<Outputs-2>

A 2-10-1: Mechanical/Electrical Daily Training

Photo-1

Lecture for reviewing mechanical flow sheet

Photo-2

Counterparts trying to fill out an test format

Photo-3

Plant manager, Mr.Ibrahim, giving instruction to an operator

Photo-4

Presentation lecture for electrical facilities

Photo-5

Electrical technicain, Mr.Swaidy, reviwing the class and explaining to the other members on a platform

Photo-6

Site training
Checking equipment with related shop drawings

Photo-7

Site training
Checking conditions of equipment installation

Photo-8

Site trainng
Reviewing the items learnt in the lectures at the site

Photo-9

Instruction about daily inspection method

Photo-10

Water quality test by operator

Photo-11

Instructkion about maintenance operation method for seldom-used equipment

Photo-12

Implementation of troubleshooting work under the instructino of the experts

Photo-13

Site training for installation of DO meter and its maintenance method

Photo-14

Site training for inspection and replacement method of solar panel

Photo-15

Instruction to understand electrical drawings

Photo-16

Discussion about how to make daily record on SCADA

Photo-17

Site inspection with an inspection format

Photo-18

Removal of screenings at the coarse screen

Photo-19

Cleaning work of fine screen at the grit chamber

Photo-1

Daily work 1
Water quality test at reactor

Photo-2

Daily work 2
Confirmation of effluent amount and quality

Photo-3

Trouble-shooting 1
Inspection of reactor mixer after lifting up

Photo-4

Trouble-shooting 2
Inspection for earth leakage of motor

Photo-5

Daily Inspection of fine screen
Removie grits and residues in case those are stuck inside

Photo-6

Regular inspection of electrical faciliy
Inuslation resistance test conducted by a pair

Photo-7

Usage of sludge drying bed
Sending thickened sludge to drying bed with checkeing the condition of its density

Photo-8

Utilization of SCADA system
Monitoring status of WWTP operation, estimating electrical bill in addition to making daily repcrt

Photo-9

Utilization of water quality test kit 1
Observing condition of activated sludge

Photo-10

Utilization of water quality test kit 2
Measuring MLSS of sewage influent

Photo-11

PR activity for visitors 1
Plant manager explaining WWTP system to visitors using SCADA system at monitoring room in administration building

Photo-12

PR activity for visitors 2
Jericho municipality staff giving presentation about treated water reuse to persons involved in agricult at conference room in administration building

Photo-13

PR activity for visitors 3
Operator explaining the functions of facilities durin WWTP tour for citizens

Photo-14

Survey for drainage from specified factory 1
Give an survey interview and PR activity to cattle shed located next to WWTP

Photo-15

Survey for drainage from specified factory 2
Give an survey interview and PR activity to a concrete factory in the city

A 2-10-2: Presentation Materials for Workshop on WWTP

2013. Nov. 3

Meeting contents of mechanical team

No.	Date/ time	Contents	Distributed material	Attendant
1	2013.10.10/ 9:30 – 12:00	Introduction of mechanical and electrical technical transfer works	O & M training for mechanical and electrical equipment	Mr. Ibrahim Abu Seiba (M), Mr. Mohammed Awajneh (M), Mr. Maher Al Swaidy (E) Mr. Omran Khalef (M) Mr. Yasuaki Konda
2	2013.10.12/ 9:15 – 10:30	Understanding of process mechanical flow diagram for WWTP (Equipment was marked on the above drawings)	Process mechanical flow diagram No. 1 to 3	Ditto
3	2013.10.19/ 9:30 – 13:00	Understanding of process mechanical flow diagram and installation layouts for WWTP (Equipment was marked on the above drawings)	Drawings of equipment layout from grit chamber to sludge treatment.	Ditto except Mr. Omran Khalef (M)
4	2013.10.20/ 11:40 –12:40	Understanding of drawings related to clarifier, other installation drawings (Major parts were marked on the above drawings)	Equipment drawings of clarifier and some installation drawings	Ditto with No.1
5	2013.10.21/ 9:30 – 11:50	Studying of theory of preliminary facility 1/2, Understanding of installed condition of clarifier at WWTP site (discussed with contractor)	Chapter 18 of "operation of municipal wastewater treatment plants"	Ditto
6	2013.10.23/ 9:40–12:15	Studying of theory of preliminary facility 2/2, structure of fine screen, and system of air supply line. Understanding of installation drawings such as foundation, isometric	Brochure and Video of fine screen, some installation drawings	Ditto except Mr. Omran Khalef (M)

		of piping including air supply and sludge line, support layout, support details. (Major information were marked on the above drawings)		
7	2013.10.24/ 10:00–12:00	Understanding of equipment drawings, such as grit pump, submersible pump, grit separator, oil skimmer. (Major parts were marked on the above drawings)	Related equipment drawings	Ditto except Mr. Omran Khalef (M)
8	2013.10.26/ 10:00–12:00	Studying of theory of primary facility, Understanding of equipment drawings, such as scum screen, screenings conveyor, submersible mixer, coarse screen, inlet gate. (Major parts were marked on the above drawings)	Chapter 19 of "operation of municipal wastewater treatment plants" , related equipment drawings	Mr. Ibrahim Abu Seiba (M), Mr. Mohammed Awajneh (M), Mr. Yasuaki Konda
9	2013.10.27/ 10:20–12:20	Studying of theory of reactor facility, Understanding of equipment drawings, such as weir gate, air diffuser, reactor tank mixer, blower, air supply valve. (Major parts were marked on the above drawings)	Chapter 20 of "operation of municipal wastewater treatment plants" , related equipment drawings	Mr. Ibrahim Abu Seiba (M), Mr. Mohammed Awajneh (M), Mr. Omran Khalef (M), Mr. Yasuaki Konda
10	2013.10.29/ 9:30–10:15	Understanding of installed condition of reactor tank mixer at WWTP site	-	Ditto with No.1
11	2013.10.30/ 9:30–10:45	Understanding of equipment drawings, such as thickener, waste sludge measuring tank, hoist, hypochlorite tank, hypochlorite pump. (Major parts were marked on the above drawings)	Chapter 29 of "operation of municipal wastewater treatment plants" , related equipment drawings	Ditto with No.1
12	2013.10.31/ 9:00–12:00	Studying of theory of thickening and dewatering facility, Understanding of equipment drawings, such as auto strainer, defoaming pump, utility supply water unit. (Major parts were marked on the above drawings)	Chapter 33 of "operation of municipal wastewater treatment plants" , related equipment drawings	Mr. Ibrahim Abu Seiba (M), Mr. Maher Al Swaidy (E), Mr. Omran Khalef (M), Mr. Yasuaki Konda

13	2013.11.2/ 11:00–13:30	Work shop (Process and Mechanical)	Presentation material of M and E	Refer attendance list
14	2013.11.3/ 9:30–12:30	Understanding of alignment of clarifier at WWTP site, Comprehensive discussion day	-	Ditto with No.1

Mr. Yasuaki Konda
Mechanical engineer
JICA Study team

Eng. Ibrahim Abu Seiba
3/11/2013

Mr. Ibrahim Abu Seiba
Mechanical engineer
Jericho municipality

Mr. Mohammed Awajneh
Mechanical technician
Jericho municipality

Mr. Maher Al Swaidy
Electrical technician
Jericho municipality

/ supervisor

Mr. Omran Khalef
Mechanical engineer
Jericho municipality (trainee)

TECHNICAL ASSISTANCE AND CAPACITY BUILDING PROJECT FOR
THE JERICHO SANITATION PROJECT

Work Shop for O and M training for Mechanical and Electrical Equipment

Ibrahim Abu Seiba_Jericho Municipality
Yasuaki Konda_JICA Expert Team

2 November 2013

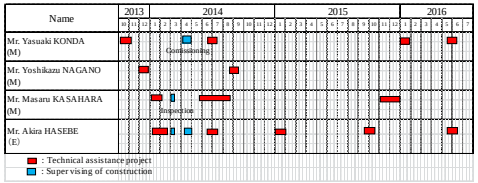
Expert Team Members

No.	Position and/or Assigned Tasks	Name
1	Chief Advisor/Institutional Operation/Legal System	Mr. Hirofumi SANO
2	Deputy Chief Advisor/Reuse of Treated Water and Sewage sludge	Mr. Satoru ONIKI
3	O&M of WWTP (Mechanical)-1	Mr. Yasuaki KONDA
4	O&M of WWTP (Mechanical)-2	Mr. Yoshikazu NAGANO
5	O&M of WWTP (Mechanical)-3	Mr. Masaru KASAHARA
6	O&M of WWTP (Electrical)	Mr. Akira HASEBE
7	Water Quality Management/ Sewer Network Construction and Maintenance-1	Mr. Keiji MATSUOKA
8	Sewer Network Construction and Maintenance-2	Mr. Kozo HAYASHISHITA
9	Awareness Raising/Project Coordinator	Ms. Fatemeh MASOULEH
10	Financial Management	Mr. Toshihiko TAMAMA

Expert Team Members of M and E

Position and/or Assigned Tasks	Name	Roles of person in charge
O&M of WWTP (Mechanical)-1	Mr. Yasuaki KONDA	Leader of M and E, Process and mechanical design of B/D, D/D, SV
O&M of WWTP (Mechanical)-2	Mr. Yoshikazu NAGANO	O and M specialist
O&M of WWTP (Mechanical)-3	Mr. Masaru KASAHARA	O and M specialist (including alignment)
O&M of WWTP (Electrical)	Mr. Akira HASEBE	Electrical design of D/D, SV, O and M

Schedule of assignment of Mechanical Engineer



The counterparts for the project

Output		Counterpart	
		Name	occupation
Project Chief		Mr. Basel Hijazi	Head of Engineering Dept.
1	Establishment of organization base for departments in charge of sewage works	Mr. Ghazi A. Al-Naji	Director of Water & Wastewater Department
		Mr. Iyad Handan	Management
		Mr. Mohammed Fetyani	Civil Engineer
		Mr. Ibrahim Abu Seiba	Mechanical Engineer
2	Development of capacity of Jericho municipality for O&M of the WWTP	Mr. Ibrahim Abu Seiba	Mechanical Engineer
		Mr. Mohammed Awajneh	Technician
		Mr. Maher Al Swaidy	Technician (Electricity)
3	Development of capacity of Jericho municipality for O&M of sewer network and promotion for connection to public sewers	Mr. Mohammed Isayed	Civil Engineer
		Mr. Mohammed Fetyani	Civil Engineer
		Mr. Ibrahim Abu Seiba	Mechanical Engineer
4	Public awareness	Mr. Mohammed Isayed	Civil Engineer
		Ms. Wiam Irekat	Public Relations
		Mr. Mohammed Azmaty	Public Relations
	Financial management	Mr. Mohammed Abu Mohsen	Finance Management
		Mr. Baha Al Shareef	Finance Management

Person in charge of M and E

On-going construction schedule of WWTP, and future schedule of M and E

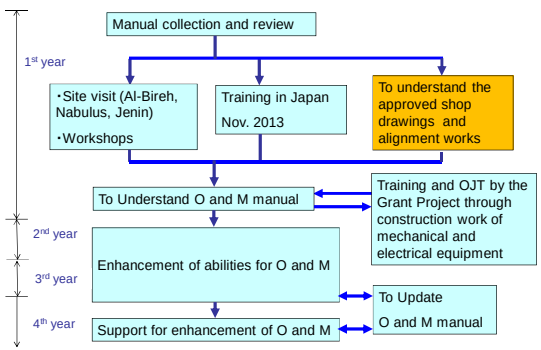
1. Completion ratio of construction works on October (C, M and E)
   Approx. over 85 %

2. Construction schedule of M and E (as reference only)
   Installation of mechanical equipment - up to January, 2013
   Installation of electrical equipment - up to February, 2014
   Related works of mechanical equipment - up to March, 2014
   Commissioning works - early April, 2014
   Trial operation and on the job training - from April - , 2014
   *Note) Technical assistance will be conducted to meet schedule of construction works.

3. Enhancement of abilities for O and M in WWTP - April, 2014 to March, 2015
   - April, 2015 to March, 2016

4. Support for enhancement of O and M in WWTP – up to July, 2016

Activity Flow of O and M in WWTP



Development of capacity for O and M of WWTP

1. To understand the approved process flow diagram
   - including mechanism of wastewater treatment
2. To understand the approved shop drawings of equipment
   - objective, structure, spare parts, material, lubricant/ oil of each equipment
3. To understand the approved shop drawings of installation

1) Layout plan
2) Detail Foundation
3) Isometric (Pipes)
4) Support and support detail layout
5) Other steel works

4. Site visit and Training in Japan

5. To understand Operation and Maintenance manual

6. To update Operation and Maintenance manual

WWTP Image

Design Criteria in Jericho WWTP

Process	: Extended Aeration Process
Sludge	: Thickening –Drying Bed
Sludge Cake	: Landfill

Flow Rate (m^3/ day)

Items	2020	Ultimate
Daily Average	6,600	9,900
Daily Maximum	9,800	14,400
Hourly Maximum	19,100	29,000

Design Criteria - 1 forMechanical Facility

Flow Rate of Facility

Items	Design Flow (m^3/day)
Grit Chamber	29,000
Reactor	9,800
Clarifier	9,800
Disinfection	9,800
Thickener	9,800
Drying Bed	6,600

*Wastewater Receiving Tank 40 m3/ hr
* Reactor was designed by considering temperature of winter season

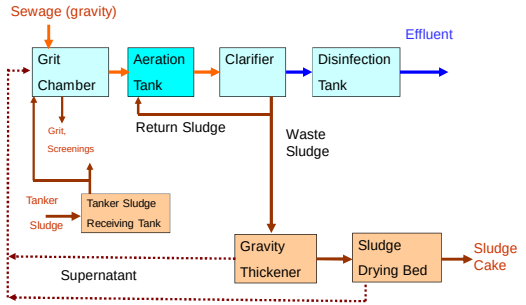
Design Water Quality

Items	Influent	Effluent
BOD	500 mg/l	20 mg/l
TSS	500 mg/l	30 mg/l
T-N	75 mg/l	25 mg/l

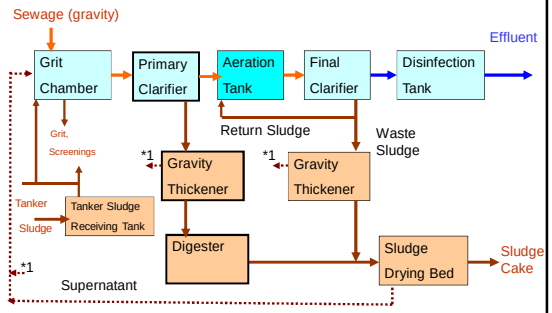
Major Design Criteria - 2 for Mechanical Facility

Items	Design criteria
Reactor	Hydraulic Retention Time (HRT) 26.6 hr MLSS approx. 2,500 mg/l Water Temperature 13 to 30 degree Water depth 5.5 m
Disinfection	Chlorine injection ratio Ave. 3 mg/ l (2 to 4 mg/l) Hypochlorine supply cycle Approx.14days
Thickener	Inlet solids content 0.6 % Inlet Sludge Solid Load 3,920 kg/ ds/ d Thickened solids content 1.3 %
Drying Bed	Dried Sludge Water Content Approx. 50 % Thickened sludge transfer volume 271 m3/d Thickened sludge transfer time, less than 3 hr/ d Sludge drying period (assumption) Summer season 14 days Winter season 21 days

Process Flow Diagram (up to 2020)



Process Flow Diagram (Ultimate)



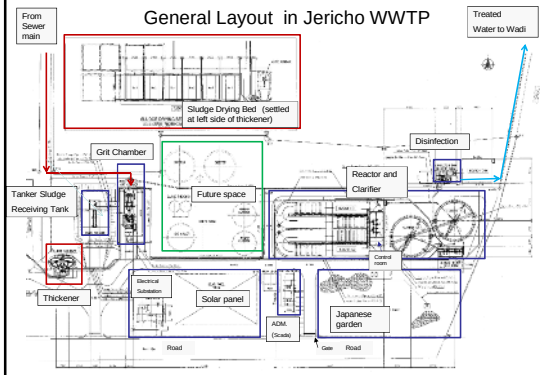
Major Facility in Jericho WWTP

- Grit Chamber
  - Screen Facility
  - Grit Removal Facility
- Reactor
- Clarifier
- Chlorination and Utility Facility
- Sludge Treatment
  - Thickener Facility
  - Drying Bed

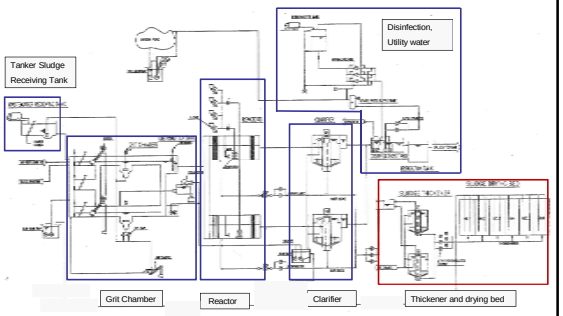
Major Facility in Jericho WWTP

Items	Main Purpose	Process
Grit Chamber (Preliminary)	Protect downstream plant equipment and treatment process	Screening Grit removal
Reactor	To remove carbonaceous biochemical oxygen demand (CBOD), to oxidize ammonia to nitrates, to remove nitrogen compounds	Aeration, mixing, Biological treated
Clarifier	Sludge/ treated water separate, Sedimented sludge is transfered to sludge thickener	Sedimentation (gravity)
Disinfection	Disinfect by oxidizing cellular material	Chlorination
Thickener	Waste sludge thickening (reduce volume)	Gravity thickening
Drying bed	Easy handling, utilized for fertelizer (reduce volume)	De-watering

General Layout in Jericho WWTP



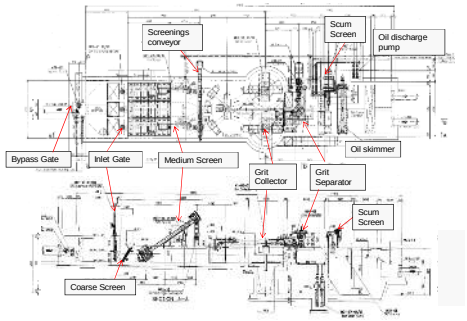
General flow in Jericho WWTP



Major equipment of Grit Chamber

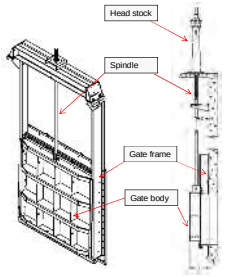
- Gate
- Coarse Screen (Manual)
- Medium Screen (Mechanical)
- Grit Pump
- Grit Collector
- Grit Separator
- Scum Screen
- Valve

Layout of Grit Chamber

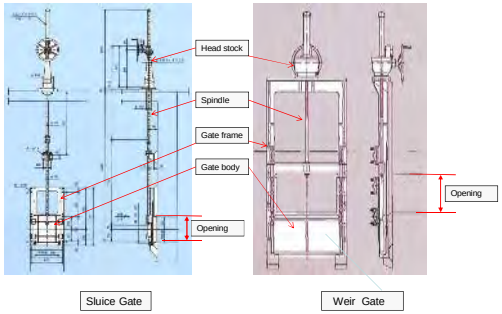


Grit Chamber
(Image)

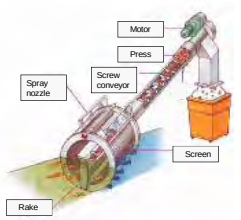
Gate (Sluice Gate/ Head Stock)

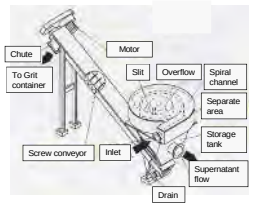


Sluice Gate/ Weir Gate



Medium Screen/ Grit Separator





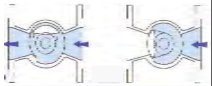
Gate Valve/Butterfly Valve

Gate Valve Butterfly Valve

Check Valve/ Eccentric Valve

Swing
Check Valve

Eccentric Valve
(less clogging)

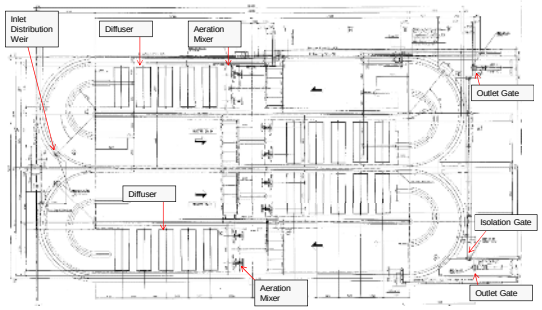


Full open close

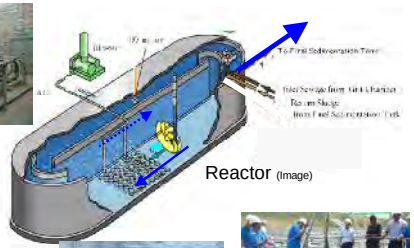
Major equipment of Reactor

- Distribution Weir and Gate
- Aeration Diffuser
- Blower
- Reactor Tank Mixer
- Air Supply Valve
- Flow Meter (Air)

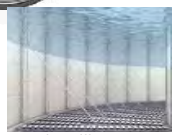
Layout of Reactor



Blower (Image)



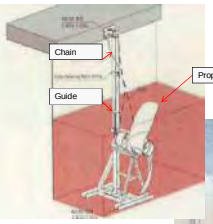
Reactor (Image)

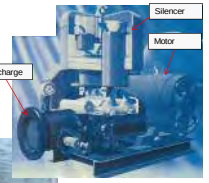


Aeration Diffuser (Image)

Reactor Tank Mixer
(Image)

Aeration Mixer/ Diffuser/ Blower

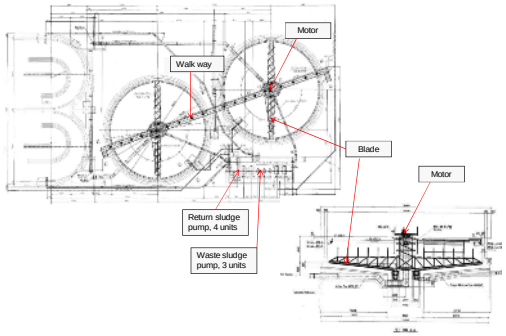


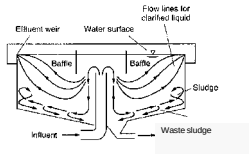


Major equipment of Clarifier

- Clarifier
- Return Sludge Pump
- Waste Sludge Pump
- Flow Meter (Sludge)
- Scum Pump

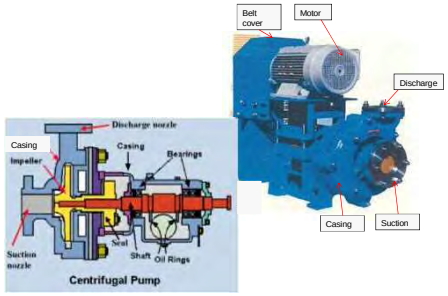
Lavout of Clarifier





Clarifier (Image)

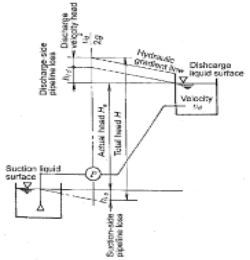
Sludge Pump



Pump Head

Total Head (H) = Ha + h1s + h1d + vd

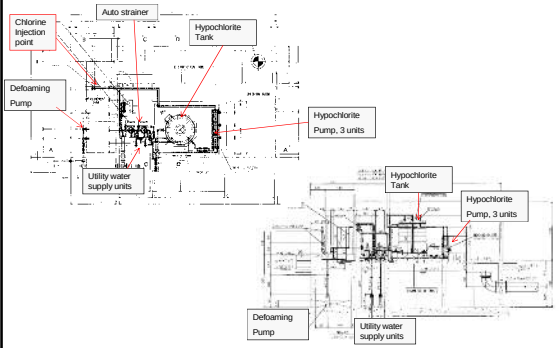
Ha : actual head
h1s : suction pipeline loss
h1d : delivery pipeline loss
vd : discharge velocity head



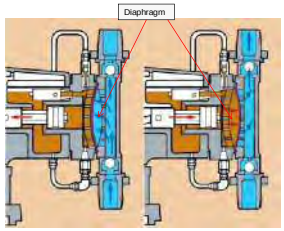
Major equipment of Disinfection

- Hypochlorite Tank
- Hypochlorite Pump
- Utility Water Supply Unit
- Defoaming Pump
- Auto strainer

Layout of Disinfection

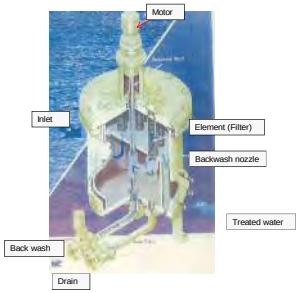


Hypochlorite Pump (Diaphragm Pump)



