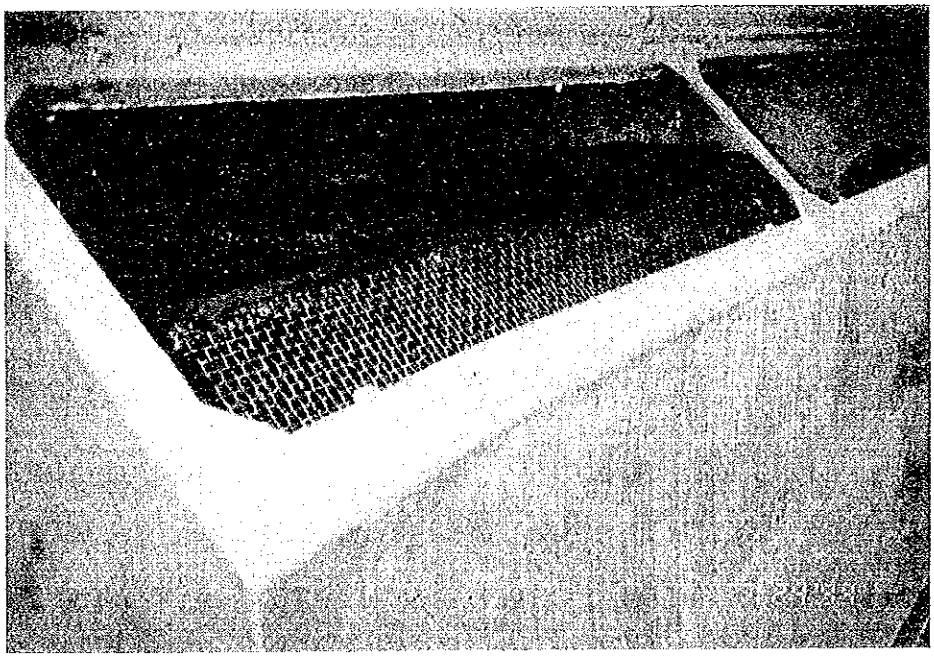
2 - 3 - 6 Outline of Existing Facilities and Equipment

(1) Present condition of the Amyria Plant facilities and equipments

1) Raw water screen

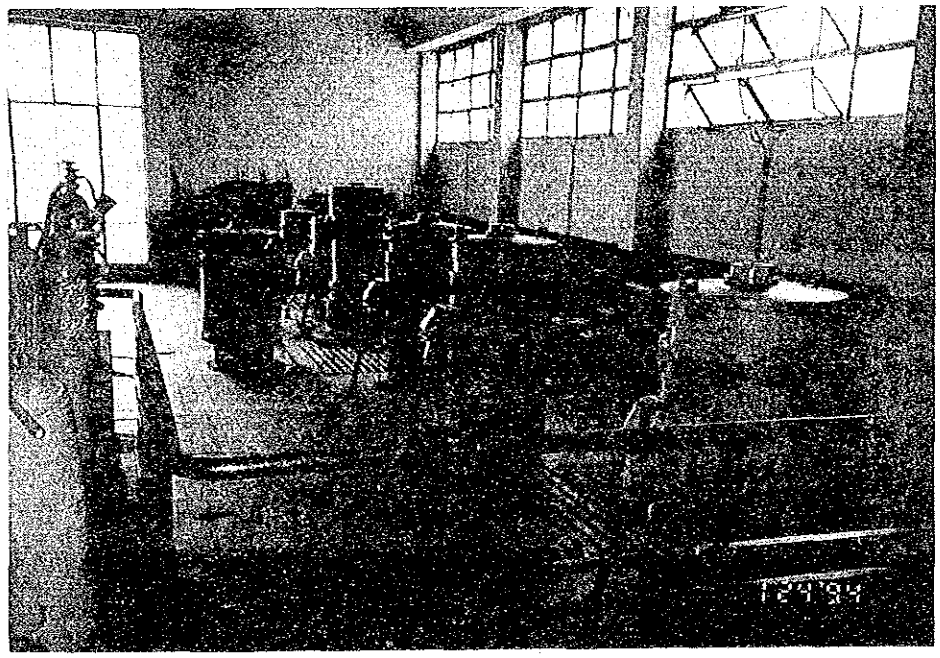
Partial corrosion of the cover, wearing out of the roller chain, partial damage of the screen connector rubber and other problems are observed in the raw water screen.



Photograph 2 - 1 Raw water screen

2) Raw water pump facilities

The raw water pump facilities consist of 4 units of large-capacity pumps and 4 units of small-capacity pumps, and 35 years have elapsed since they were first installed in 1959. These pumps present noise, vibration and other problems, but the impeller has been changed 5 times by the Egyptian authorities in charge of the matter. The system for maintenance and control of these raw water pumps is functioning satisfactorily, and the local personnel has the technical skill required to rewind the coil of the motors. As things now stand, the driving unit of the motor-driven discharge valve system is out of order, and the opening/closing operation of the discharge valve is being carried out manually.



