	sp/t	che	wrk	Interval	Activities
WPS 1	Water well	0.5		1		3	0.5				1	1	Daily	Check water level
													Monthly	Cleaning site and sampling
													Yearly	Repair and paint
													Emergency	Disinfection
WPS 2	Well pump/motor	1		3		as per required		1	1			1	Daily	check and operation monitoring
													Monthly	Greasing and stuffing box check
													Yearly	annual overall and change defect
WPS 3	Diesel well pump (Not applicable)	1		3		as per required		1	1			1	Daily	check machine condition
													Monthly	run at full load
													Yearly	annual overall and change defect parts
WPS 4	Piping and valves	1		6		144		1	1			1	Daily	check all valves
													Monthly	greasing and stuffing box check
													Yearly	polish and repaint all valves
WPS 5	Instrumentation	1		2		as per required			1			1	Daily	check instruments functions
													Monthly	check measured data
													Yearly	recalibration all instruments
WPS 6	Chlorination facility special technician: :chlorine handling	4		16		as per required		1		1		2	Daily	check and control dose
													Monthly	repair chlorine injection equipment
													Yearly	check and test pipes and fittings
WPS 7	Electrical power supply	0.5		1		184		1	1			1	Daily	check and operation monitoring
													Monthly	repair and adjust all relays
													Yearly	measuring transformer oil properties
WPS 8	Elevated tank	1		4		240		1	1			1	Daily	operation and water level monitoring
													Monthly	maintain valves and level indicator
													Yearly	repair and paint valves
WPS 9	Crane facility special technician: : crane driver	0.5		3		6		1		1		2	Daily	check crane conditions
													Monthly	oiling and greasing bearings
													Yearly	annual check for gears and wires
	Total	10.5	0	39	0	577	0.5	7	6	2	1	11		
	Frequency	365	52	12	4	1								
	Total hours in a year (hrs)	3,833	0	468	0	1154	← Extra working hours shall be added as per requierd works.(estimated facotr: 2)							
	Gross hours in a year (hrs)	5,455												
	Ratio of O&M activity	0.6	(estimated factor of ratio of O&M activity/whole work hours of activity in the plant)											
	Gross hours in a year (hrs)	9,091												

Standard Manpower working hours for Bilbeis BPS

sv: supervisor, tec: technician, sp/t: special technician, che: chemist, wrk: labor

		Required working time for required activity period (hour)						Rresource (jobs)						
No.	Equipment	Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	sv	tec	sp/t	che	wrk	Interval	Activities
BPS 1	Clear water reservoir	2		4		240	3	1				1	Daily	monitor operation and water level
													Monthly	maintain the inlet gates
													Yearly	repair and paint gates,. Cleaning & disinfection
													Emergency	Disinfection
BPS 2	Booster pump	8		12		as required		1	2			2	Daily	check and operation monitoring
													Monthly	Greasing and stuffing box check
													Yearly	annual overall and change defect
BPS 3	Chlorination facility special technician: :chlorine handling	4		16		as required		1		1		2	Daily	check and control dose
													Monthly	repair chlorine injection equipment
													Yearly	check and test pipes and fittings
BPS 4	Piping and valves	2		6		144		1				4	Daily	check all valves
													Monthly	greasing and stuffing box check
													Yearly	polish and repaint all valves
BPS 5	Instrumentation	1		2		as required			1			1	Daily	check instruments functions
													Monthly	check measured data
													Yearly	recalibration all instruments
BPS 6	Electrical power supply	1		6		184		1	2			2	Daily	check and operation monitoring
													Monthly	repair and adjust all relays
													Yearly	measuring transformer oil properties
BPS 7	Diesel generator	1		3		8		1	2			2	Daily	check machine condition
													Monthly	run at full load
													Yearly	annual overall and change defect parts
BPS 8	Crane facility special technician: : crane driver	1		3		6		1		1		1	Daily	check crane conditions
													Monthly	oiling and greasing bearings
													Yearly	annual check for gears and wires
BPS 9	Elevated tank	1		4		240		1	1			2	Daily	operation and water level monitoring
													Monthly	maintain valves and level indicator
													Yearly	repair and paint valves
	Total	21	0	56	0	822	3	8	8	2	0	17		
	Frequency	365	52	12	4	1								
	Total hours in a year (hrs)	7,665	0	672	0	1644	← Extra working hours shall be added as per requierd works.(esitimated factor: 2)							
	Gross hours in a year (hrs)	9,981												
	Ratio of O&M activity	0.6	(estimated factor of ratio of O&M activity/whole work hours of activity in the plant)											
	Gross hours in a year (hrs)	16,635												

No.	Equipment	Daily	Weekly	Monthly	3-mo.	Yearly	Emergency	sv	tec	sp/t	che	wrk	Interval	Activities

Componet of technical staff in the current in Asulougi WPS

Job category	worker No.
Technician	3
Chemist	–
Labor	6
Total	9

Numbers of worker are put into table as default value

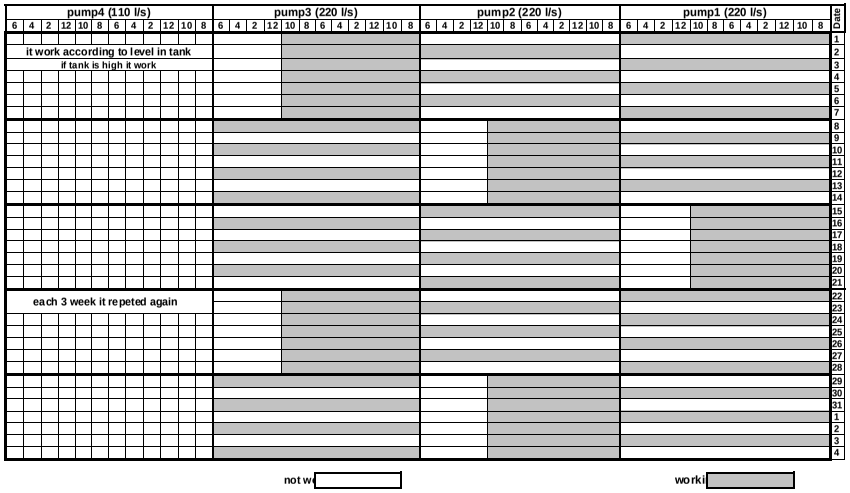
operation schedule for Raw Pumps at Abbasa WTP

Day	old plant																								1st Extention												2nd Extention											
	Q(250 l/s) No(1)						Q(250 l/s) No(2)						Q(250 l/s) No(3)						Q(250 l/s) No(4)						Q(750 l/s) No(1)						Q(750 l/s) No(2)						Q(500 l/s) No(1)						Q(500 l/s) No(2)					
	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am
1																																																
2																																																
3																																																
4																																																
5																																																
6																																																
7																																																
8																																																
9																																																
10																																																
11																																																
12																																																
13																																																
14																																																
15																																																
16																																																
17																																																
18																																																
19																																																
20																																																
21																																																
22																																																
23																																																
24																																																
25																																																
26																																																
27																																																
28																																																
29																																																
30																																																

operation schedule for Raw Pumps at Abbasa WTP

Day	old plant																								1st Extention												2nd Extention											
	Q(250 l/s) No(1)						Q(250 l/s) No(2)						Q(250 l/s) No(3)						Q(250 l/s) No(4)						Q(750 l/s) No(1)						Q(750 l/s) No(2)						Q(500 l/s) No(1)						Q(500 l/s) No(2)					
	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am	8 am	12 pm	4 pm	8 pm	12 am	4 am
1																																																
2																																																
3																																																
4																																																
5																																																
6																																																
7																																																
8																																																
9																																																
10																																																
11																																																
12																																																
13																																																
14																																																
15																																																
16																																																
17																																																
18																																																
19																																																
20																																																
21																																																
22																																																
23																																																
24																																																
25																																																
26																																																
27																																																
28																																																
29																																																
30																																																

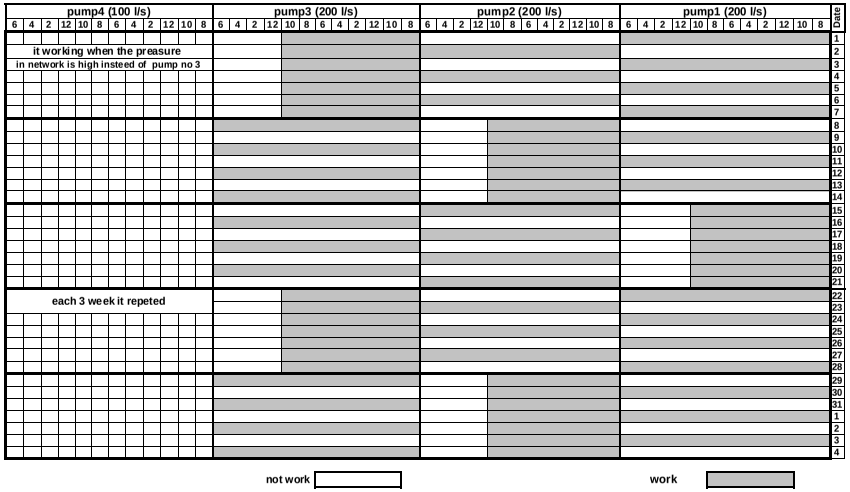
Zagazig WTP
operation schedule for raw water pump



operation schedule for Raw Pumps at Abbasa WTP

Day	old plant								1st Extention				2nd Extention			
	Q(250 l/s) No(1)		Q(250 l/s) No(2)		Q(250 l/s) No(3)		Q(250 l/s) No(4)		Q(750 l/s) No(1)		Q(750 l/s) No(2)		Q(500 l/s) No(1)		Q(500 l/s) No(2)	Q(500 l/s) No(3)
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

Zagazig WTP
operation schedule for Transmission pump



operation schedule for transmission pumps at Abbasa WTP

Day	old plant										1st Extention				2nd Extention					
	Q(240 l/s) No(1)		Q(240 l/s) No(2)		Q(240 l/s) No(3)		Q(220 l/s) No(4)		Q(440 l/s) No(5)		Q(500 l/s) No(1)		Q(500 l/s) No(2)		Q(500 l/s) No(1)		Q(500 l/s) No(2)		Q(500 l/s) No(3)	
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
21																				
22																				
23																				
24																				
25																				
26																				
27																				
28																				
29																				
30																				

zagazig wtp

operation schedual for alum pump			
Alum pump 3	Alum pump 2	Alum pump 1	date
			1
			2
			3
			4
			5
			6
			7
			8
			9
			10
			11
			12
			13
			14
			15
			16
			17
			18
			19
			20
			21
			22
			23
			24
			25
			26
			27
			28
			29
			30

not work work

zagazig wtp

operation schedual for washing pump		
wash pump no 2	wash pump no 1	date
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

not work work

zagazig wtp

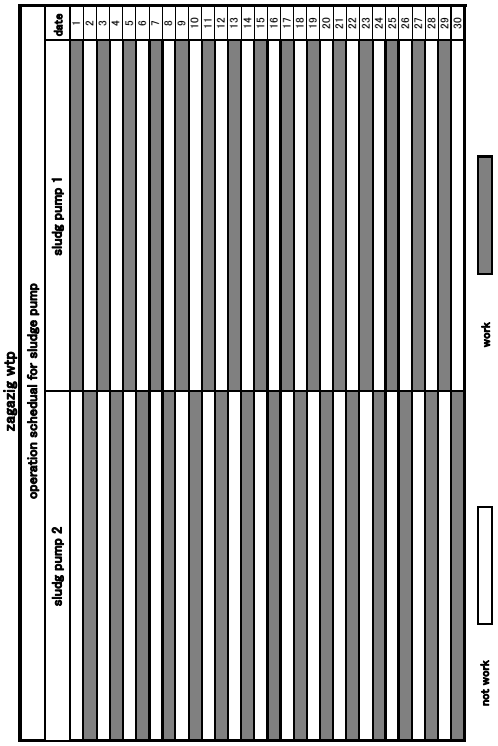
operation schedual for bostter pump		
bostter pump 2	bostter pump 1	date
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

not work work

zagazig wtp

operation schedual for BLOWER		
blower no 2	blower no 1	date
		1
		2
		3
		4
		5
		6
		7
		8
		9
		10
		11
		12
		13
		14
		15
		16
		17
		18
		19
		20
		21
		22
		23
		24
		25
		26
		27
		28
		29
		30

not work work



8. Emergency Plan

Assumption of Emergency Situation
and
The measures against Emergency Situation

SHAPWASCO
JICA Expert Team
14/February/2009
Ver-1

Preface

Water supply facility is one of the most important infrastructures for the people. The safe water and sufficient amount water shall be supplied to the people every day from the water supply facility with reasonable price.

Hence, equipment and water treatment process shall be maintained in suitable condition always by adequate operation and maintenance activities.

However, generating of contingency situation in the water supply facility should not be avoided even by daily adequate operation and maintenance activities.

Under the above situations, persons in water supply facility should need to prepare the activity plan against the contingency situation beforehand. Some of the contingency may reach to the emergency situation by unsuitable response speed against contingency. Hence, the preparations of activity plans against emergency situation are useful and important for the water supply facility staff.

This document provides required items for the preparations of activity plans against emergency situations as following;

1) Definition of a emergency situation
2) Assumption of emergency situation
3) The acknowledgment of the risk and risk assessment
4) Required measures against emergency situation
5) Procedures for required activities against emergency situation

1. Definition of assumption of emergency situation in water supply facility

Emergency situations in water supply facility are as followings.

1-1.The situation that water supply facility is unable to function, or is predicted to unable function as a water supply facility.

The situation that it became impossible to secure or is predicted to secure required water quality or required water quality or required transmission water quantity, and required transmission water pressure

The assumed unusual conditions to lead to emergency

1) Unusual condition of source water quality
2) Unusual condition of intake facility
3) Unusual condition of transmission water facility
4) Power down
5) Unusual residual chlorine in transmission water
6) Unusual turbidity of transmission water

1-2.The condition that with a possibility of exerting a danger on environment around water supply facility

1) Leakage of chlorine gas

2. Detection of emergency situation

By early detection of emergency situation, it is possible that bad affects to the plant generated by emergency situation can be minimized. Periodical monitoring and check should be required to detect the assumed emergency situations in the generated early phase. The assumed unusual situations to lead to emergency should be monitored and checked every two (2) hours in a day.

1) The required measures against Emergency Situation

When the emergency situation will be generated, discoverer of the emergency situation shall inform the generation of emergency situation to plant manager.

If plant manager will be absent or it will not be able to contact with the plant manager, the discoverer shall inform to number two's person in charge who decided beforehand.

The plant manager or number two's person in charge who decided beforehand, shall grasp the actual current situation of emergency on site. After the above mentions, the situation will be judged as actual emergency situation by the plant manager, the plant manger shall carry out the correspondent treatment according to the procedures beforehand immediately. Simultaneously the plant manager shall contact or inform the generation of emergency situation to relative sections.

In case of actions against the emergency situation, the plant manager shall call the required staff and order the required materials for treatment of recovery of emergency situation and treat to recovery of the emergency situation immediately

3. Risk assessment for situation of assumed emergency situation

The degree of risk C is indicated by the calculation result of the product of A and B shown as following.

C = A x B

A: Degree of effects by generation of unusual situation

B: Possibility of generation of unusual situation

C: Degree of the risk

In this document, A and B in the above mentions are set the three (3) stages individually for assessment of degree of the risk. A (Degree of effects by generation of unusual situation) is set as three (3) stages tentatively as following

Stage 3 Serious effects which affect a human body or a human life

Stage 2 Medium effects which affect the whole water supply facility

Stage 1 Light effect which affects a part of water supply facility

B (Possibility of generation of unusual situation) is set as three (3) stages tentatively based on experiences in the past as following

Stage 3 Case that possibility of generation will be more than twice in a year

Stage 2 Case that possibility of generation will be more than once in a year

Stage 1 Case that it may generate but possibility of generation is very low

According to the above mentions, calculation results of degree of the risk C is shown in following table.

Assumed unusual	Effect (A)	Possibility (B)	Risk (C)
Water quality of intake	3	1	3
Facility of intake	1	1	1
Facility of transmission	1	1	1
Power down	3	3	9
Residual chlorine of transmission water	3	1	4
Turbidity of transmission water	3	1	3
Chlorine leakage	3	2	6

The result of assessment on the risk is shown as following table

Risk level	Risk item
High	Power dawn and chlorine leakage
Medium	Water quality of intake, Residual chlorine and turbidity of transmission water
Low	Facility of intake and facility of transmission

Preparations for the measure against the emergency situation will be carried out depend on the risk level.

To decrease the risk level, it should be required that implementation of daily monitoring, maintenance of stand-by equipment and study about automatic detection system for generated unusual condition.

5. The required treatment against emergency situation

5-1 Power down

The cases of power down are separated to 2 kinds. One is the case that schedule of power down is informed by staff in power station. Another is the case of sudden happening. In case of former, stop of water supplying can be informed to the customers and preparations for power down can be carried out by staff in water supply facility such as preparation of operation of diesel engine generator.

In case of sudden power down, the function of water supply facility will be stopped in the meantime.

1) Treatment activities at power down

1-1) Stop of chlorine dose

Chlorine dose is carried out by suck of chlorine gas into the injector by vacuum pressure generated by injector and vacuum pressure in injector is generated by pressure water supply by booster pump

After power down, chlorine dose can not be performed because of stop of booster pump for injector. Hence, chlorine gas supply should be stopped to avoid chlorine gas leakage. Chlorine gas supply is stopped by close of valve for chlorine gas master valve of chlorine drum.

Negative pressure will be remaining in chlorine gas pipes of the chlorinator at immediate after of stop of chlorine dose. However, remaining negative pressure will be decrease in a few hours and decrease of negative pressure will cause the chlorine leakage. Hence chlorine gas supply shoud be stopped from chlorine drum and check no leakage of chlorine gas from chlorine gas pipes and the chlorinator. In case of chlorine gas leakage, chlorine gas neutralization equipment shall be operated and leaked chlorine gas shall be neutralized and after that exhausted to outside.

1-2) Stop of flow out from the filter by close of outlet valve of the filter

In case of use the motor actuated valves for the tilter piping, motor actuated valve is kept the condition at power down. Hence, the filter is kept the filtering and filtered water flows out into the reservoir even under condition of power down, In case of using of manual valves, same situation as the above mentions. During filtering under condition of power down, chlorine dose is stopped and chlorine is not dosed into the filtered water. This situation is continued during power down.

Residual chlorine of clear water cannot be controlled.

1-3) Stop of alum dose

In Abbassa WTP, alum is dosed into the raw water by gravity. Alum is kept dosing during power down under situation that raw water supply to the distribution shaft is stopped. By this result, alum will be dosed into raw water excessively and unnecessarily. Excessive dose of alum will be cause of poor coagulation when plant operation will be resumed after recovery of power down. And excessive and unnecessary alum dose is waste consumption of alum.

Hence, alum dose shall be stopped immediately at generating of power down.

1-4) Other rotary machines

All rotary machines shall be in condition of stop by manually as one of the safety action. These machines will be stooped suddenly in condition of working of switches at generating of power down and these machines may start automatically at recovery of power down however this action is not necessary for machines with protection circuit to avoid automatic re-start after power down.

It is necessary to confirm and restart the machines immediately after recovery of power down.

1-5) Confirmation of water level in clear water reservoir

Water level in the clear water reservoir will be not decrease because the transmission pump is stopped during power down but may be increase by water flow from the filter. the filtered water will not flow into the reservoir under usual condition during power down. However, if water sealing ability of filtered water valves or inlet water for reservoir will not be sufficient, water will flow into the reservoir even under conditions of valve closed. In this case, water level in the reservoir may increase. And clear water may flow out through overflow pipe. If overflow pipe is not available in the reservoir, water will flow out to the outside from the reservoir through inspection opening. Flown out water from the reservoir may cause damage of other equipment as

secondary accident. Hence during power down, water level in clear water reservoir shall be confirmed periodically and it shall be avoided that water level of the reservoir become high abnormally. Water level of reservoir can be down by handling of drainage valve to be opened.

2) The required treatment at recovery of power down

The activities and procedures for treatment at recovery of power down are almost same procedures as star up for water supply facility. After confirmation of water level in each basin and quality of water in the clear water reservoir, then start up the transmission pump. After that start up the raw water pump and chlorine and alum dose simultaneously. Flash mixer, flocculator, sludge collector should be started one by one.

The filtering should start after confirmation and adjustment of water level in the filter basin.

After completion of start up of all facilities, water quality of clarified water and filtered water shall be monitored. And alum dosing rate and/or chlorine dosing rate shall be adjusted as required for treatment process, if necessary. Tentative increase of chemical dose will be required often at start up of water supply plant.

5-2.The required treatment against accident of chlorine leakage

Chlorine gas is poisonous gas and it is the cause of inflicting an injury on a human life in case that the high concentration chlorine is attracted by a person. The chlorine gas leakage shall be detected early as soon as possible. Hence, the chlorine leakage shall be checked by chlorine gas detector automatically and continuously, and periodical check shall be carried out by operator by manually.

The rooms with a possibility that chlorine leakage may occur are container storage room and chlorinator room. The chlorine leakage in container room will be cases of leakages from containers and chlorine gas pipes and valves. The chlorine leakage in chlorinator room will be cases of chlorine leakages from the chlorinators and chlorine gas pipes and valves.

A possibility of generating of chlorine leakage will be high from chlorine gas pipes and valves, because that handling works of valves and tube in chlorine gas piping are one of the routine works accompanying container change activity for the operation staff in charge of chlorination equipment.

The main causes of leakage from chlorine gas piping and valves will be degradation of gaskets and of sealing performance of piping and valves. Hence, the possibility of generating of chlorine leakage accident will be able to reduce by implementation of periodical inspection and replacement of parts.

1) The required treatment against high-concentration of chlorine leakage

(In case that concentration of chlorine leakage is more than 1ppm)

The action performed by discoverer of chlorine leakage accident is to close the doors of room under condition of leakage of chlorine. The diffusion of leaked chlorine gas to the open air shall be avoided by this action. After that chlorine gas neutralization equipment shall be

started.

The working chlorinator shall be kept working during the above actions.

Then the discoverer shall inform the actual status of chorine leakage to the plant manager and shall arrange the staff to aid against chlorine leakage accident. The discoverer does not take action to treat for any repairing or investigation activity. The action by one person is very dangerous. The treatment action against chlorine leakage accident shall be carried out by 2 persons or more to ensure the safety for operator.

The investigation to find out the portion of chlorine leakage shall be carried out under condition with gas mask wearing. Prior to investigation master valve for container shall be closed at the first action. After specifying the leakage portion, first-aid treatment shall be carried out in order to lessen the leaking chlorine amount and enforcement person once comes out of a room and waits until chlorine concentration in the room becomes low. Detail investigation and recovery or repairing activities shall be carried out after chlorine concentration in the room will be low.

Ammonia solution water shall be used to find out the leakage portion of chlorine gas. . If the cloth in which aqueous ammonia was dipped is put closely to the leakage part of chlorine, white smoke will come out. We can specify the chlorine leakage portion to confirm that the place where white smoke comes is checked.

2) The required treatment against high-concentration of chlorine leakage

(In case that concentration of chlorine leakage is less than 1ppm)

In case that concentration of chlorine leakage is less than 1ppm, the action performed by discoverer of chlorine leakage accident is to open all the doors of room under condition of leakage of chlorine for the diffusion of leaked chlorine gas to the open air. After that, investigation and recovery or repairing activities shall be carried out after chlorine concentration in the room will be low.

5-3.Unusual concentration of residual chlorine in transmission water

1) Unusual low concentration of residual chlorine in transmission water

Unusual low concentration of residual chlorine in transmission water will be a fault of supply of safe water to the network. Residual chlorine concentration as free is checked by water analysis of the sampled water taken from the pipe of transmission pump and/or the transmission pipe line.

However, the water quality as concentration of residual chlorine in transmission water, shall be monitored the inlet water to the clear water reservoir, that is filtered water after dosing of post-chlorine, simultaneously. If concentration of residual chlorine in transmission water is unusual all the water in the reservoir shall be replaced to the suitable quality water, or be adjusted the concentration of residual chlorine of water in clear water reservoir to be suitable.

By the monitoring the water in the pre-process prior to final transmission water process, it is easy to

perform that concentration of residual chlorine in transmission water to be kept in a treatment target range by adjustment the dosing rate of post-chlorine.

2) Unusual high concentration of residual chlorine in transmission water

If condition of unusual high concentration of residual chlorine in transmission water is generated, the discoverer shall inform the fact to the plant manager and grasp the actual situation and investigate the cause of unusual condition. After grasping the actual situation and site investigation, the cause of unusual high concentration of residual chlorine in transmission water shall be specified and cause of unusual condition shall be removed. After that the high concentration water shall be drained of be adjusted the concentration of residual chlorine of water in clear water reservoir to be suitable.

When the high concentration water of residual chlorine is drained, the high concentration water of residual chlorine shall be diluted to the low concentration that drainage water does not affect to the ecosystem around the water supply facility. For reference, effects of residual chlorine to fishes are shown as following;

- A carp can be survived in the water under the condition that free residual chlorine is less than 10 mg/l.
- The survival rate of a carp is 20% in the water under the condition that free residual chlorine is less than 3 mg/l.

5-4.Unusual turbidity in transmission water

The turbidity of inlet water to the clear water reservoir shall be monitored to check the turbidity in transmission water by a same reason as the above mentions about motoring of residual chlorine of the transmission water. And turbidity in the water shall be motored the water of the upstream process such as filtering process. The causes which may generate unusual turbidity in transmission water are as following

- Unusual high turbidity of filtered water
- Contamination of the water in the clear water reservoir
- Contamination of the water flowing from the filter to the clear water reservoir

The condition of unusual high turbidity of filtered water is the high possibility cause which unusual turbidity in transmission water generates.

The major causes which may generate unusual turbidity in filtered water are as following

- Unusual high turbidity of clarified water
- Unusual high filtering rate
- Unusual filter run time
- Damage of under drain system

The monitoring and control of turbidity of filtered water are the essential activities to avoid the generation of unusual turbidity in transmission water.

If condition of unusual high turbidity in transmission water is generated, the discoverer shall inform the fact to the plant manager and grasp the actual situation and investigate the cause of unusual condition. After grasping the actual situation and site investigation, the cause of unusual high turbidity in transmission water shall be specified and cause of unusual condition shall be removed. The filter or the reservoir cause of high turbidity water shall be specified .After specifying the causes, the filter and the reservoir, stop the working of specified filter or reservoir and the high turbidity water shall be drained as required. If unusual high turbidity condition is generated in the reservoir, the inside of reservoir shall be inspected totally and intimately under condition of empty.

5-5.Unusual condition of source water quality

The unusual condition of source water quality shall be detected in early stage of contamination of source water by implementation of daily monitoring of visual check, smell check and water analysis.

When the unusual condition is detected in source water, the unusual condition shall be informed to the plant manager immediately. And the actual unusual condition shall be confirmed by the plant manager the chemist and required treatment such as shut down of intake waster shall be carried out immediately, if necessary. It becomes possible that the contamination of the facilities in the plant can be minimized for water supply facility, by early detection of contamination of source water and early judgment of shut down of intake waster to avoid inflow of contaminated source water into the water facility. The unusual condition of source water quality shall be informed to the outside section of SHAPWASCO in charge of canal management in parallel to carry out required treatment activities for the water supply facility. The unusual condition of source water quality shall be informed to SHAPWASCO H/Q and SHAPWASCO H/Q shall inform the unusual condition of source water quality to the relative other water supply facilities in SHAPWASCO if necessary.