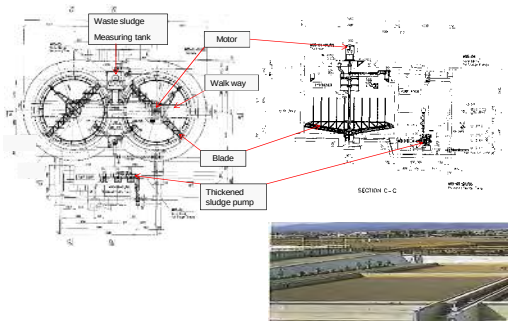
Suction **Discharge**

Auto Strainer



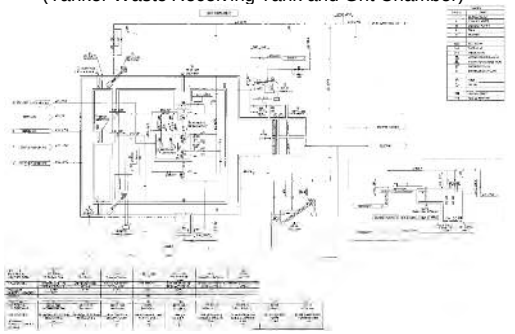
Major equipment of Sludge Treatment

- Thickener
- Thickened Sludge Pump

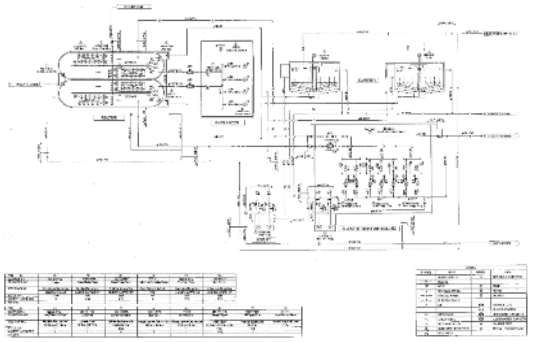


Thickener and Drying Bed (Image)

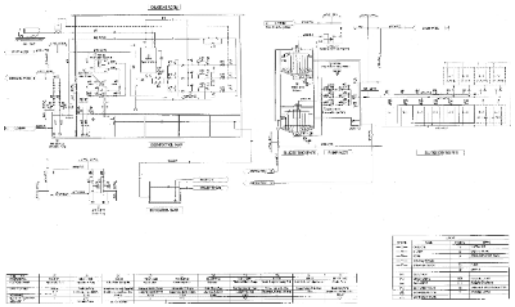
Process Flow Diagram (Tanker Waste Receiving Tank and Grit Chamber)



Process Flow Diagram (Reactor and Clarifier)



Process Flow Diagram
(Disinfection and Sludge Treatment)

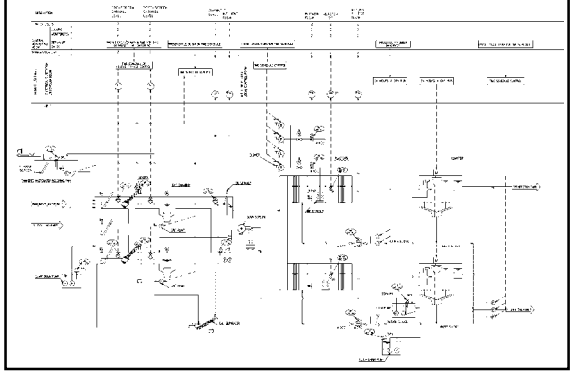


Operation time
of major equipment (referene)

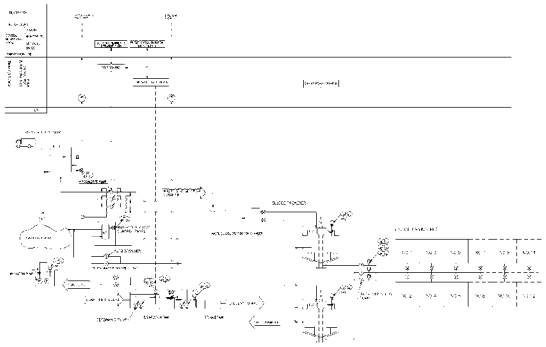
D:duty, S:standby

Items	Operation time	Control
Medium Screen, Conveyor	20 min/ day x 2 to 3 times	timer or detect water level
Grit pump, Grit separator	10 min/ day (up to grit volume)	timer
Aeration Mixer	24 hr/ day, 4 D/ train x 2 trains	
Aeration Diffuser	Max. 12 hr/ day	
Blower	Max. 24 hr/ day, 2 D + 2 S	timer or DO control
Clarifier	24 hr/ day, 2 D	
Return Sludge Pump	24 hr/ day, (1 D + 1S)/ each train	Normally 1 duty, Max. 2 duty/ each train
Waste Sludge Pump	6 hr/ day, (2 D + 1S)	Day time operation
Thickener	24 hr/ day, 2 D	
Thickened Sludge Pump	3 hr/ day, (2 D + 1S)	Day time operation
Hypochlorite Pump	24 hr/ day, 1D/ 2 D + 1S	Daily Max. 1 duty, Hourly Max. 2 duty

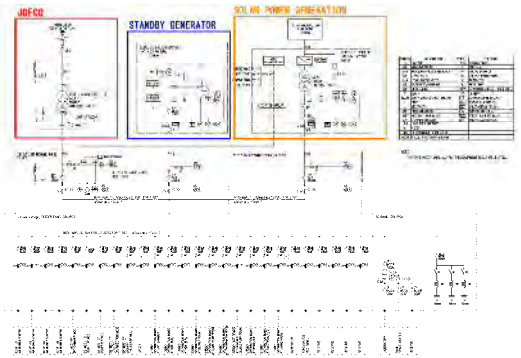
Instrumentation Flow Diagram (1/2) in Jericho WWTP



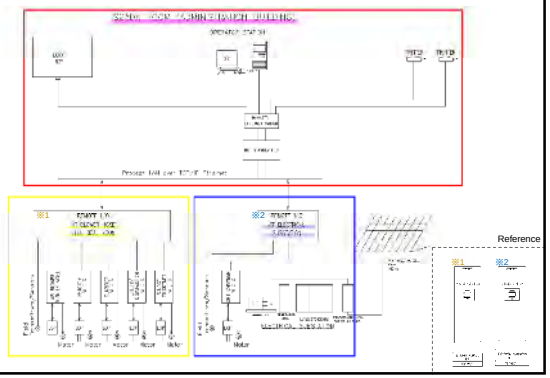
Instrumentation Flow Diagram (2/2) in Jericho WWTP



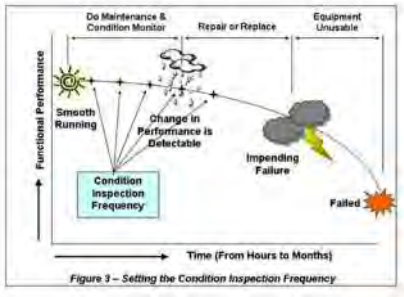
Single Line Diagram in Jericho WWTP



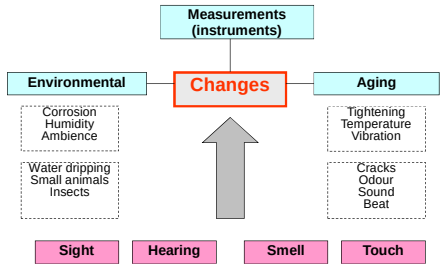
System Flow Diagram in Jericho WWTP



Functional performance image



Daily Inspection - 1



Daily Inspection - 2

- Cracks
  - Rust differs from others
  - Darkened
- Deformation
  - Striped
- Discoloration
  - Spotted
- Deterioration
  - Oily
  - White powdered (cables)
  - Rust differs from others

Daily Inspection - 3

- Foreign objects
  - Drippings
  - Small animals/insects
  - Water drippings
- Measurement
  - Motion time/ period/frequency
  - Value

Pump Inspection

Frequency	Inspection Item	Remarks
Daily	- Appearance - Vibration/Sounds - Bearing Temperature - Gland packing (heat/leakage) - Pressure reading	
Monthly	- Grease/Lubricating oil - Gland packing (wearing) - Pressure reading	- check leakage around seals
Semi-annual	- Re-tighten bolts/nuts - Check protective devices	
Every 1-4 years	- Replace grease/lubricating oil - Replace gland packing - Overhaul and service unit	- check wearing/corrosion

Motor Inspection

Frequency	Inspection Item	Remarks
Daily	- Appearance - Vibration/Sounds - Bearing temperature - Frame temperature - Remove dirt/debris	- slip ring/brush, if any
Monthly	- Check brush up/down movement	- slip ring/brush, if any
Semi-annual	- Grease/Lubricating oil - Insulation resistance - Check protective devices	1 MΩ
Annual	- Replace grease/lubricating oil	

Motor Control Panel

Frequency	Inspection Item	Remarks
Daily	- Appearance - Vibration/Sounds - Smell - Temperature - Remove dirt	
Monthly	(in addition to daily inspection) - Paint condition - Remove dirt	
Annual	(in addition to daily/monthly inspection) - Insulation/ground resistance - Check protective devices (thermal, over-current etc.) - Check instrumentation (level meter, flow meter etc.)	

Temperature – 1 (general)

Equipment/Part	Permissible Temperature (℃)
Pump - Bearing	75
Motor - Bearing	75
Motor - Frame	75-100
Motor – Terminal Box	70
Motor - Cable	70

Temperature - 2

Surface Temperature	Feeling	Remarks
40℃	Some warm	Slightly warm to touch
45℃	Warm	Comfortably warm
50℃	Some hot	Palm reddens for extended periods
60℃	Hot	Can hold hand for 3-4 seconds
70℃	Externally hot	Can hold a finger for 3 seconds
80℃	Externally hot	Can hold a finger for only 1 second

Electrical Check List – Daily - 1

1. Listen for unusual sounds e.g. motors
2. Look for visible damage
3. Check for excessive temperature (10 sec. hand count)
4. Feel for any excessive vibration
5. Check air flow on motors
6. Report any unusual odors (e.g. burning, chlorine leakage)

Electrical Check List – Daily - 2

7. Check for any visible signs of cable damages
8. Clean motor exterior, ensure that it is free from oil, dust, water causing improper cooling
9. Look at glands if water spraying on motors or motor terminal boxes
10. Check motor sight glass to see oil level is OK
11. If motor fails to start, check phase monitor, overload relay unit, breaker and JPS fuse links

Electrical Check List – Monthly

1. Observe if JPS lines are in need of bushing
2. If terminations inside MCC are turning green
3. Inspect panel for loose doors, mechanical damage and defective instruments
4. All panel doors must be kept closed especially where electronic devices located and pumps and pipes are close
5. Report any signs of electricity THEFT

In General

1. Pass on any observations to fellow operators
2. Any improvement works or modifications done, must be share with co-workers
3. Any other concerns call Maintenance Department

Warning

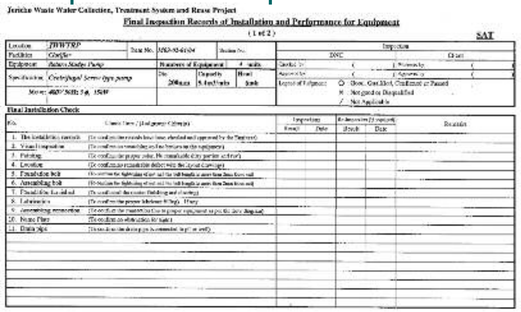
1. Never attempt to touch any part of electrical switchgear other than switches, pushbuttons, reset buttons and breaker handles
2. Try not to make contact with rotating parts i.e. with loose closing, chains and other jewelry that may get caught in equipment
3. Reports are more effective when witten

Sample 1-1 of O&M manual

Sample 1-2 of O&M manual

Sample 1-3 of O&M manual

Sample 1-1 of inspection record


Jericho Waste Water Collection, Treatment System and Reuse Project

Final Inspection Records of Installation and Performance for Equipment

(1 of 2)

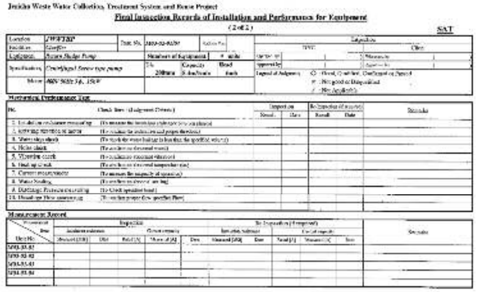
SAT

Location	JWWTRP	Item No.		Inspection	
Facilities	Clarifier				
Equipment	Return Sludge Pump	Numbers of Equipment	4 units		
Specification	Centrifugal Screw type pump	Dia. 200mm	Capacity	Head	
Motor				Legend of Judgment	○ Good, Qualified, Confirmed or Passed; × Not good or Disqualified; / Not Applicable

Final Installation Check

No.	Check Item / (Judgment Criteria)	Inspection Result	Inspection Date	Re-inspection Result	Re-inspection Date	Remarks
1. The installation records						
2. Visual inspection						
3. Painting						
4. Location						
5. Foundation bolt						
6. Assembling bolt						
7. Foundation level						
8. Lubrication						
9. Assembling connection						
10. Name Plate	(To confirm no obstruction for sight)					
11. Drain pipe						

Sample 1-2 of inspection record


Jericho Waste Water Collection, Treatment System and Reuse Project

Final Inspection Records of Installation and Performance for Equipment

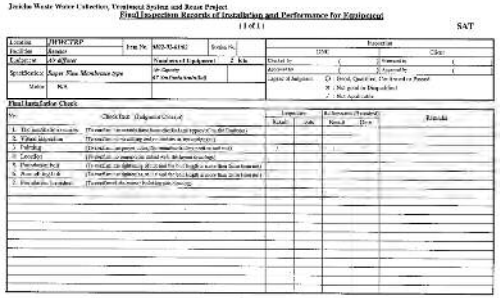
(2 of 2)

SAT

Mechanical Performance Test

Measurement Record

Sample 2 of inspection record


Jericho Waste Water Collection, Treatment System and Reuse Project

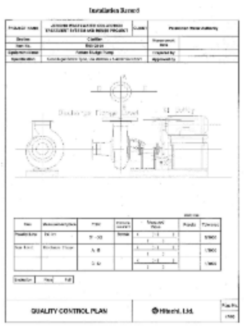
Final Inspection Records of Installation and Performance for Equipment

(1 of 1)

SAT

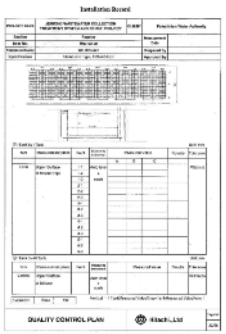
Final Installation Check

Sample of installation record


Installation Record

QUALITY CONTROL PLAN

Hitachi, Ltd.


Installation Record

QUALITY CONTROL PLAN

Hitachi, Ltd

Thank you very much

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O and M training for Mechanical and Electrical Equipment

Yasuaki Konda_Mechanical Engineer
Akira Hasebe_Electrical Engineer
JICA Expert Team (NJS Consultants)

Expert Team Members

No.	Position and/or Assigned Tasks	Name
1	Chief Advisor/Institutional Operation/Legal System	Mr. Hirofumi SANO
2	Deputy Chief Advisor/Reuse of Treated Water and Sewage sludge	Mr. Satoru ONIKI
3	O&M of WWTP (Mechanical)-1	Mr. Yasuaki KONDA
4	O&M of WWTP (Mechanical)-2	Mr. Yoshikazu NAGANO
5	O&M of WWTP (Mechanical)-3	Mr. Masaru KASAHARA
6	O&M of WWTP (Electrical)	Mr. Akira HASEBE
7	Water Quality Management/ Sewer Network Construction and Maintenance-1	Mr. Keiji MATSUOKA
8	Sewer Network Construction and Maintenance-2	Mr. Kozo HAYASHISHITA
9	Awareness Raising/Project Coordinator	Ms. Yasumi TSUTSUI
10	Financial Management	Mr. Toshihiko TAMAMA

Expert Team Members of M and E

Position and/or Assigned Tasks	Name	Roles of person in charge
O&M of WWTP (Mechanical)-1	Mr. Yasuaki KONDA	Leader of M and E, Process and mechanical design of B/D, D/D, SV
O&M of WWTP (Mechanical)-2	Mr. Yoshikazu NAGANO	O and M specialist
O&M of WWTP (Mechanical)-3	Mr. Masaru KASAHARA	Installation specialist, O and M specialist
O&M of WWTP (Electrical)	Mr. Akira HASEBE	Electrical design of D/D, SV, O and M

The counterparts for the project

Outputs		C/P Team	
		Name	Qualification
Project Chief		Mohammed Fetyani	Civil Engineer
(1)	Establishment of organizational base for departments in charge of sewage works	Iyad Hamdan	Management
		Mohammed Fetyani	Civil Engineer
		Ibrahim Abu Seiba	Mechanical Engineer
(2)	Development of capacity of Jericho municipality for O&M of the WWTP	Ibrahim Abu Seiba	Mechanical Engineer
		Mohammed Khalaf	Technician
		Maher Al Swaidy	Technician (Electricity)
(3)	Development of capacity of Jericho municipality for O&M of sewer network and promotion for connection to public	Mohammed Isayed	Civil Engineer
		Mohammed Fetyani	Civil Engineer
		Ibrahim Abu Seiba	Mechanical Engineer
(4)	Public awareness	Mohammed Isayed	Civil Engineer
		Wiam Irekat	Public Relations
		Mohammed Azmuty	Public Relations
	Financial management	Mohammed Abu Muhsen	Finance Management
		Baha Al Shareef	Finance Management

: Key personnel in each task

Person in charge of M and E

On-going construction schedule of WWTP, and future schedule of M and E

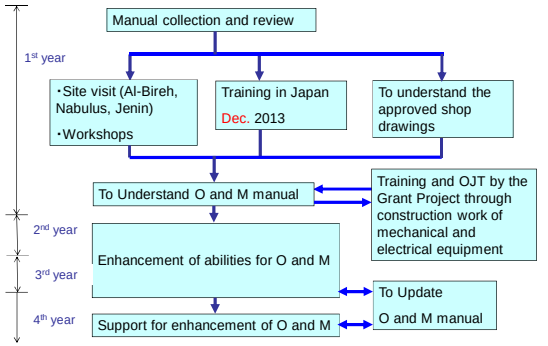
1. Completion ratio of construction works on October (C, M and E)
   Approx. 85 %

2. Construction schedule of M and E (reference)
   Installation of mechanical equipment - up to November, 2013
   Installation of electrical equipment - up to December, 2013
   Related works of mechanical equipment - up to December, 2013
   Commissioning works - up to early of March, 2014
   Trial operation and on the job training - up to middle of March, 2014
   * Actual operation may extend on July due to necessity of cooperation with this project

3. Enhancement of abilities for O and M in WWTP - April, 2014 to March, 2015
   - April, 2015 to March, 2016

4. Support for enhancement of O and M in WWTP – up to July, 2016

Activity Flow of O and M in WWTP



Development of capacity for O and M of WWTP

1. To understand the approved process flow diagram
   - including mechanism of wastewater treatment
2. To understand the approved shop drawings of equipment
   - objective, structure, spare parts, material, lubricant/ oil of each equipment
3. To understand the approved shop drawings of installation
1) Layout plan
2) Detail Foundation
3) Isometric (Pipes)
4) Support and support detail layout
5) Other steel works

4. Site visit and Training in Japan

5. To understand Operation and Maintenance manual

6. To update Operation and Maintenance manual

Design Criteria in Jericho WWTP

Process	: Extended Aeration Process
Sludge	: Thickening –Drying Bed
Sludge Cake	: Landfill

Flow Rate (m^3/ day)

Items	2020	Ultimate
Daily Average	6,600	9,900
Daily Maximum	9,800	14,400
Hourly Maximum	19,100	29,000

Design Criteria - 1 forMechanical Facility

Flow Rate of Facility

Items	Design Flow (m^3/day)
Grit Chamber	29,000
Reactor	9,800
Clarifier	9,800
Disinfection	9,800
Thickener	9,800
Drying Bed	6,600

*Wastewater Receiving Tank 40 m3/ hr
* Reactor was designed by considering temperature of winter season

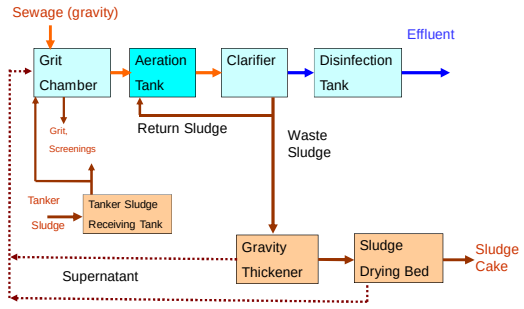
Design Water Quality

Items	Influent	Effluent
BOD	500 mg/l	20 mg/l
TSS	500 mg/l	30 mg/l
T-N	75 mg/l	25 mg/l

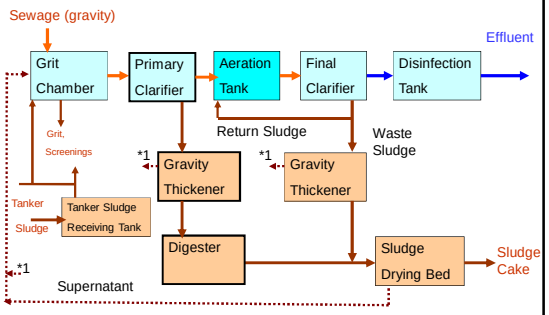
Major Design Criteria - 2 for Mechanical Facility

Items	Design criteria
Reactor	Hydraulic Retention Time (HRT) 26.6 hr MLSS approx. 2,500 mg/l Water Temperature 13 to 30 degree Water depth 5.5 m
Disinfection	Chlorine injection ratio Ave. 3 mg/ l (2 to 4 mg/l) Hypochlorine supply cycle Approx.14days
Thickener	Inlet solids content 0.6 % Inlet Sludge Solid Load 3,920 kg/ ds/ d Thickened solids content 1.3 %
Drying Bed	Dried Sludge Water Content Approx. 50 % Thickened sludge transfer volume 271 m3/d Thickened sludge transfer time, less than 3 hr/ d Sludge drying period (assumption) Summer season 14 days Winter season 21 days

Process Flow Diagram (up to 2020)



Process Flow Diagram (Ultimate)



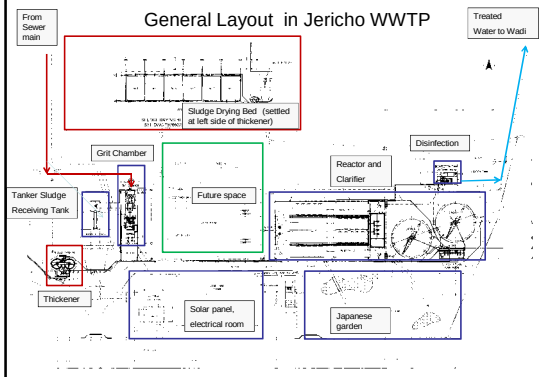
Major Facility in Jericho WWTP

- Grit Chamber
  - Screen Facility
  - Grit Removal Facility
- Reactor
- Clarifier
- Chlorination and Utility Facility
- Sludge Treatment
  - Thickener Facility
  - Drying Bed

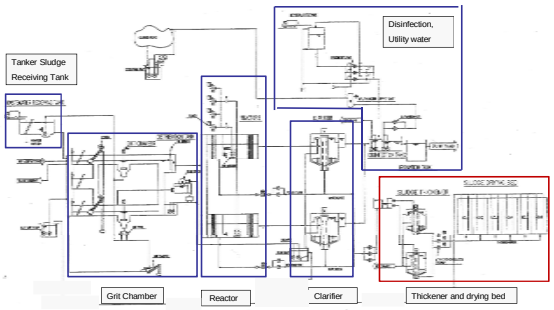
Major Facility in Jericho WWTP

Items	Main Purpose	Process
Grit Chamber (Preliminary)	Protect downstream plant equipment and treatment process	Screening Grit removal
Reactor	To remove carbonaceous biochemical oxygen demand (CBOD), to oxidize ammonia to nitrates, to remove nitrogen compounds	Aeration, mixing, Biological treated
Clarifier	Sludge/ treated water separate, Sedimented sludge is transfered to sludge thickener	Sedimentation (gravity)
Disinfection	Disinfect by oxidizing cellular material	Chlorination
Thickener	Waste sludge thickening (reduce volume)	Gravity thickening
Drying bed	Easy handling, utilized for fertelizer (reduce volume)	De-watering

General Layout in Jericho WWTP



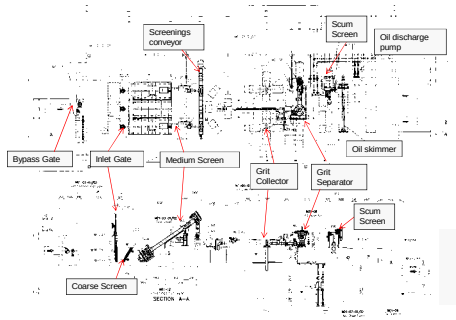
General flow in Jericho WWTP



Major equipment of Grit Chamber

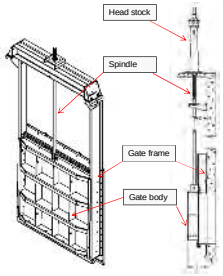
- Gate
- Coarse Screen (Manual)
- Medium Screen (Mechanical)
- Grit Pump
- Grit Collector
- Grit Separator
- Scum Screen
- Valve

Layout of Grit Chamber

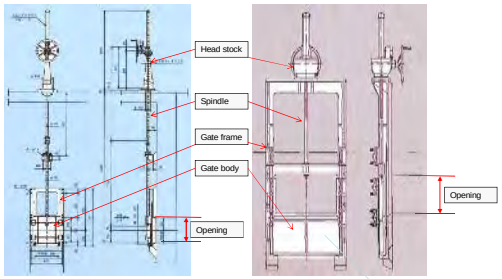


Grit Chamber
(Image)

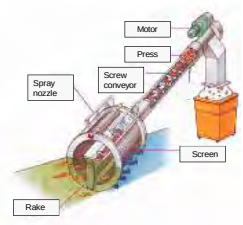
Gate (Sluice Gate/ Head Stock)