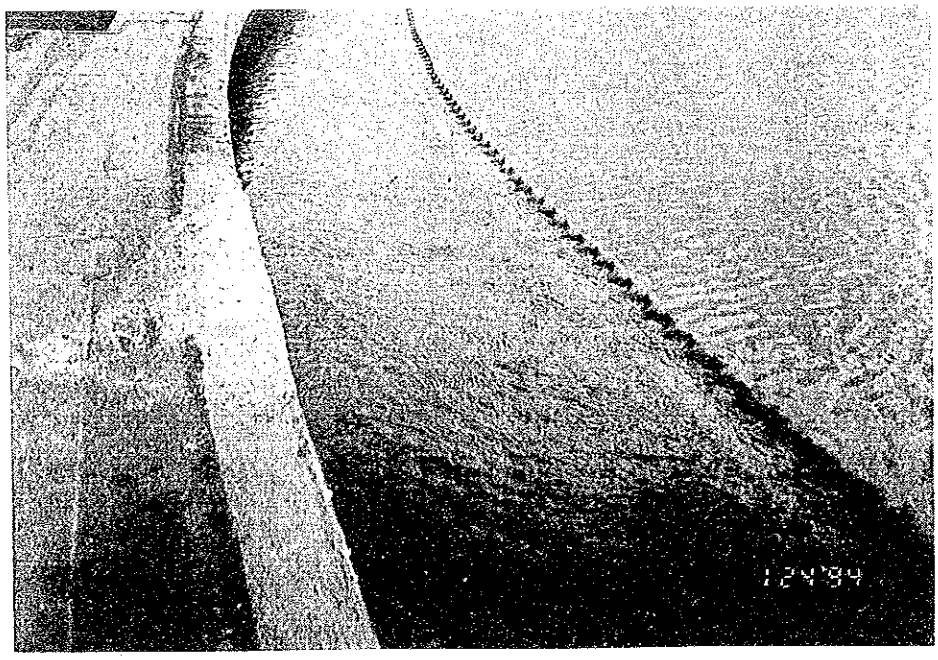
Photograph 2 - 2 Raw water pumps

3) Distribution shaft and clari-flocculation facilities

The distribution shaft is provided with distribution operation weir, but since it is being used with water volumes surpassing the estimated design volume of 330,000 m^3/d, the water level of the distribution shaft itself is high, it is functioning as a submerged weir, and as a matter of fact it is difficult to distribute the volume of water equably to clari-flocculator.

The flash mixer installed in the sedimentation basin is not being used in view of its small agitation effect. It was judged at the field survey that the flash mixer was unnecessary for the mixing system. There is leakage of oil from part of the speed reduction gears and other equipment, and the sludge agitator equipment are operating barely 1 to 2 hours a day because the degree of turbidity of the raw water is low. The overflow weir of the sedimentation basin is corroded and deteriorated.

Since the diameter of the connection pipe existing between the sedimentation basin and the filter basin is small, from time to time there is overflow of water from the sedimentation basin. The floor drainage pump has been removed.

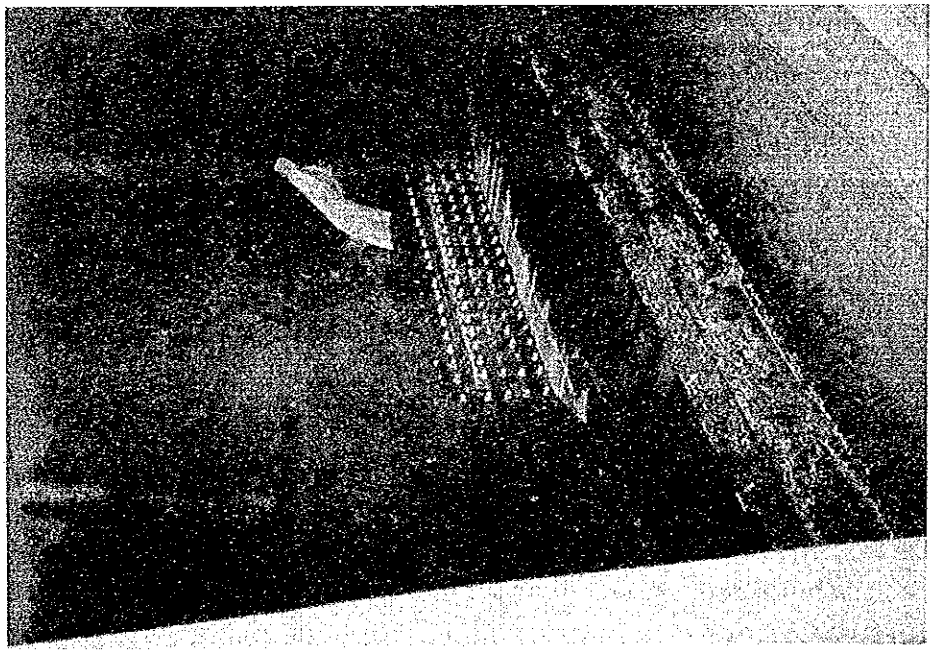


Photograph 2 - 3 Sedimentation basin periphery overflow weir

4) Filtration facilities

The filter basins consist of two ponds per basin. The filtration material has single layer configuration consisting exclusively of sand, and since the sand layer and the water collecting strainer located beneath it are directly in contact with each other, there is clogging of the water collecting strainer. Since the water collecting plate located at the lower part of the filtration system in superannuated and partially damaged, and the masonry joint is missing at some parts, the filter sand is dropping through the parts where the water collecting plate is damaged, and is accumulating beneath it. Moreover, the strainer installed in the water collecting plates is improperly shaped, unevenly installed, and partially damaged. The peripheral walls of the filtration facilities are contaminated with stagnant scum stuck on the surface.