The check items for judgment of unusual situation of canal water are as following.

1) The case that color or turbidity of canal water is changed remarkably

(This case include the condition that oil and fat is floating remarkably on the water surface)

2) The case that smell of canal water is changed remarkably

3) The case that a large number of dead fishes are floating

The communication regime shall be provided between SHAPWASCO, water supply facilities and other relative outside and inside sections of SHAPWASCO to perform the rapid treatment activities in corporation with each relative section against the unusual situation of source water quality.

5-6.Unusual condition of intake facility and/or transmission facility

Stand-by equipment is installed to keep the function of water supply facility working.

Therefore, the above both facilities can be worked continuously with their functions in case that unusual condition is generated in a part of these facilities.

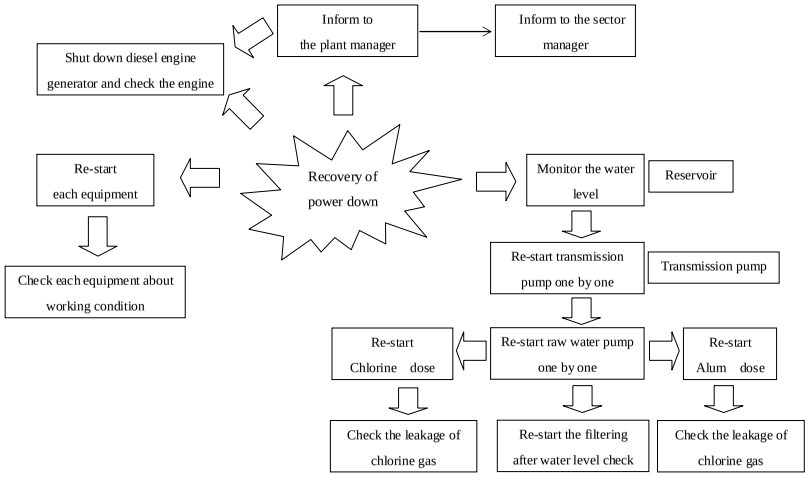
However, stand-by equipment shall be carried out the inspection and check of the equipment and working conditions constantly. And if unusual condition is generated in a part of equipment, generated unusual condition shall be recovered with investigation of cause of unusual condition.

Corrective action shall be carried out through the activities of investigations and analysis about detail cause of unusual condition such as operation status, frequency of maintenance activities, and so on.

Depend on the unusual situation of the equipment, procurement of the component parts takes a long periods. Hence, consumable parts for the equipment should be store for stock in the plant as much as possible.

Flow charts for major procedures for required treatment activity against emergency situations are shown in next pages.

Major procedures for the required treatment activities at recovery of power down

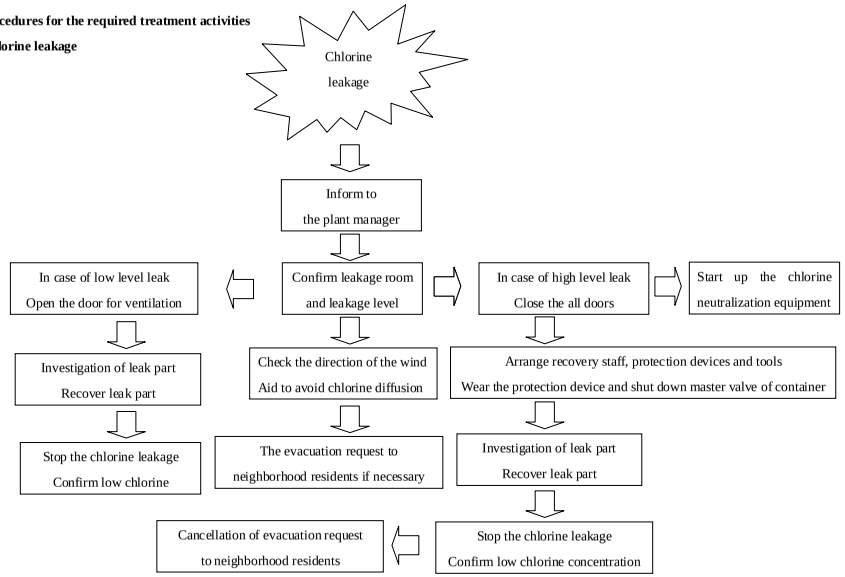


3/7-F

Flow chart for major procedures for required treatment activity against emergency situations

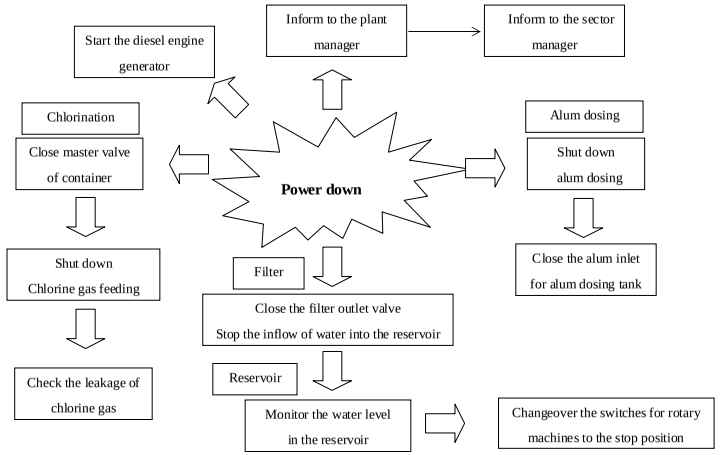
1/7-F

Major procedures for the required treatment activities against chlorine leakage



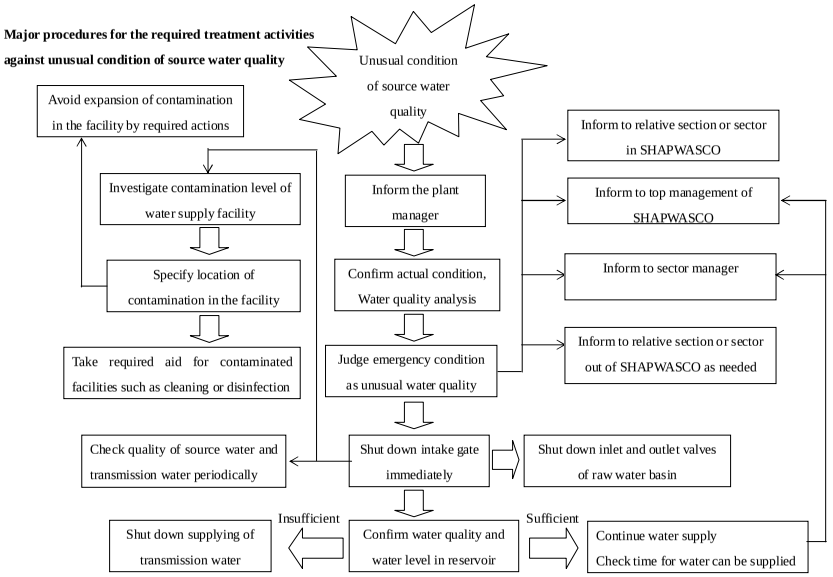
4/7-F

Major procedures for required treatment activity against power down accident



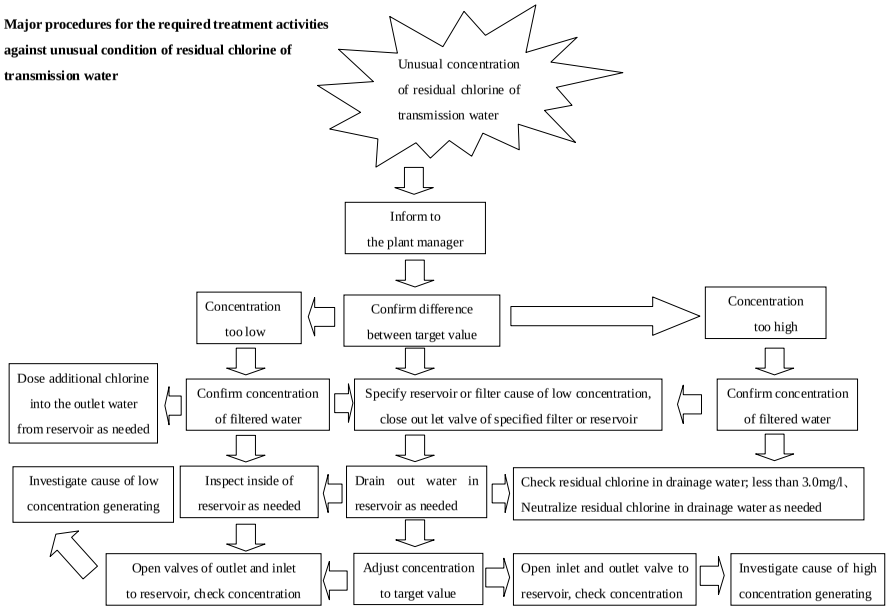
2/7-F

Major procedures for the required treatment activities against unusual condition of source water quality



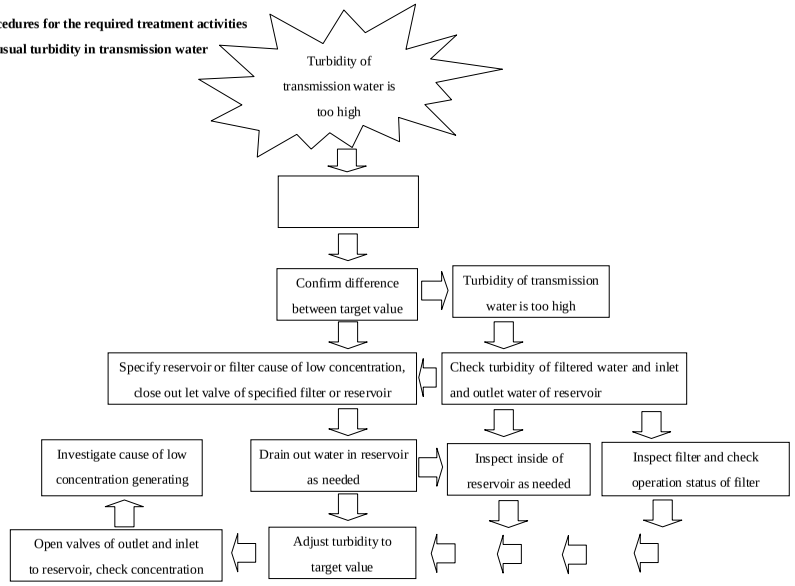
7/7-F

Major procedures for the required treatment activities against unusual condition of residual chlorine of transmission water



5/7-F

Major procedures for the required treatment activities against unusual turbidity in transmission water



6/7-F

Trouble Shootings for Water Treatment Plant

1) Trouble Shootings for System
2) Trouble Shootings for Process

SHAPWASCO

JICA Expert Team

February-2009 Ver-1

Trouble shooting sheets for system and process in WTP　　Predicted trouble, cause of trouble, remedy and required corrective action for WTP system

S：Trouble shooting sheets for WTP system

Name of System		Predicted Trouble		Cause		Remedy		Required Corrective Action
S-1	Water Intake systen	S-1-1	Raw water quantity is not sufficient to the raw water basin from water intake	1)	Insufficient opening degree of intake water gates	1-1)	Check of opening of water intake gate and adjust the opening of the intake gate to adequate opening degree	Confirmation of opening of water untake gate and open the gate
				2)	Intake water screen is clogged by foreign substances	2-1)	Check the screen condition and cleaning, removel mud or foreign substances in the intake channe, if necessary.. Removed mud or foreign substances should be disposed.	Daily inspectiom
				3)	Intake channel is clogged by precipitated mud or foreign substances	3-1)	Check the intake channel condition and cleaning, removel mud or foreign substances in the intake channe, if necessary.. Removed mud or foreign substances should be disposed.	Daily inspectiom
				4)	Insufficient opening degree of outlet valve to the raw water basin from intake water gates	4-1)	Check the opening of outlet valve of source water to the raw water basin and adjust the opening of the outlet valve to adequate opening degree	Daily inspectiom
				5)	Clogging of the raw water outlet valve of intake channel by foreign substances	5-1)	Check the condition of outlet valve and remove clogging foreign substances if necessary	Priodical inspection and cleaning
				6)	Pipe between outlet valve of intake channel and outlet valve of raw water basin is clogged between	6-1)	Check the intake channel condition and flush out the water in the clogged pipe in the condition of having lowered the water level of the raw water basin	Periodical cleaning
				7)	Clogging of the raw inlet valve of the raw water basinby the foreign substances	7-1)	Check the condition of raw water inlet valve of raw water basin in the condition of having lowered the water level ofthe raw water basin	Periodical inspection

Name of System		Predicted Trouble		Cause		Remedy		Required Corrective Action
		S-1-2	Existing of foreign substances in the raw water basin	1)	Inadequate setting up of intake screen	1-1)	Check the setting up condition of intake screen and set the screen into the frame of screen if necessary	Daily inspectiom
				2)	Clearances between screen bars of intake screen is too rough	2-1)	Modification of intake screen	Periodical inspection
				3)	Tapping of foreign substances into the intake channel from intake area	3-1)	Disposal of removed foreign substances	Daily inspectiom
		S-1-3	Inadequate water level of raw water basin	1)	Raw water quantity is not sufficient to the raw water basin from water intake	1-1)	Refer to S-1-1	Refer to S-1-1
				2)	Clogging of the raw inlet valve of the raw water basinby the foreign substances	2-1)	Check the intake channel condition and flush out the water in the clogged pipe in the condition of having lowered the water level of the raw water basin	Periodical inspection
				3)	Clogging of the raw outlet valve of the raw water basinby the foreign substances	3-1)	Disassemble the piping and cleaning or flushing inside of raw water outlet pipe of raw water basin	Periodical inspection
S-2	Coagulation and sedimentation system	S-2-1	Inadequate distribution water quantity for each distribution shaft	1)	Inadequate opening degree of valeves of raw water transfer pipes	1-1)	Adjustment of valve opening degree looking at indicator of raw water flow meter	Daily inspectiom
				2)	Clogging of insdie of pipe of raw water transfer pipe	2-1)	Cleaning of raw water transfer pipe by flushing the inside of pipe	Daily inspectiom
		S-2-2	Inadequate distribution quantity of raw water to each sedimentation basin	1)	Inadequate opening degree of raw water outlet valve of distribution shaft	1-1)	check the opening degree of raw water outlet valve of distribution shaft	Daily inspectiom
		S-2-3	Insufficient mixing of raw water and chemicals in the rapid mixing basin	1)	Stop of flash mixer	1-1)	Check the flash mixer and repair, re-installing or overhaul of the flash mixer if necessary	Daily inspectiom Periodical inspection

Name of System		Predicted Trouble		Cause		Remedy		Required Corrective Action
				2)	Unusual condition of mixing shaft or paddle of flash mixer	2-1)	Check the installation condition of mixing shaft and paddle of flash mixer.and repair or adjust the alignment of shaft should be conducted if necessay	Daily inspection Periodical inspection
		S-2-4	Insufficient sludge drainege from the sedimentation basin	1)	Clogging inside of sludge drainage pipe in the sedimentation basin	1-1)	Check the condition of precipitated sludge around sludge collecting pit If uneven precipitated condition of sludge is confirmed, review of it should be concidered that modifying of sludge drainage pipings such as arrangement of sludge drainage pipe or pipe diameter of sludge drainage pipe inside of the sedimentation basin	Daily inspection Periodical inspection
				2)	Discharge pipe or valve is cologged	2-1)	Flushing out inside of discherge pipe by compressed water supply or remove the foreign substances in valve by dismantling of valve	Periodical inspection
S-3	Filtering system	S-3-1	Inadequate water level in filter basin	1)	Inadequate filtering rate	1-1)	The filtering rate should be kept in less than 120m/d	Daily inspection Periodical inspection
				2)	Clogging of filter media	2-1)	The filter media shoud be refreshed according to the procedures of filter refreshment	Periodiacal check of effectiveness of fiter washing
						2-2)	Removal of fine surfacing sands	Periodical inspection
						2-3)	Completion of removal of air in sand layer prior to operation of the filter after maintenance activities of filter equipment	Check prior to operation after maintenance activities Do not start the filter washing without air removal in the back wash pipe, under drain or sand layer

Name of System		Predicted Trouble		Cause		Remedy	Required Corrective Action
		S-3-4	Nonuniform air bubbling by air scouring to the whole filter basin	1) Clogging of filter media	1-1)	Refer to S-3-1	Refer to S-3-1
				2) Clogging of air scouring pipe or valve	2-1)	Refer to S-3-3	Refer to S-3-3
				3) Nonuniformity of filter media depth between left bank and right bank of filter basin	3-1)	Refer to S-3-1	Refer to S-3-1
				4) Unusual condition of under drain system with water collection equipment	4-1)	Refer to S-3-1	Refer to S-3-1
		S-3-5	Insufficient back washing	1) Insufficient opening degree of back wash valve	1-1)	Adjustment of valve opening degree of back wash water discharge valve looking at indicator of filtered water water flow meter Flow rate of back wash water should be approximately 0.5 m3/m2/min	Dialy inspection
				2) Unusual condition of back wash pump	2-1)	Invetigation of cause according to the instruction manual of equipment	Daily inspection Periodical inspection
				3) Wear of main parts of back wash pump	3-1)	Check the inside of the pump according to the insruction manual of the pump and overhaul, replace parts if necessary	Periodical inspection
				4) Opening degree of back wash valve is not full	4-1)	Check the opening of valve and inspection of valve, overhaul or repairing of valve or, if necessary	Periodical inspection
				5) Clogging of filter media	5-1)	Refer to S-3-1	Refer to S-3-1
				6) Clogging of back wash pipe or valve	6-1)	Refer to S-3-3	Refer to S-3-3
				7) Air accumulator ball in back wash pipe	7-1)	Completion of removal of air in sand layer prior to operation of the filter after maintenance activities of filter equipment	Check prior to operation after maintenance activities Do not start the filter washing without air removal in the back wash pipe, under drain or sand layer

Name of System		Predicted Trouble		Cause		Remedy	Required Corrective Action
				3) Nonuniformity of filter media depth between left bank and right bank of filter basin	3-1)	Check the depth of sand layer about left bank and right bank	Priodical inspection
					3-2)	Check the flown out of sand during filter washing Filter washing time or filter washing water quantity is modified if necessary	Priodical check of effectiveness of filter washing
				4) Unusual condition of under drain system with water collection equipment	4-1)	When unusual condition is not observed in above mentions 1)2)3), there is possibility that under drain system is in unusual condition such as damage of water collection strainer or uneven arrangement of M block units and so.	Periodical inspection Do not start the filter washing without air removal in the back wash pipe, under drain or sand layer
		S-3-2	Inadequate filter rate	1) Inadequate valve opening degree of control valve of filtering rate	1-1)	Check the filtered water flow rate Adjust the valve opening degree of control valve of filtering rate to adequate flow rate	Daily inspection
				2) Nonuniformity of filter media depth between left bank and right bank of filter basin	2-1)	Refer to S-3-1	Refer to S-3-1
				3) Clogging of filter media	3-1)	Refer to S-3-1	Refer to S-3-1
				4) Unusual condition of under drain system with water collection equipment	4-1)	Refer to S-3-1	Refer to S-3-1

Name of System		Predicted Trouble		Cause		Remedy	Required Corrective Action
		S-3-6	Nonuniform back washing to the whole filter basin	1) Clogging of filter media	1-1)	Refer to S-3-1	Refer to S-3-1
				2) Clogging of back wash pipe or valve	2-1)	Refer to S-3-3	Refer to S-3-3
				3) Nonuniformity of filter media depth	3-1)	Refer to S-3-1	Refer to S-3-1
				4) Unusual condition of under drain system	4-1)	Refer to S-3-1	Refer to S-3-1
		S-3-7	Nonuniform level of filter sand leyer	1) Nonuniform back washing to the whole filter basin	1)	refer to S-3-6	refer to S-3-6
S-4	Chemical and chlorine dosing system	S-4-1	Coagulant is not dosed	1) Insufficient valve opening of suppy valve of alum solution from alum supply tank	1)	Open fully the alum supply valve	Daily inspection
				2) Outlet valve of alum solution supplying is clogged	2)	Check the inside of valve by disassembling of valve and cleaning of inside of valve if necessary	Daily inspection Periodical cleaning
				3) Clogging of strainer for alum solution supply pipe	3)	Cleaning of strainer mesh	Periodical cleaning
				4) Clogging of inside of ball tap for alum solution supply	4)	Check the normal working of ball tap and disassemle and clean the needle valve of ball tap if necessary	Daily inspection Periodical cleaning
				5) Clogging of inside of flow meter for measuring of alum dosing quantity	5)	Cleaning inside of flow meter by hot water	Daily inspection Periodical cleaning
				6) Damage of alum dosing pipe	6)	Check the solution level of alum dosing tray Check the discharge presssure of alum dosing pipe Cleaning inside on alum dosing pipe if necessary	Daily inspection Periodical cleaning
				7) Clogging or damage of alum dosing pipe	7)	Check the solution level of alum dosing tray Check the discharge presssure of alum dosing pipe Repair the damadeg part of alum dosing pipe if necessary	Daily inspection

Name of System		Predicted Trouble		Cause		Remedy	Required Corrective Action
		S-3-3	Insufficient air scouring	1) Unusual condition of blower for air scouring	1-1)	Invetigation of cause according to the instruction manual of equipment	Daily inspection Periodical inspection
				2) Wear of rotar of blower for air scouring	2-1)	Check the condition of suction air filter and clean the strainer or replace the filter if necessary.. Frequency of replacement of strainer should be carried out according to the instruction manual of equipment.	Periodical inspection Periodical replacemant
				3) Clogging of suction air strainer	3-1)	Same as above mentions	Same as above mentions
				4) Clogging of air scouring pipe or valve	4-1)	There is a posibbility that pipe is clogged by flown out sand from filter through under drain. Check the pipe inside or valve by dismantling of pipe connection and clean inside of pipe or valve, if necessary	Periodical inspection
				5) Clogging of filter media	5-1)	Refer to S-3-2	Refer to S-3-2
				6) Nonuniformity of filter media depth between left bank and right bank of filter basin	6-1)	Refer to S-3-1	Periodical inspection
				7) Opening degree of air scouring valve is not full	7-1)	Check the opening of valve and inspection of valve, overhaul or repairing of valve or, if necessary	Periodical inspection

Name of System		Predicted Trouble		Cause	Remedy	Required Corrective Action
		S-4-4	The set-up pre-chlorine dosing rate is not dosed into the raw water.	1) Unusual condition of chlorinator	1) Refer to S-4-3	Refer to S-4-3
				2) Inadequate valve opening of flow rate control valve of chlorinator	2) Refer to S-4-3	Refer to S-4-3
				3) Clogging of a injector	3) Refer to S-4-3	Refer to S-4-3
				4) Insufficient water supply pressure for the injector	4) Refer to S-4-3	Refer to S-4-3
				5) Insufficient chlorine quantity in the in-use container(s)	5) Refer to S-4-3	Refer to S-4-3
				6) Valve of chlorine gas feeding line is not opened	6) Refer to S-4-3	Refer to S-4-3
				7) Unusual condition of chlorine gas pressure reducing valve such as clogging at needle valve part	7) Refer to S-4-3	Refer to S-4-3
				8) Unusual condition of chlorine water dosing pipe	8) Check the chlorine dosing pipe and repair the pipe if necessary.	Periodical inspection
				9) Insufficient openinng degree of chlorine water dosing valve	9) Check the chlorine dosing valve and open valve fully the valve opening if necessary.	Daily inspection
		S-4-5	Post-chlorine is not dosed	1) Same as S-4-3	1) Refer to S-4-3	Refer to S-4-3
		S-4-6	The set-up post-chlorine dosing rate is not dosed into the raw water.	1) Same as S-4-4	1) Refer to S-4-3	Refer to S-4-3
S-5	Distribution water system	S-5-1	Inadequate water level of clear water reservoir	1) The raw water quantity is not an amount corresponding to the distribution water quantity	1) Raw water quanity should be controled to be adequate water level range in clear water reservoir	The adequate control of raw water quantity based on collected data about change trend based on time progress in a day and seasonal water demand in network
				2) Water leakage from clear water reservoir by damage of clear water reservoir	2) Check the inside of clear water reservoir and repair it if necessary	Periodical inspection

Name of System		Predicted Trouble		Cause	Remedy	Required Corrective Action
				8) Insufficient solution level in alum solution tank	8) Change the soition tank for use	Daily inspection
				9) Alum dosing pump is stopping	9) Invetigation of cause according to the instruction manual of equipment	Daily inspection Periodical inspection
				10) Unusual operation of ball check valves inside of dosing pump	10) Check the inside of the dosing pump according to the insruction manual of the dosing pump and clean, overhaul, replace parts if necessary	Daily inspection Periodical inspection
				11) Clogging of inside of back pressure valve	11) Disassembing and dismantling of back pressure valve and check inside of valve and clean the insode of valve if necessary	Daily inspection Periodical inspection Periodical cleaning
				12) Inadequate pre-set pressure value of back pressure valve	12) Check the pressure indicator and re-set the set pressure of back pressure valve if necessary	Daily inspection Periodical inspection Periodical cleaning
				13) Unusual condition of alum dosing pump	13) Invetigation of cause according to the instruction manual of equipment	Daily inspection Periodical inspection
		S-4-2	The alum of set-up dosing quantity does not flow	1) Inadequate valve opening of valve for control of alum dosing flow rate	1-1) Adjust the valve opening of flow rate control valve to adequte flow rate. Adequate flow rate should be claculated based on raw water flow rate, alum dosing rate and concentration of alum solutiuon.	Daily inspection
				2) Inadequate stroke setting of alum dosing pump for control of alum dosing flow rate	2-1) Adjust the control dial of dosing pump to adequte dischrge flow rate. Adequate flow rate should be claculated based on raw water flow rate, alum dosing rate and concentration of alum solutiuon.	Daily inspection
				3) Same as S-4-1	3-1) Refer to S-4-1	Refer to S-4-1

Name of System		Predicted Trouble		Cause	Remedy	Required Corrective Action
				3) Damage of clear water intlet pipe or clear water outlet pipe of clear water reservoir	3) Check the water leakage of clear water intlet pipe or clear water outlet pipe of clear water reservoir and repair it if necessary	Periodical inspection
				4) Inadequate opening of outlet valve of filtered water	4) Check the valve opening degree of the outlet valve and the valve opening should be changed if necessary.	Daily inspection
		S-5-2	Inadequate distribution water quantity	1) Inadequate working number of distribution pump	1) Check the indicator of distribution water flow meter and working number of distribution water pump should be changed according to requirment of water demand in the network, if necessary.	The adequate control of distribution water quantity based on collected data about change trend based on time progress in a day and seasonal water demand in network
				2) Low water level of distribution water pump sump	2) Check the inside of distribution water pump sump and repair it if necessary	Periodical inspection
				3) Cavitation of distribution water pump	3) Check the working condition of the distribution water pump and the number of working pump should be set so that the discharge quantity of each distribution water pump may become below allowable value. Cavitation of pump has to avoid anytime.	Daily inspection
				4) Unusual condition of distribution pump	4) Invetigation of cause of unusual condition according to the instruction manual of equipment	Daily inspection Periodical inspection