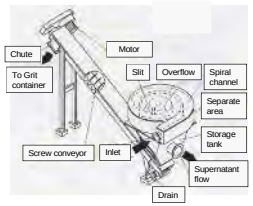


Sluice Gate/ Weir Gate



Medium Screen/ Grit Separator





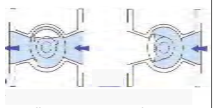
Gate Valve/Butterfly Valve

Gate Valve Butterfly Valve

Check Valve/ Eccentric Valve

Swing
Check Valve

Eccentric Valve
(less clogging)

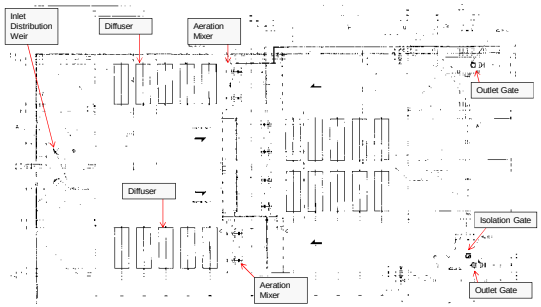


Full open close

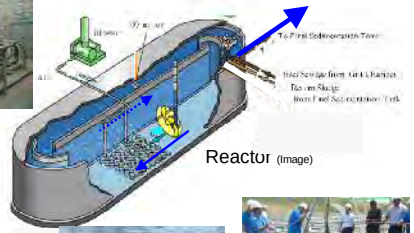
Major equipment of Reactor

- Distribution Weir and Gate
- Aeration Diffuser
- Blower
- Reactor Tank Mixer
- Air Supply Valve
- Flow Meter (Air)

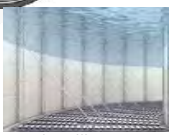
Layout of Reactor



Blower (Image)



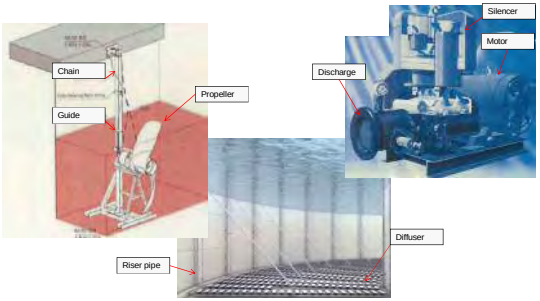
Reactor (Image)



Aeration Diffuser (Image)

Reactor Tank Mixer (Image)

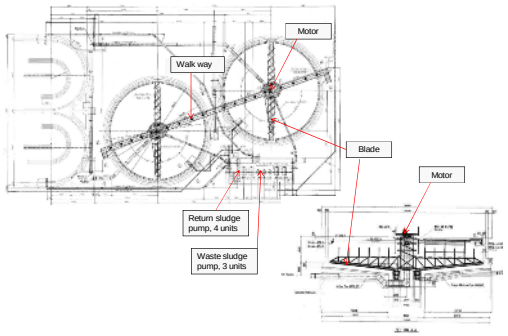
Aeration Mixer/ Diffuser/ Blower

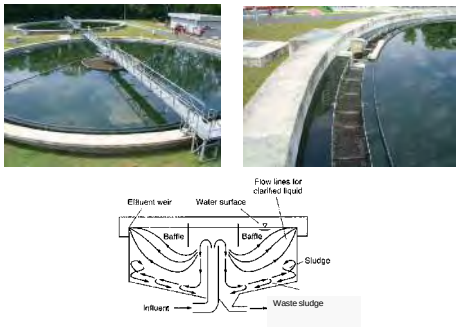


Major equipment of Clarifier

- Clarifier
- Return Sludge Pump
- Waste Sludge Pump
- Flow Meter (Sludge)
- Scum Pump

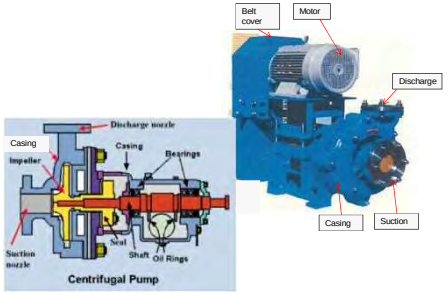
Layout of Clarifier





Clarifier (Image)

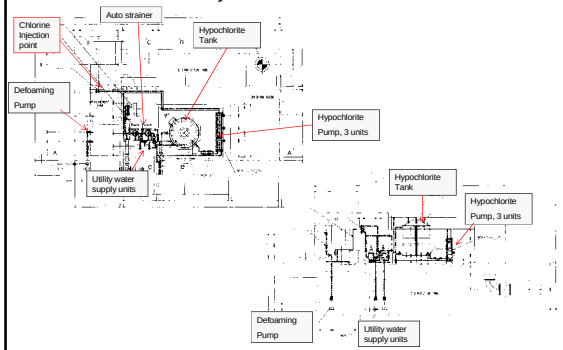
Sludge Pump



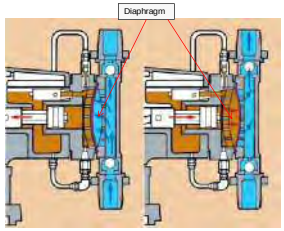
Major equipment of Disinfection

- Hypochlorite Tank
- Hypochlorite Pump
- Utility Water Supply Unit
- Defoaming Pump
- Auto strainer

Layout of Disinfection

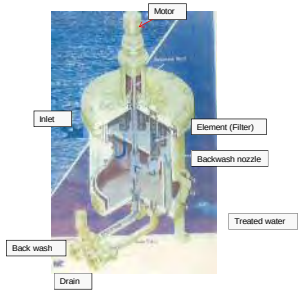


Hypochlorite Pump (Diaphragm Pump)



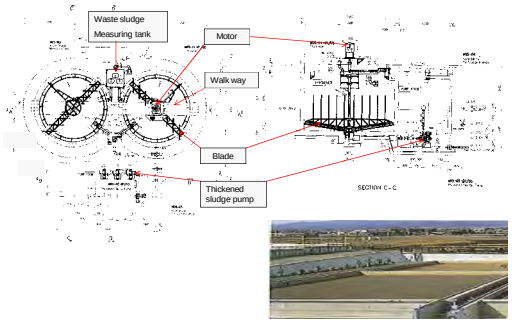
Suction **Discharge**

Auto Strainer



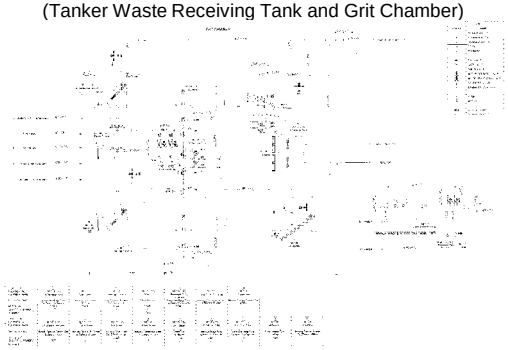
Major equipment of Sludge Treatment

- Thickener
- Thickened Sludge Pump

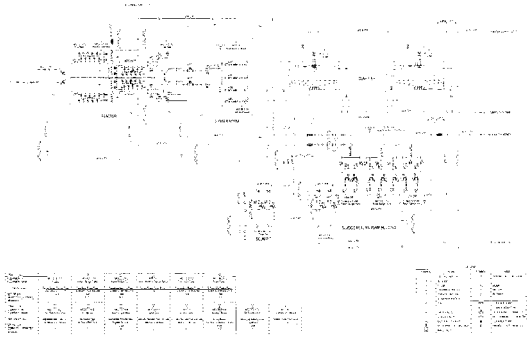


Thickener and Drying Bed (Image)

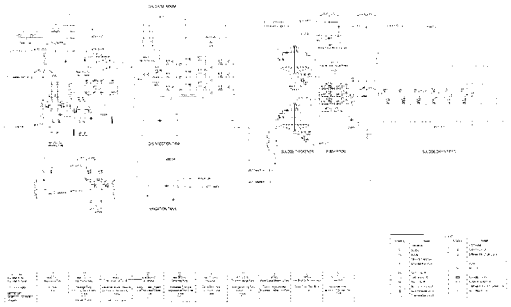
Process Flow Diagram
(Tanker Waste Receiving Tank and Grit Chamber)



Process Flow Diagram (Reactor and Clarifier)



Process Flow Diagram
(Disinfection and Sludge Treatment)

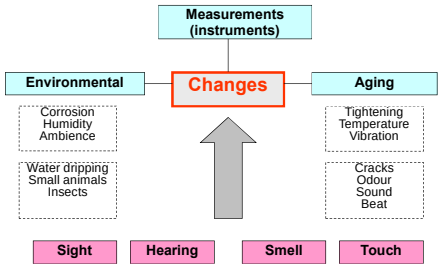


Operation time
of major equipment (referene)

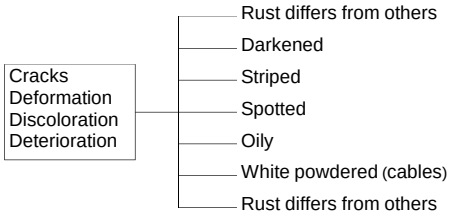
D:duty, S:standby

Items	Operation time	Control
Medium Screen, Conveyor	20 min/ day x 2 to 3 times	timer or detect water level
Grit pump, Grit separator	10 min/ day (up to grit volume)	timer
Aeration Mixer	24 hr/ day, 4 D/ train x 2 trains	
Aeration Diffuser	Max. 12 hr/ day	
Blower	Max. 24 hr/ day, 2 D + 2 S	timer or DO control
Clarifier	24 hr/ day, 2 D	
Return Sludge Pump	24 hr/ day, (1 D + 1S)/ each train	Normally 1 duty, Max. 2 duty/ each train
Waste Sludge Pump	6 hr/ day, (2 D + 1S)	Day time operation
Thickener	24 hr/ day, 2 D	
Thickened Sludge Pump	3 hr/ day, (2 D + 1S)	Day time operation
Hypochlorite Pump	24 hr/ day, 1D/ 2 D + 1S	Daily Max. 1 duty, Hourly Max. 2 duty

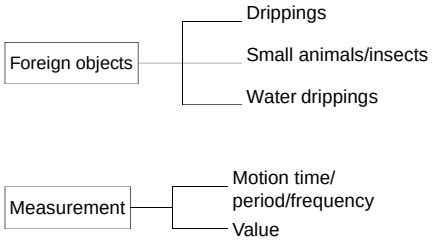
Daily Inspection - 1



Daily Inspection - 2



Daily Inspection - 3



Pump Inspection

Frequency	Inspection Item	Remarks
Daily	- Appearance - Vibration/Sounds - Bearing Temperature - Gland packing (heat/leakage) - Pressure reading	
Monthly	- Grease/Lubricating oil - Gland packing (wearing) - Pressure reading	- check leakage around seals
Semi-annual	- Re-tighten bolts/nuts - Check protective devices	
Every 1-4 years	- Replace grease/lubricating oil - Replace gland packing - Overhaul and service unit	- check wearing/corrosion

Motor Inspection

Frequency	Inspection Item	Remarks
Daily	- Appearance - Vibration/Sounds - Bearing temperature - Frame temperature - Remove dirt/debris	- slip ring/brush, if any
Monthly	- Check brush up/down movement	- slip ring/brush, if any
Semi-annual	- Grease/Lubricating oil - Insulation resistance - Check protective devices	1 MΩ
Annual	- Replace grease/lubricating oil	

Motor Control Panel

Frequency	Inspection Item	Remarks
Daily	- Appearance - Vibration/Sounds - Smell - Temperature - Remove dirt	
Monthly	(in addition to daily inspection) - Paint condition - Remove dirt	
Annual	(in addition to daily/monthly inspection) - Insulation/ground resistance - Check protective devices (thermal, over-current etc.) - Check instrumentation (level meter, flow meter etc.)	

Temperature - 1

Equipment/Part	Permissible Temperature (℃)
Pump - Bearing	75
Motor - Bearing	75
Motor - Frame	75-100
Motor – Terminal Box	70
Motor - Cable	70

Temperature - 2

Surface Temperature	Feeling	Remarks
40℃	Some warm	Slightly warm to touch
45℃	Warm	Comfortably warm
50℃	Some hot	Palm reddens for extended periods
60℃	Hot	Can hold hand for 3-4 seconds
70℃	Externally hot	Can hold a finger for 3 seconds
80℃	Externally hot	Can hold a finger for only 1 second

Electrical Check List – Daily - 1

1. Listen for unusual sounds e.g. motors
2. Look for visible damage
3. Check for excessive temperature (10 sec. hand count)
4. Feel for any excessive vibration
5. Check air flow on motors
6. Report any unusual odors (e.g. burning, chlorine leakage)

Electrical Check List – Daily - 2

7. Check for any visible signs of cable damages
8. Clean motor exterior, ensure that it is free from oil, dust, water causing improper cooling
9. Look at glands if water spraying on motors or motor terminal boxes
10. Check motor sight glass to see oil level is OK
11. If motor fails to start, check phase monitor, overload relay unit, breaker and JPS fuse links

Electrical Check List – Monthly

1. Observe if JPS lines are in need of bushing
2. If terminations inside MCC are turning green
3. Inspect panel for loose doors, mechanical damage and defective instruments
4. All panel doors must be kept closed especially where electronic devices located and pumps and pipes are close
5. Report any signs of electricity THEFT

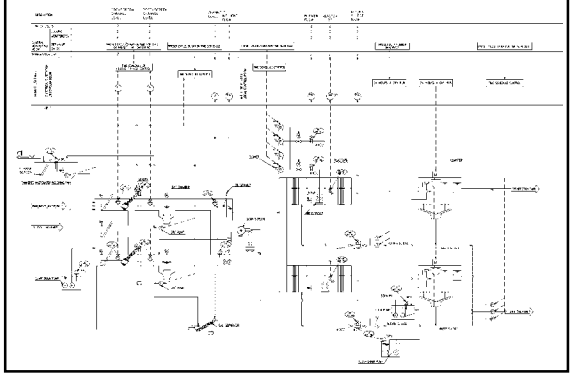
In General

1. Pass on any observations to fellow operators
2. Any improvement works or modifications done, must be share with co-workers
3. Any other concerns call Maintenance Department

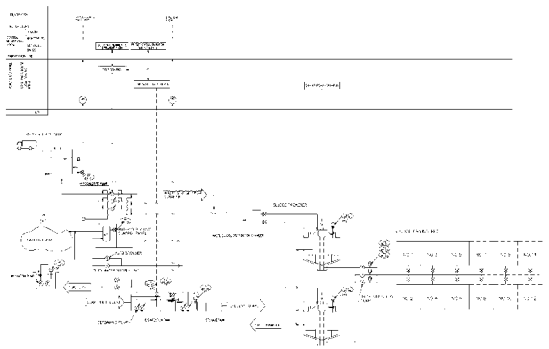
Warning

1. Never attempt to touch any part of electrical switchgear other than switches, pushbuttons, reset buttons and breaker handles
2. Try not to make contact with rotating parts i.e. with loose closing, chains and other jewelry that may get caught in equipment
3. Reports are more effective when witten

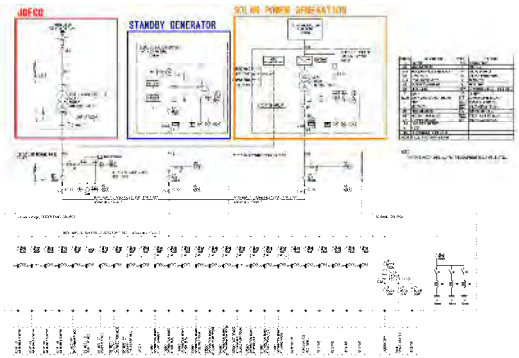
Instrumentation Flow Diagram (1/2) in Jericho WWTP



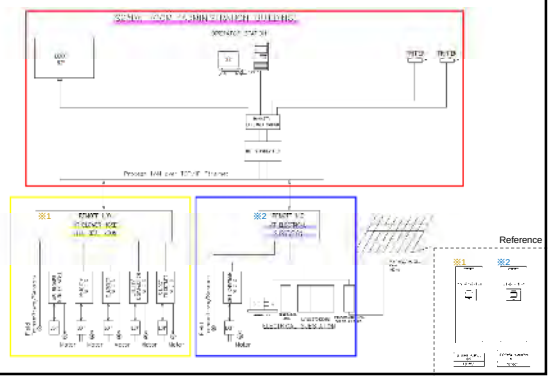
Instrumentation Flow Diagram (2/2) in Jericho WWTP



Single Line Diagram in Jericho WWTP



System Flow Diagram in Jericho WWTP

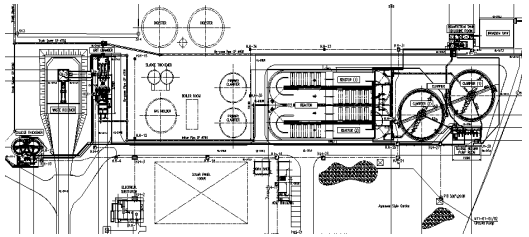


O and M training for Mechanical and Electrical Equipment

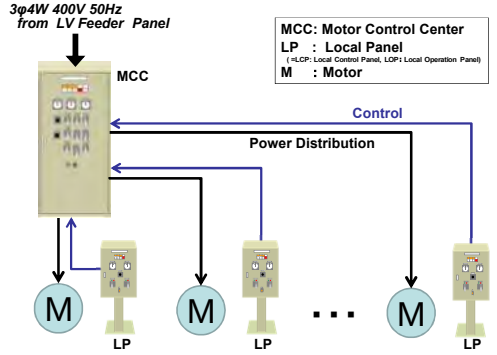
Kasahara_Mechanical Engineer
Hasebe_Electrical Engineer
JICA Expert Team (NJS Consultants)

What is a purpose of Electrical equipment?

- Provide power to loads
- Safe and easy control
- Monitoring

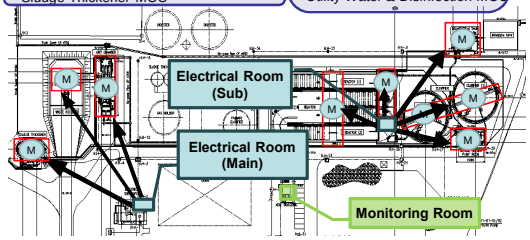


How to Control ??



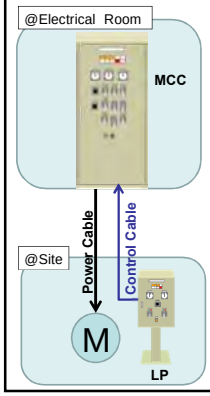
Where are they ??

- Electrical Room (Main) –
  - JDECO/DG Set Incoming Panel
  - PV System Incoming Panel (PV: Photo Voltaic)
  - LV Feeder Panel (LV: Low Voltage)
  - SC Panel (SC: Static Capacitor)
  - Power Conditioner
  - Grit Chamber MCC01,02
  - Sludge Thickener MCC
- Electrical Room (Sub) –
  - No.1 Air Blower Control Panel
  - No.2 Air Blower Control Panel
  - No.3 Air Blower Control Panel
  - No.4 Air Blower Control Panel
  - Biological Reactor MCC01,02
  - Clarifier MCC01,02
  - Utility Water & Disinfection MCC



~ General Operation Rule ~

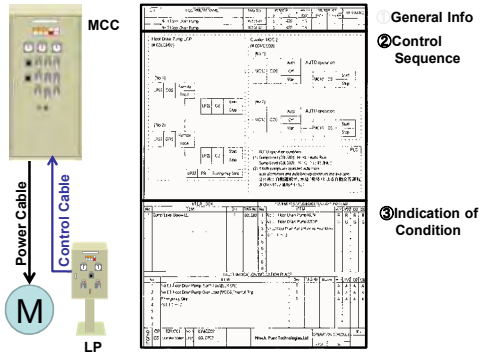
for Jericho STP



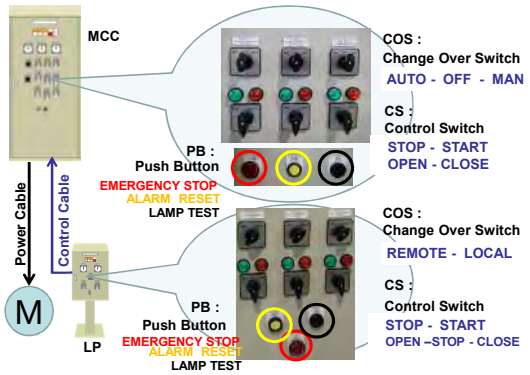
- You can control equipment (motor) from….
  1.MCC or 2. LP
  ※SCADA system does not have function to control equipment remotely but for monitor it only.
- Normally, equipment should be operated automatically in auto mode.
- In case of maintenance or commissioning, manual mode will be applied.
- As a general rule of control sequence,
  Local operation shall be always given the first priority.
  → for an operator's safety

Put a 'Caution' sign on MCC at Electrical Room when you work with LP at the Site.

How to Read "Functional Operating Diagram"

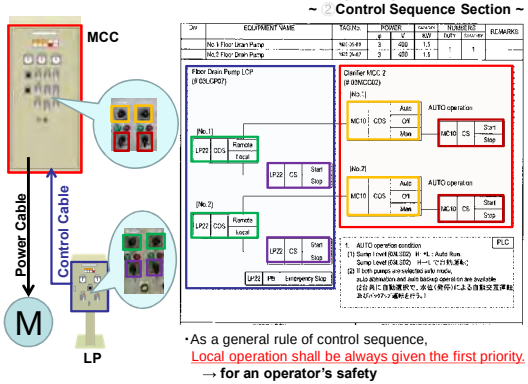


'Control' Parts Introduction



How to Read "Functional Operating Diagram"

~ Control Sequence Section ~



・As a general rule of control sequence,
Local operation shall be always given the first priority.
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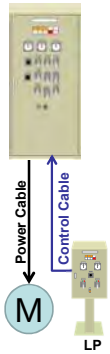
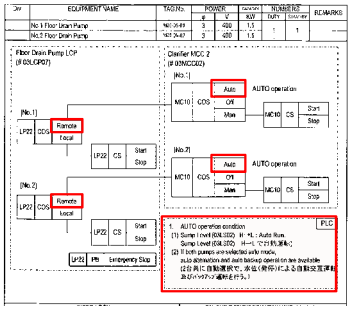
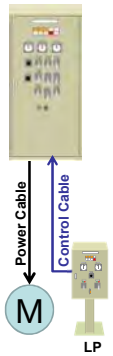
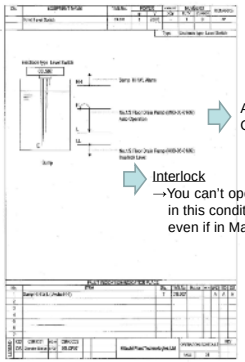


・Normally, equipment should be operated automatically in auto mode.



How to Read "Functional Operating Diagram"

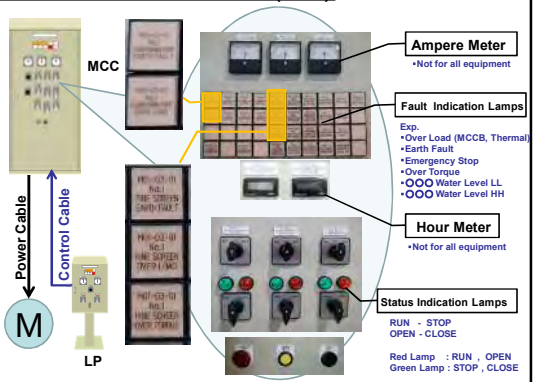




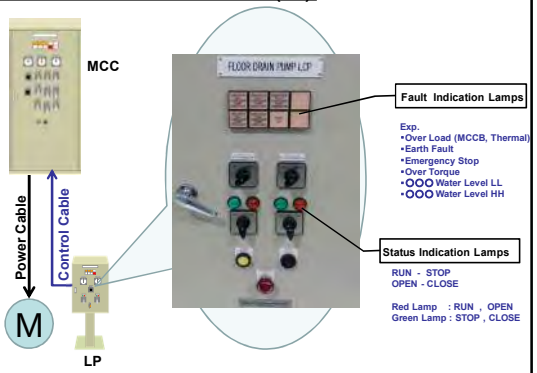
Auto Mode Operation

Interlock
→You can't operate it in this condition even if in Manual Mode

'Indication' Parts Introduction (MCC)

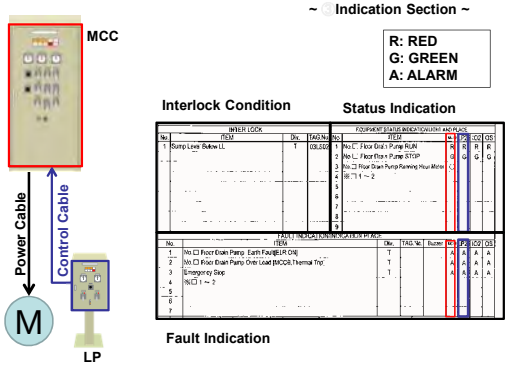


'Indication' Parts Introduction (LP)



How to Read “Functional Operating Diagram”

~ Indication Section ~

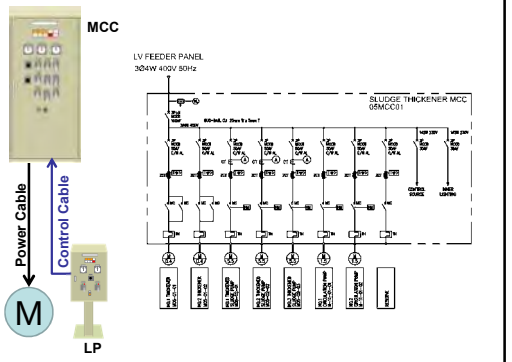


Let’s Practice!