Since sand is overflowed to the drainage trough during the simultaneous washing with air and water, which is part of the sand backwash process, this process has been shortened to 2 minutes instead of the usual duration of 4 minutes. Two troughs for water conveyance, washing and drainage are provided at the two sides of the basin, but since the water conveyance conditions of one of these troughs are not satisfactory, and the spacing between the troughs (5 meters) is too large, the drainage of the back



Photograph 2 - 4 Under drainage system of a filter basin

backwash water is not sufficient. Two out of the 3 backwash pumps have been replaced, but the remaining unit is obsolete. The blowers for air washing have 3 different specifications, but the units with larger capacity have part of the air bypassed so as to realize appropriate volume of air.

5) Treated water pump facilities

Broadly speaking, the destination of the water pumped by the treated water pump facilities is divided in 2 systems. The 6 pumps being used for distributing water to the low pressure areas were installed in 1987 and there are no functional problems in particular, and they can be used in their present condition.

On the other hand, the four booster pumps for conveying water to high pressure areas were built in 1958, and 36 years have elapsed after that. In the meantime, the impellers of those pumps were replaced 5 times in the same way as in the case of the raw water pumps.

Photograph 2 - 5 Booster pumps for high pressure area

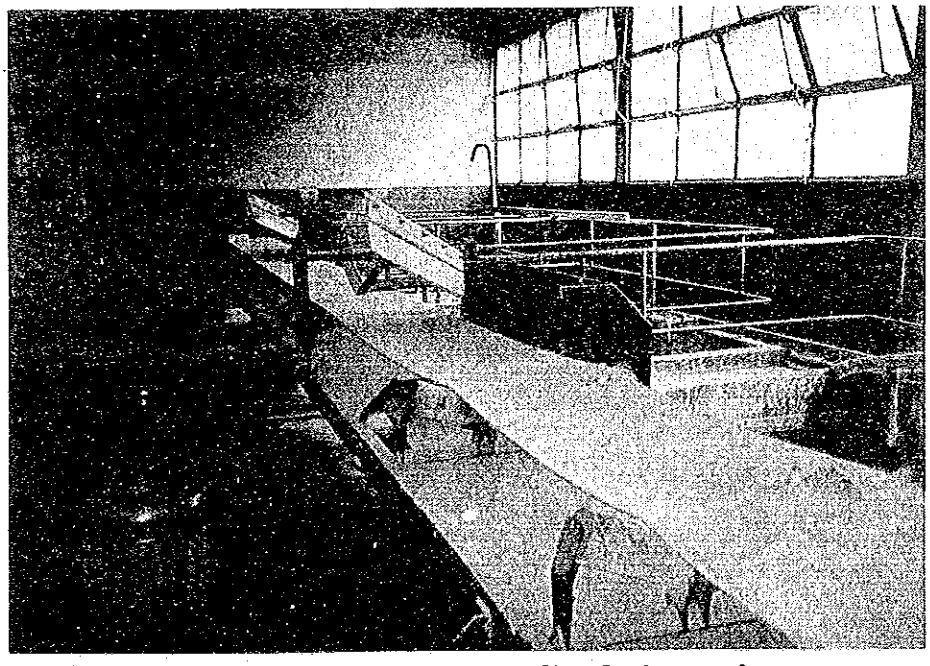
It must be remembered that booster pumps for high pressure areas are directly connected with the pipes of the pumps for low pressure areas, and this is problematic from the hydraulic and the operational standpoint.

6) Backwashing water and sludge discharge facilities

There are three drainage pumps, and no abnormalities have been observed in these facilities.

7) Alum dosing facilities

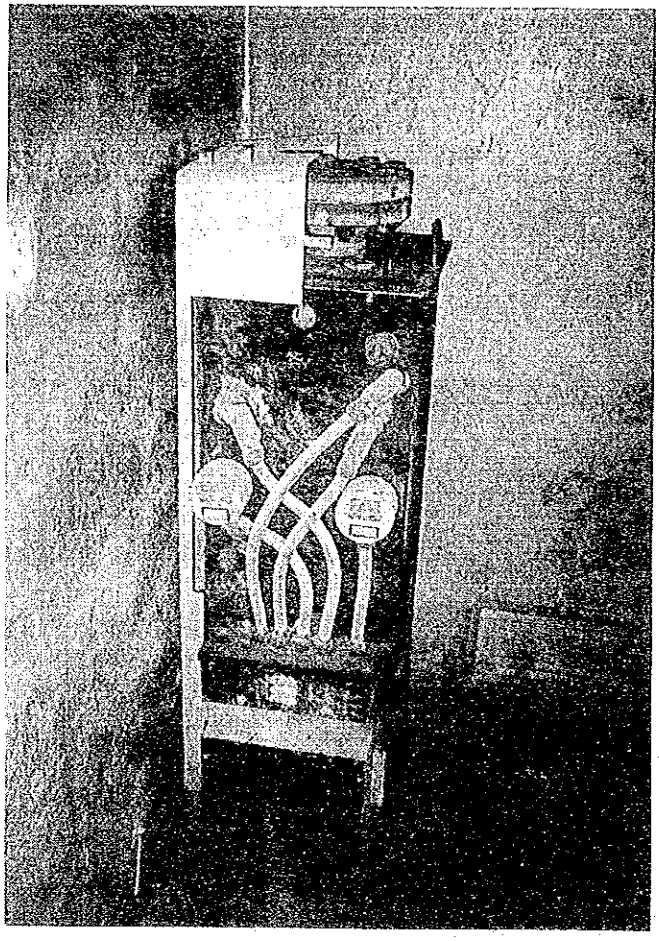
Both at the eastern side and the western side are 3 or 4 units of injection pumps, all ready for use. The solid alum facilities are being used only when there is no supply of alum due to the maintenance of the plant manufacturing this product (approximately 3 weeks per year).