Name of System		Predicted Trouble		Cause	Remedy	Required Corrective Action
		S-4-3	Pre-chlorine is not dosed	1) Unusual condition of chlorinator	1) Check the chlorinator according to the insruction manual of the equipment and overhaul, replace parts if necessary	Daily inspection Periodical inspection
				2) Clogging of a injector	2) Disassemble and check the injector according to the insruction manual of the equipment and cleanig, overhaul, or replace the parts if necessary	Daily inspection Periodical inspection
				3) Insufficient water supply pressure for the injector	3) Check the indicator of water supply pressure gauge whether required water pressuure is supplied to the injector	Daily inspection
				4) Insufficient chlorine quantity in the in-use container(s)	4) Check the indicator of weighing scale of container(s) or pressure gauge of chlroine gas feeding line and chlrine container(s) should be changed over to stand-by container(s), if necessary	Daily inspecttion
				5) Valve of chlorine gas feeding line is not opened	5) Check the switching condition of valve installed to the line in from container before chlorinator such as master valve for container, dischange valve from container, and so. Valves should be opened or closed adequately.	Daily inspecttion
				6) Unusual condition of chlorine gas pressure reducing valve such as clogging at needle valve part	6) Disassemle and check the chlorine opressure reducing valve and clean, overhaul or replace the parts inside of the valve if necessary.	Periodical inspection Periodical cleaning
				7) Unusual condition of chlorine water dosing pipe	8) Check the chlorine dosing pipe and repair the pipe if necessary.	Periodical inspection

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
					4-2)	Control the coagulant dosing quantity to the value calculated by raw water flow rate and dosing rate of coagulant		Daily inspection
			5)	Stop of flash mixer	1-1)	Check the flash mixer and repair, re-installing or overhaul of the flash mixer if necessary		Daily inspectiom Periodical inspection
			6)	Unusual condition of mixing shaft or paddle of flash mixer	2-1)	Check the installation condition of mixing shaft and paddle of flash mixer.and repair or adjust the alignment of shaft should be conducted if necessay		Daily inspection Periodical inspection
			7)	Inadequate operation of flocculator	7-1)	Modifying of operationg number of flocculators.		The adequate action based on collected data
					7-2)	Inspection of shaft and paddles for flocculators and if necessary repair or re-fixiing them		Periodical inspection
			8)	Stop of flocculator by unusal condition	8-1)	Inspection of insulation resistance and if necessary change or overhaul the motor		Periodical inspection
					8-2)	Inspection of power reduction unit and if necessary change or overhaul the power reduction unit		Periodical inspection
					8-3)	Insufficient quantity or quality of lubricant		Daily inspection
			9)	Change of meteorogical condition (Air temperature, water temperature, weather)	9)	There is a possibility that the grown-up flocs may be destroyed by flocculation. Coagulation reaction speed will be high cause of rising of raw water temperature and coagulation flocs will be grown up to be big flocs before flocculation. Modifing of operation number of flocculators Modifing of rotating number of flocculator Judgement of necessisty of		The adequate action based on collected data

Name of System		Predicted Trouble		Cause		Remedy		Required Corrective Action
				5)	Wear of impeller of distribution water pump	5)	Check the impeller of the pump according to the instruction manual of equipment and cause of wear should be investigated and the impeller will be replaced if necessary.	Priodical inspection
		S-5-3	Inadequate distribution water pressure	1)	Inadequate working number of distribution pump	1)	Same as S-5-2	Same as S-5-2
				2)	Cavitation of distribution water pump	2)	Same as S-5-2	Same as S-5-2
				3)	Unusual condition of distribution pump	3)	Same as S-5-2	Same as S-5-2
				4)	Wear of impeller of distribution water	4)	Same as S-5-2	Same as S-5-2

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
		P-2-2	Many carry-over flocs in the effluent water from sedimentation basin	1)	Growth of coagulation flocs is not sufficient	1)	Refer to P-2-1	Refer to P-2-1
				2)	Soaring of coagulation flocs by short pass flow	2)	Partial rising of flow velocity of inlet water to the sedimentation basin from flocculation basin by partial clogging of inlet opening by predipitated sludge	Periodical inspection at the time of inside cleaning of sedimentation Modification of re-arrangement of sludge drainage pipes or modification of structure of inlet opening will be considered if necessary
							Growth of coagulation flocs is not sufficient Refer to P-2-1	Refer to P-2-1
				3)	Excess of inlet water flow rate into the sedimentation basin	3-1)	Inadequate raw water flow rate to the distribution shaft Refer to S-2-1	Refer to S-2-1
						3-2)	Inadequate distribution of raw water quantity to the sedimentation basins Refer to S-2-2	Refer to S-2-2
		P-2-3	Big amount of algae adhesion to the wall and other parts in the sedimentation basin	1)	Inadequate free residual chorine concentration in effluent water from the sedimentation basin	1-1)	Inadequate pre-chlorine dosing Refer to S-4-3	Refer to S-4-3
						1-2)	Inadequate pre-chlorine dosing flow rate	Refer to S-4-4
						1-3)	Inadequate pre-chlorine dosing rate Increasing of vapared free residual chlorine amount from water surface of sedimentation basin by rising of air temperature Increasing of consumed free residual chlorine by rising of water temperature Increasing of chlrione demand of raw water by changing of raw water quality such as cause of increasing of algae acounts	The adequate action based on collected data

Trouble shooting sheets for system and process in WTP

P: Trouble shooting sheets for WTP process

Predicted trouble, cause of trouble, remedy and required corrective action for WTP process

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
P-1	Water Intake Process	P-1-1	Intake water turbidity changed to unusually high(30 NTU or more)	1)	Unusual condition in water source	1-1)	Modification of dosing rate of coagulant based on jar test results	The adequate action based on collected data
						1-2)	Confirm the treatment condition of coagulation and sedimentation process and water level in clear water reservoir. The raw water flow rate should be reduced within possible limit when reauired.	The adequate action based on collected data
						1-3)	Frequency of sludge trainage from sedimentation basin should be modified based on coagulant dosing rate and turbidity of raw water.	The adequate action based on collected data
						1-4)	Modifying of operationg number of flocculators.	The adequate action based on collected data
				2)	Effluent of high turbidity water with precipitated mud in a pipe(Temporary increasing)	2)	Temporary increasing of dosing rate of cagulant.	The adequate action based on collected data
		P-1-2	Intake water quality became unusual condition such as contamination by huzardus substances or unusual smell or unusual color)	1)	Cotamination of source water	1)	Shut down of intake water according to a situation of contamination	According to emegency action plan
				2)	Re-mixing of removed hazardus substances beside intake channel into the intake channel	2)	Disposal of removed substances from intake screen or intake channel	Daily inspection
P-2	Coagulation and Sedimentation Process	P-2-1	Growth of coagulation flocs is not sufficient	1)	Change of water quality pH, turbidity, alkalinity, alge acounts, water temperature, ets.	1)	Modification of dosing rate of coagulant based on jar test results	The adequate action based on collected data
				2)	Inadequate pH of raw water for coagulation reaction	2)	Modification of dosing rate of coagulant based on jar test results	The adequate action based on collected data
							Modification of dosing rate of pre-chlorine based on jar test results	The adequate action based on collected data
				3)	Inadequate dosing rate of coagulant	3)	Modification of dosing rate of coagulant based on jar test results	The adequate action based on collected data
				4)	Inadequate dosing quanity of coagulant	4-1)	Refer to S-4-1、S-4-2 of System trouble shooting sheets	Refer to S-4-1、S-4-2 of System trouble shooting sheets

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
		P-3-6	Fishes live in the filter basin	1)	Inadequate free residual chlorine concentration of clarified water	1)	Refer to P-2-5	Refer to P-2-5
		P-3-7	Many air bubbles are arising from filter sand surface in filtering	1)	Inadequate water level of filter basin in filtering	1)	Refer to S-3-1 of System trouble shooting sheets	Refer to S-3-1 of System trouble shooting sheets
				2)	Inadequate filtering rate	2)	Refer to S-3-1 of System trouble shooting sheets	Refer to S-3-1 of System trouble shooting sheets
P-4	Water Transmission Process	P-4-1	Turbidity of transmission water is higher than the treatment target turbidity of transmission water	1)	Turbidity of filtered water is higher than the treatment target turbidity of filtered water	1-1)	Inadequate filtering rate Control the filteriing rate to less than 120 m/day by adjustment of valve openig of filtered water flow rate control valve	The adequate action based on collected data
						1-2)	Inadequate filter run time Keeping the filter run time in a range of pre-set value In a case of sand ilter with single layer filer media, filter run time is recommended less than 36 hours or less	The adequate action based on collected data
						1-3)	Soil of filter media Refer to S-3-3,4,5,6	Daily inspection Periodical inspection
				2)	Contamination of filtered water in the filtered water basin	2)	Inspection of filtered water basin and repair or recover the filter water basin, if necessary	Periodical inspection
				3)	Contamination of filtered water in the clear water reservoir	3)	Refer to S-5-1	Refer to S-5-1
		P-4-2	Free residual chlorine concentration of transmission water is out of range of the treatment target range of free residual chlorine concentration of transmission water	1)	Free residual chlorine concentration of filtered water is out of range of the treatment target range of free residual chlorine concentration of filtered water	1)	Refer to P-3-2	Refer to P-3-2
				2)	Inadequate dosing of post-chlorine	2)	Refer to S-4-5of System trouble shooting sheets	Refer to S-4-5of System trouble shooting sheets
				3)	Inadequate dosing quantity of post-chlorine	3-1)	Refer to S-4-6of System trouble shooting sheets	Refer to S-4-6of System trouble shooting sheets

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
				2)	Many carry-over flocs in the effluent water from sedimentation basin	2)	Refer to P-2-3	Refer to P-2-3
		P-2-4	Turbidity of clarified water is higher than the treatment target turbidity of clarified water	1)	Growth of coagulation flocs is not sufficient	1)	Refer to P-2-1	Refer to P-2-1
				2)	Many carry-over flocs in the effluent water from sedimentation basin	2)	Refer to P-2-2	Refer to P-2-2
				3)	Inadequate dosing of coagulant	3)	Refer to S-4-1	Refer to S-4-1
				4)	Inadequate dosing quantity of coagulant	4)	Refer to S-4-2	Refer to S-4-2
				5)	Inadequate dosing rate of coagulant	5)	Refer to P-2-1	Refer to P-2-1
		P-2-5	Free residual chlorine concentration of clarified water is out of range of the treatment target range of free residual chlorine concentration of clarified water	1)	Change of water quality pH, turbidity, alkalinity, alge acounts, water temperature, ets	1)	Refer to P-2-1 1)	Refer to P-2-1 1)
				2)	Change of meteorogical condition (Air temperature, water temperature, weather)	2)	Refer to P-2-1 9)	Refer to P-2-1 9)
		P-2-6	Drained sludge concentration from sedimentation basin falls in a minute after start of sludge drainage	1)	Clogging of sludge drainage pipes in the sedimentation basin	1)	Refer to S-2-4	Refer to S-2-4
				2)	Sludge drainage is carried out not smoothly	2)	Refer to S-2-5 of System trouble shooting sheets	Refer to S-2-5 of System trouble shooting sheets
		P-2-7	Fishes live in the sedimentation basin	1)	Inadequate free residual chlorine concentration of clarified water	1)	Refer to P-2-3	Refer to P-2-3
P-3	Filtering Process	P-3-1	Turbidity of filtered water is higher than the treatment target turbidity of filtered water	1)	Turbidity of clarified water is higher than the treatment target turbidity of clarified water	1)	Refer to P-2-4	Refer to P-2-4
				2)	Inadequate filter run time	2)	Keeping the pre-set filter run time Filter run time shall be less than 36 hours	The adequate action based on collected data
				3)	Inadequate filtering rate	3)	Refer to S-3-1 of System trouble shooting sheets	Refer to S-3-1 of System trouble shooting sheets
				4)	Soil of filter media or mud balls	4)	Refer to S-3-3,4,5,6 of System trouble shooting sheets	Refer to S-3-3,4,5,6 of System trouble shooting sheets

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
					Inadequate dosing rate of post-chlorine	3-2)	Re-set post-chlorine dosing rate base on free residual chlorine of filtered water and free residual chlorine of transmission water	The adequate action based on collected data
				4)	Contamination of filtered water in the filtered water basin	4)	Refer to P-4-1	Refer to P-4-1
				5)	Contamination of filtered water in the clear water reservoir	5)	Refer to P-4-1	Refer to P-4-1
				6)	Soil of inside of clear water reservoir	6)	Periodical cleaning of iiside of clear water reservoir	Periodical inspection and cleaning
				7)	Change of meteorogical condition (Air temperature, water temperature, weather)	7)	Increase of consumption of free residual chlorine of water in the clear water reservoir cause of rising of water temperature Modifying of post-chlorine dosing rate	The adequate action based on collected data
		P-4-3	Unusual consumption of free residual chlorine during retention of clear water in the clear water reservoir	1)	Contamination of filtered water by dirty water in the clear water reservoir	1)	Refer to P-4-1	Refer to P-4-1
				2)	Contamination of filtered water by foreign substances in the clear water reservoir	2)	Contamination of clear water from inspection oppening Keeping closed the inspection opening of clear water reservoir	Daily inspection
				3)	Soil of clear water reservoir	3)	Peridical cleaning of clear water reservoir	Periodical inspection
				4)	Change of meteorogical condition (Air temperature, water temperature, weather)	4)	Increase of consumption of free residual chlorine of water in the clear water reservoir cause of rising of water temperature Modifying of post-chlorine dosing rate	The adequate action based on collected data
		P-4-4	Contamination of filtered water by foreign substances in the sump for transmission pump	1)	Contamination of filtered water in the clear water reservoir	1)	Refer to P-4-1	Refer to P-4-1
				2)	Keeping opened the cover for inspection opening of clear water reservoir	2)	Contamination of clear water from inspection oppening Keeping closed the inspection opening of clear water reservoir	Daily inspection

Name of Process		Predicted Trouble		Cause		Remedy		Required Corrective Action
				5)	Unusual condition of under drain	5)	Refer to S-3-3,4,5,6 of System trouble shooting sheets	Refer to S-3-3,4,5,6 of System trouble shooting sheets
		P-3-2	Free residual chlorine concentration of filtered water is out of range of the treatment target range of free residual chlorine concentration of filtered water	1)	Inadequate free residual chlorine concentration of clarified water	1)	Refre to P-2-5	Refre to P-2-5
				2)	Soil of filter media or mud balls	2)	There is a possibility that the soil of filter media may cause of incrase of consumption of free residual chlorine in filter basin. Refer to S-3-3,4,5,6 of System trouble shooting sheets	Refer to S-3-3,4,5,6 of System trouble shooting sheets
				3)	Soil of inner wall of filter basin	3-1)	Inadequate free residual chlorine concentration of clarified water Refre to P-2-5	Refre to P-2-5
						3-2)	Periodical cleaning of inner wall	Periodical inspection Periodical cleaning
				4)	Change of meteorogical condition (Air temperature, water temperature, weather)	4)	There is a possibility that the consumption amount of free residual chlorine in filter basin will increase by increasing of vapored residual chlorine from water surface of filter basin cause of rising of air temoperature or water temperature. Modifing of pre-shl;orine dosing rate	The adequate action based on collected data
		P-3-3	Propagation of algae on the filte sand surface	1)	Inadequate free residual chlorine concentration of clarified water	1)	Refer to P-2-5	Refer to P-2-5
				2)	Inadequate turbidity of clarified water (Inadequate algae acount in the clarified water)	2)	Refer to P-2-4	Refer to P-2-4
		P-3-4	Soil of filter media or mud balls	1)	Inadequate operation of filter washing	1)	Refer to S-3-3,4,5,6 of System trouble shooting sheets	Refer to S-3-3,4,5,6 of System trouble shooting sheets
		P-3-5	Big amount of algae adhesion to the wall and other parts in the fiter basin	1)	Inadequate free residual chlorine concentration of clarified water	1)	Refer to P-2-5	Refer to P-2-5

10. O&M Cost

Estimated reduction volume of filter washing water in ZAGAZIG water treatment plant

		Before modification	After modification
Filter washing regime	Air acouring	3 min	5 min
	Air and backwash	5 min	5 min
	backwashing	8 min	5 min
	Dischaege volume of backwashing pump	475 l/sec	530 l/sec
	Backwashing rate	0.41 m3/m2/min	0.46 m3/m2/min
	Water consumption per one filter	370.5 m3	318.0 m3
	Difference between before and after modification per once washing per one filter	53 m3/filter/washing	
	Filter run time per one filter	24 hr	36 hr
	Frequency of filter washing in a week per one filter	7 times	5 times
	Total quantity of water consumption in a week per one filter	2,593.5 m3/filter	1,484.0 m3/filter
	Difference between before and after modification per one week per one filter	1109.5 m3/week/filter	
	Water reduction quantity in a day per one filter	158.5 m3/day/filter	
	total reduction of water consumption in a day Number of the filter 6 filters per all filter	951.0 m3/day/6 filters	
	total reduction of water consumption in a month Number of the filter : 6 filters	28,530.0 m3/month/6 filters	

Estimation of reduction water volume for filter washing

1 Estimation of reduction water volume by modification of filter washing regeme

	WTP	Capacity of WTP (l/sec)	Capacity of WTP (m3/day)	Estimation of capacity operating rate (%)	Estimation of actual production water volume (m3/d)
1	Zagajigu	400	34,560	85	29,376
2	Abbasa	1,000	86,400	95	82,080
3	Kafr saqr	1,200	103,680	85	88,128
4	New faqus	1,200	103,680	85	88,128
5	Hussainia	400	34,560	85	29,376
	Total	4,200	362,880		317,088

1-1 Estimation of reduction water volume per filter in a day

50 m3/day/filter

1-2 Estimation of reduction water volume at 5 WTP in a day

	WTP	Number of the filter	Estimation of reduction water volume (m3/day/WTP)
1	Zagajigu	6	300
2	Abbasa	12	600
3	Kafr saqr	14	700
4	New faqus	14	700
5	Hussainia	6	300
	Total	52	2600

1-3 Estimation of total reduction water volume at 5 WTP

In a day	2600	m3/day
In a month	78000	m3/month
In a year	936000	m3/year

2 Estimation of reduction water volume by decrease in washing frequency

2-1 Estimation of decrease in washing frequency

	WTP	Washing frequecy (a time/day)		Ratio of filter washin water volume per production water volime	
		The current condition	Estimation after improvement	The current condition (%)	Estimation after improvement (%)
1	Zagajigu	1	0.5	6	3.0
2	Abbasa	1	1	6	6
3	Kafr saqr	3	1	18	6
4	New faqus	3	1	18	6
5	Hussainia	1	0.67	6	4.0
	Total	9	4	54	25.02

2-2 Estimation of reduction water volume by decrease in washing frequency

	WTP	Estimation of actual production water volume (m3/d)	Water volume for filter washing of WTP (m3/day) The current condition	Estimation after improvement	Estimation of reduction water volume (m3/d)
1	Zagajigu	27,648	1,659	829	829
2	Abbasa	82,080	4,925	4,925	0
3	Kafr saqr	88,128	15,863	5,288	10,575
4	New faqus	88,128	15,863	5,288	10,575
5	Hussainia	29,376	1,763	1,181	582
	Total	315,360	40,072	17,511	22,562

3 Estimation of total reduction volume of water for filter washing at 5 WTP in SHAPWASCO

3-1 Estimation of total reduction volume of water for filter washing at 5 WTP in a day

	WTP	Estimation of reduction water volume (m3/day/WTP)	Estimation of reduction water volume (m3/day/WTP)	Total	Reduction ratio per production water volume (%)
1	Zagajigu	300	829	1,129	3.8
2	Abbasa	600	0	600	0.7
3	Kafr saqr	700	10,575	11,275	12.8
4	New faqus	700	10,575	11,275	12.8
5	Hussainia	300	582	882	3.0
	Total	2,600	22,562	25,162	7.9

3-2 Estimation of total reduction cost of water for filter washing at 5 WTP in a day

Estimation of production cost of water per m3 0.72 LE

	WTP	Estimation of cost reduction by save water (LE/day)
1	Zagajigu	813
2	Abbasa	432
3	Kafr saqr	8118
4	New faqus	8118
5	Hussainia	635
	Total	18,116

3-2 Estimation of total reduction weight of chemicals in reduction waterat 5 WTP

Estimation of dosing rate of alum	25	g/m3
Estimation of dosing rate of chlori	5	g/m3

Estimation of reduction weight of alum	629	kg/day
Estimation of reduction weight of chlorine	126	kg/day

Cost of solid alum per kg	1.2	LE/kg
Cost of chlorine per kg	1.4	LE/kg

Estimation of reduction cost of alum	755	LE/day
Estimation of reduction costt of chlorine	176	LE/day
	931	LE/day
	0.037	LE/day/m3

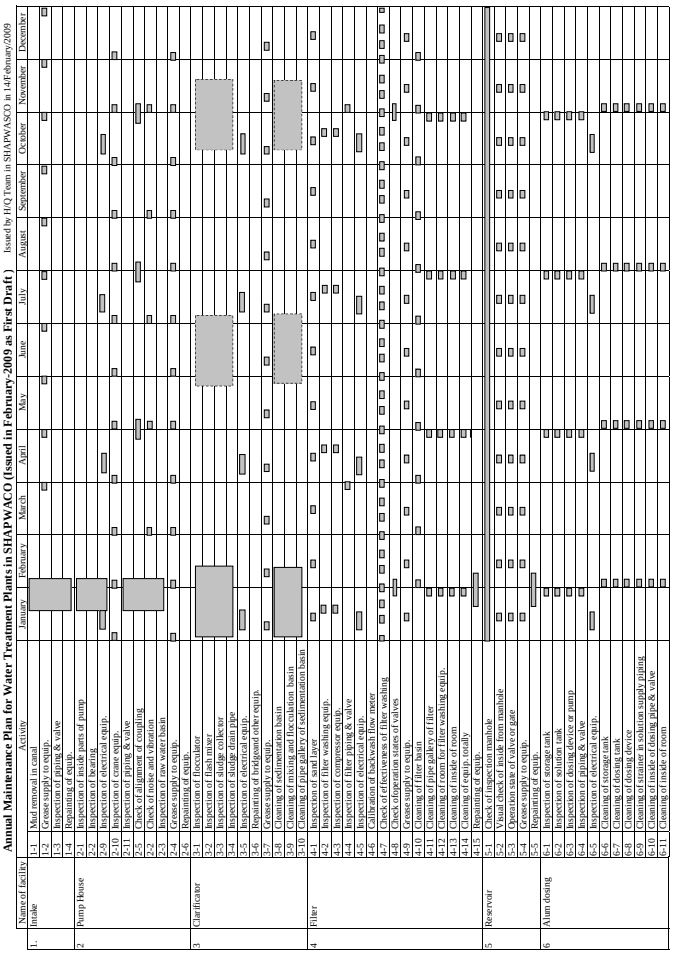
Estimation of total cost reduction	19,047	LE/day
	0.76	LE/day/m3

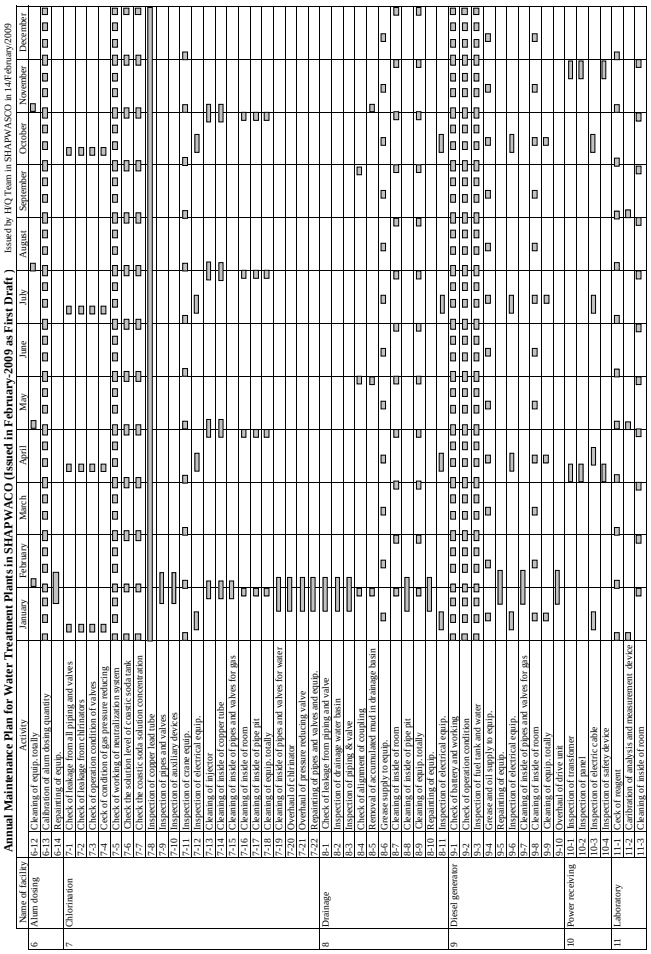
Estimation of total reduction water volume at 5 WTP in a day, month and year

	Water saving		Cost saving	
In a day	25,162	m3/day	19,047	LE/day
In a month	754,854	m3/month	571,425	LE/month
In a year	9,058,250	m3/year	6,857,095	LE/year

II. Operation Plan

1. O&M Annual Plan





2. *Materials for O&M Plan in Abbasa WTP*

SHAPWASCO

Abu Hamad MArkaz

First: Potable Water

The budget is by millions

A-Projects required to be completed			B-Projects required to be constructed			C-Projects required to be developed		
No.	Name of Project	Required budget	No.	Name of Project	Required budget	No.	Name of Project	Required budget
A1	**Completion of development for Old station in Abbasa WTP for all the electrical, mechanical, civil, chlorine, alum and power factor improvement works**	15	B1	**Third extension of capacity 500 L/sec. for Abbasa WTP**	100	C1	**Rehabilitation for - Abu Hamad/Bilbeis water pipe line of length 6 km and diameter 400mm - Al Shibeni pipe line of length 5 km and diameter 300 mm - The feeding pipe line for Kafr Al Azazi and Al Esadia of length 10 km and diameter 300mm**	9
			B2	**Constructing Transmission pipe linefrom Abbasa to Al Koreen City of length 7 km and of diameter 12"**	2	C2	**Networks in Abu Hamad Markaz of length 17 km and diameters 150 and 200 mm**	1
			B3	**Constructing a feeding pipe line for Al Sawa area of length 2.5 km and of diameter 12"**	1	C3	**Improvement and development for the low and meduim voltage panels**	5
			B4	**Constructing water pipe lines in Abu Hamad City of different lengths and for a length of 1 km inside monitoring rooms**	0.5			
	No. of projects (1)	15		**No. of projects (4)**	103.5		**No. of projects (3)**	15

SHAPWASCO
Abu Hamad Branch

Completion of development for Old station in Abbasa WTP for all the electrical, mechanical, civil, chlorine, alum and power factor improvement works

NO.	ITEM	No.of pieces	Unit price		Total Price		Remarks
			L.E.	P.T.	L.E.	P.T.	
1	Replacement of meduim and low voltage panels in the old station						
2	Replacement and changing of electrical panel board in for the old filters						
3	Replacement and changing of electric chargers D.C./110V						
4	Completion of lightening inside the plant						
5	Replacement of raw water pumps by new ones of discharge 350 l/sec						
6	Installation of Power factor devices						
7	Change of vacuum pumps basins and installing rest of motors						
8	Making a crane extension for the near by station						
9	Development of old raw water intake						
10	Installing flow meters for the facilities						
11	Replacement and installation for valves of different size 150-250-350-400mm						
12	Installation of 3 backwashing units 350 l/sec for filter backwashing						
13	Inside and Outside Repairing for 3 clarificators						
14	Painting of electric panels and pumps						
15	Replacement of Bridges and mixers	3					
16	Installation of sludge collector for the old plant 350 l/sec	3					
17	Installation of flow meters for the filter facility and pressure gauges	16					