Please try to draw
Functional Operation Diagram
on your note book

Exp. Floor Drain Pump

Next Session - Single Line Diagram -



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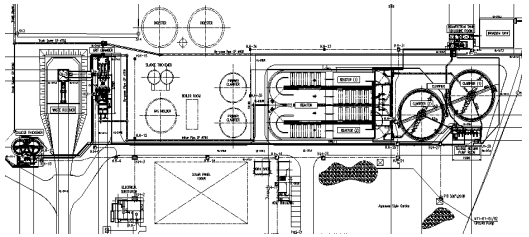
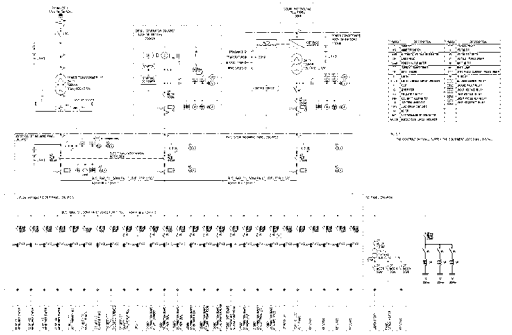
- Provide power to loads **Safely and Efficiently**
- Safe and easy control
- Monitoring



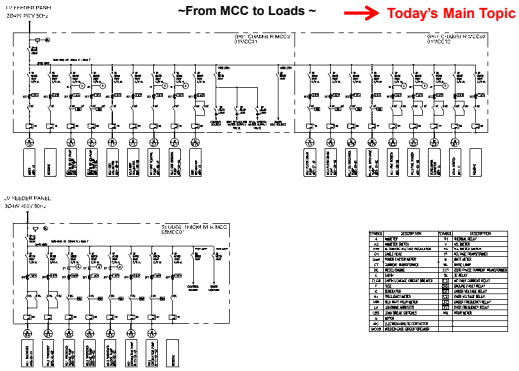
Single Line Diagram in Jericho WWTP

~From Power Source to Receiving/Feeder Panel ~



Single Line Diagram in Jericho WWTP

~From MCC to Loads ~ → **Today's Main Topic**

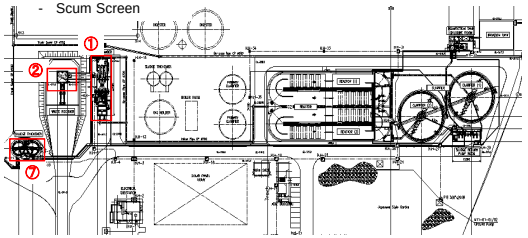


Locations of the loads

① Grit Chamber
- Fine Screen
- Screening Conveyor
- Grit Collector
- Grit Removal Pump
- Floor Drain Pump
- Grit Separator
- Oil Discharge Pump
- Scum Screen

② Tankered Receiving Tank
- Wastewater Pump for Vacuum
- Mixer

⑦ Sludge Thickener
- Thickener
- Thickened Sludge Pump



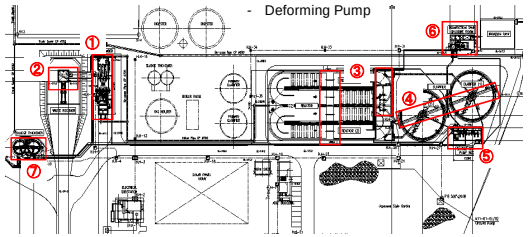
Locations of the loads

③ Reactor
- Reactor Tank Mixer
- Aeration Blower
- Air Supply Valve

④ Clarifier
- Clarifier

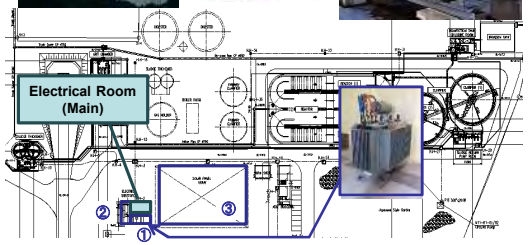
⑤ Pump Station
- Return Sludge Pump
- Waste Sludge Pump
- Floor Drain Pump
- Scum Pump

⑥ Disinfection Facilities
- Hypochlorite Pump
- Utility Water Supply Unit
- Auto Strainer
- Deforming Pump



Locations of the Power Source

① JDECO Power Supply ② Standby Diesel Generator ③Solar Photovoltaic System



Function of Electrical Panels

All motored equipment (Loads) need power to be driven anyway.

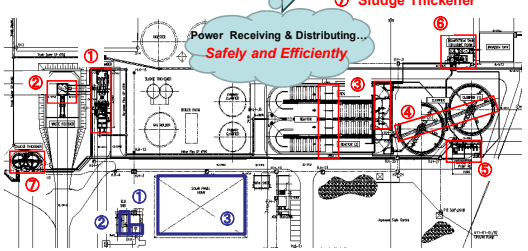
Power Source

① JDECO Power Supply
② Standby Diesel Generator
③ Solar Photovoltaic System

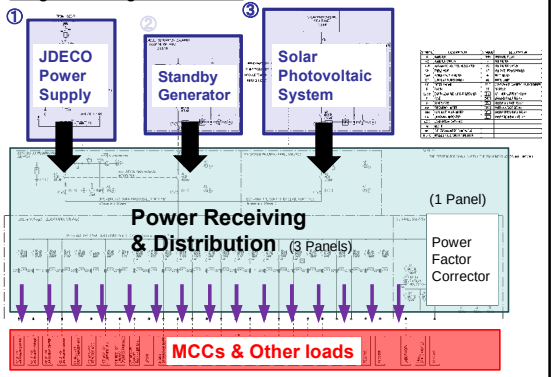
Electrical Panels & Cables

Loads

① Grit Chamber
② Tankered Receiving Tank
③ Reactor
④ Clarifier
⑤ Pump Station
⑥ Disinfection Facilities
⑦ Sludge Thickener



Single Line Diagram Overview



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Where are they ??

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・PV System Incoming Panel (PV: Photo Voltaic)
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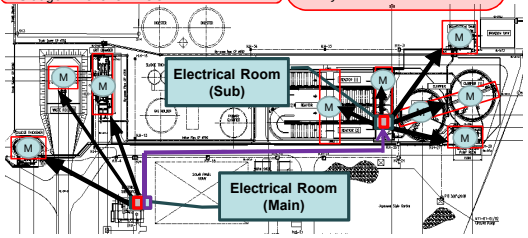
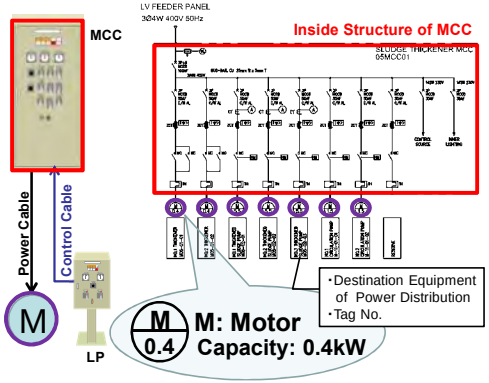
・Clarifier MCC01,02
・Utility Water & Disinfection MCC

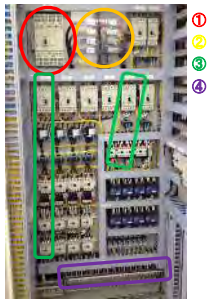


Introduction of Single Line Diagram - MCC -

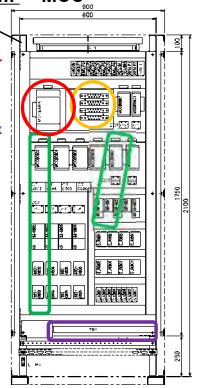


Introduction of Single Line Diagram - MCC -

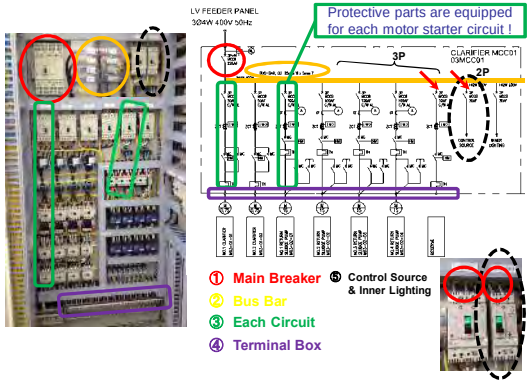
Shop Drawing



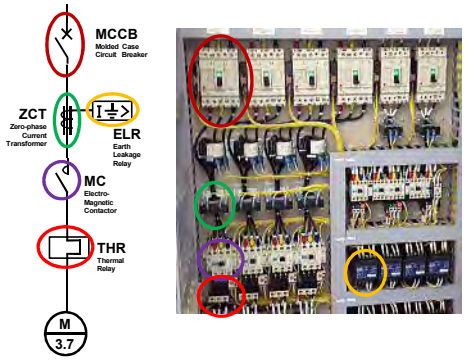
① Main Breaker
② Bus Bar
③ Each Circuit
④ Terminal Box



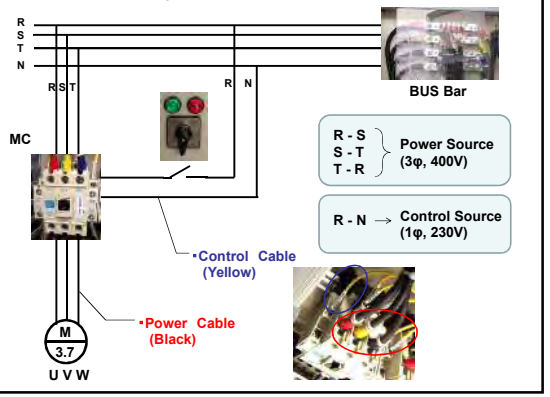
Introduction of Single Line Diagram - MCC -



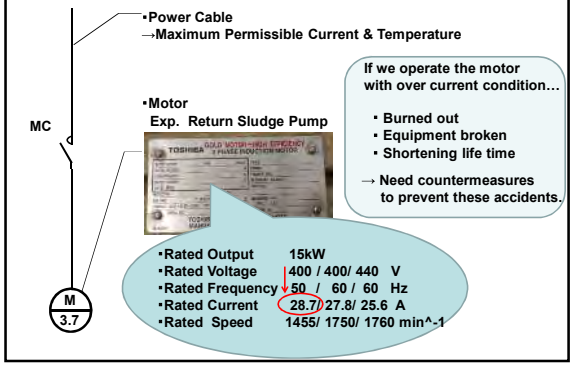
Introduction of Protective Parts for General Circuit



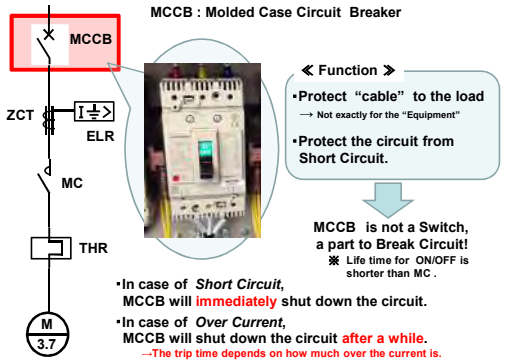
What are needed to operate(ON/OFF) a motor?



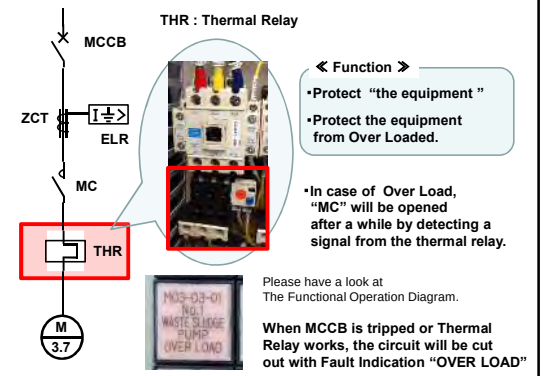
Why & What parts we need to protect ?



How to protect? - MCCB-

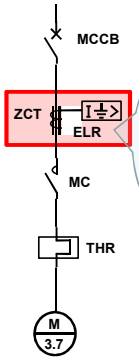


How to protect? - THR-



How to protect? - ZCT, ELR-

ZCT : Zero-phase Current Transformer
ELR : Earth Leakage Relay



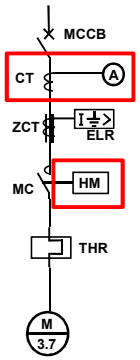
≪ Function ≫

- Protect "the circuit", "equipment" and "Human" from leakage.
- Earth Leakage informs us the possibility of a major trouble in advance.
- In case of Earth Leakage, "MC" will be opened after a while by detecting a signal from the ELR.

Please have a look at
The Functional Operation Diagram.

When ELR detects the electrical leakage, Fault Indication "EARTH LEAKAGE" will be shown at LP, MCC and SCADA.

Additional Parts for operation management - Ampere Meter, Hour Meter-



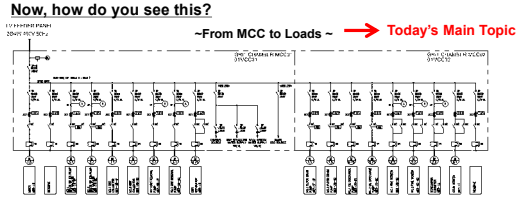
CT :
Current Transformer

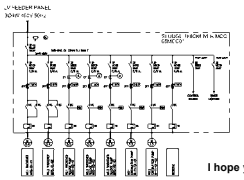
Ⓐ : Ampere Meter

HM : Hour Meter

Now, how do you see this?

~From MCC to Loads ~ → Today's Main Topic





I hope you feel more familiar to this SLD than the beginning !

Let's Practice!

Please try to draw
Single Line Diagram for Motor Circuits
on your note book

Exp. Floor Drain Pump & Others

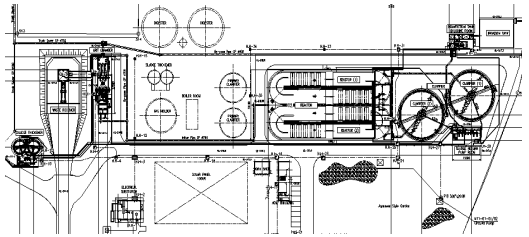
Please retry to draw
Functional Operation Diagram as well
and See the relationship

O and M training for Mechanical and Electrical Equipment

Kasahara_Mechanical Engineer
Hasebe_Electrical Engineer
JICA Expert Team (NJS Consultants)

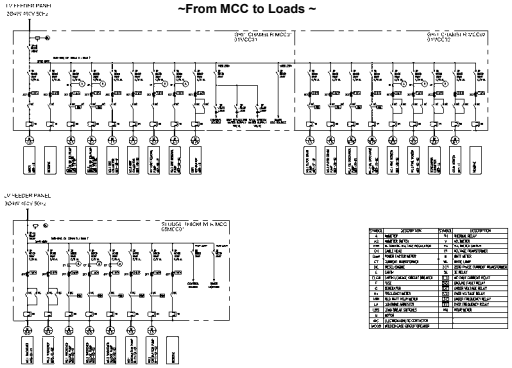
What is a purpose of Electrical equipment?

- Provide power to loads **Safely and Efficiently**
- Safe and easy control
- Monitoring



Single Line Diagram in Jericho WWTP

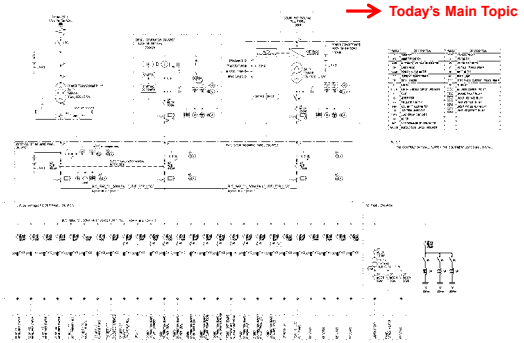
~From MCC to Loads ~



Single Line Diagram in Jericho WWTP

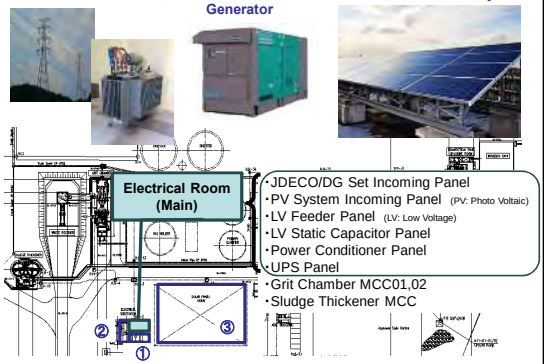
~From Power Source to Incoming/Feeder Panel ~

Today's Main Topic



Locations of the Main Panels

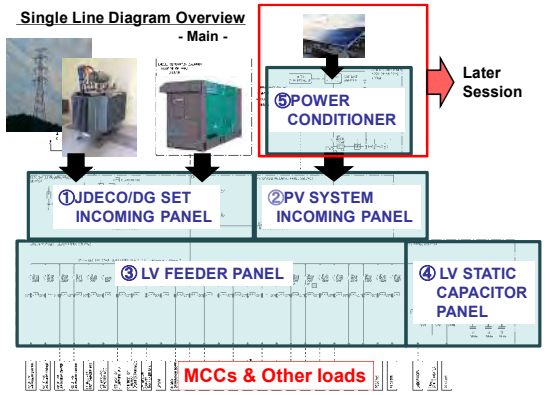
① JDECO Power Supply ② Standby Diesel Generator ③Solar Photovoltaic System



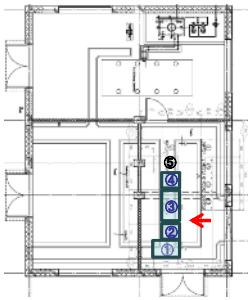
- JDECO/DG Set Incoming Panel
- PV System Incoming Panel (PV: Photo Voltaic)
- LV Feeder Panel (LV: Low Voltage)
- LV Static Capacitor Panel
- Power Conditioner Panel
- UPS Panel
- Grit Chamber MCC01,02
- Sludge Thickener MCC

Single Line Diagram Overview

- Main -



Introduction of the Main Panels



① JDECO / DG SET INCOMING PANEL (09LVP01)

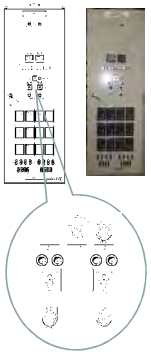
② PV SYSTEM INCOMING PANEL (09LVP02)

③ LV FEEDER PANEL (09LVP03)

④ LV STATIC CAPACITOR PANEL (09LVP04)

⑤ UPS Panel → Later Session

① JDECO / DG SET INCOMING PANEL (09LVP01)

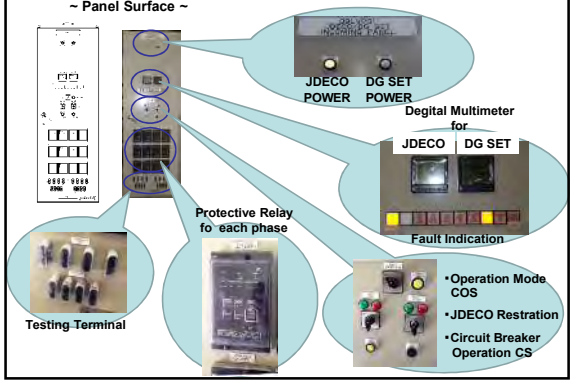


≪ Function ≫

- Receive the main power from *either* JDECO Power *or* Standby Generator and pass it to LV Feeder Panel.
- In case of power failure, **Automatically start to receive the power from Standby Generator Set** instead of JDECO Power.
- Detect various faults of main power to protect the plant from any major troubles.
  - ACB (Air Circuit Breaker)
  - Over Current Relay , Over / Under Voltage Relay
  - Lightning Arrester etc.
- Monitor the conditions of main power and overall plant.
  - Digital Multi-meter, Fault Indication Lamps
- Reverse some surplus power generated by Solar system to the grid.

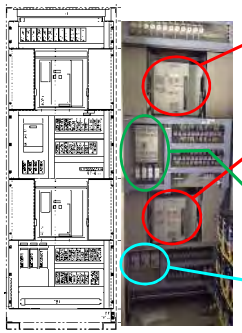
① JDECO / DG SET INCOMING PANEL (09LVP01)

~ Panel Surface ~



① JDECO / DG SET INCOMING PANEL (09LVP01)

~ Panel Inside ~



- ACB1 (Air Circuit Breaker) for JDECO Power
  - Over Current Relay ×3 phases,
  - Over Voltage Relay × 1 (R-S)
  - Under Voltage Relay × 1 (R-S)

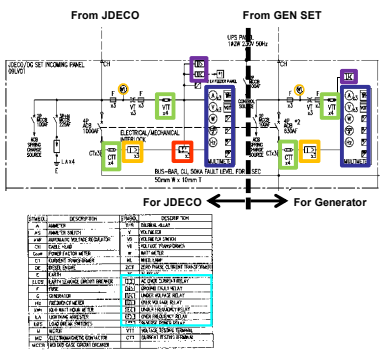
  →ACB1 TRIP
- ACB2 (Air Circuit Breaker) for Standby Generator Set
  - Over Current Relay ×3 phases,
  - Under Voltage Relay × 1 (R-S)

  →ACB2 TRIP
- Lightning Arrester Feeder
- MCCB for
  - ACB1 (JDECO) Spring Charge Source
  - ACB2 (GEN.) Spring Charge Source
  - Control Source from UPS

① JDECO / DG SET INCOMING PANEL (09LVP01)

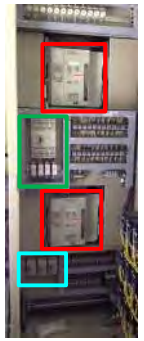
~ Single Line Diagram (Panel Surface)~

Panel Surface

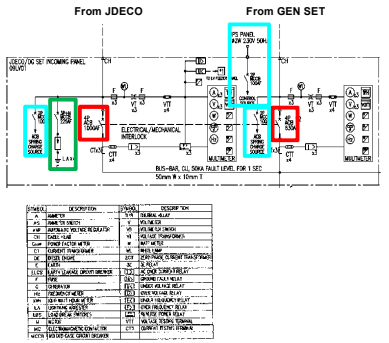


① JDECO / DG SET INCOMING PANEL (09LVP01)

~ Single Line Diagram (Panel Inside)~

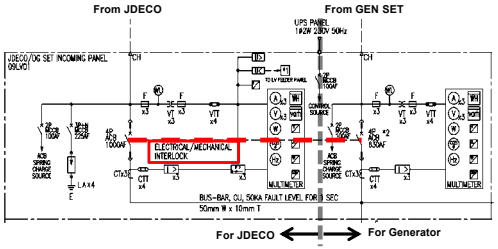


Panel Inside



① JDECO / DG SET INCOMING PANEL (09LVP01)

~ Necessary Function for the Operation~



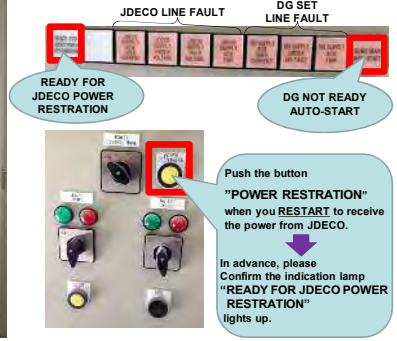
●ACB1 and ACB2 cannot be set "ON" at the same time.
→ Mechanical & Electrical Interlock equipped between the ACBs

●In case of power failure of JDECO, ACB2 will be automatically turned on after ACB1 is turned off in AUTO MODE.

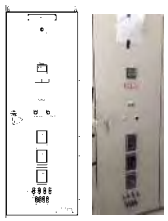
① JDECO / DG SET INCOMING PANEL (09LVP01)

~ Necessary Function for the Operation~

Panel Surface



② PV SYSTEM INCOMING PANEL (09LVP02)

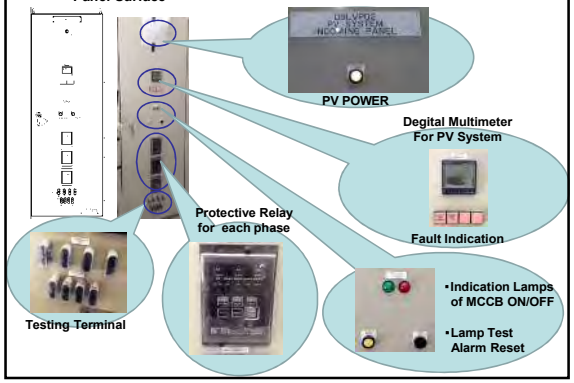


≪ Function ≫

- Receive the power from Power Conditioner Panel and pass it to LV Feeder Panel.
- In case of power failure, **Automatically STOP to receive the power from Power Conditioner Panel .**
  →The Solar System cannot be operated together with the Standby Generator.
- Detect various faults of main power to protect the plant from any major troubles.
  - MCCB
  - Over Current Relay
- Monitor the conditions of the Solar power supply.
  - Digital Multi-meter, - Fault Indication Lamps

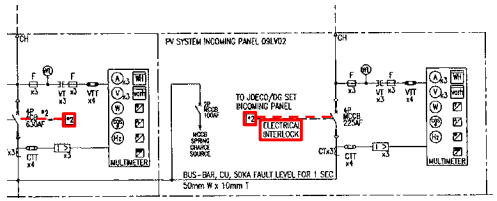
② PV SYSTEM INCOMING PANEL (09LVP02)

~ Panel Surface ~



② PV SYSTEM INCOMING PANEL (09LVP02)

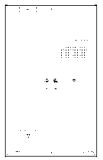
~ Necessary Function for the Operation~



●Solar system cannot be operated with Standby Generator.
The MCCB for Solar can be set "ON" only when JDECO Power is available.