Photograph 2 - 6 Alum dissolution tank

8) Chlorination facilities

The chlorination facilities are obsolete, and the values of the graduations indicated on the scale can not be confirmed clearly. The evaporator is installed only in the preliminary chlorination facilities, and are obsolete. The chlorine cylinder weighing machines have been removed, and concrete was placed on the floor on which the weighing machines were located.



Photograph 2 - 7 Pre-cholorination facilities

9) Electrical facilities

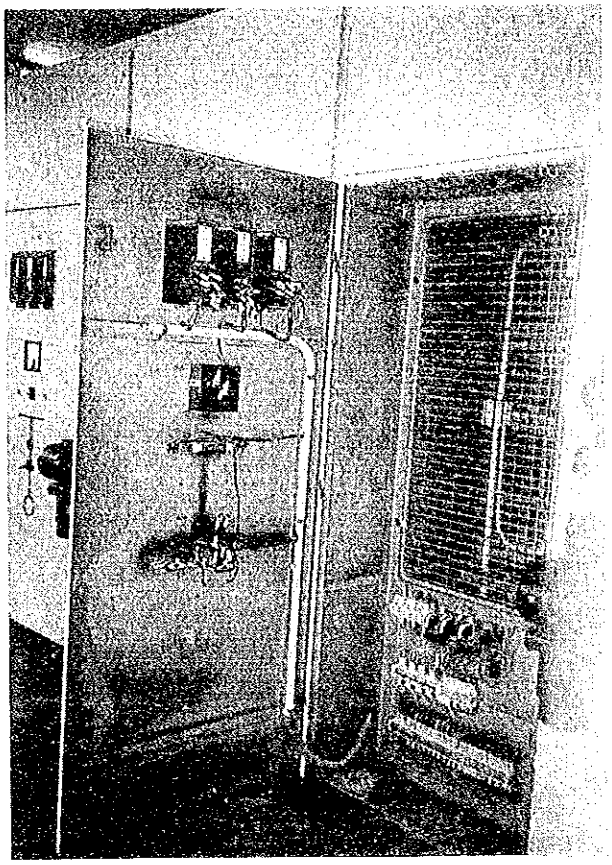
Both the internal equipment and the casing of the high-voltage board of the filtration facilities is advanced state of corrosion due to the high humidity conditions prevailing in the surrounding environment. As for the water treatment plant central monitoring board, the control equipment, instrumentation and indication equipment and the internal wiring are obsolete, and as things now stand their function is stopped. The sedimentation basin drainage pump board is corroded and its function is stopped.

10) Instrument facilities

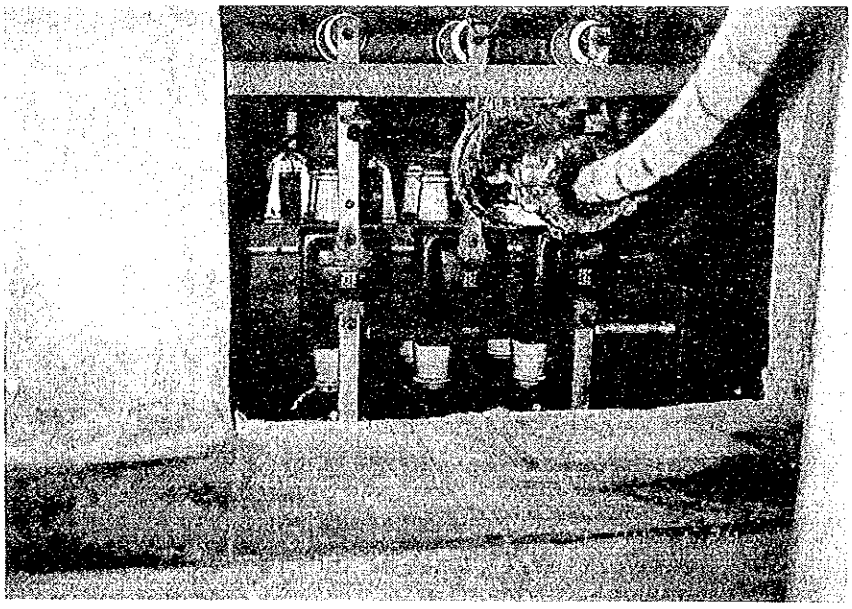
The following measuring instruments are obsolete, and their functions are stopped.