NO.	ITEM	No.of pieces	Unit price		Total Price		Remarks
			L.E.	P.T.	L.E.	P.T.	
18	Repainting for the old pump house						
19	Repairing for old filter facility i.e. concrete footings, repainting of the facility and flooring						
20	Construction of chlorine cylinders store of capacity(100 cylinder) safety devices have to be provided						
21	Changing old chlorinators and construction of new facility						
22	Preparing a room for getting rid of damaged cylinders						
23	Changing Alumfacility						
24	Construction for alum storage tank of 100 ton capacity						
25	Repairing of alum solution tank and installing measurment devices						
26	Completion of the lightening in the pump house and the filter facility						
27	Supplying a truck with hydraluic stairs for maintenance works						
28	Installation of air ventilators in old pump house and the second extension pump house						
29	Completation of paving works inside the station						

Total allocated budget (15000000) fifteen million egyptian pounds

SHAPWASCO
Abu Hamad Branch

Third extension of capacity 500 L/sec. for Abbasa WTP

NO.	ITEM	No.of pieces	Unit price		Total Price		Remarks
			L.E.	P.T.	L.E.	P.T.	
1	Construction of raw water intake on Ismailiya canal						
2	Construction of raw water basin						
3	Construction of Pump house for raw water and treated water pumps (3 raw water pumps of 500 l/sec flow rate)						
4	Construction of receiving well						
5	Construction of 3 clarificators of 350 l/sec. capacity						
6	Construction of 6 filters of 100 l/sec. capacity						
7	Construction of ground clear water reservoir						
8	Construction of discharge and suction pipe lines with the required diameters						
9	Construction of sludge collectors and the pumps of 350 l/sec discharge						
10	Construction of alum and chlorine facilities						
11	Connecting the third extension with the old and new stations						
12	Construction of filter backwashing facility						

Total allocated budget (100000000)hundred million egyptian pounds

SHAPWASCO
Abu Hamad Branch

Improvement and development for the low and meduim voltage panels

NO.	ITEM	No.of pieces	Unit price		Total Price		Remarks
			L.E.	P.T.	L.E.	P.T.	
1	Installation of protection systems for the low and meduim voltage electric panels						
2	Installation of control circuits for the low and meduim voltage panels						
3	Changing the breakers for the low, meduim voltage panels and the pumps						
4	Required maintenance works for low and meduim voltage panels						
5	Repairing the diesel generator						

Total allocated budget (5000000)five million egyptian pounds

SHAPWASCO
Abu Hamad Branch

Constructing a feeding pipe line for Al Sawa area of length 2.5 km and of diameter 12"

NO.	ITEM	Unit	Quantity	Unit price		Total Price		Remarks
				L.E.	P.T.	L.E.	P.T.	
1	PVC pipes of 300 mm diameter	meter	2500	300		750000		
2	High pressure valve 12 inch diameter	piece	3	2000		6000		
3	Cast iron pieces like T and elbows	ton	3	7000		21000		
4	Reinforced concrete man hole 2*2m with cast iron cover	piece	3	10000		30000		
5	High pressure cast iron valve 4 inch diameter	piece	1	500		500		
6	Reinforced concrete man hole 1.5*1.5m with cast iron cover	piece	1	7000		7000		
7	Information Center fees	meter	2500	2		5000		
8	Excavation	meter	2100	10		21000		
	Total					841125		

Total allocated budget (841125)eight hundred forty one thousand and one hundred twenty five egyptian pounds

SHAPWASCO
Abu Hamad Branch

Constructing water pipe lines in Abu Hamad City of different lengths and for a length of 1 km inside monitoring rooms

NO.	ITEM	Unit	Quantity	Unit price		Total Price		Remarks
				L.E.	P.T.	L.E.	P.T.	
1	PVC pipes of 8" diameter	meter	2200	200		440000		
2	PVC pipes of 6" diameter	meter	13700	100		1370000		
3	PVC pipes of 4" diameter	meter	7650	50		382500		
4	Valves of 8" diameter	piece	3	1000		3000		
5	Valves of 6" diameter	piece	22	800		17600		
6	Valves of 4" diameter	piece	15	500		7500		
7	Reinforced concrete man hole 150*150*150	piece	22	7000		154000		
8	Reinforced concrete man hole 120*120*120	piece	4	5000		20000		
9	Cast iron pieces	ton	14	7000		98000		
10	Aquaduct of thickness 6"	meter	24	350		8400		
11	Information Center fees	meter	19550	4		78200		
12	Repavement	meter	3050	50		152500		
13	Excavation	meter	19000	10		190000		
	Total					2131135		

SHAPWASCO
Abu Hamad Branch

Networks in Abu Hamad Markaz of length 17 km and diameters 150 and 200 mm

NO.	ITEM	Unit	Quantity	Unit price		Total Price		Remarks
				L.E.	P.T.	L.E.	P.T.	
1	PVC pipes of 8" diameter	meter	7500	200		1500000		
2	PVC pipes of 6" diameter	meter	36000	100		3600000		
3	Valves of 8" diameter	piece	6	1000		6000		
4	Valves of 6" diameter	piece	42	800		33600		
5	Valves of 4" diameter	piece	28	500		14000		
6	Reinforced concrete man hole 200*200	piece	1	10000		10000		
7	Reinforced concrete man hole 150*150	piece	69	7000		483000		
8	Cast iron pieces	ton	20.25	7000		141750		
9	Aquaduct pipes of diameter 8"	meter	120	500		60000		
10	Aquaduct pipes of diameter 6"	meter	55	350		19250		
11	Information Center fees	meter	43500	2	25	97875		
12	Repavement	meter	5040	50		252000		
13	Excavation	meter	17300	10		173000		
	Total					6335475		

SHAPWASCO
Abu Hamad Branch

Abu Hamad/Bilbeis water pipe line of length 3.55 km and diameter 400mm

NO.	ITEM	Unit	Quantity	Unit price		Total Price		Remarks
				L.E.	P.T.	L.E.	P.T.	
1	PVC pipes of 16" diameter	meter	3550	700		2485000		
2	PVC pipes of 4" diameter	meter	5000	500		2500000		
3	Valves of 16" diameter	piece	2	3000		6000		
4	Valves of 8" diameter	piece	3	1000		3000		
5	Valves of 6" diameter	piece	12	800		9600		
6	Valves of 4" diameter	piece	6	500		3000		
7	Reinforced concrete man hole 200*200	piece	2	10000		20000		
8	Reinforced concrete man hole 150*150	piece	14	7000		98000		
9	Cast iron pieces	ton	6	7000		42000		
10	Information Center fees	meter	5000	2	50	12500		
11	Repavement	meter	5000	50		250000		
	Total					3179100		

SHAPWASCO
Abu Hamad Branch

The feeding pipe line for Kafr Al Azazi and Al Esadia of length 10 km and diameter 300mm

NO.	ITEM	Unit	Quantity	Unit price		Total Price		Remarks
				L.E.	P.T.	L.E.	P.T.	
1	PVC pipes of 12" diameter	meter	10000	300		3000000		
3	Valves of 12" diameter	piece	6	2000		12000		
	Valves of 8" diameter	piece	4	800		3200		
4	Valves of 6" diameter	piece	12	500		6000		
5	Valves of 4" diameter	piece	10000	2	25	22500		
7	Reinforced concrete man hole 150*150	piece	6	7000		42000		
8	Cast iron pieces	ton	10	7000		70000		
9	Aquaduct pipes of diameter 2"	meter	25	2000		50000		
11	Information Center fees	meter	6	1000		6000		
13	Excavation	meter	7500	10		75000		
	Total					3223700		

Abbasa WTP Maintenance Plan (Electrical)

Facility	Activities	Daily	Weekly	Monthly	3months	6months	annually	Remarks
Transformers and Meduim and low voltage electric panels	Meduim voltage panels 11 KV							**Daily maintenance:**
	General cleanness for electric cells and inspect bars insulators							Check and observe pump motors if there is ubnormal condition (temperature, vibration, Ampere, Volt)
	Check breakers							
	Check and inspect transformer oil							Check electric transformers
	Clean and check the oil level for the starter							Cleanness of electrical cells
	-1 Transformer no.1 - 11/3.3							
	-2 Transformer no.2 - 11/3.3							
	3- Transformer no.3 - 380/3.3							**Weekly maintenance**
	4- Transformer no.4 - 380/3.3							Check voltmeters and ammeters
								Check cleanness and shirbon
	Check and inspect starter oil							Use blowers to clean electric cells
	1 Raw water pumps (9)							
	2 Treated water pumps (10)							**Monthly maintenance**
	Inspect and check electrical chargers 110 V (2)							General cleanness for electric cells and inspect bars insulators
	Check electrical cells and breakers in low voltage panels							General maintenance for batteries and chargers 110V
Chemicals and chlorine Clarificators Filters	**Chemicals**							Use the avometer to check fuses and replace if damaged
	Maintenance for the following :							
	Motors and agigaators for the solution tank	—			—			Check the safety of the operation switches and clean contact points
	Alum dossing pumps	—			—			
	Chlorine							
	Pre chlorine dossing pumps	—						**The 3 months maintenance**
	Post chlorine dossing pumps	—						Open the fore and back openings in the panels if available
	Chlorine heaters maintenance			—		—		
	General maintenance for gas suction devices(ventilators)		—				—	Confirm that there is no electric charges on the bus bars and evacuate any electric charges
	Clarificators							Clean the bus bars using the air blower
	General maintenance for the following : - Agitator, bridges and floculators motors			—			—	Clean the contact points using the proper cleaner
	Filters							
	Voltage Distrubition panels 380 V							
	Backwashing pumps motors							
	Compressors motors							
	Drainage pumps and hydrofour motors							

Attatchement-4

Abbasa WTP Maintenance Plan (Mechanical)

Facility	Activities	Daily	Weekly	Monthly	3months	6months	annually	Remarks
Raw water intake and raw water basin	Cleaning the screens (2)	—						**Daily maintenance:**
	Smoothen the intake valves operation (4)				—			Check the cleanness of pump house around pumps areas and electric pannels
	Smoothen the inlet valves operation for raw water basin (4)				—			
	Washing raw water basin access line						—	
	Sweeping preciptation from the basin						—	Monitor and Clean the intake area and the gate
	Repainting suction raw water pumps screen (9)					—		
	Repainting intake gates (4)					—		
Chemicals	**ALUM**							Check the stuffing box so that water drops is in proper state
	Clean the pipes and basins	—						
	General Maintenance for valves and agitators		—					Check the bearing temperature
	General Maintenance for dossing devices							Check any ubnormal condition like vibration
	Chlorine				—			**Weekly maintenance**
	Inspect pre and post chlorine connection	—		—				Check pump bearing oil or grease and add the necessary amounts
	General Maintenance for pre chlorinators						—	
	General Maintenance for post chlorinators						—	Check unit fixation and adjust all fixing bolts equipment
Clarificators	Removing floating algae from clarificators (7)	—						Check stuffing box gland backing and repair
	Cleaning the channels inside the clarificator(7)		—					**Monthly maintenance**
	General Maintenance for sludge drainage valves (7)					—		Add the necessary amount of oil or grease
	Smoothen the inlet and outlet valves for clarificators				—			Check the bearing temperature
	Sweeping remaining water from bottom of clarificator		—					Check and adjust pump bearing oil
	Taking out preciptations from clarificators						—	Close discharge valve totally during operation, check pressure and compare with the performance curve and if any change occurs, check copper rings wearings
Filters and ground reservoirs	Cleaning filter walls and weirs	—						
	Cleaning the reservoirs below filters						—	
	Inspect bottom of filter						—	
	General maintenance for filter operation valves and their auxillaries	—		—				
	General maintenance for drain pumps	—	—		—			**The 3 months maintenance**
	Checking sand level inside filters						—	Clean and check the bearings
	Smoothen the inlet and outlet valves for ground reservoirs					—		
	General maintenance for backwashing pumps and attatchements	–			–			
	General maintenance for compresors and attatchements							
				—			—	
	General maintenance for the hydrofore unit and its attatchements		—	—			—	

Attatchement-4

Facility	Activities	Daily	Weekly	Monthly	3months	6months	annually	Remarks
Pump House	**Voltage distruibution panels 3.3 V**							**The 6 months maintenance**
	General cleanness for electric cells and inspect bars insulators							Open the fore and back openings in the panels if available
	Check breakers							Confirm that there is no electric charges on the bus bars
	Check batteries and chargers							Clean the bus bars using the air blower
	Voltage distruibution panels 380 V							Earthing test for the earthing inside the station
	General cleanness for electric cells and inspect bars insulators							Check electric switches and breakers
	Check electric switches							
	General maintenance for the following:							**Annual maintenance**
	- raw water pumps motors							Open the fore and back openings in the panels if available
	- treated water pumps motors							Confirm that there is no electric charges on the bus bars
	-vacuum pumps motors							
	-drainage pumps motors							Refixing and tight the bus bars with the cells
	- Check pump bearing oil or grease for raw water pumps							Clean the bus bars using the air blower
	- Check pump bearing oil or grease for treated water pumps							Test transformers oil and changing if possible
	- Make the necessary maintenance for the crane							
								Connect cable terminals in the transformers
Sludge drainage and Lightening	**Sludge drainage operation panels**							
	1 General cleanness for electric cells and inspect bars insulators							
	2 General maintenance for sludge drainage motors							
	3 Check pump bearing oil or grease for sludge drainage pumps							
	4 Check electric switches and breakers							
	5 Facility lightening units							
	6 Lightening units in the station							

Attatchement-4

Facility	Activities	Daily	Weekly	Monthly	3months	6months	annually	Remarks
Raw and treated water pump house	**Raw water pumps**	—						**The 6 months maintenance**
	Pump no.1	—						Check pump bearing oil or grease and add the necessary amounts
	Pump no.2	—						Check pump and motor alignment and do necessary adjustment
	Pump no.3	—						
	Pump no.4	—						Check the unit performance during operation
	Pump no.5	—						**Annual maintenance**
	Pump no.6	—						Do annual overall for pumps and replace defected parts
	Pump no.7	—						General maintenance for the clarificators and filters including civil works
	Pump no.8	—						**Remark :**
	Pump no.9	—						Maintenance work performed for the raw and treated water pumps are done alternatively according daily operation condition
	Vacuum raw water pumps							
	Treated water pumps							
	Pump no.1	—						
	Pump no.2	—						
	Pump no.3	—						
	Pump no.4	—						
	Pump no.5	—						
	Pump no.6	—						
	Pump no.7	—						
	Pump no.8	—						
	Pump no.9	—						
	Pump no.10	—						
	Vacuum treated water pumps	—						
	Drainage pumps	—						
	Crane	—						
Sludge drainage facility	Check and inspect pumps in facility no.1 (3)	—					—	
	Check and inspect pumps in facility no.2 (3)	—					—	
	Check and inspect the pumps at the bottom of facility			—				
	Check inlet and outlet valves					—	—	

List of facility inventory

	name of equipment		name of facility	Nos.	year of constructed	Maitainance record: addisional contruction	repair	repaint	replace	cleaning of basin or tank	Name of manufacturer	specifications (Detail decription should be described in annex sheet)
1	Intake raw water basin	1-1	Intake raw water basin	2	1957-2004						local-German	
		1-2	screen	8	1957-2004						local	
		1-3	Crane	1	2004						Tcheek	
			number of lines for old intake	2								1000mm diameter
		1-4	number of lines for new intake	3								600mm diameter
2	Raw water reservour	2-1	Raw water reservour	2	1957-2004						local-German	
		2-2	Screen	6	2000-2004						local-German	
		2-3	Crane	1	2004						local	
3	Raw water pump	3-1	Raw water storage basin	1	1957-1994-2004						local	
		3-2	Raw water pump -type1									
			motor	4	1959						German	
			pump	4	1959						German	
			pressure guage									
		3-3	Raw water pump -type2									
			motor	5	1994						Tcheek	
			pump	5	1994						Tcheek	
			pressure guage									
		3-4	pipings & valves	12	1957-1994		repair		replaced		German+Tcheek	
4	Receiving well	4-1	Receiving well	2	1994						local	
		4-2	Flush mixer	4	1994						local	
			drive unit	4	1994						local	
			common base	4	1994						local	
			shaft & paddle	4	1994						local	
		4-3	Raw water flowmeter									
5	Flocculation basin	5-1	Flocculation basin	7	1959-1994						local	
		5-2	flocculator	7	1959-1994						local	
			drive unit	22	1959-1994						local	
			common base	28	1959-1994						local	
			shaft & paddle	28	1959-1994						local	
6	Sedimentasion basin	6-1	Sedimentasion basin	7	1959-1994						local	
		6-2	sludge collector	7	1959-1994						local	
			drive unit	7	1959-1994						German	
			common base	7	1959-1994						German	
			bridge	7	1959-1994						German	
			cllector blade unit	14	1959-1994						German	
7	Sludge drainage	7-1	drainage pump									
			motor	6	1959-1994						German	
			pump	6	1959-1994						German	
			pressure guage	0								
		7-2	pipings & valves	15	1959-1974						German	
8	Rapid sand filter	*8-1	rapid sand filter basin	28	1994							
	*Marked items should	*8-2	composion of filter layer	4						in intrvals	local	the depth for the filter meduim is 160cm(115cm sand and 45 cm gravel)
	be described on each		gravel 1	1						in intrvals	local	32-64mm3 gravel,depth 20cm
	filter.		gravel 2	1						in	local	8-16mm3
			operation desk	12, 16	1959-1994						German	
		8-4	type of underdrain									
		8-5	backwash pump	3	1994						German	
			motor	3	1994						German	
			pump	3	1994						German	
			pressure guage	0								
		8-6	air blower for air wash	2+2	1959-1994						German	
			motor	2+2	1959-1994						German	
			blower	2+2	1959-1994						German	
			air storage tank	1	1994						German	
		*8-7	pipings & valves	168	1959-1994						local	
9	clear water resorvour	9-1	clear water resorvour	6	1959-1994						local	
		9-2	pipings & valves	4	1959-1994						local	
		9-3	other auxiliary	0								
10	Alum dosing facility	10-1	alum storage yard	1							local	
		10-2	alum solution tank	2	1994						local	
		10-3	liquid alum receiver tank	3	1959						local	
		10-4	agitator of solution tank	2	1959						local	
		10-5	alum dosing pump type1	0								
		10-6	alum dosing pump type2	0								
		10-7	Level guage	4	1959						German	
			for solution tank									
		10-8	pressure guage	0								
		10-9	backpressure valve	2	1959						German	
		10-10	relief valve	0								
		10-11	strainer	0								
		10-12	pipings & valves	6	1959						German	
11	chlorination facility	11-1	cylinder storage base	1	1994						local	
		11-2	lead tube for chlorine gas									
		11-3	auxiliary valves	1	1994						local	
		11-4	cylinder changeover devise	1	1994						local	
		11-5	pressure guage for chlorine gas	2	1994						local	
		11-6	chlorine gas filter	1	1994						Tcheek	
		11-7	Pre-chlorinator	2	1994						Tcheek	
		11-8	Intermediate chlorinator	0								
		11-9	post chlorinator	2	1959-1994						Tcheek	
		11-10	injector unit for pre chlorinator	1	1994						Tcheek	
		11-11	injector unit for int. chlorinator									
		11-12	injector unit for post chlorinator	2	1959-1994						Tcheek	
		11-13	pipings & valves	1	1959-1994						local	
		11-14	water booster pump for chlorination									

14	Stand-by generator	14-1	generator	1	1994		repaired				Tcheek	to prevent ground water leakage and prevent mix the oil with water
		14-2	oil tank	1	1994		repaired				Tcheek	
		14-3	battery	1	1994		repaired				Tcheek	
15	Electrical switch board	15-1	for Raw water pump	2	1959-1994						German+Tcheek	
		15-2	for Flush mixer	4	1994						Tcheek	
		15-3	for Flocculater	22	1959-1994						German+Tcheek	
		15-4	for Sludge collector	5	1959-1994						German+Tcheek	
		15-5	for Bachwash pump	3	1994						Tcheek	
		15-6	for Air wash pump	5	1959-1994						German+Tcheek	
		15-7	forAlum solution tank agitator	2	1959						German	
		15-8	for Alum solution dosing pump	4	1994						Tcheek	
		15-9	for chlorinator	0								
		15-10	for booster pump for chlorinator	0								
		15-11	for coasitc pump	2	1994						Tcheek	
		15-12	for exhaust fan	12	1994						Tcheek	
		15-13	for distribution pump	0								
		15-14	for treated water pump	0								
		15-15	for drainage pump	0								
		15-16	for sludge drainage pump	0								
		15-17	for sludge thickner	0								
		15-18	for Stand by generator	0								
		15-19	for Crane	6	1959-1994						Tcheek	
		15-20										
		15-21										
		15-22										
		15-23										
		15-24										
		15-25										
16	Transformer	16-1	transformer 1	2	1959						German	
		16-2	transformer 2	2	1994						Tcheek	
		16-3	transformer 3	2	1994						Tcheek	
17	Chemical laboratory	17-1	Chemical laboratory	1	1959							
		17-2										
		17-3										
18	Maintainance equipment	18-1	Moving trucks	2	1994				replaced		local	ABB1
		18-2	Workshop equipment	1	1957				replaced		England+local	Big Lathers & equipments
19	Safety equipment	19-1	Emergency device for cholorine gas									
		19-2										
		19-3										
		19-4										
		19-5										

			motor	4	1994						Tcheek	
			pump	4	1994						Tcheek	
			pressure guage	1	1994						Tcheek	
			pipings & valves	8	1994						Tcheek	
		11-15	clorine gas neutralization system	1	1994						German	
		1)	coastic soda solution pump	2	1994						German	
			motor	2	1994						German	
			pump	2	1994						German	
			attched parts	0								
			pipings & valves	4	1994						local	
	chlorination facility	2)	exhaust fan									
			motor	12	1994						Tcheek	
			fan	12	1994						Tcheek	
			attched parts	0								
			pipings & valves	0								
		3)	caustic soda solution tank									
			coastic soda solution									
			solution tank	1	1994						Tcheek	
		4)	reaction & absorption tower	1	1959-1994							
12	drainage facility	12-1	drainage basin									
		1)	drainage basin									
		2)	drainage pump									
			motor									
			pump									
		3)	pipings & valves									
		12-2	sludge drainage basin									
		1)	sludge drainage basin									
		2)	sludge thickner									
			drive unit									
			common base									
			bridge									
			cllector blade unit									
		3)	drainage pump									
			motor									
			pump									
			pipings & valves									
13	Treated water pump	13-1	pump -type1									
			motor	4	1959						German	
			pump	4	1959						German	
			pressure guage									
		13-2	pump -type2									
			motor	2	1994						Tcheek	
			pump	2	1994						Tcheek	
			pressure guage									
			out going transmission line	4								800mm cast iron main to Abu Hamad- 900mm steel coated main to Zagazig-600mm asbestos main to Faqus- 600mm asbestosmain to Bilbais city

Operation & Maintenance Plan

Contents (for reference - August 2008)

for Abbasa WTP

Note: SOP documents including Water Quality Control Program prepared in the Project will be referred to Chapters 2, 3 and 4.

Explanation of the Table of Contents

Preface (Concept of O&M Plan from SOP overview)

O&M plan is developed to provide a material that can be easily referred to as guidance in the operating of the water system.

The O&M plan will also provide ready reference for following;

- All equipment data which is necessary for performing normal maintenance
- Ordering replacement parts and supplies
- Organized system for keeping records of O&M of the system
- Water sampling, analysis and testing which required for compliance with regulations
- Monitoring of the treatment process for compliance with accepted waterworks procedures.
- Information regarding start-up and normal operating procedures and emergency operating procedures

O&M plan will become a training manual to provide personnel with handy source reference while they learn to operate the facilities.

The experienced operator will usually refer to the O&M plan for confirmation of normal operation and maintenance procedures and as a reference guide for unusual operating conditions. The entry level operator should frequently refer to the O&M plan for guidance and instruction.

Equipment List and Equipment Record Cards

Individual components of equipment are numbered according to the facility they are associated with and their position in the process flow. The number becomes the equipment's identifier whenever maintenance is involved.

Each component of equipment is registered on a record card containing every feature about the unit. Where possible, this information is to be taken from the manufacturer's nameplate attached to the component. Manufacturer's name, address, phone number, contact person, purchase order number, and/or contract number should be included. Additionally, equipment related to the unit, such as the drive motor and gear reducer, is added to the card.

Task Classification

Task Classification (Task classifications identify responsibilities and are broken down into the following general categories).