→ Electrical Interlock between MCCB for Solar and ACB2 for GEN.

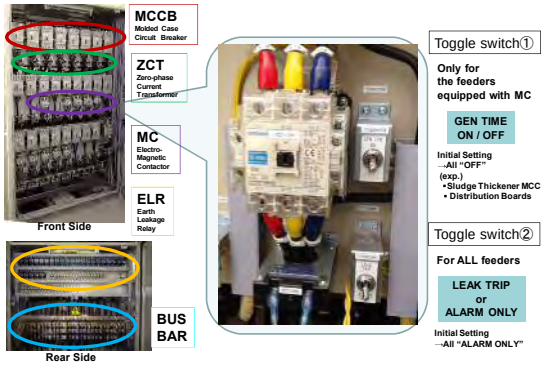
③ LV Feeder Panel (09LVP03)



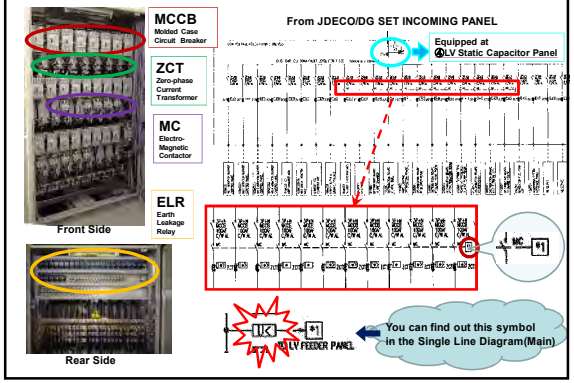
≪ Function ≫

- Receive the main power from JDECO/ DG SET INCOMING PANEL and distribute it to MCCs and Distribution Board.
- Detect various faults of each feeder to protect the facilities from any troubles.
  - MCCB
  - ELR (Earth Leakage Relay) →You can select the mode MCCB Trip or Only Alarm
- In case of Standby Generator's operation, the LV Feeder Panel will distribute the power **only to necessary feeders for treatment process.**
  →Not to supply the power to unnecessary loads such as Sludge Thickener MCC, Distribution Boards for building, etc.

③ LV Feeder Panel (09LVP03) ~ Panel Inside ~



③ LV Feeder Panel (09LVP03) ~ Noted Function for the Operation~



④ LV Static Capacitor Panel (09LVP04)

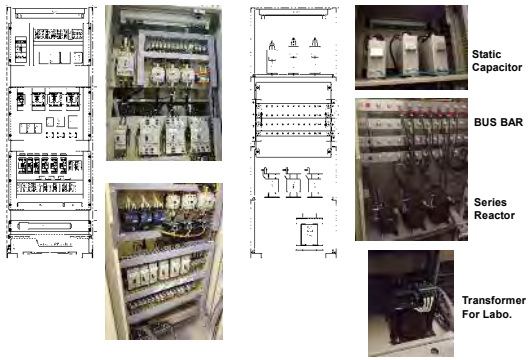
≪ Function ≫

- Correct the Power Factor of whole plant automatically in order to make the plant operation efficient.
  - APFC (Auto Power Factor Controller)
  - SC (Static Capacitor) 30kVar, 30kVar, 20kVar
  - SR (Series Reactor)

→APFC will automatically control a MC (ON/OFF) of each SC feeder to keep the power factor more than 0.95.

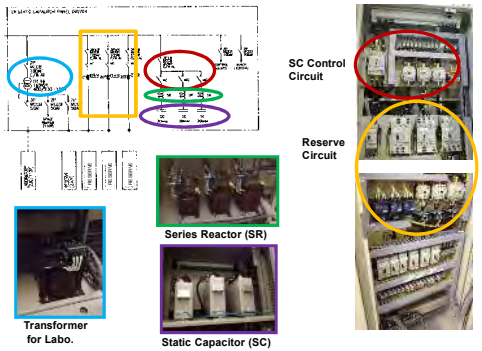
- Distribute the lower voltage (230V/110V) to Laboratory for the Laboratory equipment.

④ LV Static Capacitor Panel (09LVP04) ~ Panel Inside ~



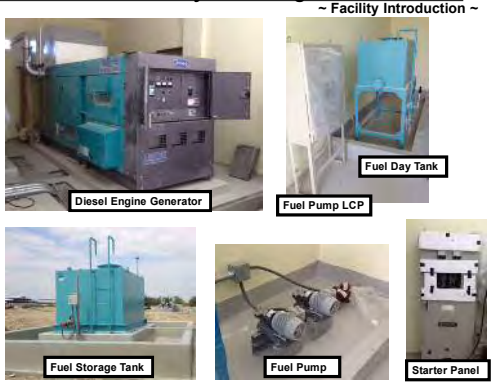
④ LV Static Capacitor Panel (09LVP04)

~ Single Line Diagram (Panel Inside)~



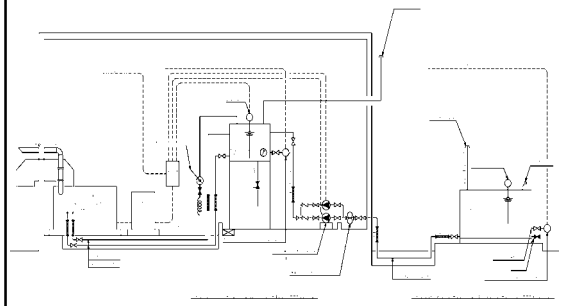
Introduction of Standby Diesel Engine Generator Set

~ Facility Introduction ~



Introduction of Standby Diesel Engine Generator Set

~ Fuel Flow Diagram~



Introduction of Standby Diesel Engine Generator Set

~ Parts Introduction ~






Let's Practice!

Please try to draw
Overall Electrical Flow Diagram and Location Map
on your note book

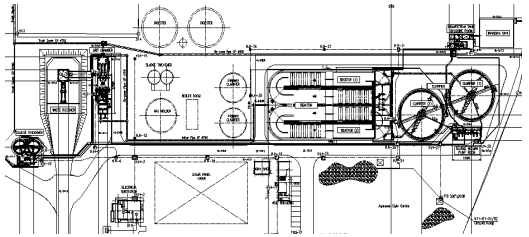
It would help you to have clearer image
about the Electrical system of your plant!

O and M training for Mechanical and Electrical Equipment

Hasebe_Electrical Engineer
JICA Expert Team (NJS Consultants)

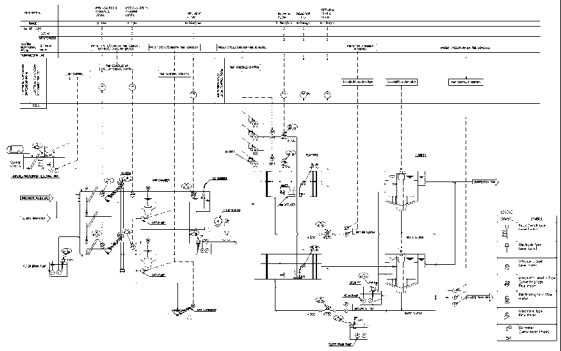
What is a purpose of Electrical equipment?

- Provide power to loads
- Safe and easy control
- Monitoring



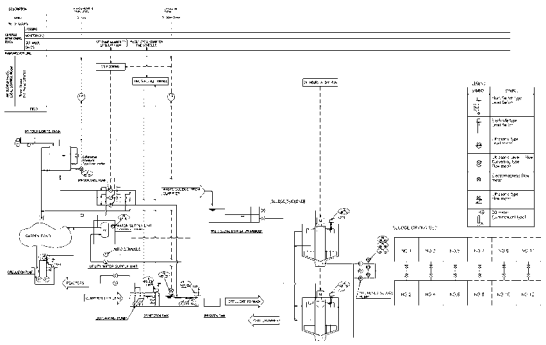
Instrumentation Flow Diagram in Jericho WWTP

~From Grit Chamber to Clarifier ~



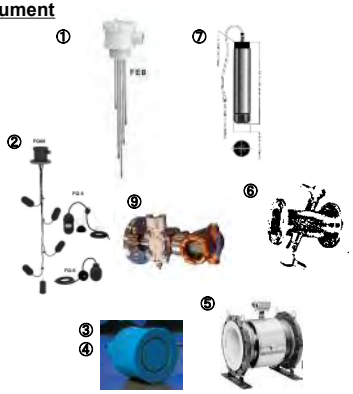
Instrumentation Flow Diagram in Jericho WWTP

~From Disinfection to Sludge Thickener ~

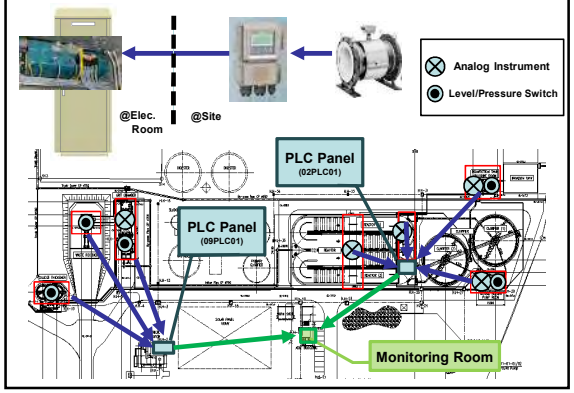


Introduction of Instrument

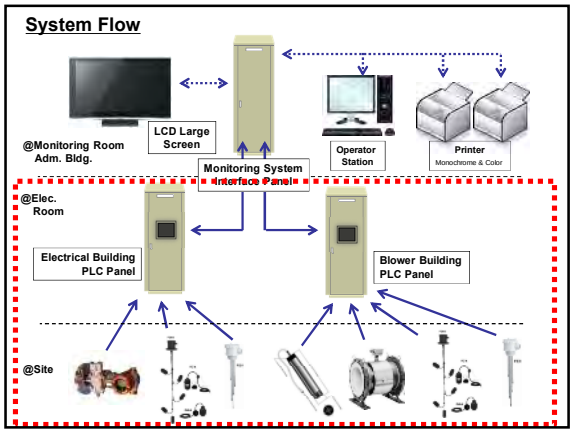
	SYMBOL	SYMBOL	
①		Float Switch type Level Switch	LS
②		Electrode type Level Switch	LS
③		Ultrasonic type Level meter	LE
④		Ultrasonic Level – Flow Converting type Flow meter	FE
⑤		Electromagnetic Flow meter	FE
⑥		Ultrasonic type Flow meter	FE
⑦		DO meter (Luminescent type)	AE
⑧	PS	Pressure Switch	PS
⑨		Differential Pressure Level Meter	LE



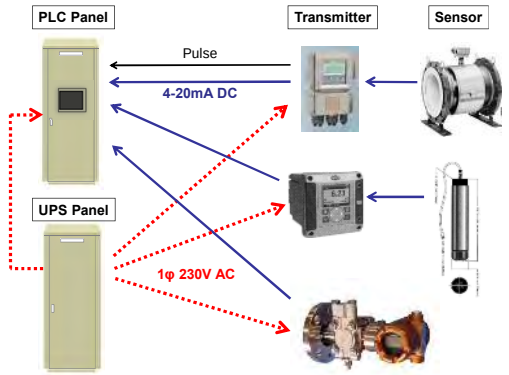
Overview



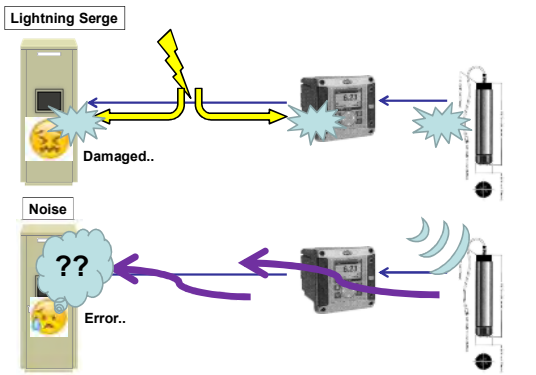
System Flow



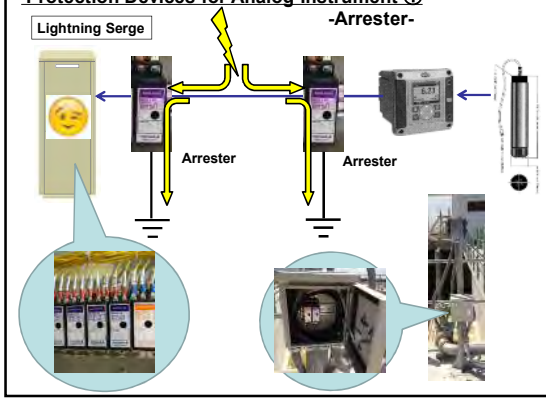
Signal / Power Flow of Analog Instrument



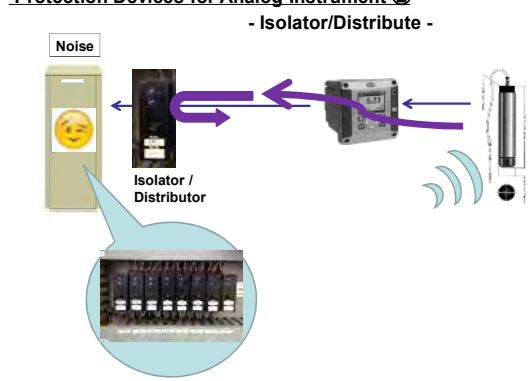
Protection Devices for Analog Instrument



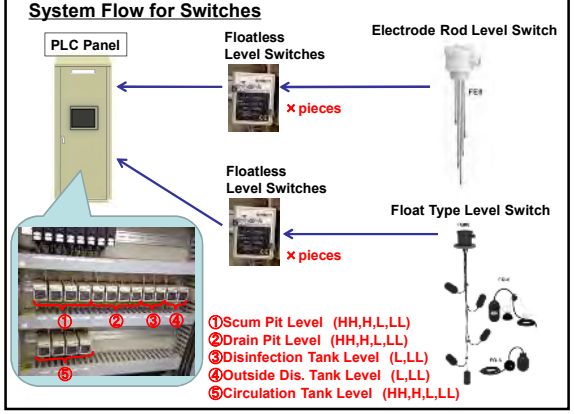
Protection Devices for Analog Instrument ①



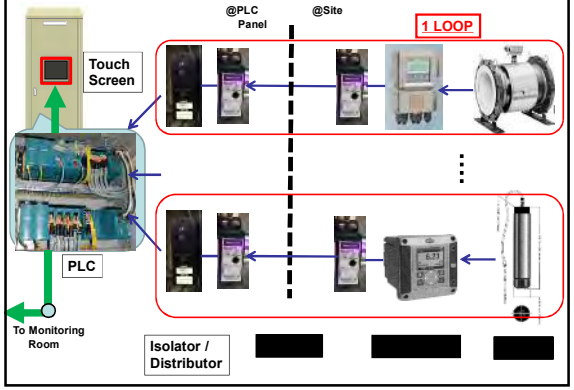
Protection Devices for Analog Instrument ②



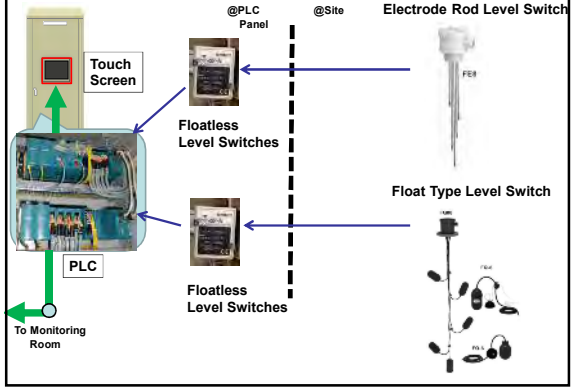
System Flow for Switches



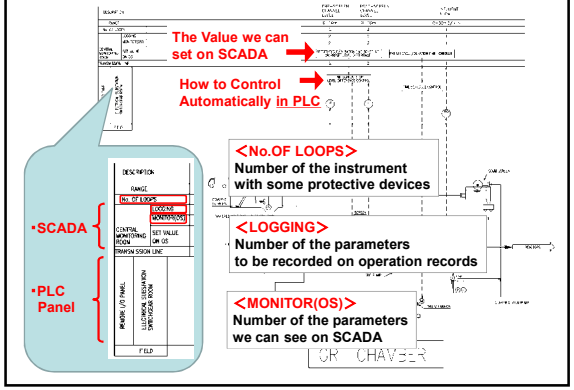
Review for the System Flow of Analog Instrument



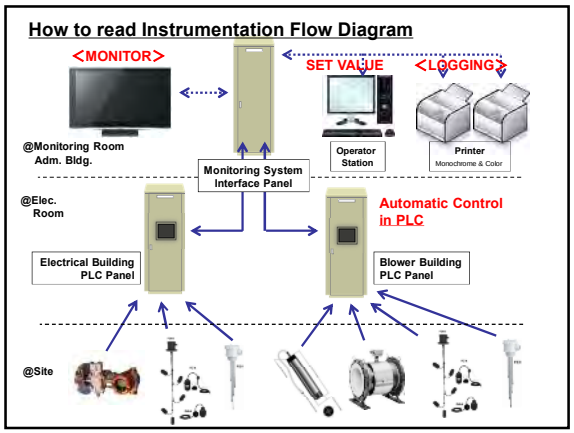
Review for the System Flow of Switches

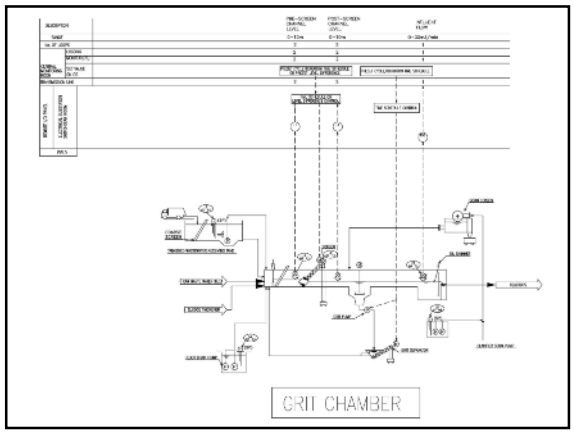


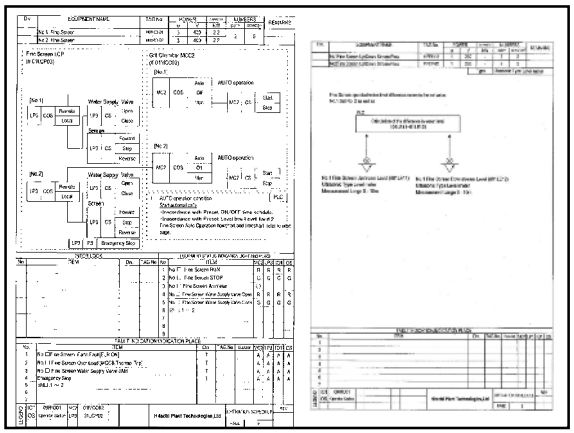
How to read Instrumentation Flow Diagram

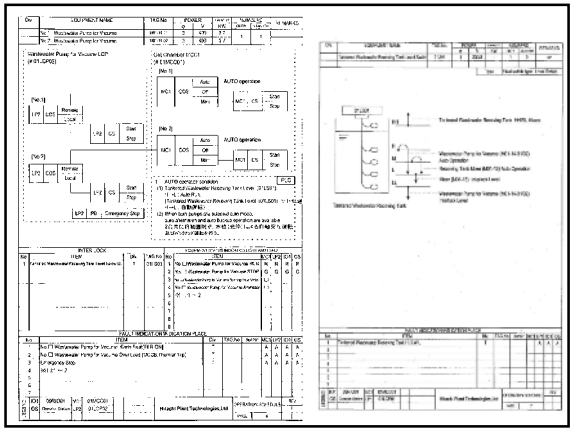


How to read Instrumentation Flow Diagram









Let's Practice!

Let's try to write down
Name & Type of Instrumentation Equipment
on a practice sheet

Locations of the loads

① Grit Chamber

Analog
- No.1,2 Fine Screen Upstream Level Meter
- No.1,2 Fine Screen Downstream Level Meter
- Influent Flow Meter

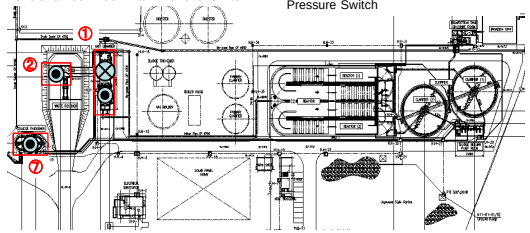
Switch
- Oil Discharge Pit Level Switch
- Grit Chamber Floor Drain Pit Level Switch

② Tanker Receiving Tank

Switch
- Receiving Tank Level Switch

⑦ Sludge Thickener

Switch
- No.1,2 Sludge Thickener Level Switch
- No.1,2,3 Thickened Sludge Pipe Pressure Switch



Locations of the loads

③ Reactor

Analog
- No.1,2 Air Blower Flow Meter
- No.1,2 DO Meter

④ Pump Station

Analog
- No.1,2 Return Sludge Flow Meter

Switch
- Scum Pit Level Switch
- Floor Drain Pit Level Switch

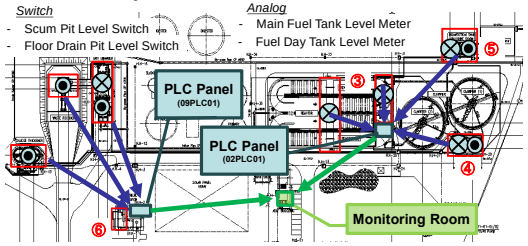
⑤ Disinfection Facilities

Analog
- Hypochlorite Tank Level Meter
- Effluent Flow Meter

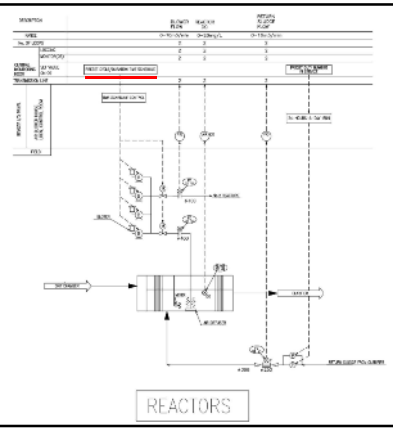
Switch
- Disinfection Tank Level Switch
- Outlet Side of Disinfection Tank Level Switch

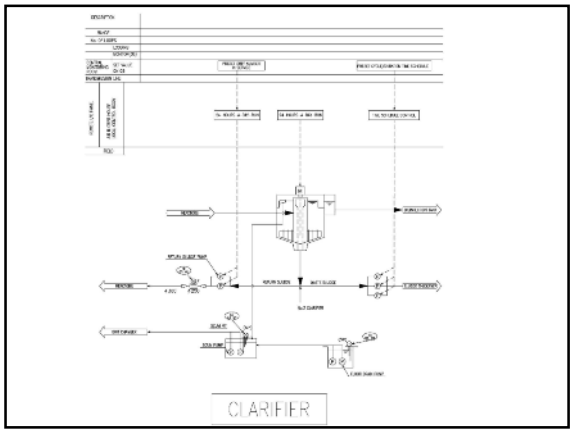
⑥ Standby Generator Set

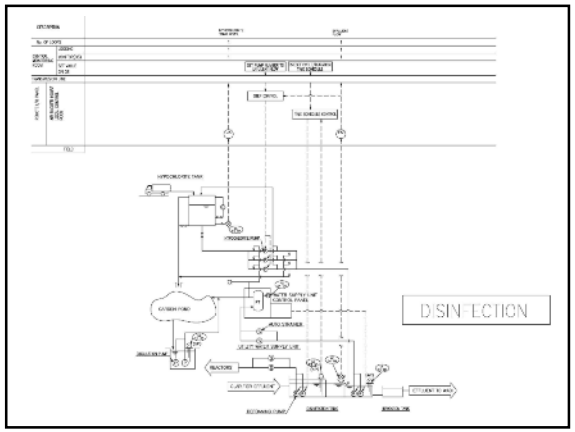
Analog
- Main Fuel Tank Level Meter
- Fuel Day Tank Level Meter

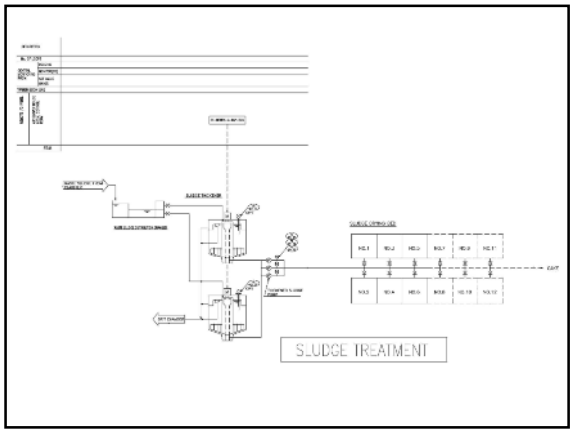


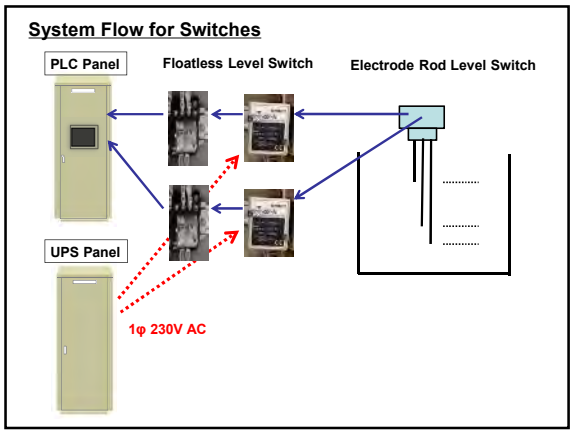
Let's check what we learnt at the site!!