- Raw water screen loss head meter
- Sedimentation basin drainage pit level switch
- Distribution shaft water level meter
- Water distribution flow meter (for high-pressure and low-pressure area mains)

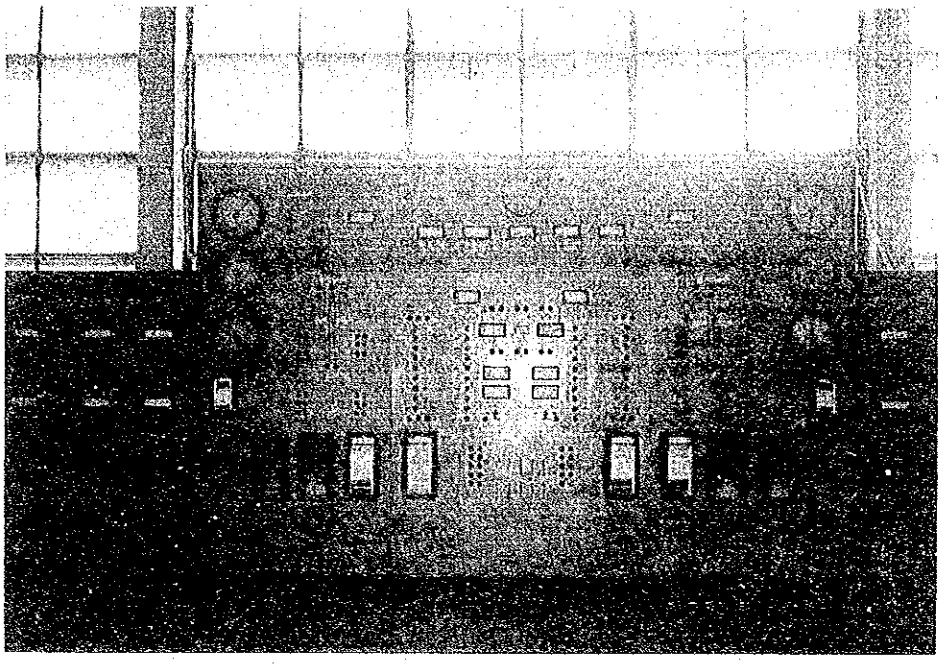
The main unit of the water level meter of the clear water reservoir is in advanced state of corrosion.



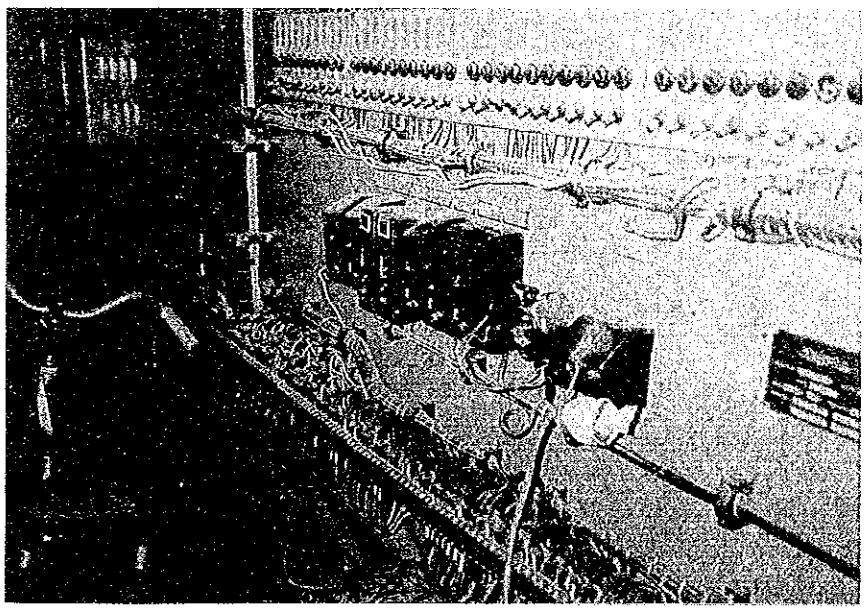
Photograph 2 - 8 Filter basin high-boltage board (front door, interior)



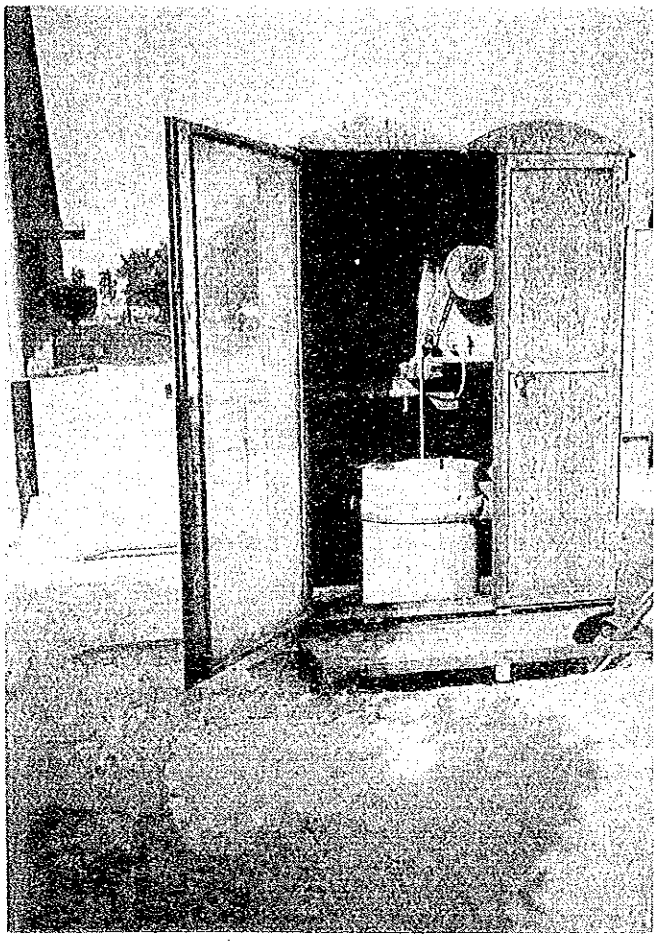
Photograph 2 - 9 Filter basin high-voltage board
(under the board, lead-in cable)