1. Supervisory/ Management: Supervisors and managers provide the leadership and guidance for the overall operation of a facility. In general, managers plan the operation and supervisors put the plan into effect.
2. Clerical: Clerks manage the data and record keeping of a facility.
3. Laboratory: The laboratory staff performs analyses of water quality for various parameters from which decisions regarding plant operation are based.
4. Operations: The operations staff provide the technical skills required to operate the equipment and processes of a facility.
5. Maintenance: The maintenance personnel provide the skills required to keep the plant equipment in good operating order, and maintain a data base on equipment costs and repairs.
6. Buildings/Grounds: The buildings and grounds personnel keep the buildings and grounds in good repair

Table-1 List of Facility Inventory

	name of equipment		name of facility		Nos.	year of constructed	Maintenance record					Name of manufacturer	specifications (Detail description in annex sheet)
							Additional construction	repair	repaint	replace	cleaning of basin or tank		
1	Intake raw water basin	1-1	Intake raw water basin		2	1957-2004						local-German	
		1-2	screen		8	1957-2004						local	
		1-3	Crane		1	2004						Czech	
			number of lines for old intake		2								1000mm diameter
		1-4	number of lines for new intake		3								600mm diameter
2	Raw water reservoir	2-1	Raw water reservoir		2	1957-2004						local-German	
		2-2	Screen		6	2000-2004						local-German	
		2-3	Crane		1	2004						local	
3	Raw water pump	3-1	Raw water storage basin		1	1957-1994-2004						local	
		3-2	Raw water pump -type1	motor	4	1959						German	
				pump	4	1959						German	
				pressure gauge									

		*8-3	operation desk	12, 16	1959-1994						German	
		8-4	type of under drain									
		8-5	backwash pump	3	1994						German	
			motor	3	1994						German	
			pump	3	1994						German	
			pressure gauge	0								
		8-6	air blower for air wash	2+2	1959-1994						German	
			motor	2+2	1959-1994						German	
			blower	2+2	1959-1994						German	
			air storage tank	1	1994						German	
		*8-7	pipings & valves	168	1959-1994						local	
9	clear water resorvour	9-1	clear water resorvour	6	1959-1994						local	
		9-2	pipings & valves	4	1959-1994						local	
		9-3	other auxiliary	0								
10	Alum dosing facility	10-1	alum storage yard	1							local	
		10-2	alum solution tank	2	1994						local	
		10-3	liquid alum receiver tank	3	1959						local	
		10-4	agitator of solution tank	2	1959						local	

		3-3	Raw water pump -type2									
			motor	5	1994						Czech	
			pump	5	1994						Czech	
			pressure gauge									
		3-4	pipings & valves	12	1957-1994		repair		replaced		German + Czech	
4	Receiving well	4-1	Receiving well	2	1994						local	
		4-2	Flush mixer	4	1994						local	
			drive unit	4	1994						local	
			common base	4	1994						local	
			shaft & paddle	4	1994						local	
		4-3	Raw water flow meter									
5	Flocculation basin	5-1	Flocculation basin	7	1959-1994						local	
		5-2	flocculator	7	1959-1994						local	
			drive unit	22	1959-1994						local	
			common base	28	1959-1994						local	
			shaft & paddle	28	1959-1994						local	
6	Sedimentasion basin	6-1	Sedimentation basin	7	1959-1994						local	
		6-2	sludge collector	7	1959-1994						local	
			drive unit	7	1959-1994						German	

		10-5	alum dosing pump type1	0								
		10-6	alum dosing pump type2	0								
		10-7	Level guage for solution tank	4	1959						German	
		10-8	pressure guage	0								
		10-9	backpressure valve	2	1959						German	
		10-10	relief valve	0								
		10-11	strainer	0								
		10-12	pipings & valves	6	1959						German	
11	chlorination facility	11-1	cylinder storage base	1	1994						local	
		11-2	lead tube for chlorine gas									
		11-3	auxiliary valves	1	1994						local	
		11-4	cylinder changeover devise	1	1994						local	
		11-5	pressure guage for chlorine gas	2	1994						local	
		11-6	chlorine gas filter	1	1994						Czech	

			common base	7	1959-1994						German	
			bridge	7	1959-1994						German	
			collector blade unit	14	1959-1994						German	
7	Sludge drainage	7-1	drainage pump									
			motor	6	1959-1994						German	
			pump	6	1959-1994						German	
			pressure gauge	0								
		7-2	pipings & valves	15	1959-1974						German	
8	Rapid sand filter *Marked items should be described on each filter.	*8-1	rapid sand filter basin	28	1994							
		*8-2	compassion of filter layer	4						in intervals	local	the depth for the filter medium is 160cm(115cm sand and 45 cm gravel)
			gravel 1	1						in intervals	local	32-64mm3 gravel, depth 20cm
			gravel 2	1						in intervals	local	8-16mm3 gravel, depth 20cm
			gravel 3	1						in intervals	local	2-4mm3 gravel, depth 5cm
			sand 1	1						in intervals	local	0.6-1.5mm3 gravel, depth 1.15m

		12-2	sludge drainage basin									
		1)	sludge drainage basin									
		2)	sludge thickener									
			drive unit									
			common base									
			bridge									
			collector blade unit									
		3)	drainage pump									
			motor									
			pump									
			pipings & valves									
13	Treated water pump	13-1	pump -type1									
			motor	4	1959						German	
			pump	4	1959						German	
			pressure gauge									
		13-2	pump -type2									
			motor	2	1994						Czech	
			pump	2	1994						Czech	
			pressure gauge									

		11-7	Pre-chlorinator	2	1994						Czech	
		11-8	Intermediate chlorinator	0								
		11-9	post chlorinator	2	1959-1994						Czech	
		11-10	injector unit for pre chlorinator	1	1994						Czech	
		11-11	injector unit for int. chlorinator									
		11-12	injector unit for post chlorinator	2	1959-1994						Czech	
		11-13	pipings & valves	1	1959-1994						local	
		11-14	water booster pump for chlorination									
			motor	4	1994						Czech	
			pump	4	1994						Czech	
			pressure guage	1	1994						Czech	
			pipings & valves	8	1994						Czech	
		11-15	clorine gas neutralization system	1	1994						German	
		1)	coastic soda solution pump	2	1994						German	

			out going transmission line	4								800mm cast iron main to Abu Hamad- 900mm steel coated main to Zagazig-600mm asbestos main to Faqus- 600mm asbestos main to Bilbais city
14	Stand-by generator	14-1	generator	1	1994		repaired				Czech	to prevent ground water leakage and prevent mix the oil with water
		14-2	oil tank	1	1994		repaired				Czech	
		14-3	battery	1	1994		repaired				Czech	
15	Electrical switch board	15-1	for Raw water pump	2	1959-1994						German + Czech	
		15-2	for Flush mixer	4	1994						Czech	
		15-3	for Flocculater	22	1959-1994						German + Czech	
		15-4	for Sludge collector	5							German + Czech	
		15-5	for Bachwash pump	3	1994						Czech	
		15-6	for Air wash pump	5	1959-1994						German + Czech	
		15-7	forAlum	2	1959						German	

			motor	2	1994						German	
			pump	2	1994						German	
			attched parts	0								
			pipings & valves	4	1994						local	
	chlorination facility	2)	exhaust fan									
			motor	12	1994						Czech	
			fan	12	1994						Czech	
			attached parts	0								
			pipings & valves	0								
		3)	caustic soda solution tank									
			caustic soda solution									
			solution tank	1	1994						Czech	
		4)	reaction & absorption tower	1	1959-1994							
12	drainage facility	12-1	drainage basin									
		1)	drainage basin									
		2)	drainage pump									
			motor									
			pump									
		3)	pipings & valves									

		18-2	Workshop equipment	1	1957				replaced		England + local	Big Lathers & equipments
19	Safety equipment	19-1	Emergency device for chlorine gas									
		19-2										
		19-3										
		19-4										
		19-5										

			solution tank agitator									
		15-8	for Alum solution dosing pump	4	1994						Czech	
		15-9	for chlorinator	0								
		15-10	for booster pump for chlorinator	0								
		15-11	for coasitc pump	2	1994						Czech	
		15-12	for exhaust fan	12	1994						Czech	
		15-13	for distribution pump	0								
		15-14	for treated water pump	0								
		15-15	for drainage pump	0								
		15-16	for sludge drainage pump	0								
		15-17	for sludge thickener	0								
		15-18	for Stand by generator	0								

		15-19	for Crane	6	1959-1994						Czech	
		15-20										
		15-21										
		15-22										
		15-23										
		15-24										
		15-25										
16	Transformer	16-1	transformer 1	2	1959						German	
		16-2	transformer 2	2	1994						Czech	
		16-3	transformer 3	2	1994						Czech	
17	Chemical laboratory	17-1	Chemical laboratory	1	1959							
		17-2										
		17-3										
18	Maintenance equipment	18-1	Moving trucks	2	1994				replaced		local	ABB1

Equipment maintenance Card

No. MC-AB-TMP 1

Plant Name: **Abbassa Water Treatment Plant (New)**

Name of facilty: **No.1 Backwash pump**

Name of Part	Pump	Name of Part	Motor	Name of Part	Pressure gauge
Specification		Specification		Specification	
Type	**Double suction**	Type	**Induction motor**	Type	**Positive pressure**
Capacity (l/sec)		Caoacity (kw)		Range (bar)	
Head (m)		Power source	**3φ 380V 50Hz**	Connection	
Material		Load current (A)			
Casing	**Cast iron**	Starting	Reactor		
Impeller	**Steel**	Bearing No.			
Shaft	**Steel**	Bearing-3			
Bearing No.		Bearing-4			
Bearing-1		Production data			
Bearing-2		Year of product			
Production data		Manufacturer			
Year of product					
Manufacturer					

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No. MC-AB-TMP 1

Plant Name: **Abbassa Water Treatment Plant (New)**

Name of facilty: **No.1 Backwash pump**

Name of Part	Pump	Name of Part	Motor	Name of Part	Pressure gauge
Specification		Specification		Specification	
Type	**Double suction**	Type	**Induction motor**	Type	**Positive pressure**
Capacity (l/sec)		Caoacity (kw)		Range (bar)	
Head (m)		Power source	**3φ 380V 50Hz**	Connection	
Material		Load current (A)			
Casing	**Cast iron**	Starting	Reactor		
Impeller	**Steel**	Bearing No.			
Shaft	**Steel**	Bearing-3			
Bearing No.		Bearing-4			
Bearing-1		Production data			
Bearing-2		Year of product			
Production data		Manufacturer			
Year of product					
Manufacturer					

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Abbassa Water Treatment Plant (New)**

Name of facilty: **No.1 Filter**

Name of Part	Filter Sand	Name of Part	Filter basin	Common condition of the filters: Formation of Filter Operation	
Sand Layer (as design)		Number of filter		Filtering run time (hrs)	
Sand size		Specification		Filtere washing regime	
Gravel-1 size		Type	**Double banks**	Tota wash time (min)	
Gravel-2 size		Dimension		Air acouring (min)	
Gravel-3 size		Long side (m)		Combined wash (min)	
Depth of sand		Short side (m)		Backwash (min)	
Depth of gravel-1		Filtering area (m2)		(Fow rate for filter wash)	
Depth of gravel-2		Nominal flow rate for each filter		Air acouring (m3/min)	
Depth of gravel-3			(l/sec)	Backwash (m3/min)	
Sand Layer (as measurement)		Nominal flitering rate for each filter		Backwash rate (m3/m2/min)	
Sand size(mm)			(m/day)	Backwash waterquantity	
Depth of sand(mm)					

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Abbassa Water Treatment Plant (Old)**

Name of facilty: **No.1 Raw water pump**

Name of Part	Pump	Name of Part	Motor	Name of Part	Pressure gauge
Specification		Specification		Specification	
Type	**Double suction**	Type	**Induction motor**	Type	**Positive pressure**
Capacity (l/sec)		Caoacity (kw)		Range (bar)	
Head (m)		Power source	**3φ 380V 50Hz**	Connection	
Material		Load current (A)			
Casing	**Cast iron**	Starting	Reactor		
Impeller	**Steel**	Bearing No.			
Shaft	**Steel**	Bearing-3			
Bearing No.		Bearing-4			
Bearing-1		Production data			
Bearing-2		Year of product			
Production data		Manufacturer			
Year of product					
Manufacturer					

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Abbassa Water Treatment Plant (Old)**

Name of facilty: **No.1 Transmission pump**

Name of Part	Pump	Name of Part	Motor	Name of Part	Pressure gauge
Specification		Specification		Specification	
Type	**Double suction**	Type	**Induction motor**	Type	**Positive pressure**
Capacity (l/sec)		Caoacity (kw)		Range (bar)	
Head (m)		Power source	**3φ 380V 50Hz**	Connection	
Material		Load current (A)			
Casing	**Cast iron**	Starting	Reactor		
Impeller	**Steel**	Bearing No.			
Shaft	**Steel**	Bearing-3			
Bearing No.		Bearing-4			
Bearing-1		Production data			
Bearing-2		Year of product			
Production data		Manufacturer			
Year of product					
Manufacturer					

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No. MC-AB-TMP 1

Plant Name: **Abbassa Water Treatment Plant (New)**

Name of facilty: **No.1 Pre-chlorinator**

Name of Part	Chlorinator	Name of Part	Injector
Specification		Specification	
Type		Supply water pres.	
Capacity (kg/hr)		(Bar)	
Min. capacity		Connection pipe dize	
Power supply	1φ,220V	Gas nlet pipe(mm)	
Production data		inlet water (mm)	
Year of product		Outlet water(mm)	
Manufacturer		Production data	
		Year of product	
		Manufacturer	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Abbassa Water Treatment Plant (New)**

Name of facilty: **No.1 Flush Mixer**

Name of Part	Power reduction	Name of Part	Motor	Name of Part	Mixing Paddle
Specification		Specification		Specification	
Type		Type	**Induction motor**	Type	**Vertical**
Rotation number		Caoacity (kw)			
		Power source	**3φ 380V 50Hz**		
		Load current (A)		Material	
Bearing No.		Starting	Reactor	Shaft	
Bearing-1		Bearing No.		Paddle	
Bearing-2		Bearing-3		Production data	
Production data		Bearing-4		Year of product	
Year of product		Production data		Manufacturer	
Manufacturer		Year of product			
		Manufacturer			

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Abbassa Water Treatment Plant (New)**

Name of facilty: **No.1 Flocculator**

Name of Part	Power reduction	Name of Part	Motor	Name of Part	Mixing Paddle
Specification		Specification		Specification	
Type		Type	**Induction motor**	Type	**Vertical**
Rotation number		Caoacity (kw)			
		Power source	**3φ 380V 50Hz**		
		Load current (A)		Material	
Bearing & Oil seal No.		Starting	Reactor	Shaft	
Bearing-1		Bearing No.		Paddle	
Bearing-2		Bearing-3		Production data	
Oil seal No.		Bearing-4		Year of product	
Production data		Production data		Manufacturer	
Year of product		Year of product			
Manufacturer		Manufacturer			

Date	Maintenance history

Note

Date	

4. Zagazig Equipment Maintenance Card

Equipment maintenance Card

No.

Plant Name: **Zagazig Water Treatment Plant (New)**

Name of facilty: **No.1 Air scouring blower**

Name of Part	Blower
Specification	
Type	**Roots type**
Capacity (l/min)	
Head (mmAq)	
Material	
Casing	**Cast iron**
Impeller	**Steel**
Shaft	**Steel**
Bearing No.	
Bearing-1	
Bearing-2	
Specification of lube	
Oil name	
Oil quantity (litter)	
Oil manufacturer	
Connection pipe size	
Inlet (mm)	
Outlet(mm)	
Production data	
Year of product	
Year of installtion	
Manufacturer	

Name of Part	Motor
Specification	
Type	**Induction motor**
Caoacity (kw)	
Power source	**3φ 380V 50Hz**
Load current (A)	
Starting	Reactor
Bearing No.	
Bearing-3	
Bearing-4	
Specification of lube	
Greasel name	
Grease quantity (kg)	
Manufacturer	
Production data	
Year of product	
Year of installtion	
Manufacturer	

Name of Part	Relief valve
Specification	
Type	
Set pres.(Bar)	

Name of Part	Suction filter
Specification	
Type	
Range (bar)	
Year of product	
Year of installtion	
Manufacturer	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Zagazig Water Treatment Plant**

Name of facilty: **No.1 Filter**

Name of Part	Filter Sand
Sand Layer (as design)	
Sand size	
Gravel-1 size	
Gravel-2 size	
Gravel-3 size	
Depth of sand	
Depth of gravel-1	
Depth of gravel-2	
Depth of gravel-3	
Sand Layer (as measurement)	
Sand size(mm)	
Depth of sand(mm)	

Name of Part	Filter basin
Number of filter	
Specification	
Type	**Double banks**
Dimension	
Long side (m)	
Short side (m)	
Filtering area (m2)	
Nominal flow rate for each filter	
(l/sec)	
Nominal flitering rate for each filter	
(m/day)	

Common condition of the filters	
Formation of Filter Operation	
Filtering run time (hrs)	
Filtere washing regime	
Tota wash time (min)	
Air acouring (min)	
Combined wash (min)	
Backwash (min)	
(Fow rate for filter wash)	
Air acouring (m3/min)	
Backwash (m3/min)	
Backwash rate (m3/m2/min)	
Backwash waterquantity	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Zagazig Water Treatment Plant (Old)**

Name of facilty: **No.1 Raw water pump**

Name of Part	Pump
Specification	
Type	**Double suction**
Capacity (l/sec)	
Head (m)	
Material	
Casing	**Cast iron**
Impeller	**Steel**
Shaft	**Steel**
Bearing No.	
Bearing-1	
Bearing-2	
Production data	
Year of product	
Manufacturer	

Name of Part	Motor
Specification	
Type	**Induction motor**
Caoacity (kw)	
Power source	**3φ 380V 50Hz**
Load current (A)	
Starting	Reactor
Bearing No.	
Bearing-3	
Bearing-4	
Production data	
Year of product	
Manufacturer	

Name of Part	Pressure gauge
Specification	
Type	**Positive pressure**
Range (bar)	
Connection	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Abbassa Water Treatment Plant (Old)**

Name of facilty: **No.1 Transmission pump**

Name of Part	Pump
Specification	
Type	**Double suction**
Capacity (l/sec)	
Head (m)	
Material	
Casing	**Cast iron**
Impeller	**Steel**
Shaft	**Steel**
Bearing No.	
Bearing-1	
Bearing-2	
Production data	
Year of product	
Manufacturer	

Name of Part	Motor
Specification	
Type	**Induction motor**
Caoacity (kw)	
Power source	**3φ 380V 50Hz**
Load current (A)	
Starting	Reactor
Bearing No.	
Bearing-3	
Bearing-4	
Production data	
Year of product	
Manufacturer	

Name of Part	Pressure gauge
Specification	
Type	**Positive pressure**
Range (bar)	
Connection	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Zagazig Water Treatment Plant**

Name of facilty: **No.1 Alum agitator**

Name of Part	**Alum agitator**
Specification	
Type	**Vertical,geared**
Rotation No. (rpm)	
Drive unit	
Power supply	**3φ,380V,50Hz**
Motor output(kw)	
Specification of lube	
Oil name	
Oil quantity (litter)	
Oil manufacturer	
Mixing shaft	
Material	
Diameter (mm)	
Length(mm)	
Production data	
Year of product	
Year of installation	
Manufacturer	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No. MC-AB-TMP 1

Plant Name: **Zagazig Water Treatment Plant**

Name of facilty: **No.1 Alum dosing pump**

Name of Part	**Alum dosing pump**
Specification	
Type	**Metering pump**
Capacity (l/h)	
Min. capacity(l/h)	
Max. pres.(Bar)	
Drive unit	
Power supply	**3φ,380V,50Hz**
Motor output(kw)	
Specification of lube	
Oil name	
Oil quantity (litter)	
Oil manufacturer	
Connection pipe size	
Inlet (mm)	
Outlet(mm)	
Production data	
Year of product	
Year of installation	
Manufacturer	

Name of Part	**Back pres. Valve**
Specification	
Set pres.(Bar)	
Connection pipe dize	
Inlet (mm)	
Outlet(mm)	
Production data	
Year of product	
Year of installation	
Manufacturer	

Name of Part	**Pressure gauge**
Specification	
Type	**Positive pressure**
Range (bar)	
Connection	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No. MC-AB-TMP 1

Plant Name: **Zagazig Water Treatment Plant (New)**

Name of facilty: **No.1 Pre-chlorinator**

Name of Part	Chlorinator
Specification	
Type	
Capacity (kg/hr)	
Min. capacity	
Power supply	1φ,220V
Production data	
Year of product	
Manufacturer	

Name of Part	Injector
Specification	
Supply water pres. (Bar)	
Connection pipe dize	
Gas nlet pipe(mm)	
inlet water (mm)	
Outlet water(mm)	
Production data	
Year of product	
Manufacturer	

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Zagazig Water Treatment Plant (New)**

Name of facilty: **No.1 Flush Mixer**

Name of Part	Power reduction	Name of Part	Motor	Name of Part	Mixing Paddle
Specification		Specification		Specification	
Type		Type	**Induction motor**	Type	**Vertical**
Rotation number		Caoacity (kw)			
		Power source	**3φ 380V 50Hz**		
		Load current (A)		Material	
Bearing No.		Starting	Reactor	Shaft	
Bearing-1		Bearing No.		Paddle	
Bearing-2		Bearing-3		Production data	
Production data		Bearing-4		Year of product	
Year of product		Production data		Manufacturer	
Manufacturer		Year of product			
		Manufacturer			

Date	Maintenance history

Note

Date	

Equipment maintenance Card

No.

Plant Name: **Zagazig Water Treatment Plant**

Name of facilty: **No.1 Flocculator**

Name of Part	Power reduction	Name of Part	Motor	Name of Part	Mixing Paddle
Specification		Specification		Specification	
Type		Type	**Induction motor**	Type	**Vertical**
Rotation number		Caoacity (kw)			
		Power source	**3φ 380V 50Hz**		
		Load current (A)		Material	
Bearing & Oil seal No.		Starting	Reactor	Shaft	
Bearing-1		Bearing No.		Paddle	
Bearing-2		Bearing-3		Production data	
Oil seal No.		Bearing-4		Year of product	
Production data		Production data		Manufacturer	
Year of product		Year of product			
Manufacturer		Manufacturer			

Date	Maintenance history

Note

Date	

5. ***Inspection List for Main Facilities***

2.Shaft coupling	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	
	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Rust of bolts and nuts	Visual observation	Check rust appearance In case that rust is generated, bolting parts should be repainting or replacing	6 months	
3.Mixing shaft and paddle	Damage	Visual observation	In case that damage is found, damaged part should be replaced. Investigation of cause of above	6 months	
	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Wear	Touching By measurement by tools (slide gauge)	In case that abrasion is more than 1mm, shaft sleeve should be installed or shaft will be replaced.	1 year	

Contents

(2) Sludge collector

Name of Part	Inspection ittem	Method	Judgment Criteria	Frequency	Judgment
1.Power reducer	Load current	Current measurement By current meter or cramp meter	Less than rated current value In case that measured current is rated current or more, investigation should be required.	1 month	
	Abnormal sound	Auscultation	Check abnormal sound In case that abnormal sound is generated, overhaul is required.	Ever day	
	Vibration	Touching or visual observation or by vibration meter	Abnormal vibration Investigation of cause of above. In case that abnormal vibration is generated, bolting parts should be tightened.	Every day	
	Temperature	By touching or thermometer	Temperature of outside surface is less than ambient temperature +40 In case of 40 or more, an overload may be the causes. Investigation should be required	Every day Check by thermometer every 1 month	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	

(1) Flush Mixer & Slow mixer (Flocculator)

Name of Part	Inspection ittem	Method	Judgment Criteria	Frequency	Judgment
1.Power reducer	Load current	Current measurement By current meter or cramp meter	Less than rated current value In case that measured current is rated current or more, investigation should be required.	1 month	
	Abnormal sound	Auscultation	Check abnormal sound In case that abnormal sound is generated, overhaul is required.	Ever day	
	Vibration	Touching or visual observation or by vibration meter	Abnormal vibration Investigation of cause of above. In case that abnormal vibration is generated, bolting parts should be tightened.	Every day	
	Temperature	By touching or thermometer	Temperature of outside surface is less than ambient temperature +40 In case of 40 or more, an overload may be the causes. Investigation should be required	Every day 1 month	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	

Blower for air scouring	Discharge pressure	Visual observation of pressure gauge	Check the pressure gauge reading. In case that reading pressure is not sufficient, check the leakage of air from piping or relief valve and cleanness of suction air filter.. If, leakage and dirtiness of air filter are not found, check the parts inside of blower casing such as the impeller.	6 months	
	Overheating of bearings and gears	Touching or measuring by thermometer	In case that overheating is happened, check bellows; Check lubricant, Check alignment Check belt tension, check wear of impeller and clearance between impellers. Detail checks should be carried out according to manufacturer's instruction manual.	Every day	
	Vibration	Touching or measuring by vibration meter	In case that abnormal vibration is found, check bellows; Check alignment, check a wear of bearings/gear, Check looseness of coupling with shaft	Every day	
	Oil leaking & cleanness of oil	Visual observation	In case that oil leakage is found, check bellows; Check excessive oil level, oil seal leakage In case that oil dirtiness is found, oil should be replaced	1 months	
	Belt tension	Touching	In case that inadequate belt tension is found, it should be adjusted.	6 months	
	Suction air filter	Visual observation	In case that dirtiness is found, it should be cleaned. In case that sir filter is wom, it should be replaced	3 months	

Backwash pump	Load current	Current measurement By current meter or cramp meter	Less than rated current value In case that measured current is rated current or more, investigation should be required.	1 month	
	Pressure indication	Visual observation		Every day	
	Abnormal sound	Auscultation	Check abnormal sound In case that abnormal sound is generated, overhaul is required.	Ever day	
	Vibration	Touching or visual observation or by vibration meter	Abnormal vibration Investigation of cause of above. In case that abnormal vibration is generated, bolting parts should be tightened.	Every day 1 year	
	Temperature	By touching or thermometer	Temperature of outside surface and bearings is less than ambient temperature +40 degree In case of 40 ↑or more, an overload may be the causes. Investigation should be required	Every day 1 month	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	
	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	

2.Shaft coupling	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	
	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Rust of bolts and nuts	Visual observation	Check rust appearance In case that rust is generated, bolting parts should be repainting or replacing	6 months	
3.Mixing shaft and paddle	Damage	Visual observation	In case that damage is found, damaged part should be replaced. Investigation of cause of above	6 months	
	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Abrasion	Touching By measurement by tools (slide gauge)	In case that abrasion is more than 1mm, shaft sleeve should be installed or shaft will be replaced.	1 year	
4.Bridge	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	

(3) Rapid sand filter

Name of Part	Inspection item	Method	Judgment Criteria	Frequency	Judgment
1.Motor valve Pneumatic valve Flow control valve	Operation condition	Visual observation or Check a switching time by stopwatch	Check smooth operating of valve shaft Check a switching time In case of that operating of valve shaft is not smooth grease rise should be required.	6 months	
	Limit switch	Visual observation	Check the position of limit switch In case that location of the limit switch has shifted, location adjustment of limit switch should be required.	6 months	
	Valve Sealing	Visual observation or judgment by hearing of sound of water flow	In case that water leakage is found, overhaul of valve should be required.	6 months	
	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	
	Overhaul	Total inspection		5 years	

	Depth of sand layer	Measurement by measuring rod	In case that lack of depth of sand layer is found, the sand of an insufficient should be supplied. In case that uneven depth of sand layer between left and right bank, depth of sand layer should be adjusted to be even depth. Investigation of cause of above	1 month	
	Flatness of surface of sand layer	Visual observation	In case that unevenness of surface of sand layer is found, unevenness condition should be corrected to even. Investigation of cause of above	1 month	

	Alignment of the pump and motor	Measurement by dial gauge		6 months	
	Wear of rotating elements	Visual observation and measurement by slide gauge	According to instruction manual by manufacturer	1 year	
	Wear ring clearances	Measurement by slide gauge	According to instruction manual by manufacturer	1 year	
	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Leakage from gland packing	Visual observation		Every day	
	Leakage of water	Visual observation		Every day	
2.Piping	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Rust of bolts and nuts	Visual observation	Check rust appearance In case that rust is generated, bolting parts should be repainting or replacing	6 months	

(4) Aluminum Sulfate storage tank & Aluminum Sulfate dosing pump

Name of Part	Inspection item	Method	Judgment Criteria	Frequency	Judgment
1. Alum storage tank 1-1. Outside condition	Leakage	Visual observation	Check outside of tank and pipe connection part. In case of that leakage is observed, repairing or re-tightening of bolts and nuts of pipe connection part should be required.	6 months	
	Damage & rust	Visual observation	Check damage, breakage, and rust. In case that damage or breakage is found, it should be repaired. In case that rust is found, it should be recovered by re-painting.	1 months	
1-2.Inside condition	Damage & rust	Visual observation	Check damage, breakage, and rust. In case that damage or breakage is found, it should be repaired. In case that rust is found, it should be recovered by re-painting.	3 months	
	Precipitate on the bottom	Visual observation	Check the condition of tank bottom or adhering on the wall inside. In case that precipitate is found, it should be removed and cleaned up.	1 month	
1-3.Level meter	Damage & rust	Visual observation	Check damage, breakage, and rust. In case that damage or breakage is found, it should be repaired. In case that rust is found, it should be recovered by re-painting.	6 months	
	Accurate indication & calibration	Confirm difference between actual indication and level meter indication	Check the difference between both readings at arbitrary point. In case that difference is 1 cm or more, calibration should be required.	6 months	

	Uniform air bubbling and uniform backwashing	Visual observation of filter washing condition	Check uniform air bubbling during air scouring and uniform backwashing during backwashing In case of that uneven bubbling or backwashing is observed, check of under drain should be required.	6 months	
4.Under drain	Damage	Visual observation	Check damage, breakage, uneven arrangement of parts, and clogging of holes at the time of inspection activity of under drain.	5 years	
5.Filter basin	Clean condition inside wall & water surface	Visual observation	Check cleanness inside wall and water surface In case that garbage is observed in filter basin, ir should be removed. In case that the adhered object such as algae is observed on wall inside, it should be removed and wall inside should be cleaned.	3 months	
6.Drainage trough	Damage & uniform drain out	Visual observation	Check the damage, breakage and uniform drain out from drain trough. In case that damage or breakage is found, repair should be required. In case that uneven drain out from drain trough is found, level adjustment of drain trough should be required.	Every day	
3.Filter media	The damage of filter media	Visual observation	In case that damage, mud balls or dirtiness is found, damaged part should be replaced and recovered the sand by compulsory washing. Investigation of cause of above	3 months	