CLARIFIER

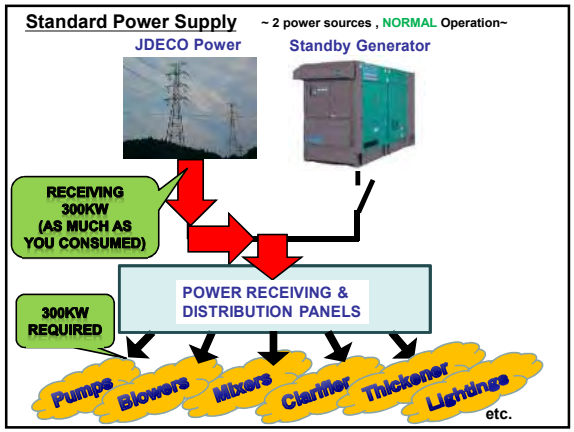

DISINFECTION

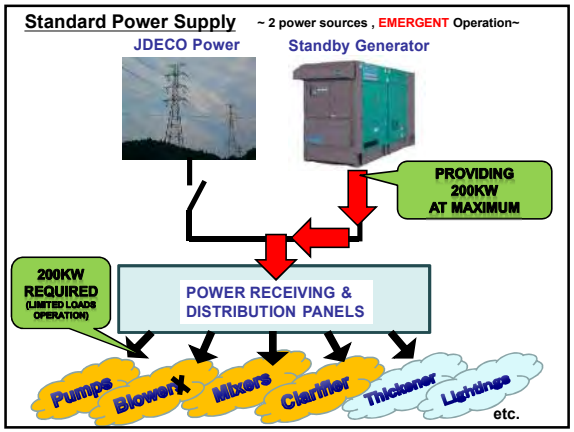

SLUDGE TREATMENT

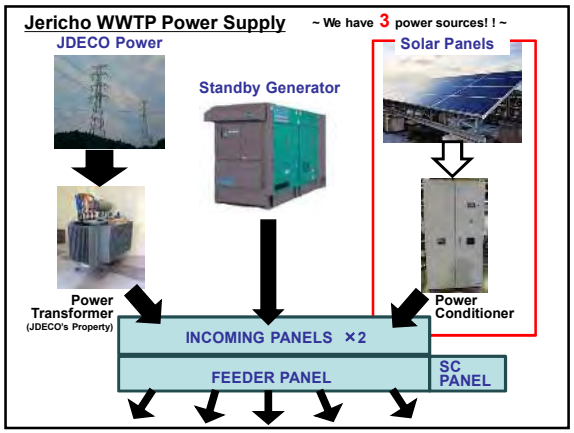

System Flow for Switches
PLC Panel
Floatless Level Switch
Electrode Rod Level Switch
UPS Panel
1φ 230V AC

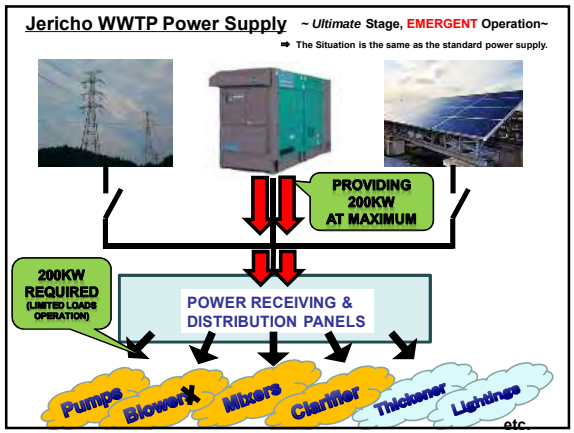
O and M training for Mechanical and Electrical Equipment

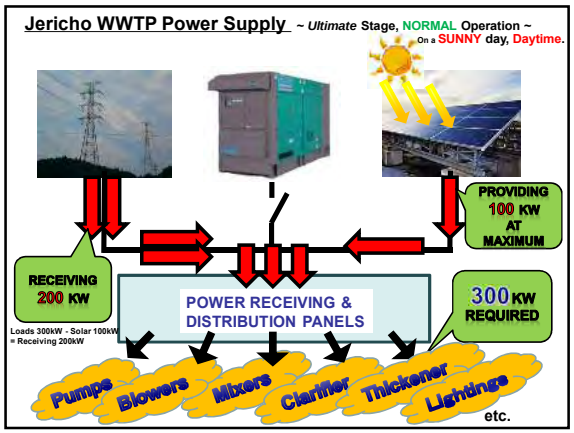
Akira Hasebe_Electrical Engineer
JICA Expert Team (NJS Consultants)

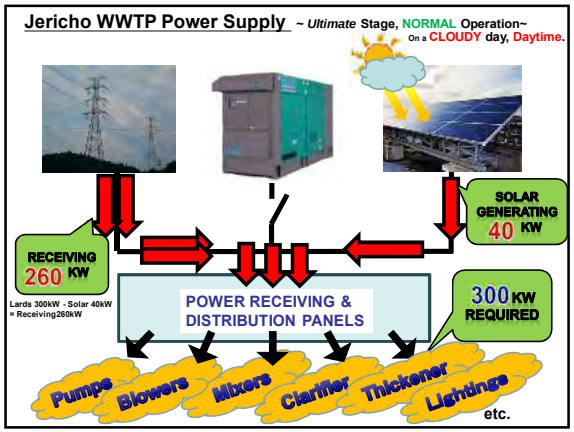


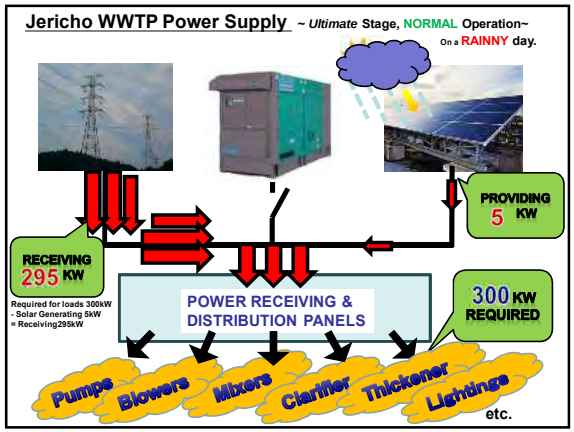


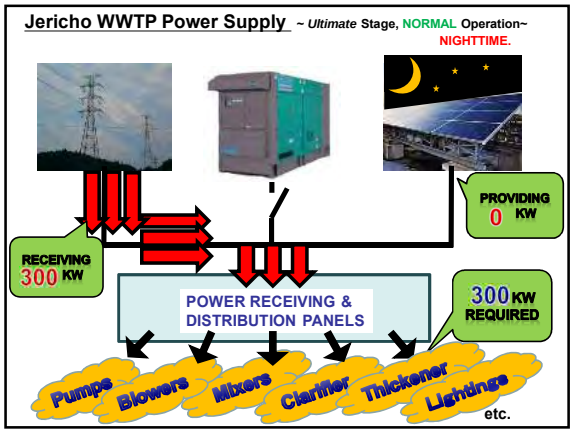


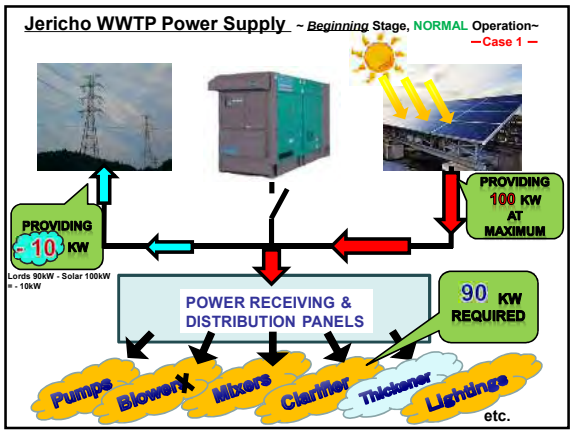


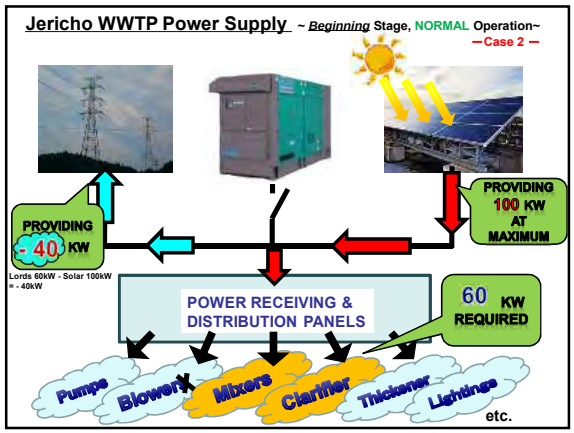












What is “kWh” ??

kWh = kW × hour
Wh = W × hour

Example.

If you use a lighting with『40W』for 8 hours…

40W × 8 hours ＝ 320Wh

If you use a pump with『15kW』for 30 minutes …

15kW × 30min/60min ＝ 7.5kWh

※1hour = 60min

If you use a pump with『15kW』for 2 hours in a day…

15kW × 2 hours/day ＝ 30kWh/d

What is “kWh” for a day??

~ Case Study, Just for Reference ~

①AM0:00 ~ AM6:00	60kW
②AM6:00 ~ PM0:00	- 10kW (Case 1)
③PM0:00 ~ AM3:00	- 40kW (Case 2)
④PM3:00 ~ PM6:00	- 10kW (Case 1)
⑤PM6:00 ~ AM0:00	60kW

① 60kW × 6 hours = 360kWh
②- 10kW × 3 hours = - 30kWh
③- 40kW × 3 hours = - 120kWh
④- 10kW × 3 hours = - 30kWh
⑤ 60kW × 6 hours = 360kWh

Total 540kWh

Without Solar…
60kW × 24 hours = 1440kWh

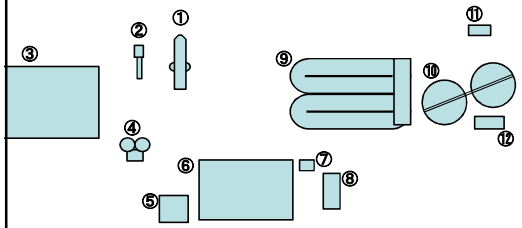
As a result…
1440kWh – 540kWh = 900kWh

Power Cut !!

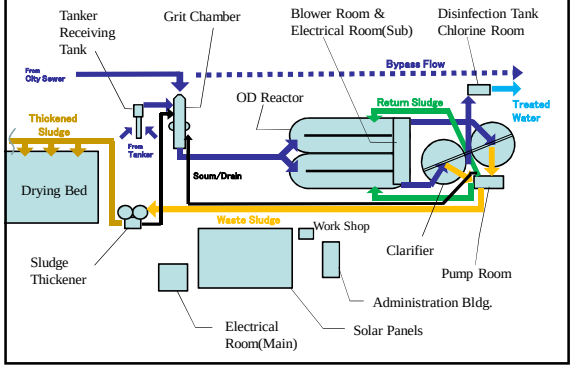
O and M training for Mechanical and Electrical Equipment
- Trial -

Kasahara_Mechanical Engineer
Hasebe_Electrical Engineer
JICA Expert Team (NJS Consultants)

WWTP Layout ~Trial Sheet~



Treatment Process Water Flow



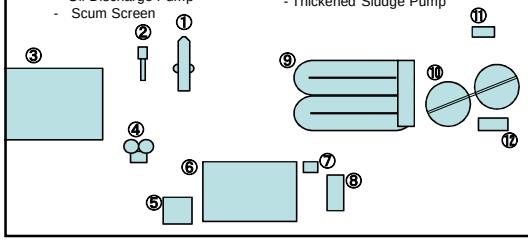
WWTP Layout

① Grit Chamber
- Coarse Screen
- Fine Screen
- Screening Conveyor
- Grit Collector
- Grit Removal Pump
- Floor Drain Pump
- Grit Separator
- Oil Discharge Pump
- Scum Screen

② Tankered Receiving Tank
- Wastewater Pump for Vacuum
- Mixer

③ Drying Bed

④ Sludge Thickener
- Thickener
- Thickened Sludge Pump



WWTP Layout

⑤ Electrical Substation

⑥ Solar Panel

⑦ Work Shop

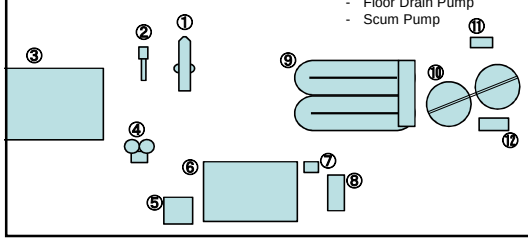
⑧ Administration Building

⑨ Reactor
- Reactor Tank Mixer
- Aeration Blower
- Air Supply Valve

⑩ Clarifier
- Clarifier

⑪ Disinfection Facilities
- Hypochlorite Pump
- Hypochlorite Tank
- Utility Water Supply Unit
- Auto Strainer
- Deforming Pump

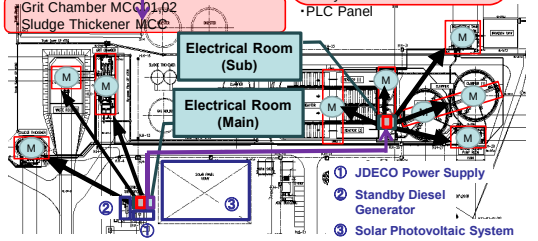
⑫ Pump Station
- Return Sludge Pump
- Waste Sludge Pump
- Floor Drain Pump
- Scum Pump



WWTP Electrical Flow

– Electrical Room (Main) –
- JDECO/DG Set Incoming Panel
- PV System Incoming Panel (PV: Photo Voltaic)
- LV Feeder Panel (LV: Low Voltage)
- SC Panel (SC: Static Capacitor)
- UPS Panel
- Power Conditioner
- PLC Panel
- Grit Chamber MCC01,02
- Sludge Thickener MCC

– Electrical Room (Sub) –
- No.1 Air Blower Control Panel
- No.2 Air Blower Control Panel
- No.3 Air Blower Control Panel
- No.4 Air Blower Control Panel
- Biological Reactor MCC01,02
- Clarifier MCC01,02
- Utility Water & Disinfection MCC
- PLC Panel



A 2-11-1: Sample of the Daily Record of Equipment

Jericho Wastewater Treatment Plant

Daily WWTP Operation Record

Approved by (Plant manager)	
Checked by (Engineer)	
Prepared by (Operator)	ibrahim jelly (Mr. Ibrahim)

Date : 19/10/18 (   )

Weather Conditions			
Weather	Fine Sunny · Sunny · A little Cloud · Cloudy · Rainy · Stormy · Sandy (Cloudy circled)		
Ambient temperature (11 :00)	33°		°C
Rainfall	: — :		mm
Electricity (Observed Time: 11 :10)			
	Accumulated	**Daily**	
JDECO Power Consumption	214519		kWh
Surplus Power to Grid	113638		kWh
Solar Power Generation	249346		kWh
Load Power Consumption			kWh
Power Factor	---	99	%

Operation Time (MCC Time Counter)		
Facility	**Machine**	**Hours**
Blower	No.1 Blower	318.7
	No.2 Blower	345.2
	No.3 Blower	92.2
	No.4 Blower	99.3
Retuen Sludge Pump	No.1 Retuen Sludge Pump	1661.5
	No.2 Retuen Sludge Pump	1634.8
Mixer(No.1 Reactor)	No.	—
	No.	—
Waste Sludge Pump	No.	—
Thicked Sludge Pump	No.	—

Wastewater Treatment		
Inflow amount	85469	m^3
Effluent amount	67839	m^3
Tanker Receiving amount		m^3
Return sludge amount (No.1)	On: 12:00 Off: 7:00	m^3
Return sludge rate	55	%
Aeration amount (No.1)		m^3

Container/Bag condition	
(1) Tanker Recieving	Clean · Quarter · Half · Nearly Full · Full (Clean circled)
(2) Screenings	Clean · Quarter · Half · Nearly Full · Full (Clean circled)
(3) Grit	Clean · Quarter · Half · Nearly Full · Full (Clean circled)
(4) Scum	Clean · Quarter · Half · Nearly Full · Full (Clean circled)
Disposal:	

Daily Maintenance Operation		Check
Coarse Screen at RT	Removal of screenings by rake	✓
Coarse Screen at GC	Removal of screenings by rake	✓
Fine Screen No.1	Clogging check of wash nozzle	✓
	Removal of screenings by tap water	✓
Fine Screen No.2	Clogging check of wash nozzle	✓
	Removal of screenings by tap water	✓
Grit Separator	Clogging check of utility water	✓
Scum Screen	Clogging check of utility water	✓
Grit Removal Pump No.1	Wash out grit collector pit	✓
	Wash out suction pipe	✓
Grit Removal Pump No.2	Wash out grit collector pit	✓
	Wash out suction pipe	✓
OD Mixer 2-1	Start (10 :50) Maintenanse Operation (MO) (15min)	✓
OD Mixer 2-2		✓
OD Mixer 2-3		✓
OD Mixer 2-4		✓
No.2 OD Diffuser No. 4	Start(10:50) MO (15min)	✓

Reactor Condition/Wastewater Quality (10 :50)			
Reactor Condition	(1) Water temp.	29	°C
	(2) SV30	180	%
	(3) SVI		mL
	(4) DO(Setting)	0 - 02	mg/l
	(5) pH	7.0	(-)
	(6) ORP(10:55)	− 40	mV
	(7) MLSS	2550	mg/l
	(8) Re Sludge SS		mg/l
Clarifier	(1) Appearance: good		
Treated Water	(1) pH	7.45	(-)
	(2) Transparency	140	cm
	(3) Appearance/Comment: good		

Disinfection Operation		
Hypo-Chorite Storage		L
Chlorine Injection Volume		L/d
Chlorine Injection Rate		mg/L
Hypo-Chorite Refilling		L
Cleaning/Watering	good	
Sludge Treatment		

General Comment: ((screenings was full container.))

Jericho Municipality

Jericho Wastewater Treatment Plant

Daily WWTP Operation Record

Approved by (Plant manager)	
Checked by (Engineer)	
Prepared by (Operator)	2ماهر بر عيسى (Mr-Hosa)

Date : 18/10/15 ( )

Weather Conditions				Operation Time (MCC Time Counter)		
Weather	Fine Sunny · Sunny · A little Cloud			Facility	Machine	Hours
	Cloudy · Rainy · Stormy · Sandy			Blower	No.1 Blower	317.8
Ambient temperature (:)	28		°C		No.2 Blower	343.7
Rainfall	: — :		mm		No.3 Blower	92.2
Electricity (Observed Time: :)					No.4 Blower	99.3
	Accumulated	Daily		Retuen Sludge Pump	No.1 Retuen Sludge Pump	1859.9
JDECO Power Consumption	214038		kWh		No.2 Retuen Sludge Pump	1633.6
Surplus Power to Grid	113451		kWh	Mixer(No.1 Reactor)	No.	—
Solar Power Generation	248891		kWh		No.	—
Load Power Consumption			kWh	Waste Sludge Pump	No.	—
Power Factor	---	96	%	Thicked Sludge Pump	No.	—
Wastewater Treatment				Daily Maintenance Operation		Check
Inflow amount	85131.84		m^3	Coarse Screen at RT	Removal of screenings by rake	✓
Effluent amount	67548.02		m^3	Coarse Screen at GC	Removal of screenings by rake	✓
Tanker Receiving amount			m^3	Fine Screen No.1	Clogging check of wash nozzle	✓
Return sludge amount (No.1)	On: : Off: :		m^3		Removal of screenings by tap water	✓
Return sludge rate			%	Fine Screen No.2	Clogging check of wash nozzle	✓
Aeration amount (No.1)			m^3		Removal of screenings by tap water	✓
Container/Bag condition				Grit Separator	Clogging check of utility water	✓
(1) Tanker Recieving	Clean · Quarter · (Half) · Nearly Full · Full			Scum Screen	Clogging check of utility water	✓
(2) Screenings	Clean · Quarter · (Half) · Nearly Full · Full			Grit Removal Pump No.1	Wash out grit collector pit	✓
(3) Grit	Clean · Quarter · (Half) · Nearly Full · Full				Wash out suction pipe	✓
(4) Scum	Clean · Quarter · Half · (Nearly Full) · Full			Grit Removal Pump No.2	Wash out grit collector pit	✓
Disposal:					Wash out suction pipe	✓
Reactor Condition/Wastewater Quality (:)				OD Mixer 2-1	Start (:) Maintenanse Operation (MO) (15min)	✓
Reactor Condition	(1) Water temp.	29	°C	OD Mixer 2-2		✓
	(2) SV30	180	%	OD Mixer 2-3		✓
	(3) SVI		mL	OD Mixer 2-4		✓
	(4) DO(Setting)	0.02	mg/l	No.2 OD Diffuser	Start(:) MO (15min)	✓
	(5) pH	6.9	(-)	Disinfection Operation		
	(6) ORP(:)		mV	Hypo-Chorite Storage	L	
	(7) MLSS	228-237	mg/l	Chlorine Injection Volume	L/d	
	(8) Re Sludge SS		mg/l	Chlorine Injection Rate	mg/L	
Clarifier	(1) Appearance:			Hypo-Chorite Refilling	L	
				Cleaning/Watering		
Treated Water	(1) pH	7.5	(-)			
	(2) Transparency		cm	Sludge Treatment		
	(3) Appearance/Comment:					

General Comment:

Jericho Municipality

A 2-11-2: Regular Site Inspection Sheet

Initial P. Operated P

Daily Inspection Sheet

- Tanker Receiving & Grit Chamber -

Date 12-10-2015 Time 10 :00 ~ :11:30

Checked by Kondal Mohammad Khaloul

Motorised Equipment

Equipment Name	Site							LCP			MCC				Condition
	Pressure	Flow	Oil	Sound	Vibration	Temp.	Leakage	Local/Remort	Fault	Lamp Test	Current	Time	Fault	Lamp Test	
Wastewater pump for vacuum -1/2	0.02			✓	✓		✓	L · (R)	✓	✓					
Wastewater pump for vacuum -2/2	0.02			✓	✓		✓	L · (R)	✓	✓					
Mixer for vacuum	Cant			✓	✓			L · (R)	✓	✓					
Fine Screen -1/2				✓	✓	✓	✓	(L) · R	✓	✓					
Fine Screen -2/2				✓	✓	✓	✓	L · (R)	✓	✓					
Grit Collector -1/2	Broken			X	X	X		L · R	X	✓					
Grit Collector -2/2	Broken			X	X	X		L · R	X	✓					
Grit Removal Pump -1/2	0.0017	0.0069	✓	✓	✓	✓	✓	(L) R	✓	✓					
Grit Removal Pump -2/2	0.003	0.052	✓	✓	✓	✓	✓	L · (R)	✓	✓					
Floor Drain Pump -1/2	0.00	0.0045						L · (R)	✓	✓					
Floor Drain Pump -2/2	-0.02	0.025			✓	✓		L · (R)	✓	✓					
Grit Separator								L · (R)	✓	✓					
Oil Discharge Pump -1/2	-0.01	0.03			✓	✓		L · (R)	✓	✓					
Oil Discharge Pump -2/2	-0.01	0.02			✓	✓		L · (R)	✓	✓					
Scum Screen					✓	✓	✓	L · (R)	✓	✓					
Screening Conveyor				✓	✓	✓	✓	(L) R	✓	✓					

-0.01~0.02
+0.01~0.03

Sensor

Equipment Name	Value	Condition
No.1 Fine Screen Upstream Level Meter		
No.1 Fine Screen Downstream Level Meter		
No.2 Fine Screen Upstream Level Meter		
No.2 Fine Screen Downstream Level Meter		
Influent Flow Meter		

Manual Equipment

Equipment Name	Open/Close	Appearance	Debris	Condition
Coarse screen for vacuum	O ~~C~~			
Grit Chamber Inlet Gate -1/3	O · C			
Grit Chamber Inlet Gate -2/3	O · C			
Grit Chamber Inlet Gate -3/3	O · C			
Coarse screen -1/2	O · C			
Coarse screen -2/2	O · C			
Bypass Screen	O · C			
Oil Skimmer	Up · Side			
Bypass Gate	O · (C)			

Daily Inspection Sheet

- Reactor & Blower Room -

Date Time : ~ :

Checked by

Motorised Equipment

Equipment Name	Site							LCP			MCC				Condition
	Pressure	Flow	Oil	Sound	Vibration	Temp.	Leakage	Local/Remort	Fault	Lamp Test	Current	Time	Fault	Lamp Test	
Air Diffuser -1/2	✓	✓		✓	✓		✓	L · R							
Air Diffuser -2/2	✓	✓		✓	✓		✓	L · R							
Reactor Tank Mixer -1/8								L · R							
Reactor Tank Mixer -2/8								L · R							
Reactor Tank Mixer -3/8								L · R							
Reactor Tank Mixer -4/8								L · R							
Reactor Tank Mixer -5/8								L · R							
Reactor Tank Mixer -6/8								L · R							
Reactor Tank Mixer -7/8								L · R							
Reactor Tank Mixer -8/8								L · R							
Aeration Blower -1/4	✓	✓	✓					L · R							
Aeration Blower -2/4	✓	✓	✓					L · R							
Aeration Blower -3/4	✓	✓	✓					L · R							
Aeration Blower -4/4	✓	✓	✓					L · R							
Air Suppiy Valve -1/2								L · R							
Air Suppiy Valve -2/2								L · R							