Photograph 2 - 10 Water treatment plant central monitoring board

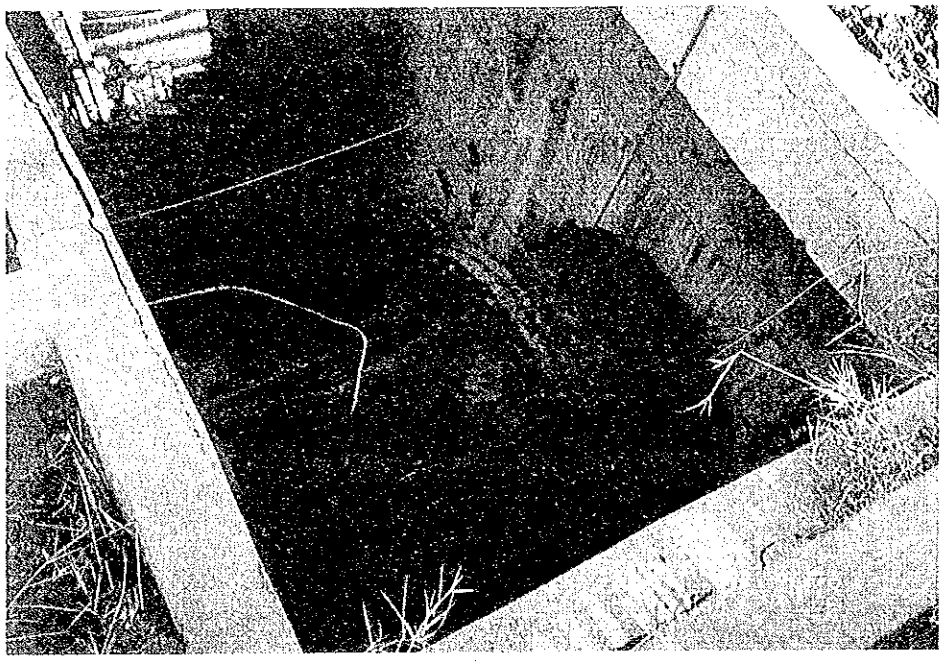


Photograph 2 - 11 Water treatment plant central monitoring board (interior)

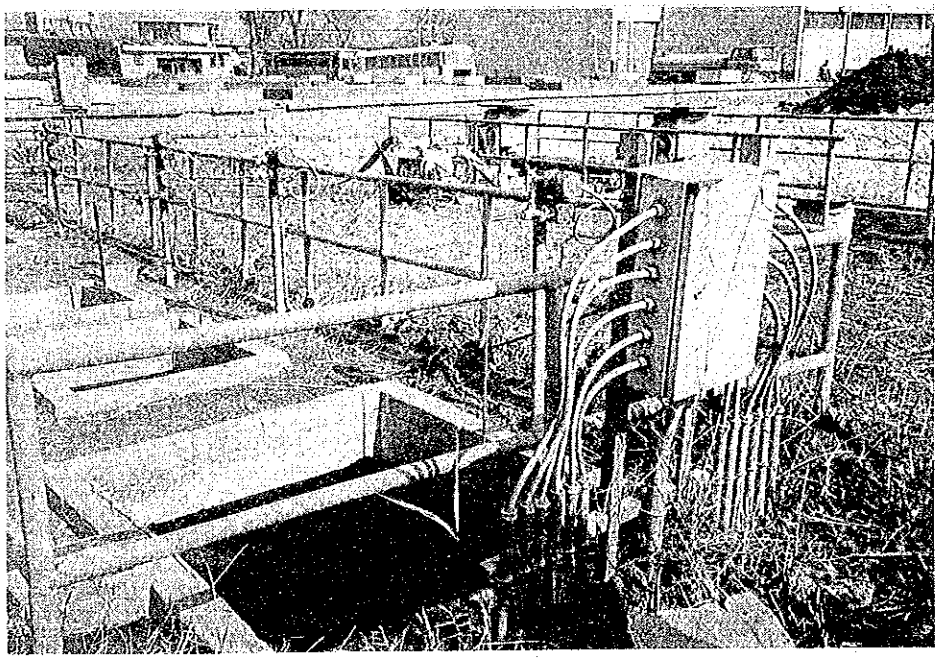


Photograph 2 - 12 Water treatment plant water level meter transmitter unit

Photograph 2 - 13 Distribution water flow meter (for mains pipe) detectorunit pit



Photograph 2 - 14 Raw water flow meter detector unit



Photograph 2 - 15 Distribution water flow meter (for branch pipe) detector unit pit & transmitter unit

(11) Water quality test laboratory

The water quality test laboratory is narrow, and the analytical equipment are not satisfactory.