	Leakage of water	Visual observation		Every day	
Chlorine drum	Leakage of chlorine	Visual observation & check by smell	Check by ammonia solution & smell In case that there is any leakage, leakage part should be found and repair or be tightened bolting part.	Every day	
	Supplied chlorine gas pressure or reading of indicator of weighing scale	Visual observation	Check indication of gas feeding pressure gauge or weighing scale. In case that indication value is not sufficient, the indicated value is observed periodically and change work of drum should be carried out when it is required.	Every day	
	Stock numbers of filled chlorine drum	Visual observation	The location in a storage room for empty drum and filling drum should be separated. The empty drum and the filling drum are identified by displaying.	Every day	

Alum dosing devise	Accurate discharge quantity of dosing pump	Measuring of discharge quantity	Check the delivered quantity from dosing pump by measuring of the drop degree of a liquid level in solution tank.	6 months	
	Accurate delivered quantity from dosing pipe	Measuring of delivered quantity	Check the actual delivered quantity from dosing pipe used by measuring cylinder and stopwatch.	6 months	
Alum dosing pump	Abnormal noise	Hearing		Every day	
	Discharge pressure	Pressure gauge	Check the discharge pressure at set pressure of back pressure valve.	Every day	
	Leakage of alum	Visual observation		Every day	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	
	Loose of bolting parts	Touching and by tools		6 months	
	Periodical check of mechanical parts	Overhaul		3 years	

(6) Pump facility

Name of Part	Inspection item	Method	Judgment Criteria	Frequency	Judgment
1.Motor valve Pneumatic valve Flow control valve	Operation condition	Visual observation or Check a switching time by stopwatch	Check smooth operating of valve shaft Check a switching time In case of that operating of valve shaft is not smooth grease rise should be required.	6 months	
	Limit switch	Visual observation	Check the position of limit switch In case that location of the limit switch has shifted, location adjustment of limit switch should be required.	6 months	
	Valve Sealing	Visual observation or judgment by hearing of sound of water flow	In case that water leakage is found, overhaul of valve should be required.	6 months	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	
	Overhaul	Total inspection		5 years	

(5) Chlorinator & chlorine drum

Name of Part	Inspection item	Method	Judgment Criteria	Frequency	Judgment
Chlorinator	Leakage of chlorine	Visual observation & check by smell	Check by ammonia solution & smell In case that there is any leakage, leakage part should be found and repair or be tightened bolting part.	Every day	
	Stable indication of flow meter indicator	Visual observation	Check stable indication of a float in indicator glass tube	Every day	
	Adequate dosing quantity	Visual observation of indicator reading	Check the raw water quantity and chorine dosing rate. Calculate dosing quantity by above values. Confirm a actual dosing quantity and adjust the dosing quantity to required dosing quantity if necessary	Every day	
	No liquid chlorine in glass tube of indicator	Visual observation	Check indicator glass tube. In case that there is any liquid chlorine in glass tube, close the outlet valve of chlorine drum and continue working until liquid chlorine in glass tube is consumed. After that change the chlorinator in working to the stand-by. The chlorinator which was being operated till then should be carried out overhaul.	Every day	
Chlorinator	Adequate working of injector	Sound hearing	Check sound of vacuum occurrence from injector. In case that there is not sound, vacuum will be not sufficient. Injector should be checked by dismantling.	Every day	

	Vibration	Touching or visual observation or by vibration meter	Abnormal vibration Investigation of cause of above. In case that abnormal vibration is generated, bolting parts should be tightened.	Every day 1 year	
	Temperature	By touching or thermometer	Temperature of outside surface and bearings is less than ambient temperature +40 degree In case of 40 ℃ or more, an overload may be the causes. Investigation should be required	Every day 1 month	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	
	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	
	Alignment of the pump and motor	Measurement by dial gauge		6 months	
	Water level of sump	Visual absevation			
2.Piping	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	

Pump	Load current	Current measurement By current meter or cramp meter	Less than rated current value In case that measured current is rated current or more, investigation should be required.	1 month	
	Pressure indication	Visual observation		Every day	
	Abnormal sound	Auscultation	Check abnormal sound In case that abnormal sound is generated, overhaul is required.	Ever day	
	Vibration	Touching or visual observation or by vibration meter	Abnormal vibration Investigation of cause of above. In case that abnormal vibration is generated, bolting parts should be tightened.	Every day 1 year	
	Temperature	By touching or thermometer	Temperature of outside surface and bearings is less than ambient temperature +40 degree In case of 40 ℃ or more, an overload may be the causes. Investigation should be required	Every day 1 month	
	Lubricant quantity blackish color leakage	Visual observation and operation record	Check oil gauge sight glass Check bolting parts In case that insufficient level of oil, oil should be supplied. In case that oil color is blackish color and used hours of oil have been more than manufacturer recommendation time, oil should be changed.	1 month	
	Rust	Visual observation	Rust appearance In case that rust is generated, repainting should be required	6 months	

	Rust of bolts and nuts	Visual observation	Check rust appearance In case that rust is generated, bolting parts should be repainting or replacing	6 months	

	Alignment of the pump and motor	Measurement by dial gauge		6 months	
	Wear of rotating elements	Visual observation and measurement by slide gauge	According to instruction manual by manufacturer	1 year	
	Wear ring clearances	Measurement by slide gauge	According to instruction manual by manufacturer	1 year	
	Loosening of bolting parts	Touching and by tools	Check bolting parts In case that loosening is generated, bolting parts should be tightened.	6 month	
	Leakage from gland packing	Visual observation		Every day	
	Leakage of water	Visual observation		Every day	
Vacuum pump	Load current	Current measurement By current meter or cramp meter	Less than rated current value In case that measured current is rated current or more, investigation should be required.	1 month	
	Pressure indication	Visual observation		Every day	
	Abnormal sound	Auscultation	Check abnormal sound In case that abnormal sound is generated, overhaul is required.	Ever day	

3.11 Water Quality Control Program for Water Supply Facilities (Action S9)

Reviewed by _____
Date: _____

Auditing Report for _____ Laboratory

DD/MM/YYYY

SHAPWASCO

(Laboratory of _____)

3.11-1

Certification

I, _____(NAME)_____ , hereby, declare that the contents written in this document are based on the fact that I witnessed during the auditing, conducted on the (DD/MM/YYYY)_____, and any of my personal suspicion is prevented from this document.

Name of the Auditor: _____

Date: _____

Signature _____

1. Abstract of the Laboratory

Name of the Lab	:	
Location	:	
Telephone	:	
Email (if any)	:	
Head of the Lab	:	
Number of Workers	:	

2. Abstract of the Auditing

Date	:	DD/MM/YYYY
Time	:	: ~ :
Interviewed with	:	
	:	
	:	

3. Checklists

Storage Location	:	
Storage Condition	:	Good / Acceptable / Terrible
Daily Checklist	:	All Completed / Partially Completed / Not Completed
Weekly Checklist	:	All Completed / Partially Completed / Not Completed
Monthly Checklist	:	All Completed / Partially Completed / Not Completed
Annual Checklist	:	Completed / Not to be done
Items NOT satisfy the requirement significantly, if any.	:	
Improvement Plan if any (optional)	:	

4. Result of the Auditing

The abstract of the auditing result is shown below. The detail of each auditing items should be referred the attached checklist.

General	/ 95
Ventilation	/ 5
Instruments	/ 20
Chemical	/ 50
Waste	/ 30
Total	/ 200 (%)

Items NOT satisfy the requirement significantly, if any.	:	
Improvement Plan if any (optional)	:	
Other Notice (optional)	:	

5. Result of the Interview

Please circle either one below. If the answer is (b), please fill the comment.

(1) General

(a) The laboratory is generally satisfied with the general condition.

(b) The laboratory is NOT satisfied with the general condition.

Why NOT satisfied?

(2) Ventilator

(a) The laboratory is generally satisfied with the ventilator.

(b) The laboratory is NOT satisfied with the ventilator.

Why NOT satisfied?

(3) Chemicals

(a) The laboratory is generally satisfied with the chemicals.

(b) The laboratory is NOT satisfied with the chemicals.

Why NOT satisfied?

SHAPWASCO
with cooperation by JICA

(4) Waste

(a) The laboratory is generally satisfied with the waste.

(b) The laboratory is NOT satisfied with the waste.

Why NOT satisfied?

6. Request from the laboratory

Please write any requests raised from the laboratory.

(End of the Auditing Report)

راجعـه : _____
التاريخ : _____

تقرير مراقبة

لمعمل _____

SHAPWASCO

(معمل _____)

3.11-5

شهادة

أقر أنا _____ بأن المكونات المذكورة بهذا المستند هي حقيقية وهذا طبقاً لما شاهدته أثناء عمل هذا الفحص وذلك في يوم _____

وهذا إقرار مني بذلك

إسم المرقب : _____

التاريخ : _____

التوقيع : _____

1) ملخص للمعمل

اسم المعمل	:	
الموقع	:	
تليفون	:	
البريد الإلكتروني (إن وجد)	:	
رئيس المعمل	:	
عدد العمال	:	

بيانات المراقبة

التاريخ	:	
الوقت	:	: ~ :
تقابل مع	:	
	:	
	:	

2) بيانات المراقبة

مكان التخزين	:	
حالة التخزين	:	**جيد / مقبول / غير مناسب**
قائمة الفحص اليومية	:	**تامة** **بعض البنود** **لم تنفذ**
قائمة الفحص الأسبوعية	:	**تامة** **بعض البنود** **لم تنفذ**
قائمة الفحص الشهرية	:	**تامة** **بعض البنود** **لم تنفذ**
قائمة الفحص السنوية	:	**تامة / لم تتم**
البنود المخالفة للمتطلبات (إن وجدت)	:	
خطة التطوير (إختيارية)	:	

3) نتيجة المراقبة

الجدول التالي يوضح ملخص نتائج المراقبة وتفاصيل كل بند من بنود المراقبة يجب ذكره في قائمة الفحص المرفقة

عامة	**105/**
التهوية	**5/**
الأجهزة	**20/**
الكيماويات	**50/**
المخلفات	**30/**
الإجمالي	**210/ (%)**

البنود المخالفة للمتطلبات (إن وجدت)	:	
خطة التطوير (إن وجدت)	:	
ملاحظات أخرى (إختيارية)	:	

4) نتيجة الزيارة

برجاء وضع دائرة على الإجابة التي توضح الحالة . إذا كانت الإجابة هي الحالة (ب) برجاء الإيضاح

(1) عام
(أ) المعمل مطابق للمواصفات العامة
(ب)المعمل غير مطابق للإشتراطات العامة

برجاء إيضاح أسباب عدم المطابقة ؟

(2) التهوية
(أ) المعمل مجهز بشفاط هواء يعمل
(ب)الشفاط لا يعمل

برجاء إيضاح أسباب عدم المطابقة ؟

(3) الكيماويات
(أ) الكيماويات بالمعمل كافية
(ب)الكيماويات غير كافية

برجاء إيضاح أسباب عدم المطابقة ؟

(4) المخلفات
(أ) المعمل مجهز بنظام لجمع المخلفات
(ب)المعمل غير مجهز بنظام لجمع المخلفات

برجاء إيضاح أسباب عدم المطابقة ؟

6) طلبات المعمل

برجاء كتابة الطلبات التي يطلبها العاملين

(نهاية تقرير مراقبة المعمل)

3.11-9

Water Quality Control Programme

(SHAPWASCO Version)

1. Objectives

The objectives of the Water Quality Control Programme are summarised as the following 3 items;

- To establish SHAPWASCO's basic policy for analysis and water quality control
- To clarify the quality control system and its reliability to public
- To prepare for emergency case such as water pollution

2. Methodology

The Water Quality Control Programme is merely a paper, which is composed of nothing new but of the existing policy, procedure and idea of you should have acquired through your daily working activity.

All you need to do is to bring your daily activity on the paper. This activity will give you for clarifying the role of the laboratory and responsibility.

As model cases, Water Quality Control Programmes for 2 water treatment plants (Zagazig and Abbasa) shall be prepared.

The Expert expects the Counterpart firstly prepare the draft version of the Programme. The Draft version shall be prepared either by Computer typing or hand writing.

All work shall be completed by the Counterpart. However, since the target of the Programme is the existing water treatment plants, the Counterpart is required to build up the Programme with the assistance and consultation of those employees in the both plants.

3. Schedule

The JICA Expert will prepare the format of the Programme by the 20th of June, 2007. The Counterpart is expected to discuss the contents with the

Expert and understand what he should describe in the Programme by the 21st of June. The counterpart is also expected to start to write the Programme from the 23rd of June.

Since the Expert leaves Egypt on the 28th of June but will return on the 16th of September, the Expert requests the Counterpart should prepare the draft version (yet, covering the complete section) of the Programme by September.

4. Assistance by the Expert

The Expert will assist on the following points;

- Field Survey on finding potential source of pollution
- Describing the contents of the Programme which the Counterpart is expected to describe.

5. Contents of the Water Quality Control Programme (Tentative)

The main contents and the brief description of the Programme is described in Attachment. However, the content is not only limited as the Expert describes. The Counterpart is expected to expand the Programme with his and his colleagues own effort.

6. Questions

The Counterpart may encounter some difficulty during his work. If any question or suspicion arises, the Counterpart is able to contact to the expert through email or phone during his absence.

The Expert's contact address is;
Email: tk-hara@yachiyo-eng.co.jp (Max Attachment: 10MB)
Phone: +81-3-59060187

Notice:
The expert requests to email weekly for reviewing and advising the progress of his works. Contact any of the JICA Expert staffs to send email.

Water Quality Control Programme

For

Abbasa Water Treatment Plant

(Draft Version)

3.11-10

October 2007

SHAPWASCO

(Sharqiya Potable Water and Sanitary Company)

SHAPWASCO
(Sharquiya Potable Water and Sanitary Company)

Preface

[Table of Content]

SHAPWASCO
(Sharquiya Potable Water and Sanitary Company)

1. Basic Policy of SHAPWASCO

(1) The Basic Policy of SHAPWASCO

Water supply company has a social responsibility to protect public health and to continuous provision of water to the citizens. The duty is significant and, therefore, the role of SHAPWASCO is very much important in the Governorate.
For comprising such duty, SHAPWASCO should have basic policy to achieve their goal.
In this section, please write the SHAPWASCO's basic concept for enrolling such duty.
Do ask the Chairman for the topic.

e,g.

- *Provide safe water.*
- *No colour in water*
- *Improve the quality of water through continuous effort and technical development*
- *Get costumer's satisfaction, etc.*

(2) The Objectives of the Programme

In this section, the reason for formulation of the Programme will be described.

e.g. The aim of the Water Quality Control Programme is to define the following contents;

- *Establishing systematic water quality control system*
- *To establish SHAPWASCO's basic policy for analysis and water quality control*
- *To clarify the quality control system and its reliability to public*
- *To prepare for emergency case such as water pollution*

(3) Target Year

It is understood that, under the current situation, it is difficult to achieve the ultimate goal (to analyse all items and meet the standard). Therefore, it is you should set the target year to achieve the goal for the above mentioned policy.

e.g. Our target year to achieve our goal, mentioned in the section (1), is 2015.

(4) Summary of the Programme

It is the summary of this paper. Therefore, write this section after completion of all items.

2. Abstraction of the Abbasa Water Treatment Plant

(1) Location of the Plant

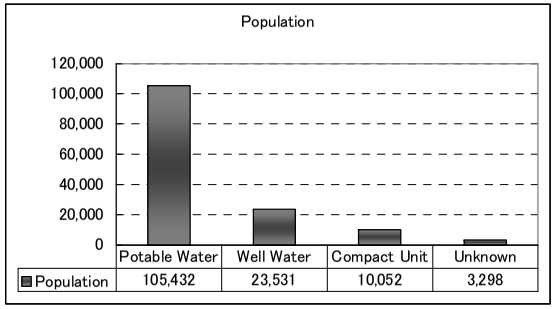
Describe the location of the water treatment plant with a map as well as the source of water. The maps should be available from the other member of the JICA Expert team. Ask them if you need.

e.g. The Abbasa Water Treatment Plant is located outside of Abu Hamad City (approximately XX km) along the XXX Canal. The location of the plant is shown in Figure-1.

(2) Target Number of Water Receiver

Describe how many people receive the water from the plant. Additionally, it is better to describes how many people receive the water from wells and compact units.

e.g. The total number of the population in Abu Hamad Markaz is 142,313 in 2007. The drinking water source in the Markaz is classified into (i) potable water, (ii) well water and (iii) compact unit.
The serving population by each water source is shown in Figure-2. The Abbasa Water Treatment Plant serves approximately 75% of the total population of Abu Hamad Markaz.

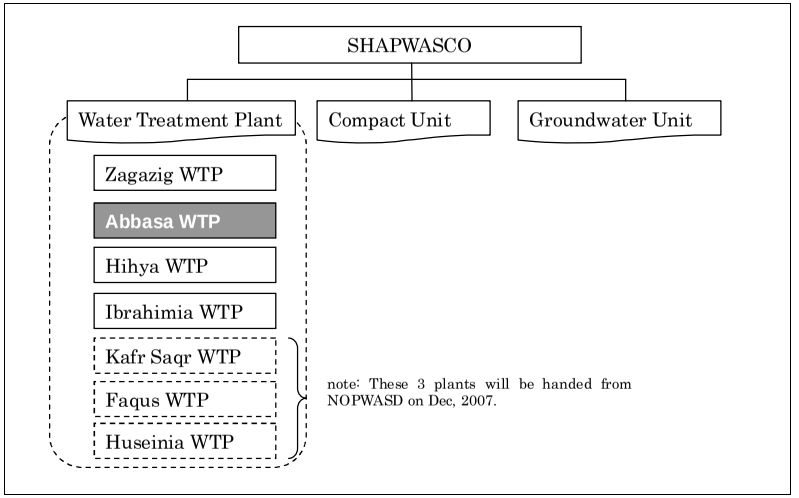


(3) Organization Chart

(a) Relationship between SHAPWASCO and the Abbasa Water Treatment Plant

Describe that Abbasa is one of the main plant of SHAPWASCO with visibly easy organization chart.

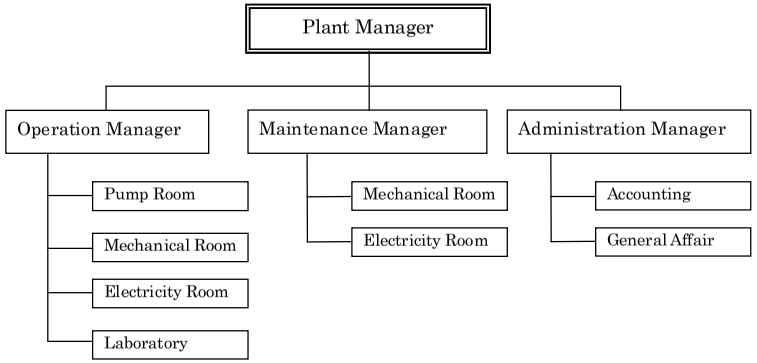
e.g. The Abbasa Water Treatment Plant is one of the main Water Treatment Plant of SHAPWASCO.



(b) Organization Chart of the Abbasa Water Treatment Plant

Describe the organization in Abbasa Water treatment plant with chart. This gives the idea of classification of responsibility.

e.g. The organization chart of the Abbasa Water Treatment Plant is shown in Figure-4.



(4) Capacity of the Plant

Describe the capacity of the plant. The operators should know the detail of it. Therefore, ask the operators in Abbasa.

e.g. The summary of the Plant is summarised Table-1.

Area	35,466m2
Construction	1952
Rehabilitation	1987
Extension	
Capacity	45,000 m3/day
Pump	XXX unit
Purification	Rapid Sand Filter
etc	
Serving Area	Abu Hamad Markaz, Zagazig Markaz

(5) Network System

Describe the network system. The operators should know the detail of it. Therefore, ask the operators in Abbasa.

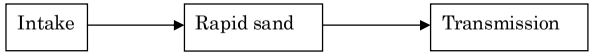
e.g. The summary of the water supply network system is shown in Table-2 and Figure-5

Serving Area	Abu Hamad Markaz, Zagazig Markaz
Total Extension	XXX km

(6) Purification Process

Describe the purification process in the plant with a simple flow diagram.

e.g. The Abbasa Water Treatment Plant employs Rapid Sand Filter and XXXX in its purification process. Figure-7 summarises the purification process of the plant.



3. Water Quality Monitoring System and Facility

(1) Responsible Entities

There are 3 organization involved in water quality analysis in Abbasa. Describe the role of each entity.

e.g. The water quality monitoring in the Water Treatment Plant is conducted by the three agencies, namely, Abbasa Water Treatment Plant, the Holding Company and the Ministry of Health. Their responsibility, coverage area and role in water analysis are described below.

(a) Abbasa Water Treatment Plant

e.g. The laboratory of the Abbasa Water Treatment Plant is the primary responsible agency to conduct daily, weekly, monthly and emergent analysis of water.

(b) Holding Company

e.g. The Holding Company is the super-structural agent of SHAPWASCO. The duty of Holding Company in water quality monitoring is to supervise the SHAPWASCO's

routine water quality monitoring system. Additionally, the entity is bear on the role to analyse in accordance to their specific water quality control programme for securing public health and hygiene condition.
The analytical items and frequency are listed below;

(c) Ministry of Health

e.g. The Ministry of Health is the Governmental organization responsible for protecting public health, hygiene condition and improvement of the water environment. The Ministry irregularly take samples from several locations and monitor the water in the distribution networks.

(2) The Current condition and ability of the Facility in Abbasa Water Treatment Plant

Describe all instruments you have and their condition as a table. Additionally, describe which parameters you can analyse and which parameters you can not analyse at this moment with using tables.

e.g. The Laboratory of the Abbasa Water Treatment Plant currently owns the wide variety of analytical equipments for water analysis. Table 2 shows those analytical instruments held in the laboratory with the purchase year and objective analytical items.

Item	Year	Objectives
Colour Meter	1997	Measuring Cl...
Turbidity Meter	2001	Measuring Turbidity

(3) Summary of the Current Issues in Analysis

Briefly describe the issue in association with analysis such as analytical instruments, laboratory condition, etc.

e.g. Since the Abbasa Water Treatment Plant is one of the oldest plant in Sharqiya, the laboratory and some equipments have suffered from deterioration. Additionally,

although there are a variety of analytical instruments available in the laboratory, there are some analytical items which can not been analysed under the current conditions due to lack of hardware.

(4) Future Expansion Plan

For overcoming the weakness described (4), the tender will be held. Describe which instruments you will buy and what change you can expect.

e.g. SHAPWASCO has currently promoted to renew the analytical instruments of the laboratory. It is expected the following instruments listed in Table-4 will be procured on the December. The procurement and renew of the instruments will contribute to strengthen the analytical ability of the laboratory.

Item	*Target Analytical Item*
pH meter	*pH*
Turbidity Meter	*Turbidity*

4. Summary of Water Quality Analysis System in Abbasa Water Treatment Plant

(1) Objectives of Water Quality Analysis in Abbasa Water Treatment Plant

Why do you have to analyse water quality? It costs and takes time. But you have reasons. Describe the reason why you are required to analyse water quality.

e.g. The objectives of water quality analysis in Abbasa Water Treatment plant can be summarized as below;

- *To protect public safety*
- *To monitor the raw water quality*
- *To monitor the purification process and advise on operation if necessary*
- *etc*

(2) Responsibility of the laboratory

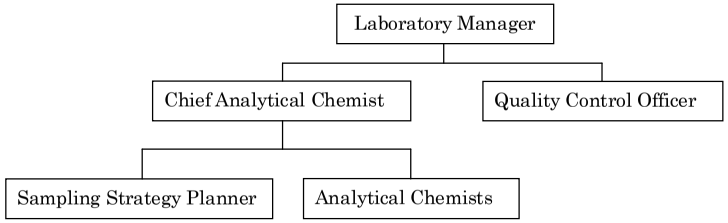
Describe the responsibility of Chemists in the process control, operation, maintenance and their routine analysis.

e.g. The obligation of the laboratory is to monitor the raw water quality, processing water and treated water. The

(3) Organization Chart for the laboratory

If there are more than 2 chemists in the laboratory, they should bear on some roles. Describe what kind of role they have with a diagram.

e.g. A total number of 5 employees including 4 chemists and 1 technician belongs to the laboratory. The structure of the laboratory is shown in Figure-5. The laboratory manager is the person in charge of all analytical activity, quality control, data storage, evaluation of the data and giving recommendation on the plant's operation to the Plant Manager.



(4) Sampling Location

Describe the sampling location in the plant and network with figures. For inside of the plant, operation team has prepared P&ID and this must greatly help to describe the locations of sampling. It is, additionally, helpful if you describe the reasons why you need to take samples from specific locations. Ask the operation team and receive the file from them.
For the network, if the sampling location is not stable, describe the previous month map and explain the system. If the sampling location is fixed, describe the reason why the samples are taken from specific locations.

e.g. The sampling location is shown in Figure-6 and Figure-7 for the water treatment process and network, respectively.

(5) Monitoring Items and Analysis Frequency

Describes the items and frequency of routine analysis.

e.g. The monitoring items and analysis frequency are shown in Figure 8. These items are determined by the Holding Company based on the instruction of the Ministry of Health.