Sensor

Equipment Name	Value	Condition
No.1 DO Meter		
No.2 DO Meter		
No.1 Air Blower Flow Meter	33 m^3/m	33 kpa
No.2 Air Blower Flow Meter		

Manual Equipment

Equipment Name	Open/Close	Appearance	Debris	Condition
Inlet Distribution Weir -1/2	O · C			
Inlet Distribution Weir -2/2	O · C			
Outlet Gate -1/2	O · C			
Outlet Gate -2/2	O · C			
Isolation Gate	O · C			

Daily Inspection Sheet

- Clarifier & Pump Room -

Date Time : ~ :

Checked by

Motorised Equipment

Equipment Name	Site							LCP			MCC				Condition
	Pressure	Flow	Oil	Sound	Vibration	Temp.	Leakage	Local/Remort	Fault	Lamp Test	Current	Time	Fault	Lamp Test	
Clarifier -1/2	V		V	V	V	V	V	L · R	V	V					
Clarifier -2/2 Foreign 3/2	V		V	V	V	V	V	L · R	V	V					
Return Sludge Pump -1/4	0.90 kPa		V	V	V	V	V	L · R	V	V					
Return Sludge Pump -2/4	0,09		V	V	V	V	V	L · R	V	V					
Return Sludge Pump -3/4								L · R							
Return Sludge Pump -4/4								L · R							
Waste Sludge Pump -1/3			V	V	V	V	V	L · R	V	V					
Waste Sludge Pump -2/3			V	V	V	V	V	L · R	V	V					
Waste Sludge Pump -3/3			V	V	V	V	V	L · R	V	V					
Floor Drain Pump -1/2								L · R							
Floor Drain Pump -2/2								L · R							
Scum Pump -1/2 0.01	0.11			V	V		V	L · R	V	V					
Scum Pump -2/2 0.00	0.1			V	V		V	L · R	V	V					

Sensor

Equipment Name	Value	Condition
No.1 Return Sludge Flow Meter	5,4	
No.2 Return Sludge Flow Meter	5,4	

Daily Inspection Sheet

- Disinfection,Garden & Thickener -

Date Time : ~ :

Checked by

Motorised Equipment

Equipment Name	Site							LCP			MCC				Condition
	Pressure	Flow	Oil	Sound	Vibration	Temp.	Leakage	Local/Remort	Fault	Lamp Test	Current	Time	Fault	Lamp Test	
Hypochlorite Pump -1/3 0,03	0,07							L · R							
Hypochlorite Pump -2/3 0,03	0,12							L · R							
Hypochlorite Pump -3/3 0,03	0,11							L · R							
Utility Water Supply Unit								L · R							
Utility Pump -1/2								L · R							
Utility Pump -2/2								L · R							
Auto Strainer -1/2	In 339 / Out 339							L · R							
Auto Strainer -2/2	In 339 / Out 339							L · R							
Defoaming Pump -1/2 0,05	0,38			✓	✓		✓	L · R	✓	✓					
Defoaming Pump -2/2 0,025	0,44			✓	✓		✓	L · R	✓	✓					
Circular Pump -1/2 0,02	0,125			✓	✓	✓	✓	L · R	✓	✓					
Circular Pump -2/2 0,01	0,2			✓	✓	✓	✓	L · R	✓	✓					
Thickener -1/2								L · R							
Thickener -2/2								L · R							
Thickened Sludge Pump -1/3								L · R							
Thickened Sludge Pump -2/3								L · R							
Thickened Sludge Pump -3/3								L · R							

Sensor

Equipment Name	Value	Condition
Hypochlorite Tank Level Meter		
Effluent Flow Meter		

Manual Equipment

Equipment Name	Open/Close	Appearance	Debris	Condition
Waste Sludge Distribution Tank	O · C			

		orginal	actual	
Utility pump	No.1	0.02	0.08	pressur Cage needs fix
〃	〃	No.2	0.0	0.04

Daily Inspection Sheet

- Diffuser -

Date 11.7.2015 Time 11 : 30 ~ : 12 : 30

Checked by Omran + Konda

Reactor No.1

Site	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Flow (M3/min)	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Pressure (KP)	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8

shall be ~~kept~~ 5.8 kpa kept

Total Flow (M3/min)	16.0
Total Pressure (KP)	

If pressure value is over 6.0kpa, flexing measure shall be performed in 2 duty Blower operation.

Reactor No.2

Site	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
Flow (M3/min)	~~0.039~~	3.5	3.5	3.6	~~3.6~~	3.7	3.5	3.5	3.5	3.6
Pressure (KP)	0.028	0.027	0.029	0.029	0.028	0.028	0.029	0.027	0.029	0.036 Mpa
	2.8	2.7	2.9	2.9	2.8	2.8	2.9	2.7	2.9	Dif: 2.9 ~~2.8~~ kpa

shall be approx kept 2.8kpa.

Total Flow (M3/min)	17
Total Pressure (KP)	

46 m³/min

بحاجة لمعايرة (need calibration of pressure gage)

Regular Maintenance for Electrical Facility - 1/2 (Formert (Updated))

- Main Electrical Room -

Date: 6-5-2015

Weather: Sunny

Checked by: Mahir Swedi

Supported by: ibrahem Jalyk

Panel	Load	Rated Capacity (kW)	Rated Ampere (A)	Actual Ampere (A) U	Actual Ampere (A) V	Actual Ampere (A) W	Insulation Resistance (MΩ) U	Insulation Resistance (MΩ) V	Insulation Resistance (MΩ) W	Bolt Tightening	Cleanliness	Detailed Condition (Noise, Overheat, Vibration, Foreign Object etc.)
Grit Chamber MCC ≪01MCC01≫ ≪01MCC02≫	Mixer for Vacuum	1.5					2000	2000	2000		≪01MCC01≫	
	Wastewater pump for vacuum -1/2	3.7					2000	2000	2000			
	Wastewater pump for vacuum -2/2	3.7					1000	1000	1000			
	Fine Screen -1/2	2.2		3.4	3.1	2.8	2000	2000	2000			
	Fine Screen -2/2	2.2		3.0	2.7	2.9	2000	2000	2000			
	Grit Collector -1/2	1.1					2000	2000	2000			
	Grit Collector -2/2	1.1					2000	2000	2000			
	Grit Removal Pump -1/2	2.2		4.9	4.5	4.7	2000	2000	2000		≪01MCC02≫	
	Grit Removal Pump -2/2	2.2		4.3	4.3	4.1	2000	2000	2000			
	Floor Drain Pump -1/2	1.5					2000	2000	2000			
	Floor Drain Pump -2/2	1.5					2000	2000	2000			
	Grit Separator	0.75		1.9	1.7	1.4	2000	2000	2000			
	Oil Discharge Pump -1/2	0.75		2	2.2	1.7	2000	2000	2000			
	Oil Discharge Pump -2/2	0.75					2000	2000	2000			
	Scum Screen	0.4		1.3	1.1	1.5	2000	2000	2000			
	Screening Conveyor	2.2		2.9	2.8	3.2	2000	2000	2000			
Sludge Thickener MCC ≪05MCC01≫	Thickener -1/2	0.4					2000	2000	2000		≪05MCC01≫	
	Thickener -2/2	0.4					2000	2000	2000			
	Thickened Sludge Pump -1/3	5.5					2000	2000	2000			
	Thickened Sludge Pump -2/3	5.5					2000	2000	2000			
	Thickened Sludge Pump -3/3	5.5					2000	2000	2000			
Others												

6.5.2015

Regular Maintenance for Electrical Facility - 2/2

- Blower Electrical Room -

Panel	Load	Rated Capacity (kW)	Rated Ampere (A)	Actual Ampere (A) U	Actual Ampere (A) V	Actual Ampere (A) W	Insulation Resistance (MΩ) U	Insulation Resistance (MΩ) V	Insulation Resistance (MΩ) W	Bolt Tightening	Cleanliness	Detailed Condition (Noise, Overheat, Vibration, Foreign Object etc.)
Aeration Blower Control Panel ≪02MCC01≫≪02MCC02≫ ≪02MCC03≫≪02MCC04≫	Aeration Blower -1/4	55.0					2000	2000	2000			
	Aeration Blower -2/4	55.0					2000	2000	2000			
	Aeration Blower -3/4	55.0					2000	2000	2000			
	Aeration Blower -4/4	55.0	65				2000	2000	2000			
Biological Reactor MCC ≪02MCC05≫ ≪02MCC06≫	Reactor Tank Mixer -1/8	3.7		8.0	8.0	8.0	2000	2000	2000		≪02MCC05≫	
	Reactor Tank Mixer -2/8	3.7		7.8	7.5	8.2	300	300	300			
	Reactor Tank Mixer -3/8	3.7		8.0	8.9	8.0	800	800	800			
	Reactor Tank Mixer -4/8	3.7		7.4	8.5	8.1	75	75	75			
	Reactor Tank Mixer -5/8	3.7		9.7	9.4	8.3	2000	2000	2000		≪02MCC06≫	
	Reactor Tank Mixer -6/8	3.7		8.5	9.0	8.5	2000	2000	2000			
	Reactor Tank Mixer -7/8	3.7		8.5	9.0	8.5	2000	2000	2000			
	Reactor Tank Mixer -8/8	3.7		9.0	8.7	9.0						
	Air Supply Valve - 1/2	0.2					2000	2000	2000			
	Air Supply Valve - 2/2	0.2					2000	2000	2000			
Clarifier MCC ≪03MCC01≫ ≪03MCC02≫	Clarifier -1/2	0.75		1.2	1.2	2.8	2000	2000	2000		≪03MCC01≫	
	Clarifier -2/2	0.75					2000	2000	2000			
	Return Sludge Pump -1/4	15.0					2000	2000	2000			
	Return Sludge Pump -2/4	15.0										
	Return Sludge Pump -3/4	15.0										
	Return Sludge Pump -4/4	15.0										
	Waste Sludge Pump -1/3	5.5					2000	2000	2000		≪03MCC02≫	
	Waste Sludge Pump -2/3	5.5					2000	2000	2000			
	Waste Sludge Pump -3/3	5.5					2000	2000	2000			
	Floor Drain Pump -1/2	1.5					2000	2000	2000			
	Floor Drain Pump -2/2	1.5					2000	2000	2000			
	Scum Pump -1/2	3.7					2000	2000	2000			
	Scum Pump -2/2	3.7					2000	2000	2000			
Utility Water & Disinfection MCC ≪04MCC01≫	Hypochlorite Pump -1/3	0.2					2000	2000	2000		≪04MCC01≫	
	Hypochlorite Pump -2/3	0.2					2000	2000	2000			
	Hypochlorite Pump -3/3	0.2					2000	2000	2000			
	Utility Water Supply Unit	7.4					2000	2000	2000			
	Auto Strainer -1/2	0.1					100	2000	2000			
	Auto Strainer -2/2	0.1					100	2000	2000			
	Defoaming Pump -1/2	3.7		7.0	7.3	7.5	2000	2000	2000			
	Defoaming Pump -2/2	3.7		7.3	7.7	7.4	2000	2000	2000			
	Circular Pump -1/2	1.5					2000	2000	2000			
	Circular Pump -2/2	1.5					2000	2000	2000			

A 2-11-3: Technical Test Result

Ibrahim

92

pass

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

The grit chamber consists of many important parts, like the fine screen which the spaces are 5 cm for removing the large materials and then the fine screen which the spaces are

5 mm remove the small materials. Also, the gravel removal unit and then oil removal. The main rule for this unit is to remove all the non-biodegradable inorganic to protect the plant and pumps from corrosion and to prevent the sedimentation of the materials in the biological tanks.

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

The main rule of the reactor is to reduce the (BOD), the reactor consists of bacteria which need the oxygen to feed on the organic matters. It a biological process depends on aerobic bacteria to oxidize the organic matters. There are also facultative anaerobes which can live without oxygen to remove the Nitrogen.

Question B-3:

Describe major roles of Final Sedimentation Tank.

The sedimentation tank or the secondary sedimentation tank is for allowing the solids (sludge) for sedimentation in the bottom of the tank and the treated water to get out from the top of the tank in order to save the solids and to bring it back to the reactor or to get rid of it outside of the tank.

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

The chlorine is used in the advanced stages to reduce the contaminates like thee-coli which affect negatively on the health of the citizens, in this case we protect the ground water from the pollutions and benefit from the treated water in irrigation... etc.

Comment- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

There are many types of equipment that reduce the SS in the wastewater like,

Fine screen: remove the inorganic matters so reduce the SS.

Gravel removal unit: it has an important role in reducing the SS.

Oil removal unit: remove the supernatant materials.

In order to reduce the BOD, there are some equipments like:

Blowers: provide the micro-organisms with the oxygen to remove the contaminates.

Mixers: mix the micro-organisms with the contaminates in order to enlarge it and settling down later.

Return sludge pumps: maintain enough amount of bacteria.

Waste return pump: get rid of the extra sludge.

Comment:Membrane diffuser, DO control system shall be included.

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

The value by using the insulation resistance test is less than 0.5 mΩ

"M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test?

Conduct the insulation resistance test periodically as a preventive procedure for the electric equipments.

Evaluate the readings and compare the results after the test, if the value decreases with time so there would be problem. This make us test the equipment early to avoid any problem can happen.

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

AMP

Volt

Bolts Bolt tightening

Voices, if any.
Clean the electrical panel
Earth leakage.

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Switch off the power through the main panel cutter.
Put a note on the broken equipments.
Not to work alone in the electrical equipments and panels.
Abide to the safety rules and wear dielectric clothes
The person must be technician or eligible to work with electricity.

need voltage check before the test

Test for Practical O and M: 66 pass

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Increasing the flow means the increasing hydraulic loading in the plant which need more operation procedures to the equipments like the return sludge pumps to maintain a fixed ratio between the bacteria and organic matter and also the waste sludge pumps of the reactor and also increasing the chlorine so this increase the operation of chlorine pumps because the raise of the contaminates in addition to the high operation of the blowers.

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Use the spare equipments but in case that all main and spare equipments were not recovered, this will affect on the process of the plant and then the coming wastewater should go through emergency line then to the valley without going to the WWTP

Comment:-O & M vender manual shall be checked.
- If the failed equipment can' t be recovered after trying the above countermeasure, issues to be solved by asking Vender.

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

We should re-evaluate the performance of the plant after recovering the equipments failed abovc.

Preventive maintenance for the equipments and provide spare parts.

Comment-Check the original commissioning data, and confirm current value and insulated resistance again about whether there are within safe value.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Avoid the unnecessary use of the electricity equipments but depending on the flow, and only the need to these high-consumption equipments by daily control.

consider reducing operation time of unnecessary load
by checking actual opearation pattern and time record

consider reducing base load such as
air conditioner and yard lighting

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Avoid the high operation through the peak period if possible. (the period that the electricity tariff is very high).

Keep the solar panel clean to increase their efficiency.

Make best use of surplus depending on the electricrity tariff.
Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

Omran Khlaf
Operator of WWTP

Test for Basic O and M:

A5
pass

Question B- 1:

Describe major roles of Grit Chamber.

Remove the big contaminants in the coarse screen then the small contaminates in the fine screen and also removing the sands and gravel by reducing the flow velocity to be deposited and removed, then removing the oils and fats and materials floating on the surface of the water through the scum screen and skimmer oil for the preparation of biological process in the aeration tank and prevent the entry of harmful substances to the instruments.

Commnet:- Therefore, protection of downstream facilities such as membrane diffusers, aeration mixers, and pumps.

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

The place of the interaction of biological process where microorganisms swim in the aeration tank and they need oxygen in order to digest the organic matters in wastewater and to create new bacterial cells.

The materials also are mixed through the mixer to prevent sedimentation in aeration tank and the addition of oxygen through the blowers and therefore BOS will be less in the generated water.

Question B-3:

Describe major roles of Final Sedimentation Tank.

Allowing the solids (sludge) for sedimentation in the bottom of the final sedimentation tank through clarifier the water, so all solids gathering in the bottom of the tank In order to bring it back to the aeration tank or other processing units and to allow the supernatant water to go out the sides of the tanks and prevent the supernatant water to do so through a septum.

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Benefit from the treated water.

Eliminates most of Pathogens like E-coli, organisms, so that protecting the groundwater from pollution in the case of the sedimentation of the treated water to the ground water. The treated water also should be matching the specifications of re-using in agriculture, cleaning and Landscape.

Comment- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Grit collector: Gathering the sand in the bottom of the sand room

Grit removal pump: removing the sands from the sand room.

Scum screen: Remove fat and floating materials from water.

Blowers: supply the organisms with the oxygen for the ingestion of contaminated material.

Mixers: mixing the microorganisms with the organics in the aeration tank.

Waste sludge pump: removing the extra sludge.

Scrapers of clarifier: gathering the sludge in the bottom of the sedimentation tank in order to ease dragging.

Grit separator: Wash the sand and take it out to the outer box.

Commnet:membrane diffuser, return sludge pump, DO control sysytem are specially important.

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

In danger when the insulation resistance is less than 0.5 mΩ. In the normal case whenever the value of the insulation resistance higher be the best "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test? to protect the equipments and the internal solenoid to protect the

equipments through the periodic maintenance and protect people and the staff from the risk of exposure to electric shock.

compare the value with the previous one and check if it decreses or not

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

Test the following:

AMP

Volt

Bolts bolt tightening

Plate heat

Clean the electrical panel

Earth leakage.

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Switch off the power through the main panel cutter.

Not to work alone in the electrical equipments and panels.

Wear dielectric clothes.

Use dielectric equipments.

Wear Protective cap.

Put a carpet to prevent the electrical conductivity.

Put a note on the broken equipment and inform the technician about it.

The person must be technician or eligible to work with electricity.

Test for Practical O and M: 65 pass

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Increasing the flow means the increasing of the organisms so the aeration tank which include microorganisms needs more oxygen so more blowers operation, also increasing the amount of sludge through the return sludge pumps will need more operation of waste sludge pumps so, the huge amount of wastewater needs more chlorine using the disinfection pumps.

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Run the spare equipments and solve the main equipment as fast as possible by providing all the spare parts.

In case that all main and spare equipments were not recovered, the coming wastewater go through emergency line then to the valley without going to the WWTP.

Comment:-O & M vender manual shall be checked.
- If the failed equipment can' t be recovered after trying the above countermeasure, issues to be solved by asking Vender.

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Make recovery to the plant and make sure of all the main and spare equipments and pumps and provide spare parts instead of the used one.

Comment-Check the original commissioning data, and confirm current value and insulated resistance again about whether there are within safe value.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

This depends on the amount of the flows; we should avoid the unnecessary running the blowers more than required, running the return sludge pumps more than required and also the other equipments.

consider reducing base load such as air conditioner and yard lighting

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Avoid the high operation through the peak period, and working through the cheapest period of the electricity price. →good

Example answer Make best use of surplus depending on the electricrity tariff. Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

49
test again

Mr. Mohammed Khalaf

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

Remove the non-biodegradable contaminants like sands, fat and plastic.

Commnet:- Therefore, what for downstream equipment?

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

It is the place of the biological process where the bacteria feed on the organisms (contaminants) by providing the oxygen to the bacteria.

Comment-key word shall be used.

Question B-3:

Describe major roles of Final Sedimentation Tank.

Allowing the solids (sludge) for sedimentation in the bottom of the sedimentation tank, and the water at the top of the tank.

Comment-Activated sludge solids to separate from the treated effluent

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Benefit from the treated water.

Irrigation.

Get rid of contaminates.

Comment
- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Fine screen

Sand pumps

Separator

Blower

mixers

Comment-
other three key equipment for treatment shall be mentioned.
What is each role?
what kind of mixer?

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

Less than 0.5 mΩ. "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test? preventive purpose: to avoid possible major problem by detecting minor problem in the early stage

Make preventive maintenance for the electrical equipments.

Conduct periodical test for the insulation.

compare the value with the previous one and check if it decreses or not

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

Test the following:

AMP

Volt

The bolts bolt tightening

Earth leakage. clean the panel inside

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Switch off the power and put a note that the equipment is broken.

Wear dielectric clothes. turn off main breaker of the panel

The person must be technician or eligible to work with electricity.

Test for Practical O and M: 4f test again

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

We must increase the oxygen and get rid of the bacteria by the waste sludge pump and increase the operation of return sludge pumps.

Comment- key word shall be used.

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Use the spare equipments or the emergency line.

Comment
- What is availability of O & M vender manual?
- Ask Vender?

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Re-test and evaluate the equipments of plant.

Comment- mention detailed action.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Avoid unnecessary use of the electrical equipments.

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Avoid the high operation through the peak period.

Example answer

P-4 consider reducing operation time of unnecessary load
by checking actual opearation pattern and time record

consider reducing base load such as
air conditioner and yard lighting

P-5 Make best use of surplus depending on the electricrity tariff.
Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

64 pass

Mr. Maher Saleh Sowaidy

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

Separate the big solids and the SS by coarse screen and then the small one by the fine screen and finally removing the sands and gravel by the grit removal pumps.

Commnet:- Therefore, what for downstream equipment?

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

Get rid of the organisms by the bacteria which needs the oxygen for this operation, and the oxygen is provided by the blowers.

Comment-key word shall be used.

Question B-3:

Describe major roles of Final Sedimentation Tank.

Allowing the solids (sludge) for sedimentation, and the supernatant water goes to the surface of the tank and then to the chlorine tank.

Comment-Activated sludge solids to separate from the treated effluent

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Benefit from the treated water.

Eliminates most of Pathogens like E-coli, organisms, so that protecting the groundwater from pollution.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Fine screen

Grit collector

Grit removal pump

Mixer

Grit separator

Comment-
other four key equipment for treatment shall be mentioned.
What is each role?
what kind of mixer?

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

Less than the electrical leakage when an insulation test.

Less than 0.5 mΩ. "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test?

implement the insulation resistance test periodically and compare the result to make sure of the pump's safety, a test should be conducted in case there is a different reading.

preventive purpose:
to avoid possible major problem by detecting minor problem in the early stage

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

Test the following:

AMP

Volt

bolt tightening

Engine heat

Clean the electrical panel

Earth leakage.

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Switch off the power through the main panel cutter.

Not to work alone in the maintenance for the general safety.

Wear dielectric clothes.

The person must be technician or eligible to work with electricity.

Test for Practical O and M: 6 / pass

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Blowers, return sludge pumps, waste sludge pumps and disinfection pumps are run for a longer period when the flow is increased.

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Run the spare equipments and solve the main equipment.

In case that all main and spare equipments were not recovered, the coming wastewater go through emergency line then to the valley without going to the WWTP.

Comment
- What is availability of O & M vender manual?
- Ask Vender?

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Check the equipments of the plant. Comment- mention detailed action.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Depend on the amount of the flow.

Avoid unnecessary use of the electrical equipments.

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Use the tariff schedule.

Avoid the high operation through the peak period.

P-4 consider reducing operation time of unnecessary load
by checking actual opearation pattern and time record

consider reducing base load such as
air conditioner and yard lighting

P-5 Make best use of surplus depending on the electricrity tariff.
Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

54
Test again

Mr. Ibrahim Al-Fahid

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

Remove the non-biodegradable solids.

Commnet:- grit, screenings in detailed?
Therefore, what for downstream equipment?

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

It is the place of the biological process where the bacteria feed on the organisms (contaminants) by providing the oxygen to the bacteria.

Comment-key word shall be used.

Question B-3:

Describe major roles of Final Sedimentation Tank.

This stage is the pre-final stage where the sedimentation go to the bottom of the tank, and the water at the top of the tank and the treated water in the middle.

Comment-Activated sludge solids to separate from the treated effluent: not pre final stage.

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Use it for irrigation and gardens and for drinking in advanced stages.

Use the chlorine to get rid of the contaminates.

Save the ground water.

Comment
- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Mixer

Blower

Fine screen

Grit removal pump

Comment-
other three key equipment for treatment shall be mentioned.
What is each role?
what kind of mixer?

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

Less than 0.5 mΩ. "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test?

Make preventive maintenance for the electrical equipments.

compare the value with the previous one and check if it decreses or not

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

Test the following:

AMP

Electrical switch

Volt

bolts bolt tightening

Clean the electrical panel

Earth leakage.

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Wear dielectric clothes.

Switch off the power through the main panel cutter.

Not to work alone in the electrical equipments and panels.

Abide to the safety rules.

39 test again

Test for Practical O and M:

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Increase the pumping of the oxygen.

Increase the operation of the waste sludge pumps.

Increase the operation of the return sludge pumps.

Comment-how about disinfection pump and blower?

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Use the spare equipments of the emergency line.

Comment

- What is availability of O & M vender manual?
- Ask Vender?

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Re-test and evaluate the equipments of WWTP.

Comment- mention detailed action.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Grit removal pumps

Blowers

Mixer

Fine screen

Example answer

consider reducing operation time of unnecessary load by checking actual opearation pattern and time record

consider reducing base load such as air conditioner and yard lighting

And finally it depends on the amount of the flow.

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Use the annual tariff schedule to know the value which it differs from day to night and between the seasons.

Example answer

reconsider laod operation schedule depending on the electricrity tariff

make best use of surplus depending on the electricrity tariff.
Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

57
test again

Mr. Ramadan Al-Ghouj

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

Separate the SS and protect the WWTP.

Commnet:- grit, screenings in detailed?
Therefore, what for downstream equipment?

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

The reactor make a biological process by the bacteria which feed on the organisms.

Comment-key word shall be used.

Question B-3:

Describe major roles of Final Sedimentation Tank.