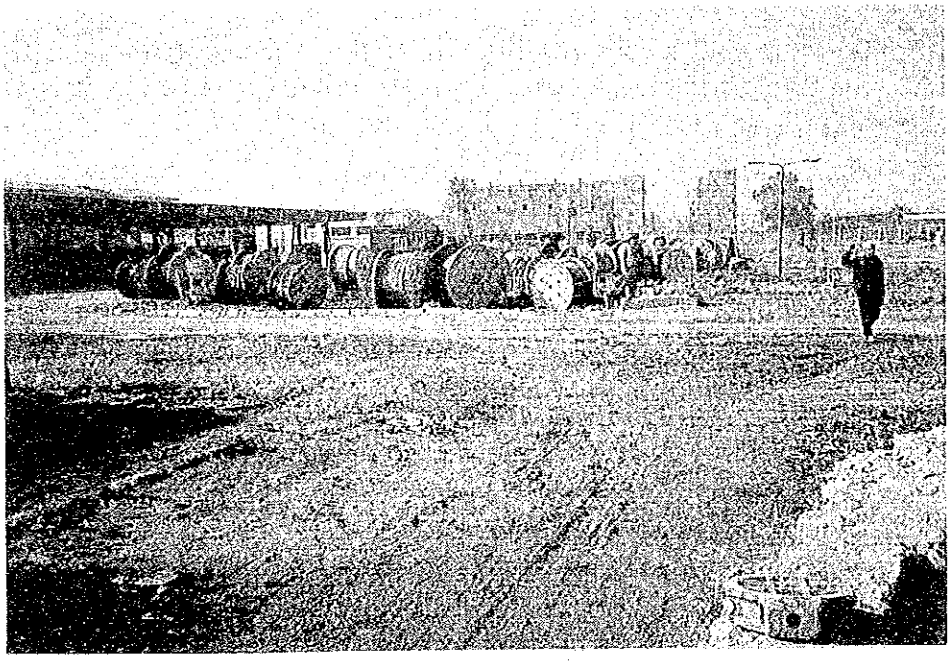
(12) Existing civil structures

As for the present status of the existing civil structures, no abnormality in particular was observed as a result of the visual inspections carried out this time.

Photograph 2 - 16 Sedimentation basin (there is no structural problem)

(13) Clearing in the treatment site

The water treatment plant must be operated under the severe water quality control so as to supply the sanitary and safety water to inhabitants in the supply area. The Amyria Plant is also operated based on the same operation standards, but from the standpoint of the appearance the situation is too much messy for a water treatment plant, and the situation is particularly bad at the vicinity of the rear gate which is being used as side gate. It will be necessary to clean the site.



Photograph 2 - 17 Vicinity of the rear gate

(2) Considerations on the existing facilities

1) Considerations from the standpoint of the volume of water

- Raw water pump:

  The existing facilities have a capacity of 407,000 m^3/d, and it will be necessary to install two more units of small capacity pumps.

- Connection pipe between distribution shaft and clari-flocculator outflow weir:

  The distribution shaft is capable to give play to its distribution functions for water volumes under 300,000m^3/d. Such being the case, the pipe located in this section will be remodeled into an open channel water conduit with the object to cope with the planned of volume of water.

- Clari-flocculator:

  It is deemed as appropriate to utilize the existing facilities by rehabilitating them, with priority given to the microflocculation water treatment method.

- Connection pipe between the clari-flocculator and filter basin:

  Since the pipe of this section has 345,000m^3/d capacity, the diameter of the pipe will be increased with the object of cope with the planned volume of water.

- Filtration facilities:

  The filtration facilities consist of the filtration mechanism and the washing mechanism. The filtration mechanism consists of a single layer consisting exclusively of sand, and without gravel layer. Since the water collecting equipment has poor performance, the washing with air and water is insufficient. There is no equipment for adjusting the volume of washing water. Washing is insufficient because the drainage of water used for washing the sand layer is insufficient. As a consequence, the performance of the filtration mechanism becomes poor, the filtration time lasts short, and in come cases the water treatment capacity becomes small. As things now stand the performance of the filtration mechanism is poor, but the fact that the filtration speed will be increased to values close to 150m/day when handling the planned water volume, it will be indispensable to properly equip the washing facilities.

- Clear water reservoir capacity:

  Since the clear water reservoir has insufficient capacity, it is recommendable to increase its capacity as much as possible.

- Treated water pumps:

  The treated water pumps have 475,000m^3/d capacity, which is 1.1 times as large as the planned water volume of 430,000m^3/d.

- Alum dosing facilities:

  The existing facilities are sufficient to cope with the planned volume of water.

- Chlorination facilities:

  The existing chlorine injection facilities are obsolete, and it is regarded as appropriate to substitute them with new ones in order to cope with the planned volume of water.

2) Considerations from the standpoint of the water quality

- Installation of a net fence in front of the raw water pump:

  This fence will have the function of preventing large-sized suspended matter from getting mixed in raw water which is being taken from the Ismailia Canal.

- Substitution of the raw water screen:

  Since the existing raw water screen is obsolete, it will be substituted with a new one with the object of carrying out efficient dust collection operation.

- Improvement of the filtration facilities washing mechanism and other related parts:

  The washing mechanism of the filter basin will be improved, with the object of upgrading the quality of the filtered water.

- Improvement of the chlorination facilities:

  The pre-chlorination and post-chlorination facilities will be substituted with the object of improving the biological treatment performance and upgrading the safety of the running water.

- Improvement of the water quality test equipment:

  Since the existing equipment for testing water quality are insufficient, they must be improved with the object of carrying out appropriate water quality control.