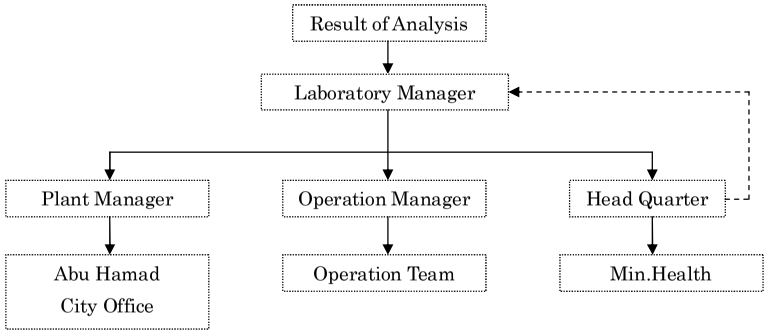
م	فترات جمع العينات Samples Collection	مياه عكرة Raw Water	مياه مروقة Clarified Water	مياه مرشحة Filtered Water	مياه معالجة Treated Water
1	كل ساعتين علي مدار 24 ساعة Every Two Hours for 24 Hours		العكارة الأس الهيدروجيني الكلور الحر المتبقي Turbidity, pH, Residual Chlorine		العكارة الأس الهيدروجيني الكلور الحر المتبقي Turbidity, pH, Residual Chlorine
2	يومياً Daily	- pH - درجة الحرارة القلوية - العكارة – الكلوريدات– التحليل الفحص المجهري البكتيري Temperature, pH, Turbidity, Alkalinity, Chlorides, Bacteriological Analysis	الفحص المجهري التحليل البكتيري Microscopic examination, Bacteriological Analysis	الفحص المجهري التحليل البكتيري العكارة Microscopic examination, Bacteriological Analysis, Turbidity	- pH - درجة الحرارة القلوية - العكارة – الكلوريدات– التحليل الفحص المجهري البكتيري Temperature, pH, Turbidity, Alkalinity, Chlorides, Bacteriological Analysis, Microscopic examination
		تحديد الجرعات (كلور - شبة)			
3	أسبوعياً (وعند ملاحظة تغير في حالة المياه) Weekly and at observing any change of water quality	الشفافية- اللون-التوصيل- العسر-الحديد- المنجنيز-مجموع الأملاح الذائبة-التوازن الكلسي - الكبريتات -السيليكات– الفلوريدات- الأكسجين المستهلك Color, Transparency, Conductivity, Hardness, Iron, Manganese, TDS, Calcitic equilibrium,			الشفافية- اللون-التوصيل- العسر-الحديد- المنجنيز-مجموع الأملاح الذائبة-التوازن الكلسي - الكبريتات -السيليكات– الفلوريدات- الأكسجين المستهلك Color, Transparency, Conductivity, Hardness, Iron, Manganese, TDS, Calcitic equilibrium,

Silica, Sulphates, Chloride, Dissolved Oxygen			Silica, Sulphates, Chloride, Dissolved Oxygen		
تحليل كامل يشمل جميع العناصر الواردة في المواصفات القياسية كيميائي (طبيعي-إشعاعي) -بكتريولوجي- Complete Analysis in accordance to the Standards			تحليل كامل يشمل جميع العناصر الواردة في المواصفات القياسية كيميائي (طبيعي-إشعاعي) -بكتريولوجي- Complete Analysis in accordance to the Standards	شهرياً (وعند الضرورة) Monthly and when necessary	4

(6) Obligation of reporting

Who write the report of the analysis? Who read it? Who make a decision making for alternation of operation? Who advise on operation? Who supervise the activity of the laboratory? Who assess the result of the analysis? Answer such questions with a simple diagram.

e.g. The result of the analysis is summarised in the format set by the Holding Company. The result is reviewed by the Plant Manager and Operation Manager and is utilized for improvement of operation. The result is also reviewed by the Head Quarter and if necessary, the Head Quarter request to cross-check the analysis.



(7) Others

If necessary, write something.

5. Current Water Quality Condition

This section should be written with several graphs of the past results. Therefore, it is expected to be filled in the late summer.

(1) Past year's Raw Water Quality
(a) Water Quality
(b) Accident

(2) Past year's Processing Water Quality
(a) Water Quality
(b) Accident
(3) Past year's Treated Water Quality
(a) Water Quality
(b) Accident
(4) Potential Source of Pollution

6. Quality Assurance and Accuracy Control
(1) Objectives of Quality Assurance and Accuracy Control

Describe why you have to do quality assurance and accuracy control *e.g. There are a wide variety of water analysis items. Their detected concentration is very much low. For minimizing the errors during analysis and securing the reliance of the analytical results, the laboratory of Abbasa Water Treatment Plant has conducted the following measures.*

(2) Standard Procedure

Describe the reason why you need to have the standard procedure in the laboratory. *e.g. There are 4 chemists in the laboratory. To minimize the difference in result depending on the analysts, the laboratory prepares its own standard procedure book for each analytical procedure.*

(3) Quality Assurance and Accuracy Control Plan
(a) Self-Auditing

Describe the objectives and content of the self-auditing system. *e.g. To maintain the laboratory environment and withdraw the best performance in analysis, SHAPWASCO introduced self-auditing system in 2007. Self-auditing is conducted by the laboratory itself based on the checklist prepared by the Head Quarter. The checklist is divided into (i)daily, (ii) weekly, (iii) monthly and (iv) annual, and each checklist focuses on the following points;* *Daily Checklist* — *Hygiene condition of the laboratory* *Weekly Checklist* — *Safety and work environment of the laboratory* *Monthly Checklist* — *Safety condition of the laboratory* *Annual Checklist* — *Maintenance and periodical calibration*

(b) Auditing

Describe the objectives and content of the auditing system. *e.g. Auditing is an activity to evaluate the laboratory by performing to ascertain the validity and reliability of information, and also provide an assessment of a system's internal control. SHAPWASCO introduced auditing system in 2007 and conducted one in a year. The auditor is selected from laboratories of SHAPWASCO, and assesses and evaluates the conditions of laboratory. In accordance with the report by the auditor, the laboratory correct and improve its quality control system.*

(c) Detection Limit

Describe how small you can analyse, which is a part of quality assurance. *e.g. The detection limits for all instruments are principally set at 1/10 of the drinking water quality standard or less. To achieve such small quantity, all instruments in the laboratory are periodically calibrated by the laboratory itself and the suppliers. Furthermore, the laboratory pays the maximum attention on prevention of any contamination in the laboratory.*

(d) Training Programmes

Describe what kind of training programme you have for education of the employees.

e.g. The

7. Emergency Case

(1) Definition of Emergency Case

Define what is the emergency case

e.g. The emergency case is defined as the following events occur.

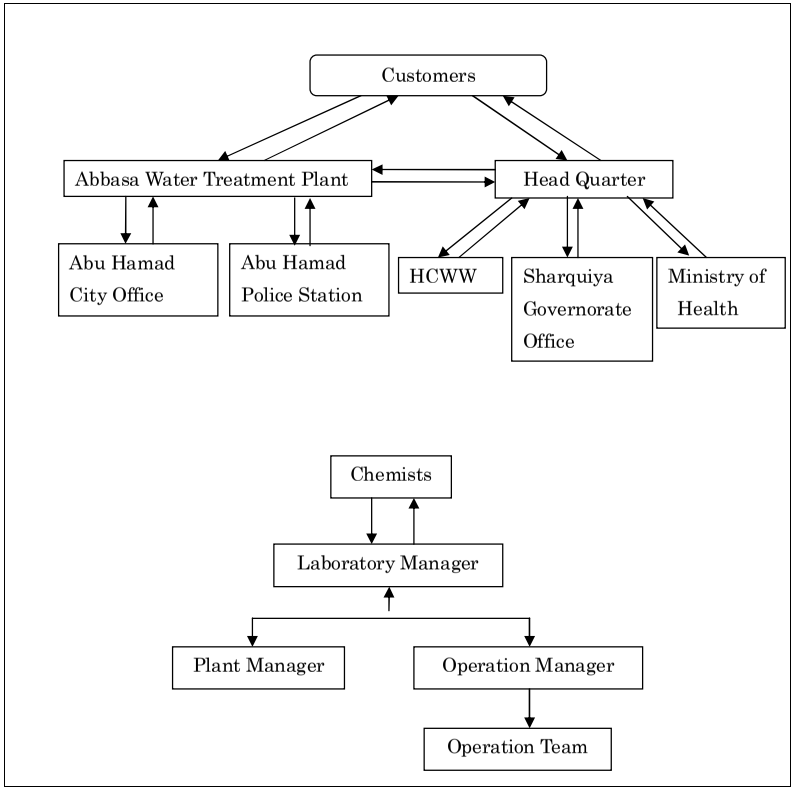
- *A number of dead fish body found on the surface of the water*
- *A significant change in colour observed*
- *A significant change in turbidity of the raw water observed*
- *A significant change in raw water quality is observed*
- *A significant change in odour is observed*
- *Any occasion costumer's claim is received*

(2) Emergency Case Organization Chart

Describe the organization chart for sharing information (including report & order).

e.g. In the case of emergency, the Abbasa Water Treatment Plant and the Head Quarter of SHAPWASCO will share all necessary information with relating institutions including Abu Hamad City Office, local police station, the Holding Company, Sharuqiya Governorate Office and the Ministry of Health. The organization chart for emergency case is shown in Figure-9 and -10.

SHAPWASCO
(Sharquiya Potable Water and Sanitary Company)



(3) Countermeasures

Although the countermeasures differ depending upon the case, describe whatever you can think at this moment.

e.g. In the case of emergency, the following countermeasures can be considered.

- *Close the intake till pollution dispelled*
- *Continuous field survey till pollution dispelled*
- *Add activate carbon in the purification process*
- *Publicity for water contamination*

Laboratory Standard Operation Procedure

October 2007

Sharquiya Potable Water and Sanitary Drainage Company

(SHAPWASCO)

Japan International Cooperation Agency (JICA)

3.11-21

[TABLE OF CONTENT]

[Record of Revision]

The first edition was prepared by JICA Expert in October 2007.

Record of Modification

Date	By	Chapter
Dec 2007	Mr. Osama	All (Translation)

3.11-22

1. OBJECTIVES OF THE DOCUMENT

1-1 DOCUMENT: This document set the standard procedure for sampling and analysis of the water taken from water treatment plants and networks.

1-2 MODIFICATION: The document shall be modified and improved at any occurrence when inadequate or better procedure is found. The record of modification shall be clearly written on the surface page.

2. DEFINITION

2-1 ANALYTICAL METHOD: The analytical method shall be in compliance with the standard methodology prepared by the American Water Work Association. .

2-2 SAMPLING: "Sampling" means the activity taking water from set points for analysis.

2-3 ANALYSIS: "Analysis" means the activity for quantifying chemical components in the sample.

2-4 ORDER: "Order" means a direction made by the Head Quarter of SHAPWASCO for Laboratory Manager or by Laboratory Manager for chemists in the laboratory. The water treatment plants, Laboratory Manager and/or Chemists have obligation to conduct the order.

2-5 REQUEST "Request" means a comment made by the treatment plants and laboratories upon the order. The Head Quarter is obligated to discuss with the personnel raised the request immediately and seek the solution.

2-6 WRITTEN DOCUMENT "Written Document" means authorised letter or equivalent paper material with signature of authorised personnel.

3. APPLICATION AND STRUCTURE

3-1 APPLICATION: The document applies to all water treatment plants and their laboratories of SHAPWASCO.

3-2 COVER: The document covers the area of sampling, analysis and associated activities.

4. OVERALL WORK STRUCTURE

4-1 WORK COMPONENT: The overall work flowchart is shown in Fig-1. Sampling and Analysis are based on laboratory's quality control system.

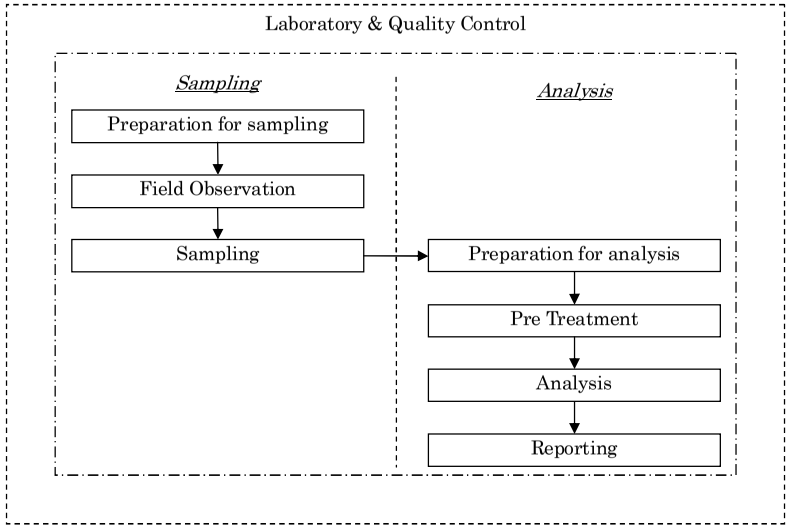


Figure 1 Work Components

4-2 STANDARD METHOD: The standard method for XXXX is the standard procedure of sampling in SHAPWASCO.

4-3 AWWA's METHOD: The Holding Company sets the standard analytical procedure shall follow the methodology described in the standard procedure prepared by AWWA.

5. PREPARATION:

5-1 RESPONSIBILITY: It is the sampler's responsibility that the laboratory shall prepare all necessary equipments for his/er field work.

5-2 EQUIPMENTS: The following sampling equipments should be prepared

- Sampling Polyethylene Bottle (1 L) for Chemical Analysis
- Sampling Glass Bottle (250 ml) for Bacterial Analysis.
- Sampling glass bottle (250ml) for Fe & Mn
  - Note: The Bottle must be disinfected.
- Cooler Box
- Glass Bar
- Cotton for disinfection
- Alcohol for disinfection
- Lighter/Match
- Colored label / Seal
- Pen / Pencil
- Field Report (See Format-1)

6. FIELD OBSERVATION

6-1 GENERAL: Field Observation is an extremely important activity to understand the conditions of raw and treated water.

6-2 RESPONSIBILITY: The sampler shall have all responsibility for identification of any conditions and reporting.

6-3 CONTENTS: The sampler shall check the following points on the field Canal water condition including Water Colour, Odour and Oil Seal in the canal.

Raw water intake condition including Garbage in the field.
Process water Condition including Garbage Condition, Water Colour and Odour at each process.

6-4 REPORTING: The observed results should be written in the Field Report (Format-1) and hand to the laboratory chemists.

6-5 UTILIZATION: The field observation is the initial examination of the water quality. It is an extremely important activity since the results of the field observation will be the initial and base reporting for understanding the condition of the field.

6-6 PHOTO RECORD: It is important to take photographs as a record whenever the sampler discovers any symptom of pollution.

7. SAMPLING

7-1 GENERAL: Sampling is the key procedure of the water quality analysis.

7-2 RESPONSIBILITY: The sampler shall have all responsibility during his/er field work. However, the laboratory shall bear responsibility for supervising his/er work.

7-3 FREQUENCY: Frequency for sampling are determined in accordance with the instruction by the Holding Company. However, frequency of sampling may be intensified dependent upon the field conditions or the basic policy of the laboratory.

7-4 HOURLY SAMPLING: Water samples for pH, Turbidity and Residual Chlorine are taken every two hours from raw water, clarified water, filtered water and treated water.

7-5 DAILY SAMPLING: Water samples for daily analysis are taken from raw water, clarified water, filtered water and treated water. The samples are taken through the sampling taps equipped at the

laboratory.

7-6 TAP WATER: The sampling procedures from the tap should follow;

- Obtain one (1) sample for chemical analysis and one (1) sample for bacterial analysis from each sampling point.
- Before collecting sample remove any aerators or other devices from the faucet or hose bib.
- Disinfect the faucet or tap at the opening with flame. If flame is not obtained, use bleach.
- Open the tap for Five (5) minutes.
- Adjust water flow to the diameter of a pencil
- **(For Chemical Analysis Only)** Rinse the sample bottle and cap with the running water three (3) times.
- **(For Chemical Analysis Only)** Fill the water in the sampling bottle up to the top and do not allow any air layer remaining.
- **(For Bacterial Analysis Only)** Do NOT rinse the sampling bottle and cap.
- **(For Bacterial Analysis Only)** Fill the water in the sampling bottle.
- During and after filling water, do NOT breathe toward the sample and never touch the inside of the cap or bottle.

7-7 SURFACE WATER: The sampling procedure for chemical and bacterial analysis from the river/canal water should follow;

- Obtain one (1) sample for chemical analysis and one (1) sample for bacterial analysis from each sampling point.
- Find a suitable sampling collection point. The sampling should be conducted at the centre of the stream. Do NOT take water from a hollow. Ideally, if there is a bridge, conduct sampling from the centre of the bridge with a bucket. If there is no bridge, use a dipper to take water from the centre of the stream.
- The sampling depth should be 10~20cm under the surface. Do NOT take water from the surface.
- Do NOT disturb sediments if any present. If any sediments are disturbed during the sampling, postpone sampling till the turbidity of sediments settle.
- Do NOT take allow any rubbish in your sampling.
- **(For Chemical Analysis Only)** Rinse the sample bottle and cap with the sampled water three (3) times.

- **(For Chemical Analysis Only)** Fill the water in the sampling bottle up to the top and do not allow any air layer remaining.
- **(For Bacterial Analysis Only)** Do NOT rinse the sampling bottle and cap.
- **(For Bacterial Analysis Only)** Fill the water in the sampling bottle.
- **(For Fe & Mn Analysis Only)** Add three (3) drops of Hydrochloric Acid (HCl) for preservation.
- During and after filling water, do NOT breathe toward the sample and never touch the inside of the cap or bottle.

7-8 PESTICIDES: The sampling procedure for pesticides/herbicides analysis should follow;

- Obtain one (1) sample for chemical analysis.
- Glass made container must be used (Polyethylene Bottle is NOT acceptable)
- Rinse the sample bottle and cap with the sampled water three (3) times.
- Fill the water in the sampling bottle up to the top and do not allow any air layer remaining.
- During and after filling water, do NOT breathe toward the sample and never touch the inside of the cap or bottle.
- Close the cap immediately and place the bottle in the cooler box. Once the sampling is completed, close the cover of the box and avoid direct sun shining on the sampling bottles.
- Deliver the samples to the laboratory at least within six (6) hours.

7-9 LABELING: Each sample must have a label to avoid miss-conduction of experiment in different samples. The label should include, but not limited;

- Date, Time and Location
- Sample ID

7-10 DELIVERRY: Samples shall be immediately brought into the laboratory.

- Close the cap immediately after sampling and place the bottle in the cooler box. Once the sampling is completed, close the cover of the box and avoid direct sun shining on the sampling bottles.
- Deliver the samples to the laboratory at least within six (6) hours.
- If the delivery is expected more than six (6) hours, refrigerate the sample

after measuring pH, temperature, *etc.*

8. PREPARATION FOR ANALYSIS

8-1 GENERAL: Preparation for analysis means necessary works to be completed before the actual analysis.

8-2 RESPONSIBILITY: All responsibility associated with works for preparation of analysis belongs to laboratory chemists. Therefore, the ultimate responsibility attributes to the Laboratory Manager.

8-3 PREPARATION: Preparation clean laboratory analytical equipments such as beakers, etc. If you suspect not clean or find remarks of previous use, wash the equipments with distilled water three (3) times.

8-4 WARM UP: Such analytical instruments including HPLC, AAS, etc., requires warm up time before use. The warm up duration should be clearly written in the maker's operation manual.

8-5 CLEANING: Such analytical instruments including HPLC, AAS, etc., requires cleaning before use. Deionised water or Distilled water shall be run three (3) times as normal analysis for cleaning inside instruments.

8-6 CALLIBRATION: Calibration is an activity to adjust the analytical instruments with a known concentration standard. Manufactures normally set the calibration timing for each instruments in their operation manuals. The set calibration timing is as in the followings;

Table 1 List of Instruments Requiring Calibration

Instruments		Calibration Timing
pH meter	:	Daily
Turbidity Meter	:	Daily
Chloride Meter	:	Daily
Fridge	:	First Saturday of Month
Incubator	:	First Saturday in January

8-7 CALIBRATION CURVE: A calibration curve is a general method for determining the concentration of a substance in an unknown sample by comparing the unknown to a set of standard samples of known concentration. Therefore, known standard concentration standards for target elements should be prepared and preserved at the laboratory. The following instrument(s) require(s) making a calibration curve at a set duration in accordance with the manufacture's instruction.

Table 2 List of Instruments Requiring Calibration Curve

Instruments		Calibration Timing
Spectrophotometry	:	Every time before analysis

9. PRETREATMENT

9-1 GENERAL: The samples taken may not be suitable for analysis. Additionally, it may be necessary to reserve the physical, chemical and biological characteristics of sampled water before analysis by pre-treatment.

9-2 RESPONSIBILITY: All responsibility associated with works for pretreatment belongs to laboratory chemists. Therefore, the ultimate responsibility attributes to the Laboratory Manager.

9-3 FILTERING: Water samples taken at river or canal should be filtered using 0.45um inline filter. In prior to filtering, all filters, including filtering paper and collection bottles shall be rinsed with the water, which is going to be filtered, three (3) times.

9-4 PRESERVATION: Physical preservation techniques are used for all samples and include cooling and keeping the samples out of the sunlight. Some of the water samples are also preserved with acid to prevent degradation of constituents before they are analyzed. All samples will be preserved immediately at the collection site.

9-4-1 Metals

Preserve metals in water for a 6 month hold time with nitric acid. Mercury has a hold time of only 28 days. 2 ml or 4 drops of 70% nitric acid is used for each 500 ml of sample water. The sample is also chilled to four (4) Degree Celsius at laboratory..

9-4-2 Nutrients

The 1,000 ml nutrient suite bottle requires 2 ml or 4 drops of H_2SO_4 and has a hold time of 28 days. The sample is also chilled to four (4) Degree Celsius in the field. Do NOT use nitric acid, otherwise, the sample is contaminated with nitrogen after sampling.

10. ANALYSIS

10-1 GENERAL: An analysis is a procedure to examine the material samples for gaining an understanding of their chemical composition and their quantification.

10-2 RESPONSIBILITY: All responsibility associated with works for analysis belongs to laboratory chemists. Therefore, the ultimate responsibility attributes to the Laboratory Manager.

10-3 STANDARD METHOD: The standard procedure for analysis is the American Water Work Association's (AWWA) method. Each laboratory

should equip original/copy of the most up-dated version of the standard procedures.

The applicable standard methods and their reference numbers are listed below, respectively.

3.11-27

Table 3 Standard Method Reference Number for Each Analysis

	Parameter	Reference Number
1	Temperature	
2	Colour, Taste & Odour	
3	Conductivity	SM 2510 B
4	pH	XM 4500 H, B
5	Turbidity	SM 2130 B
6	Total Dissolved Solids (TDS)	
7	Suspended Solids	
8	Total alkalinity	SM 2320 B
9	Carbonate alkalinity	
10	Calcitic Equilibrium	
11	Total hardness	SM 2340 C
12	Permanents hardness	
13	Temporary hardness	
14	Calcium hardness	SM 3500 Ca – B
15	Calcium (Ca^{++})	
16	Magnesium hardness	SM 3500 Mg – B
17	Magnesium (Mg^{++})	
18	Chlorides	SM 4500 Cl – B
19	Sulphates	SM 4500 SO_4 - F
20	Fluoride	
21	Silica	
22	Iron	SM 3500 Fe – B
23	Manganese	SM 3500 Mn – B
24	Phosphate	
25	Oxygen dissolved	
26	Oxygen consumed	
27	Ammonia	
28	Nitrite	SM 4500 NO_2
29	Nitrates	SM 4500 NO_3
30	Bicarbonate (CO_3)	
31	Chlorine residual	
32	HPC	
33	Total Coliform	SM 9221 B
34	Algae count	SM 10200
35	Microscopic examination	
36	Jar test	
37	Chlorine dose	

NOTE: Upon alternation of the standard method, the above table should be modified.
Non indicated parameters shall be subject to be filled when the standard methodology is set.

10-4 OTHER METHOD: If the standard procedure is not applicable, the USEPA's or other well known methods may be alternatively applied. However, when any methodology other than SHAPWASCO's standard procedures is applied, such application shall be clearly written in the result.

10-5 CHANGE OF STANDARD METHOD: Upon agreement among the chemists belonging to SHAPWASCO or direction from the Holding Company, the standard method employed in SHAPWASCO may be substituted to another.

If such change arises, the Head Quarter shall order to each laboratory with a WRITTEN DOCUMENT. In such occasion, this SOP shall be revised.

10-6 JAR TEST: The test used to determine the dosage rate for each chemical is the jar test. A jar test is an attempt to duplicate the water treatment processes in glass beakers with varying doses of chemicals so the floc formation and settling can be observed in a laboratory setting.

From the tests performed, the operator can select what appears to be the most effective combination of chemicals and then can set the chemical feed dosages accordingly. The jar test cannot duplicate exactly the actual plant conditions so the results of those chemical settings must be observed at the effluent of the sedimentation basin and adjustment made accordingly.

Prior to starting a jar test, a sample of the water (IMPORTANT: must be RAW WATER ONLY. Any water containing chloride is NOT acceptable. The existence of chloride indicates on-going of chemical reaction, and, therefore, the characteristics of water at the beginning and at the end of the experiment totally differ.) to be tested should be analyzed for turbidity, temperature, pH, alkalinity, hardness, and colour. The results should be recorded on a jar test results form. The amounts of chemicals to be added to each of the six beakers should be calculated and prepared for immediate addition to the beakers at the proper time.

The specified rate of rotation and rotating time differ upon the plant. The proper time and rotation speed for the jar test can be calculated from the actual retention time and rotation speed of the flocculation basin.

10-6-1 TEST METHOD

Jar test shall be conducted in the following manner.

(a) Collect at least eight (8) liters sample of RAW WATER, which should not contain any chloride owing to any pre-treatment, to be tested.

(b) Immediately measure six 1,000 ml quantities and place into six 1,000 ml beakers.

(c) Place all six (6) beakers on the stirring apparatus.

(d) With a measuring pipet, add increasing dosages of the coagulant solution to the beakers as rapidly as possible. For example, add enough solution to be equivalent to a 10 mg/l dose in beaker #1 and add enough solution to be equivalent to a 12 mg/l in beaker #2.

(e) Add standard solutions and feed rates for any other chemicals normally used. If a coagulant aid is used, the alum feed rate may be uniform for all six jars and the coagulant aid could be the variable.

(f) Quickly lower the stirring paddles into the beakers and activate the paddles immediately for one (1) minute at 80 rpm. The specified rate and time are typical of the action and detention time found in many treatment plants, but calculations have to be made to meet actual conditions present in your treatment process.

(g) Reduce the mixer speed to 20 rpm for 20 minutes to simulate the flocculation basin conditions. Again, time and rate adjustments should be made according to the treatment plant conditions.

(h) Record the time required for visible floc to form and describe the floc characteristics (pin-head sized floc, flake sized floc) during mixing.

(i) Stop the stirrers. Allow the floc to settle for 30 minutes or for a period similar to your plant conditions. Observe and note how quickly the floc settled, the floc appearance, and the turbidity of settled water above the floc. You can remove a sample of the clear water with a pipet for testing.

(j) Using the sample of clear water from each beaker, measure the turbidity, pH, and alkalinity of the water.

10-6-2 IMPOTANT NOTICE

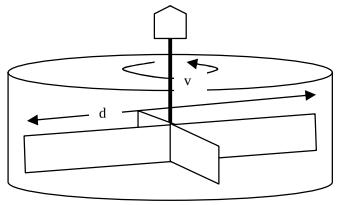
The following three (3) points should be carefully considered.

It should be emphasized that coagulation efficiency is highly relate to the water condition (particularly with pH and alkalinity). Hence, the frequency of jar test is not limited in once in a day, but the test should be conducted upon the change of raw water condition.

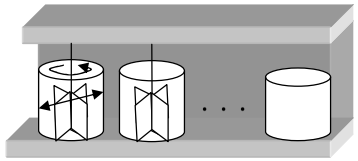
The rotation speed and time duration of jar test are dependent upon the plant conditions. Each plant may have a specific rotation speed in flocculater and, therefore, there is no standard rotation speed or retention time in jar test. It is necessary to calculate the rotation speed and retention time by the laboratory in prior to the experiment.

It should be also addressed that the jar test cannot duplicate exactly the actual plant conditions so the results of those chemical settings must be observed at the effluent of the sedimentation basin and adjustment made accordingly.

Example of calculation for determining specified rotation speed and time:
The numbers in the blanket ( ) are taken from Hihya Water Treatment Plant



Flocculater
Diameter: d (=300cm)
Rotation Speed v (=1rpm)
Volume V (=62.7 m^3) × 4 units



2. Jar Tester
Diameter: d_b (=6cm)
Rotation Speed X rpm

3. Raw Water Inflow Information:
Vin (35,000m^3/day)

The rotation speed of jar test must be identical to the rotation speed of the flocculator.