Sedimentation for the organic matters and reuse for the biological process or the get rid of it completely and take the water.

Comment-Activated sludge solids to separate from the treated effluent.

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Benefit from the treated water.

Irrigate plants and gardens.

Use the chlorine to avoid from the diseases and prevent polluting the ground water.

Comment
- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Fine screen

Blower

Mixer

Grit removal pump

Grit separator.

Comment-
other three key equipment for treatment shall be mentioned.
What is each role?
what kind of mixer?

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

Less than 0.5 mΩ. "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test?

Preventive maintenance for the electrical equipments. Compare values reveal a potential problem. preventive purpose:
to avoid possible major problem by detecting minor problem in the early stage

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

AMP

Electrical switch

Volt

Clean the electrical panel

Earth leakage.

Bolts bolt tightening

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Wear dielectric clothes.

Not to work alone in the electrical equipments and panels.

Abide to the safety rules.

turn off main breaker of the panel
need voltage check before the test
electrical expert only

Test for Practical O and M: 4/ test again

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Increase the pumping of the oxygen.

Increase running the waste sludge pumps.

Increase running the R.S

Comment-how about disinfection pump and blower?

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Use the spare equipments or the emergency line.

Comment
- What is availability of O & M vender manual?
- Ask Vender?

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Re-test and evaluate the plant.

Comment- mention detailed action.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Grit removal pumps

Blowers

Mixer

Fine screen

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Use the annual tariff schedule

Avoid the high operation through the peak period.

Example answer

P-4 consider reducing operation time of unnecessary load by checking actual opearation pattern and time record

consider reducing base load such as air conditioner and yard lighting

P-5 reconsider laod operation schedule depending on the electricrity tariff

make best use of surplus depending on the electricrity tariff. Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule. e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

44

Mr. Adnan Ashour

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

Remove the non-biodegradable solids.

Commnet:- grit, screenings in detailed?
Therefore, what for downstream equipment?

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

It is the process where the bacteria feed on the organisms (contaminants) by providing the oxygen to the bacteria.

Comment-key word shall be used.

Question B-3:

Describe major roles of Final Sedimentation Tank.

Allowing the solids (sludge) for sedimentation in the bottom of the sedimentation tank

Comment-Activated sludge solids to separate from the treated effluent:

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Use the chlorine to get rid of the contaminate, benefit from the treated water and save the ground water.

Comment
- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Blowers

Grit removal pumps

Fine screen

Mixer

Grit separator pump

Comment-
other three key equipment for treatment shall be mentioned.
What is each role?
what kind of mixer?

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

Less than 0.5 mΩ. "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test?

preventive purpose:
to avoid possible major problem by detecting minor problem in the early stage

So that leakage does not occur.

compare the value with the previous one and check if it decreses or not

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

Test the following:

AMP

Volt

The bolts bolt tightening

Earth leakage. clean the panel inside

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Switch off the power and put a note that the equipment is broken.

Wear dielectric clothes.

Abide to the safety rules.

need voltage check before the test

not to work alone

electrical expert only

4/ test ag

Test for Practical O and M:

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Increase the pumping of the oxygen.

Increase the operation of the waste sludge pumps.

Increase the operation of the return sludge pumps.

Comment-how about disinfection pump and blower?

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Use the spare equipments or the emergency line.

Comment

- What is availability of O & M vender manual?
- Ask Vender?

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Re-test and evaluate the equipments of WWTP.

Comment- mention detailed action.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Avoid unnecessary use of the electrical equipments.

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Use the annual tariff schedule to know the value which it differs from day to night and between the seasons.

Example answer

P-4 consider reducing operation time of unnecessary load
by checking actual opearation pattern and time record

consider reducing base load such as
air conditioner and yard lighting

P-5 reconsider laod operation schedule depending on the electricrity tariff

make best use of surplus depending on the electricrity tariff.
Compare the benefit to use the solor power as power consumption or selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around noon time due to large generation from solor.

46
test ans

Mr. Mousa

Test for Basic O and M:

Question B- 1:

Describe major roles of Grit Chamber.

Separate the useless SS.

Commnet:- grit, screenings in detailed?
Therefore, what for downstream equipment?

Question B-2:

Describe major roles of Reactor."BOD, foods, oxygen, microorganisms"as a key word shall be included in your answer.

The bacteria feeds on the organic matters in the water.

Comment-key word shall be used.

Question B-3:

Describe major roles of Final Sedimentation Tank.

Allowing the solids (sludge) for sedimentation in the bottom of the sedimentation tank.

The cleaned water used later.

Comment-Activated sludge solids to separate from the treated effluent:

Question B-4:

Describe major roles of chlorine disinfection facility."E-coli, groundwater, reclamation" as a key word shall be included in your answer.

Purify the water by using the chlorine to benefit from it for the irrigation.

Comment
- key word shall be used.

Question B-5:

What is the most important mechanical equipment for water treatment reducing BOD and SS? Describe five key equipment and each role excluding solar panel and generator.

Mixer

Blower

Fine screen

Grit removal pump

Grit separator

Comment-
other three key equipment for treatment shall be mentioned.
What is each role?
what kind of mixer?

Question B-6

What is an indicating value for electrical leakage when you implement insulation resistance test?

Less than 0.5 mΩ. "M" Ω

Question B-7

Why do we have to implement the insulation resistance test REGULARLY? How should we find potential problem based on the result of the regular insulation resistance test?

Preventive maintenance for the electrical equipments. Compare values reveal a potential problem.

Question B-8

Except for the insulation resistance test, what kinds of actions can be implemented as regular/preventive maintenance of electrical facilities?

Test the following:

AMP

Electrical switch

bolt tightening

Volt

Clean the electrical panel

Earth leakage.

Question B-9

What kinds of actions can be taken in order to avoid risk of electrical shock when you do regular maintenance work of electrical panels?

Wear dielectric clothes.

Switch off the power through the main panel cutter.

Not to work alone in the electrical equipments and panels.

Abide to the safety rules.

Test for Practical O and M:

4 | test again

Question P-1:

In case thatinfluent flow will increase from current approx. 250 m3/d to 2,000 m3/d,describe how tochange operated conditionrelated to return sludge pumps, waste sludge pumps, disinfection pumps, and blowers.

Increase the pumping of the oxygen.

Increase the operation of the waste sludge pumps.

Increase the operation of the return sludge pumps.

Comment-how about disinfection pump and blower?

Question P-2:

In case that key dutyequipment were failed seriously and not recovered, describe how to take an action.

Use the spare equipments or the emergency line.

Comment
- What is availability of O & M vender manual?
- Ask Vender?

Question P-3:

After above failed equipment is recovered, what shallbe checked by inspector.

Re-test and evaluate the equipments of WWTP.

Comment- mention detailed action.

Question P-4:

For reducing electrical CONSUMPTION of WWTP, what kinds of items can be cared on daily operation? Answer as many as possible.

Grit removal pumps

Blowers

Mixer

Fine screen

Question P-5:

For reducing electricity COST of WWTP, what kinds of operation can we arrange? Answer as many as possible.

Avoid the high operation through the peak period.

Use the annual tariff schedule to know the value which it differs from day to night and between the seasons.

Example answer

P-4 consider reducing operation time of unnecessary load
by checking actual opearation pattern and time record

consider reducing base load such as
air conditioner and yard lighting

P-5 Make best use of surplus depending on the electricrity tariff.
Compare the benefit to use the solor power as power consumption or
selling surplus and rearrange the load operation schedule.

e.g. all the maintenance operation can be conducted around
noon time due to large generation from solor.

A 2-13-1: Questionnaire Form for Factory

Date: / /

Questionnaire Form for Specified Factory

1. Contact person

(1) Name	
(2) Department	
(3) Position	
(4) Phone number	
(5) E-mail address	

2. Outlines of factory

(1) Name	
(2) Address	
(3) Type of industry	
(4) Existing or Planned	
(5) Number of employees (persons)	

3. Water source and volume of water

(1) Water source	
(2) Total volume of water (m^3/day)	
- for cooling (m^3/day)	
- for washing (m^3/day)	
- for heating (m^3/day)	
- for raw materials (m^3/day)	
- for boiler (m^3/day)	

4. Treatment method

(1) Existing discharge method	
(2) Having pretreatment facility or not	
(3) Treatment method	

5. Wastewater

(1) Wastewater quality	*Refer to the attached sheet*
(2) Volume of wastewater (m^3/day)	

Jericho Municipality

Owner of Factory

Wastewater Quality Check Sheet

Items for Living Environment

Qustionaire Form for Specified Factory	Concentration	Standard in Sewerage By Law
1) Water temperature (^{o}C)		45
2) pH (-)		6.0 - 10.0
3) Vegetable and animai oils (mg oil/L)		100
4) Mineral oils (mg oil/L)		20.0
5) Cyanides, CN (mg/L)		2.0
6) COD (mg/L)		2,000
7) Sulphides, S^{2-} (mg/L)		2.0
8) Sulphates, SO_4 (mg/L)		600
9) Fluorides, F (mg/L)		1.0
10) Phenols (mg/L)		10.0

Items for Heavy Metals

Items	Concentration (mg/L)	Standard in Sewerage By Law (mg/L)		
		greater than 50 m^3/day	between 15 - 50 m^3/day	less than 15 m^3/day
1) Zinc (Zn)		5.00	10.00	15.00
2) Boron (B)		3.00	4.00	5.00
3) Chromium IV (Cr IV)		0.10	0.15	0.20
4) Total Chromium (Cr)		0.50	2.00	5.00
5) Copper (Cu)		1.00	2.00	4.50
6) Cadmium (Cd)		0.10	0.50	1.00
7) Aluminium (Al)		25.00	25.00	25.00
8) Mercury (Hg)		0.01	0.10	0.50
9) Mananese (Mg)		1.00	2.50	5.00
10) Nickel (Ni)		1.00	2.50	4.00
11) Lead (Pb)		0.25	0.40	0.60

※Please attach the "Analytical Report" for water quality test

A 2-13-2: Agreement between Jericho Municipality and JAIP

Agreement of Sewage Services Connection for JAIP to Jericho WWTP

This agreement is organized and signed in Jericho city on 11/08/2016:

First party: The Municipality of Jericho, which address is the city of Jericho / city center. The person authorized for signature is its president Mr. Mohamed Abed Jalita.

The Second Party: Jericho Agro-Industrial Developer Company; The Beneficiary. Address is Jericho Agro-Industrial Park, registered under No. (562518787) on 8/5/2012. The person authorized for signature is its CEO, Mr. Nabil Al-Sarraf.

Third Party: PIEFZA (Owner of Jericho Agro-Industrial Park). Address: Ramallah - Al-Masyoun City, near the Legislative Council. The person authorized for signature is HE Minister of National Economy, Ms. Abeer Odeh.

Introduction:

The first party is the local body whose functions, powers and authorities are set forth in Law No. (1) for the year 1997 on the law of the Palestinian Local Authorities and its amendments. And since Jericho Agro-Industrial Park is within the limits of its organizational area, and as the body that manages and operates the WWTP which is part of the Peace and Prosperity Initiative.

The second party is a private limited partnership company for the development, management and operation of Jericho Agro-Industrial Park. And it signed a concession agreement to develop Jericho Agro-Industrial Park (the developer) on 12/6/2012 under the patronage of His Excellency the President of the State of Palestine Mahmoud Abbas. Since developer established an integrated sewage network covering the first phase of the project of Jericho Agro-Industrial Park. And because of the needs to connect this network with the WWTP that is related to the first-party.

Whereas the third party is considered a governmental institution and the competent authority for the establishment and supervision of the industrial cities in Palestine under Law No. 10 of 1998,. And since it is considered the owner of Jericho Agro-Industrial Park under the allocation decision No. (3/44/12/M.W /S.F) For a total area of 115 dunums of public treasury land. Decision issued by the cabinet on 3/3/2008, under the decision of acquisition No. (7/96/13 / M.W / S.F) for the interest of the third party. and since PIEFZA established the collection and pumping station for waste water drainage from Jericho Agro-Industrial Park, for the purpose of pumping it towards the WWTP related to the first party, through the grant provided by the Japanese government (Attached is the cost of the establishment of this station).

It has been agreed among the parties, under their legal mandate, it has been agreed on the items of this Agreement.

Agreement terms

1. The introduction to this Agreement and its Annexes shall be deemed to be an integral part thereof and shall be read as one of its items.
2. The Parties agreed to calculate the value of the grant allocated by the Government of Japan, as set out in the introduction to this Agreement, for the sewage elements in the offsite infrastructure of the Jericho Agro-Industrial Park, which included the establishment of collection and pumping station, and compressed transporter pipe to transport sewage coming from the industrial park to the manhole related to municipality, which discharge flow to the WWTP, as equivalent to the value of the network connection fees which is required to be paid by tenants. (Attached is the letter of the value of these investments, as reported by UNDP).
3. Parties agreed to transfer the value of the investments mentioned in item (2) of this agreement from the US dollar to the shekel at the exchange rate at the date of signing this agreement (3.90) shekels for each one US dollar, so that the intended amount is (1,777,649.25 NIS), one million seven hundred seventy seven thousands and six hundred forty nine NIS and twenty five Agorot.
4. The parties agreed to divide the amount referred to in item (3) of this agreement, to divided it over (13) shekels, which is the municipal fees imposed on each square meter as stated in the system of connecting the facilities and residential places to the sewage network service for the year 2013. Note that the total area covered by the first phase is (136,742) square meters of factories in Jericho Agro-Industrial Park.
5. The first party shall comply with the treatment of wastewater transported from the second party through the collection and pumping station mentioned in this Agreement.
6. The second party shall request fees from new factories and tenants who invest after finishing the amount mentioned in item (4) of this agreement, for the purpose of connecting their factories to the sewage service in accordance with the provisions of the law, regulations and / or applied instructions. Provided that such fees are for the interest of the first party.
7. The first party is obliged to consider all tenants in Jericho Agro-Industrial Park as one customer who (the tenants) are represented by the second party.
8. The second party shall pay one shekel to the first party for each cubic meter of the consumed water, regardless of its different sources according to the system of connecting the facilities on the sewage network for the year 2013.
9. The second party shall bear the costs of managing, operating and maintaining the following:

a) Gravity-activated sewage network inside Jericho Agro-Industrial Park.
b) Collection and pumping station.
c) Pressure Lines coming out of the pumping station towards Municipality's manhole No. (19) located in the area of "Ketf Al-Wad".

10. The second party shall collect the wastewater inside Jericho Agro-Industrial Park and transfer it to Jericho WWTP either by the collection and pumping station or "in case of difficulty" by the pumping tanks.
11. The second party shall comply and oblige tenants to comply with the specifications of the wastewater generated by each facility in accordance with the conditions and specifications specified by the first party as attached to this agreement. The second party shall oblige the investors to install a preliminary treatment unit to ensure conformity of the waste water to the specifications attached and mentioned in this item.
12. The first party shall perform a weekly periodic inspection in his laboratory in Jericho WWTP for the waste water comes from JAIP, and shall document the results in a special archive and provide the second party with a copy of these results. In case the results don't match the specifications mentioned in this agreement, the first party has the right to stop the pumping of the waste water comes from JAIP to the WWTP and then to request the second party to maintain the situation directly.
13. Both, first party and second party commit to provide the third party with any letter, notification or warning between each other's which is related to this agreement.
14. All parties have to evaluate this agreement after two years of signing. According to the evaluation outputs, amendment annex is to be signed from all parties added to this agreement (if needed). In case the amendment annex is not signed, then this agreement will consider valid.
15. The second party committed to install a meter on the pressure line which is going out of the pumping station to measure the quantities of waste water transferred to WWTP of the first party and mentioned in this agreement. The measures is to be archived by the first party and the second party to be used for the evaluation mentioned in term No. (14) of this agreement, or to be used for other statistical purposes.
16. It is obvious by all parties that the change in the fees is a competence for the first party only, and could be changed based on the regulations of "connecting the establishments and houses to the waste water network" for the year 2013.
17. Except to what mentioned in term (12), any conflict that may happen between the first party and the second party for any term mentioned in this agreement or its annexes, it have to be treated in a friendly way, consider the start of negotiations within 2 weeks after any party notify the other for the conflict, or from the time when the conflict starts. In case no compromise happen, then judgment according to the valid Palestinian law and provisions shall be taken.
18. This agreement is considered as valid from the date of being signed by all parties.
19. The regulations of "connecting the institutions and houses to WW network" for the year of 2013 is the legal reference which control all parties.

20. All previous agreements related to the WW between parties is considered as cancelled, and this agreement is considered as the final agreement to regulate the relationship between parties.
21. This agreement is consist of 21 term, including this term, and printed on four pages and three originals. Each party is to keep one original, considering all attached annexes mentioned in this agreement.

Based on what mentioned, all parties agreed, under their legal mandate, in Jericho city, on 11/8/2016

First Party Second Party Third Party

To: PIEFZA

Dr. Ali Shaath

Greetings,

Subject: The specifications of the Waste Water related to JAIP project

Jericho municipality present you the best wishes. Regarding to the above mentioned subject, and according to the meeting which was conducted in Jericho municipality on Sunday 2/8/2015, it was request from the municipality to provide you with the specifications of the waste water to be pumped through the municipality's network of waste water to reach the WWTP. These specifications are mentioned in the regulation issued by the cabinet, so it is a must to commit to it.

Please accept high respect and appreciation

Mahammad Jalaita
Mayor of Jericho

Attached/

Specifications of the waste water which have to be committed on.

Attachment

The instructions of WW comes from the commercial, industrial and agricultural to the public waste water network

Term (1)

It is prohibited to pump the WW from the commercial, industrial and agricultural to the public network unless being treated and got a written approval from the service provider based on this instructions.

Term (2)

It is forbidden for anyone to discharge or allow others to discharge the following water and waste to the public WW network:

1. Any solid or liquid in any quantity or volume, in any biological, chemical, or physical status, which could prevent the flow inside the WW network, or could cause harm to the general health or to issue bad things or that could harm the public WW network or employees or contradict the maintenance and operation work of the treatment plants or contradict any of the treatment stages, or could result in producing a harmful treated waste water that could harm the general health and safety. For example ,and only example not limitation, ash, burned coal remains, sand, clay, straw, sawdust, metals, glass, ceramic, feathers, tar, plastic, wood, blood and animal gut, animal manure, hair, paper dishes, various kinds of packaging, fats and oils, acids and carbon, mineral salts, steam, hot gases, dyes, pesticides, liquid waste from olive presses, dairy products and animal blood from slaughterhouses.
2. Any solid, liquid or gas that is considered according to the opinion of the provider of the services, consider to contains toxic elements, metals or heavy metals that could harm or contradict the treatment or could produce harm on humans, animals or plants, (either solo element or if chemically reacted with each other's or with waste).
3. Any materials that could leads to:

a) Prevent the treatment during the treatment process.
b) Produce residues that could settles or froze or that could become viscous on temperature between 0-40 degrees centigrade.
c) Contradict the final use of the treated water, such as causing the increase of the salt concentration dissolved such as the ones produced from the Sesame paste pressures and the Jeans Laundries.

4. Any WW going out of the facility that have a PH less than 5 or more than 9.5.

5. The liquid waste produced by the stone saw and the factories of tiles, marble, bricks and cement mixers, or any liquid waste that have the concentration of solid residuals (50)mille gram /liter and specific weight more than (1.5) gm/cm^3.
6. Any liquid or gas with temperature more than (65) degrees centigrade. In case it is proved for the service provider that even the liquids or gases in lower temperatures could harm the WW treatment system, or could cause any other harm, then it have the right to stop its drainage to the WWT system.
7. The WW that contains vegetable/animal oil and fat or wax in a emulsion shape (Emulsified) in concentration more than 100 mille gram/liter.
8. Any waste water or material that contains Cyanide or its compounds in a concentration that could produce (2) mille gram/liter as Cyanide shape.
9. Any waste water that contains Phenol in a concentration more than (10) mille gram/liter as a Phenol shaped or in a concentration more than (100) mille gram/liter as a Phenol is free of halogens.
10. Any waste water or material that contains sulfur compounds in a concentration more than (2) mille gram/liter as Hydrogen sulfide shape.
11. Any waste water or materials that contains chlorinated organic solvents.
12. Any waste water or materials that contains Chemical Detergents that are classified as MBAS in a concentration more than (40) mille gram/liter.
13. Any waste water that contains oil from cutting machines or Distillers in a concentration more than (20) mille gram/liter.
14. Any waste water or materials that contains Sulfate compounds (SO4) in a concentration more than (1000) mille gram/liter.
15. Any waste water or materials that chloride compounds (CL) in a concentration more than (500) mille gram/liter.
16. Any waste water or materials that contains Florid in a concentration more than (60) mille gram/liter.
17. Any waste water or materials that contains total suspended solid in concentration more than (600) mille gram/liter.
18. Any waste water that contains the Chemically absorbed oxygen (COD) in a concentration more than (2000) mille gram/liter.
19. Any waste water that contains the Sodium components in a concentration more than (500) mille gram/liter.

Term (3)

It is prohibited to discharge any liquids or materials that contains Heavy or toxic elements which shows the concentration on the pumping station more than the shown in the below table:

Element	Concentration (mille gram/liter)
*Total Chrome	5
* Copper	4.5
Stannum	10
Beryllium	5
* Nickel	4
* Cadmium	1
Arsenic	5
Barium	10
* Lead	0.6
Manganese	10
* Silver	1
Boron	5
* Mercury	0.5
Iron	50
Zinc	15
* Cobalt	0.05
* Selenium	0.05
Lithium	5
* Vandium	0.1
Aluminum	10

* The sum of these elements in total shall not exceed 10 mg / L, and the service provider have the right to modify the above table if a Palestinian specification in this regards is being issued.

Term (4)

It is prohibited to reduce the concentration of contaminants in wastewater by mixing them with fresh or potable water to reach the required concentrations.

A 2-13-3: Layout Plan of JAIP

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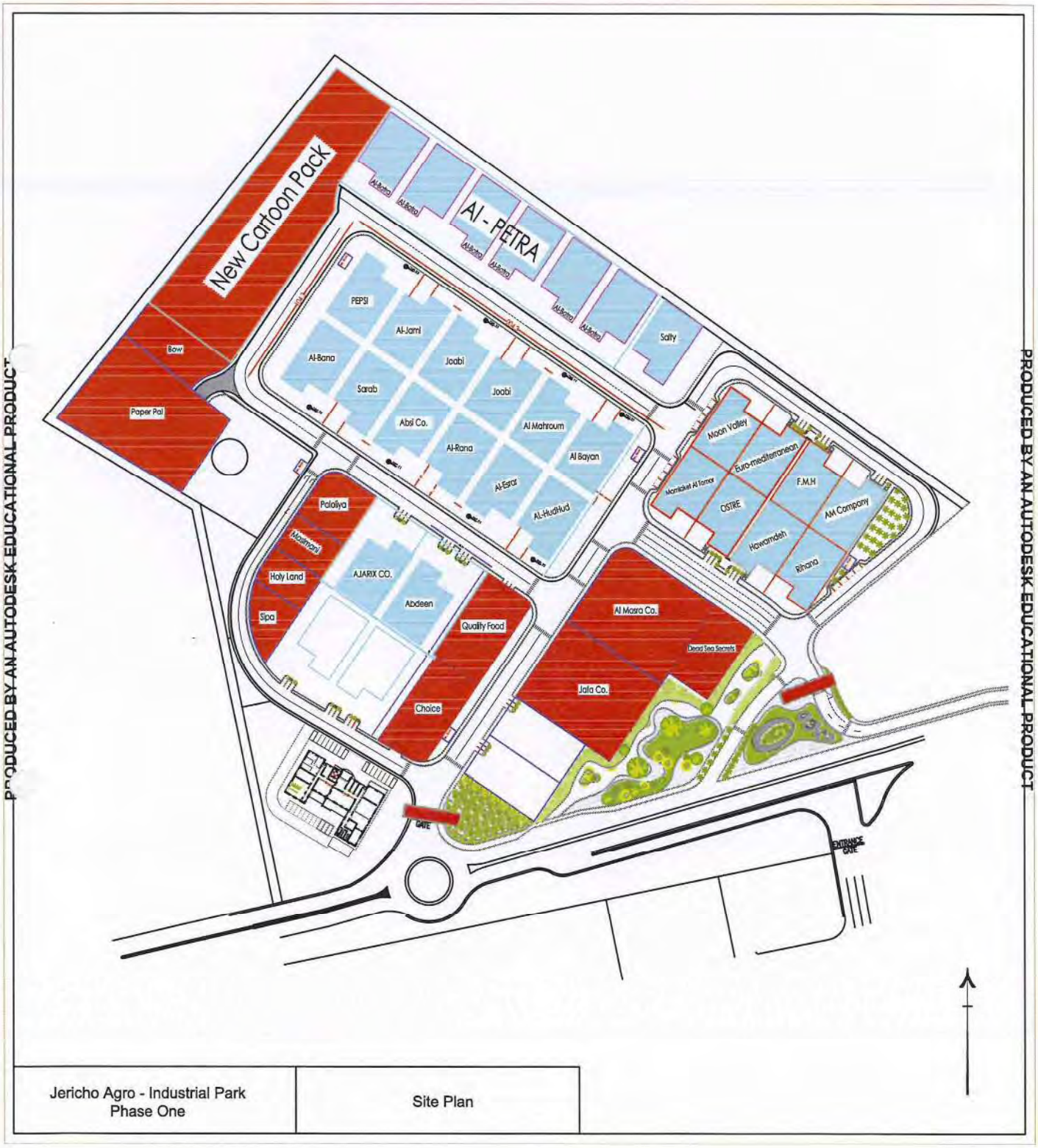

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