Actual Rotation Speed of the Flush Mixer : Y (cm/sec)

Y = d (300 cm) × v (1 rpm)× π (=3.14) ÷ 60 (sec/min)
= 15.7 cm/sec

NOW, to adjust the jar test rotation speed with the actual rotation speed;

Rotation Speed of the Jar test: X (rpm)

X =Y (15.7 cm/sec) ÷ d_b (6 cm) ÷ π (=3.14) × 60 (sec/min)
=50 rpm

The actual mixing duration time is calculated from the volume of inflow raw water and the size of flocculation basin.

Inflow raw water: Vin (= 35,000 m^3/day
= 1,458.3 m^3/hour = 24.3 m^3/min = 0.41 m^3/s)

Volume of flocculation basin: V (= 62.7 m^3 × 4 units)

Mixing duration time in flocculation basin: T

T = V (62.7 m^3× 4 units) ÷Vin (=24.3 m^3/min)
= 10 min

11. POST ANALYSIS

11-1 CHEMICALS: All chemicals utilised during the experiment shall be returned to the original shelf after closing the cap. If necessary upon the laboratory's own rule, the amount of chemicals used in the experiment shall be recorded.

It should be emphasized that any chemicals once transferred to glassware such as beaker from the original chemical solution bin should NOT pour back to the bin. It may causes contamination of the original solution. Therefore, any chemicals transferred to glassware should be disposed properly.

11-2 ANALYTICAL INSTRUMENTS: It is the analyst's responsibility to check, clean up and turn off the analytical instruments used for the experiment. All analytical instruments used at different location shall be returned to the original location.

11-3 GLASSWARE: Glassware shall be washed after analysis immediately. The washing of glassware is as following.

- Check the remaining chemicals in glassware. For unknown chemical remaining, if pH is significantly high or low (*i.e.* below pH 5 or above pH 9), the remaining water must be identified as highly hazardous. Therefore, these remaining chemical must be separately collected.
- Non-hazardous chemicals may be disposed through sink and public sewerage system. During discharge of remaining chemicals, do NOT stop water running for the purpose of dilution.
- Wash the glassware carefully with washing powder/liquid and brush.
- Rinse with tap water carefully.
- Rinse outside of glassware with distilled water once and inside three (3) times.
- Dry the Glassware and bring back to the original shelf.

12. DATA ANALYSIS

12-1 GENERAL: Data analysis is an activity to review and understand the result of the analysis.

12-2 REQUIREMENT: The person who conducts data analysis shall be well acknowledged with spread sheet such as Microsoft Excel.

12-3 STANDARD: The water quality standard, the criteria and specifications for the potable and domestic use water which admitted by high committee in 26/2/1995, is set by the Protective Affairs under Secretary of the Ministry of Health in Law 108:1995.

The Standard is seen in ATTATCHMENT-2.

12-4 TURBIDITY: By agreement among the chemists, SHAPWASCO hereby set a further strict internal standard for turbidity. The standard set in SHAPWASCO is shown below.

Table 4 Turbidity Standard

NTU	Note
0.5	Desirable limit for operation in the Internal Agreement
1.0	Maximum limit in the Internal Agreement
5.0	Maximum limit for surface water by the law
10.0	Maximum limit for groundwater by the law

12-5 DAILY DATA ANALYSIS: As a daily data analysis, the analyst compares the result of the analysis with the standard listed above everyday after the experiment.. The analyst may check if the result of the analysis is below or satisfy the standard. If the result of the analysis exceed the standard, it may be necessary to re-check (i) sample collection method, (ii) pre-treatment procedure, (iii) analytical procedure or (iv) other factors. Re-examination of the analysis may be necessary. If no error found, it is necessary to step forward to the emergency procedure described in the later section.

12-6 MONTHLY DATA ANALYSIS: A series of data collected from daily analysis should be arranged in a graphs or other proper manner at the last day of every month. The Head Quarter requires to make graphs of at least, but not limited to, pH, Turbidity and Alkalinity graphs for raw water, clarified water and treated water. The sample of the graph is available below.

The objective of making graphs is to show the general trend of raw water, clarified water and treated water. If any abnormal condition, exceeding the set standard found, other factors including chemical biological parameters of the found date should be carefully examined.

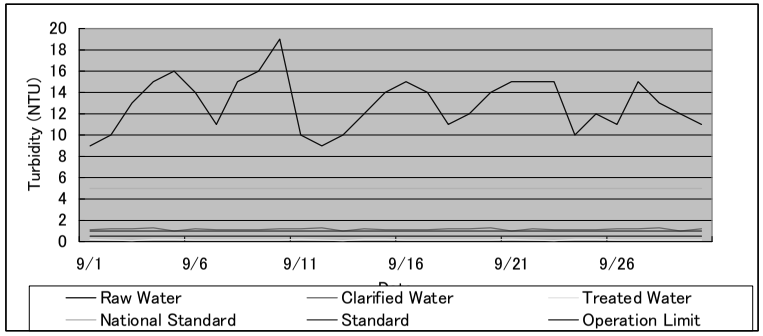


Figure 2 Example of Graph of Turbidity

12-7 ANNUAL: A series of monthly data graphs in a calendar year should be compiled in a report, which should be submitted to the Head Quarter.

13. REPORTING

13-1 GENERAL: The result of analysis should be clearly written and kept as a record and utilized for effective operation of the water treatment plant.

13-2 RESPONSIBILITY: The responsibility for preparation of the report

belongs to the analyst who conducted chemical examination. Additionally, it is important that the result of analysis is authorised with an approval of the laboratory manager's approval. Therefore, the Laboratory Manager shall ultimately bear all responsibility for reporting and the result of the analysis.

13-3 RECORD: The result of analysis shall be written in the standard format set by the Holding Company and the Head Quarter. Additionally, the result of the analysis shall be put on record as Excel format.

13-4 SUBMISSION: The analyst shall submit the record of analysis to his/er manager for approval of the result. The Laboratory Manager is obligatory to submit the record to the Station Manager for utilization of plant operation. These procedures shall be commenced immediately after completion of analysis.

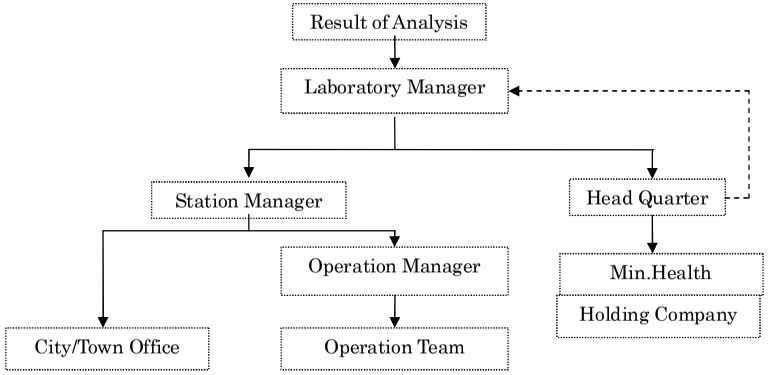


Figure 3 Report Submission Organization Chart

13-5 RECORD PRESERVATION: The record of analysis shall be preserved at least three (3) years at minimum in accordance to the direction by the Holding Company.

14. QUALITY CONTROL

14-1 QUALITY CONTROL: Quality Control in analysis is an activity to check and assess the accuracy of analysis.

14-2 RESPONSIBILITY: The Laboratory Manager shall appoint a person who bears all responsibility for quality control of the laboratory. Otherwise unless the manager appoints, the manager himself/herself shall bear the responsibility for the quality control of the laboratory.

14-3 DEFINITION: Quality Control is a procedure or set of procedures intended to ensure that a manufactured product (*i.e.* treated water at tap of each customer's house) or performed service (*i.e.* water quality analysis) adheres to a defined set of quality criteria, or meets the requirements of the customer.

In a narrow definition through sampling and analysis, quality control is a procedure or set of procedure to ensure the result of analysis is accurate and is sufficient enough to determine the operation of the water treatment plant (*e.g.* amount of alum dose, *etc.*)

14-4 TASKS: The person in charge of quality control of laboratory should periodically check the accuracy of analysis conducted in the laboratory and laboratory general environment.

14-4-1 BLANK SAMPLE

Distilled water produced in the laboratory is used as a blank sample. The pre-treatment procedures should be identical as other environmental samples (*i.e.* if acid is applied for metal's preservation, acid must be added for blank sample, too). Analyses of blank is required to demonstrate freedom from contamination

Blank sample test should be conducted at the beginning of analysis. The application of analysis is limited in spectrophotometer (as of in the year 2007).

Since the blank sample is composed of distilled water, the result of analysis should not show any significant value. If there is any contamination found, it may attribute either analytical error or contamination in analytical instrument, and blank sample test must be repeated.

14-4-2 FIELD DUPLICATION

Two or more samples should be taken from one sampling location. These samples must be treated identically and run in analysis to find error in sampling.

This activity should be conducted at least once in a month.

14-4-3 INTERNAL DUPLICATION

An analysis of one (1) sample should be repeated twice or more in the same procedure. The result of the analysis gives an internal error either in analytical way or in analytical instrument.

This activity should be conducted at least once in a month.

15. EMERGENCY CASE:

15-1 DEFINITION: The definitions of emergency case are summarized as below:

A. During Field Work

- Radical changes in Colour and Turbidity are observed.
- Radical changes in Odour and Taste are identified.
- Numerous number of dead fish bodies are found.
- When the above phenomenon is likely longs for a while or any alleviation of the phenomenon is unlikely expected.

B. In Water Treatment Plant

- No disinfection is available due to malfunction of chlorinator or lack of the

chlorination.

- Radical changes in Colour and Turbidity are observed.
- Radical changes in Odour and Taste are identified
- When the above phenomenon is likely longs for a while or any alleviation of the phenomenon is unlikely expected.

C. During and Post Analysis

- Any suspicious, including dissolve of hazardous materials or pathogens in the water, is raised.

15-2 RESPONSIBILITY: Each personnel in the laboratory shall bear the following responsibility.

Head of Laboratory

- Reporting the condition to the Station Manager, the Head Quarter and relevant organization
- Direct the laboratory for ceasing the case.

Chemist/Technicians
Collect information on the cause of the emergency case
Conduct necessary analysis
Report to the Laboratory Manager
Follow the order made by the Laboratory Manager

Head Quarter
Direct the Laboratory Manager and Station Manager
Report to the organizations including the Holding Company and the Ministry of Health.

15-3 COMMUNICATION: Any cases of emergency case shall be immediately reported to the Head of Laboratory. The laboratory should report to the necessary contact address including the Head Quarter and the Station Manager.

Emergency contact address and communication flow chart with the name of organization and person, and telephone number, shown in Appendix A, should

be clearly posted near the telephone.

15-4 IDENTIFICATION: Nevertheless ways of countermeasures differs dependent upon case, the priority action taken is to identify the source, pathway and receipt of the contamination.

- Source: to identify the location and type of the contamination
- Pathway: to identify how the contamination transmit to the receipt
- Receipt: to identify who and where is suffered by the contamination

15-5 COUNTERMEASES: The countermeasures to be employed depend on the case of emergency. Therefore, there is no set standard countermeasure to be taken.

However, the principal methodology of countermeasure is (i) to stop or remove the source of contamination, (ii) to cut off the pathway and (iii) to stop the contamination before the receipt.

The following descriptions are examples of countermeasures. Appendix B shows some ideas of countermeasures against specific contamination.

e.g. If the source of the pollution is the effluent of a factory upstream, it is necessary to stop the factory's effluent. Such source of contamination is so-called Point Contamination Source. In this case, the type of the contamination may be heavy metal or specific organic chemicals. Meanwhile, it is important to stop the intake until all pollutant in the raw water disappears. Additionally, the raw water taken in the water treatment plant should be either discharged or treated with activated carbon, etc.

e.g. Another potential contamination likely occurs is discharge or runoff from agricultural land. Such source of contamination is so-called Non-Point Contamination Source. In this occasion, the type of contamination may attribute to nitrogen including nitrate, nitrite and ammonia, or phosphate. Nitrite is the most hazardous threaten among them. However, sufficient application of chlorination as disinfection alters nitrite into nitrate, and decrease the degree of toxicity.

e.g. If the source of the contamination is in the water treatment plant process, the first countermeasure taken is to stop water supply and investigate the source of the contamination.

e.g. If the source of the contamination is in network, the first countermeasure taken is to identify the source of the contamination. Bacterial contamination is the most likely contamination occurring in network due to inflow of sewerage water from the broken pipes. Another potential contamination occurring in network is rust/coloured water due to deterioration of the pipes.

e.g. If any complaints such as mingling of impure substances or coloured water arises from the customers after replacement of pipelines and/or water supply cut off, such complaints may attribute to the effect of the replacement work and/or water cut off. The water treatment plant shall ask the customers to leave the tap opening for 10 minutes till all alien substances generated due to water cut off flows out.

e.g. Typical groundwater contaminations in Sharquiya are saline water, bacteria, Mn and Fe. Additionally, it is necessary to pay particular attention on nitrate and nitrite.

15-6 REPORTING: The importance of reporting in emergency case is not only limited in acknowledging the accident, but also bears to share the information and experience with other chemists. The Report shall clarify, at least but not limited, the following contents,

- General Description of the Emergency Case
- Date, Time and Location
- Source and type of Contamination
- Results of chemical/biological analysis
- Countermeasures taken for ceasing the contamination
- Photographs

The report must be submitted to the Head Quarter within TWO (2) WEEKS after occurrence of accident.

16. WASTE

16-1 GENERAL: SHAPWASCO's basic policy on waste is (i) to minimize generation, (ii) to reuse if possible, and (iii) to deal with properly dispose.

16-2 RESPNSIIBILITY: All responsibility regarding waste control and management belongs to Laboratory Manager.

16-3 GARBAGE BOX: Laboratory must equip separate garbage boxes for general item, glasses and hazardous materials. Clear sign of general, glass or hazardous waste must be posted on or near the boxes. This is not only for identification of the type of the box but also for clear caution for securing all employees' safety.

16-4 GENERAL GARBAGE: Any non-contaminated solid materials including paper, small quantity of soil or sediment, chip of woods, *etc.* are categorised as general garbage. These wastes must be disposed in the general garbage box.

Reflecting upon the social background, once recycling system is established, plastics, bin, battery, *etc.*, shall be subjected on recycling.

16-5 GLASS GARBAGE: Any glass materials including bin, broken laboratory glassware such as pipette and beaker, etc., are categorised as glass garbage. These wastes must be disposed in the glass garbage box.

It is important to rinse bin-made chemical containers before dispose for minimizing the hazardous characteristics of chemicals. On the other hand, broken glassware such as pipette or beakers is not subjected to rinse for protecting chemist's safety.

16-6 HAZARDOUS GARAGE: Hazardous garbage is defined as Hazardous Waste is a "solid waste" which because of its quantity, concentration,

or physical, chemical, or infectious characteristics may:

- Pose a substantial present or potential hazard to human health or the environment when impropoerly treated, stored or disposed of, or otherwise mismanaged; or
- Cause or contribute to an increase in mortality, or an increase in irreversible or incapacitating illness.
- These wastes are separately stored and final disposal should be commenced by an appropriate company which, for instance, deals with medical waste. When a large quantity of hazardous material is stored, the laboratory may consult with the Head Quarter regarding the final treatment of the waste.

16-7 LIQUID WASTE: Any remaining chemicals in beakers or other laboratory glassware after experiment are categorised as waste chemicals. It is important NOT to pour back to the original bin since it causes contamination in the original bin.

Most of liquid waste may be discharged to sewerage system through sink. While discharging chemical waste, tap water should be run through its dispose for dilution of the liquid.

However, those chemicals pH is lower than five (5) or higher than nine (9), containing Mercury and Cyanide, or containing chemicals more than the environmental standard set by the Ministry of Health can not be discharged into the sink. These solutions should be collected into separate containers. Their final disposal must be consulted with the Head Quarter.

Neutralization, separation, fixation, oxidization, and precipitation are useful methodology for minimizing the influence of hazard. However, particular attention for the following notes should be paid.

- Neutralization, separation, fixation, oxidization, and precipitation are chemical reactions. Therefore, heat and gas may be generated.
- Do NOT try any reaction if you are unforeseen the chemical reaction.
- Do NOT use strong acid such as chromic acid. 8N or less concentrated HCl or H_2SO_4 are the suitable acid.

17. OTHERS

17-1 TRAINING: SHAPWASCO's basic policy in water quality control is "Continuous effort on improving analytical techniques". Each laboratory manager is obligatory that all chemists and technicians shall have appropriate training.

The record of training attendant and the contents should be kept. The record should be kept in the laboratory for its quality control purpose. The sample of record is available in Appendix-C.

17-2 PERIODICAL MEETING: The chemists belonging to SHAPWASCO have a periodical meeting. The frequency of the meeting is once in three months.

Meeting call and organization of the meeting is conducted by the Head Quarter.

The contents of the meeting may be as followings;

- General condition of raw, process and treated water in the last three months.
  - Explain the characteristics of water with graphs
  - If unusual phenomenon occurs, explain the condition
- Specific topics for process control
- Other items such as waste control

17-3 REVISION: The Head Quarter have responsibility to review and improve this document periodically. The frequency is, at least but not limited to, once in a year.

However, depending upon change of conditions, this document may be altered any occasion.

17-4 OTHERS: Any contents not listed in this document should be subjected to the Head Quarter.

Name list of laboratories in SHAPWASCO

No	Lab Name
1	Zagazig laboratory filtration station
2	Abbasa laboratory station
3	Alqanayat laboratory
4	Ibrahimia laboratory
5	Menia Elqamh laboratory
6	Abu Kabier laboratory

Name list of laboratories in NOPWASD

(NOPWASD supervised station operation in it)

No	Lab Name
1	Faqus laboratory filtration station
2	Kafr Saqr laboratory station
3	Alhusainia laboratory station

1st: SHAPWASCO LABORATORIES

1- Zagazig laboratory filtration station:

No	Instrument	Number	The condition
1	Incubator	2	Very good
2	Water bath	1	Good
3	Hotplate	3	Very good
4	Electricity Balance	1	Very good
5	Electricity Sensitive balance	1	Very good
6	Color meter to measure(residual chloride, Fe, Mn, Ammonia ,Nitrates and chlorides)	1	Acceptable
7	Turbidity meter		
8	pH meter comparator	1	Good
9	TDS & Conductivity Meter	1	Acceptable
10	Hot plate & Magnetic stirrer	1	Very good
11	Drying oven	1	Good
12	Muffle furnace	1	Very good
13	UV oven	1	Very good
14	Distiller Water Apparatus	2	Good
15	Membrane filter	1	Not operated yet
16	Alum Jar tester	1	Very good
17	Colony counter	1	Very good
18	Autoclave	1	Very good
19	Glassy water distiller	1	Out of work
20	Cooling unit	2	Good
21	Spectrophotometer	1	Acceptable & need additions
22	Microscope	1	Out of work

Instruments required for completing the laboratory:

1) Residual chlorine meter
2) Spectrophotometer
3) pH digital meter
4) Microscope
5) Membranes for filtration membrane

2- Abbasa laboratory station:

No	Instrument	Number	The condition
1	Color meter to measure(residual chloride, Fe, Mn, Ammonia ,Nitrates and chlorides)	1	Acceptable
2	Fridge	1	Under maintenance
3	pH meter using color meter	1	Acceptable
4	Turbidity meter	1	Acceptable
5	TDS & Conductivity Meter	1	Working
6	Centrifuge	1	Working
7	Microscope	1	Good
8	Sand sieves	1	Good
9	Magnetic stirrer	1	Good
10	Drying oven	1	weak
11	Hot Plate	1	Out of work
12	Alum Jar tester	2	Out of work
13	Incubator	2	Good
14	Electricity Sensitive Balance		Good
15	Electricity Balance	1	Good
16	Drying oven	1	Out of work
17	Muffle furnace	1	Good
18	Disinfection meter	2	acceptable
19	Water bath	1	working
20	Disinfection meter	1	working
21	Stirrer	1	working
22	Electricity Sensitive balance	1	Out of work
23	Spectrophotometer “very old”	1	Out of work

Instruments required for completing the laboratory:

1) TDS & Conductivity Meter
2) Turbidity meter
3) pH digital meter
4) Spectrophotometer
5) Drying oven
6) Fridge
7) Three dimensional shaker for Sand sieves
8) Membrane filter
9) Colony counter
10) COD digester & reader

3- Alqanayat laboratory (Fe, Mn removal Plant):

No	Instrument	Number	The condition
1	Centrifuge	1	Good
2	Hot plate	1	Acceptable
3	Drying oven	1	Good
4	Disinfection meter	1	Good
5	TDS & Conductivity Meter	1	Acceptable
6	Electricity Sensitive balance	1	Good
7	Spectrophotometer	1	Good
8	Incubator	1	Good
9	Distiller Water Apparatus	1	Out of work
10	Fridge	1	Good
11	pH meter	1	Acceptable

Instruments required for completing the laboratory:

1) Colony counter
2) Distiller Water Apparatus
3) Turbidity meter
4) Membrane filter

4- Ibrahimia laboratory:

No	Instrument	Number	The condition
1	Alum Jar tester	1	Very Good
2	Distiller Water Apparatus	1	Very Good
3	Fridge	1	Very Good
4	TDS & Conductivity Meter	1	Acceptable
5	Drying oven	1	Good
6	Color meter	2	Acceptable
7	Centrifuge	1	Good
8	Microscope	1	Good
9	Turbidity meter	1	Out of work
10	Sensitive balance	1	Good

Instruments required for completing the laboratory:

1) Spectrophotometer
2) Incubator
3) Disinfection meter
4) Turbidity meter
5) Water bath
6) Muffle furnace
7) Colony counter

5-Menia Elqamh laboratory:

No	Instrument	The condition
1	Electricity Sensitive balance	Very Good
2	Spectrophotometer	Good
3	Alum Jar tester	Good
4	Residual chlorine meter	Acceptable
5	Drying oven	Good
6	Portable pH meter	Good

Instruments required for completing the laboratory:

1) TDS & Conductivity Meter
2) Incubator
3) Disinfection meter
4) Turbidity meter
5) Chlorine digital meter
6) Centrifuge
7) Fridge
8) pH meter

6-Abu Kabier laboratory:

No	Instrument	The condition
1	Turbidity meter	Out of work
2	TDS & Conductivity Meter	Acceptable
3	Distiller Water Apparatus	Good
4	Alum Jar tester	Out of work
5	Microscope	Out of work
6	Electricity Sensitive balance	Good
7	Drying oven	Good
8	Fridge	working
9	Incubator	acceptable
10	Hot plate	Good
11	Color meter	Acceptable

List of Instruments required in shapwasco laboratory & what is been in tender:

No	Instrument	No. In Tender	Number
1	Centrifuge	-	1
2	Residual chlorine meter	2	2
3	Spectrophotometer	2	2
4	Ph meter(Digital)	4	3
5	Microscope	3	1
6	Membrane filter	1	2
7	Turbidity meter	4	4
8	TDS & Conductivity Meter	3	2
9	Colony counter	1	4
10	Incubator	3	2
11	Autoclave	3	2
12	Drying oven	-	1
13	Fridge	2	1
14	Distiller Water Apparatus	2	1
15	Water Bath	4	1
16	Muffle furnace	-	1
17	Sampler	-	6

2nd laboratories which NOPWASD supervise the operation of its station:

1-Faqus Potable water station:

No	Instrument	Number	The condition
1	Alum Jar tester	1	Out of work
2	Magnetic Stirrer	1	Good
3	Fridge	1	Out of work
4	Autoclave	1	Acceptable
5	Incubator	1	Good
6	Turbidity meter	1	Out of work
7	TDS & Conductivity Meter	1	Out of work
8	pH Meter	1	Out of work
9	Balance	1	Out of work
10	Sand sieves	1	Good
11	Spectrophotometer	1	Out of work
12	Muffle furnace	1	Out of work
13	Microscope	1	Out of work
14	Drying oven	1	Acceptable
15	Water Bath	1	Good
16	Color meter	1	Acceptable
17	Hot Plate	1	Acceptable
18	UV Candle for Lab Disinfection	2	Good
19	Centrifuge	1	Out of work
20	Distiller Water Apparatus	1	Out of work
21	Electricity balance	2	Out of work
22	Electricity Sensitive balance	1	Out of work
23	Shaker	1	Acceptable
24	Distiller Water Apparatus	1	Good
25	Vacuum pump	1	Working

Instruments required for completing the laboratory:

1) pH Meter
2) TDS & Conductivity Meter
3) Turbidity meter
4) Alum Jar tester
5) Centrifuge
6) Incubator
7) Microscope
8) Residual chlorine meter
9) Membrane filter
10) Electricity Sensitive balance
11) Spectrophotometer
12) Autoclave
13) Colony counter
14) Ice box

2- Kafr Saqr Laboratory Filtration Station:

No	Instrument	Number	The condition
1	TDS & Conductivity Meter	1	Out of work
2	Alum Jar tester	1	Out of work
3	Color meter	1	Acceptable
4	Turbidity meter	1	Out of work
5	Drying oven	1	weak
6	Spectrophotometer	1	Out of work
7	Sand sieves	1	Good
8	Balance	1	Out of work
9	Microscope	1	Out of work
10	Disinfection meter	1	weak
11	Fridge	1	Acceptable
12	Magnetic Stirrer	1	Good
13	Water Bath	1	Good
14	pH Meter	1	Out of work
15	Incubator	1	Weak
16	Centrifuge	1	Out of work
17	UV Oven	4	Good
18	Hot Plate	1	Weak
19	Suction Room for vapor & Gas	1	Out of work
20	Hot Plate	1	Out of work
21	Vacuum pump	1	Weak
22	Muffle furnace	1	working
23	Sensitive Balance	2	Out of work
24	Electric Sensitive Balance	1	Out of work
25	Disinfection meter	1	Good

Instruments required for completing the laboratory:

1) Spectrophotometer
2) Membrane filter
3) Electricity Sensitive balance
4) Turbidity meter
5) pH Meter
6) Alum Jar tester
7) TDS & Conductivity Meter
8) Colony counter
9) Autoclave
10) Incubator
11) Color meter
12) Microscope

3- Alhusainia laboratory station:

No	Instrument	Number	The condition
1	Hot Plate	2	Very good
2	Turbidity meter	2	Weak
3	Centrifuge	1	Very good
4	pH & Ammonia & Florid Meter	1	Out of work
5	Spectrophotometer	1	Good
6	pH Meter	1	Out of work
7	Flame Photometer	1	Good
8	Turbidity meter	1	Out of work
9	TDS & Conductivity Meter	1	Acceptable
10	Deionizer	1	Weak
11	Alum Jar tester	1	Very good
12	Color Meter	3	Weak
13	Drying Oven	1	Good
14	Sand sieves	1	Good
15	Autoclave	1	Good
16	Sampler	1	Good
17	Vacuum pump	4	Good

Instruments required for completing the laboratory:

1) Colony counter
2) Microscope
3) Electricity Sensitive balance
4) Residual Chlorine meter
5) Fridge
6) pH Sensor

Hihya Laboratory Station:

No	Instrument	Number	The condition
1	Electrical balance	1	Good
2	Fridge	1	Good
3	Disinfection Meter	1	Good
4	Incubator	1	Good
5	Muffle furnace	1	Good
6	Water Bath	1	Good
7	Distiller Water Apparatus	1	Good
8	Microscope	1	Good
9	Colony counter	1	Good
10	Hot Plate	1	Good
11	Magnetic Stirrer	1	Good
12	Alum Jar tester	1	Good
13	Residual Chlorine Meter	1	Good
14	Turbidity Meter	1	Good
15	TDS & Conductivity Meter	1	Good
16	Color Meter using D.P.D	1	Good
17	Gas Ventilator	1	Good