3) Considerations from the standpoint of the maintenance and control

- Measuring instrument

  Raw water flow meter, treated water flow meter and other equipment are available in the water treatment plant, but they must be improved because the required instrumentation units are not properly equipped.

- Generators

  Existing generators were installed since a long time ago, but its maintenance and repair are done sufficiently. Generators will operated smoothly and be used for a long term.

(3) Present conditions of the groundwater supply facilities

1) The wells facilities

Number of wells:	41 wells
Well diameter:	20 centimeters
Well depth:	67.5 meters (average)
Pumping volume:	200m^3/hr (average)
Static water level:	6 to 8 meters
Pump capacity:	200m^3/hr×100 meters
Wells in operation:	18 wells

2) Quality of the groundwater

According to official data of 1991-1993, all wells are surpassing the W. H. O. standards with regard to more than one item. (Refer to Table 2-11). All wells are surpassing the permissible concentrations of iron (Fe) and manganese (Mn). In particular, it must be remembered that water taken from these wells contain ammoniacal nitrogen, and the turbidity is worsening gradually. Under the circumstances, it may safely be said that the decision of the Egyptian sanitary authorities, that ordered immediate suspension of the use of these wells was correct.

3) Available quantity of groundwater

Within the site of the Amyria Plant, which is sized 300,000 square meters, there are 41 wells besides the water treatment facilities with 300,000 m^3/d capacity. The minimum separation distance between these wells is 10 meters, and the maximum distance is 100 meters. In order to secure a pump capacity of the order of 200 m^3/hr it is generally necessary to have a separation distance of the order of 300 meters between adjacent wells, and as things now stand the separation distance between the existing wells is very small. Such being the case, the volume of groundwater currently available for pumping is subject to serious restrictions. As a matter of fact, the number of wells in operation declined to 27 in 1991, to 24 in 1992 and at the present time (1993) there are only 18 wells in operation. As a result of analytical studies carried out about the matter, it is presumed that 30,000 m^3/d is the maximum limit of water that can be pumped from these wells.

TABLE 2-11 SUMMARY OF WATER QUALITY OF WELLS IN THE AMYRIA PLANT

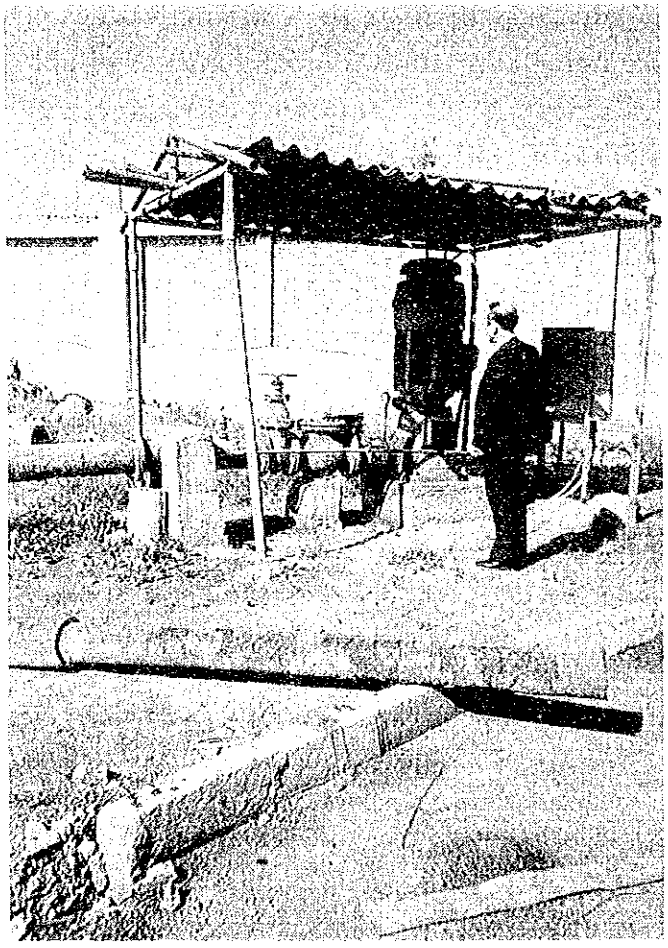
Item	Water quality standards	Number of wells surpassing the standards (%)		
		1991	1992	1993
NH4-N	- (0.5mg/l)	(25.9)%	(16.7)%	(11.1)%
Turbidity by	5°(5°)	33.3 (33.3)	50.0 (50.0)	72.2 (72.2)
Dissolved matter	1,500mg/l	26.9	20.8	27.8
Total hardness	500mg/l	48.1	50.0	44.4
Calcium ion	200mg/l (75mg/l)	29.6 (55.6)	8.3 (66.7)	33.3 (77.8)
Chlorine ion	600mg/l (250mg/l)	(44.4)	(41.7)	(44.4)
Sulphate ion	400mg/l (400mg/l)	40.7 (40.7)	41.7 (41.7)	33.3 (33.3)
Iron	1mg/l (0.3mg/l)	33.3 (66.7)	37.5 (66.7)	44.4 (44.4)
Manganese	0.5mg/l (0.1mg/l)	100.0 (100.0)	62.5 (100.0)	94.4 (100.0)

-1. Water quality standards show Egyptian one and figures putting in parentheses show W. H. O guideline.

-2. Percentage of number of wells surpassing the standards is formulated follows:

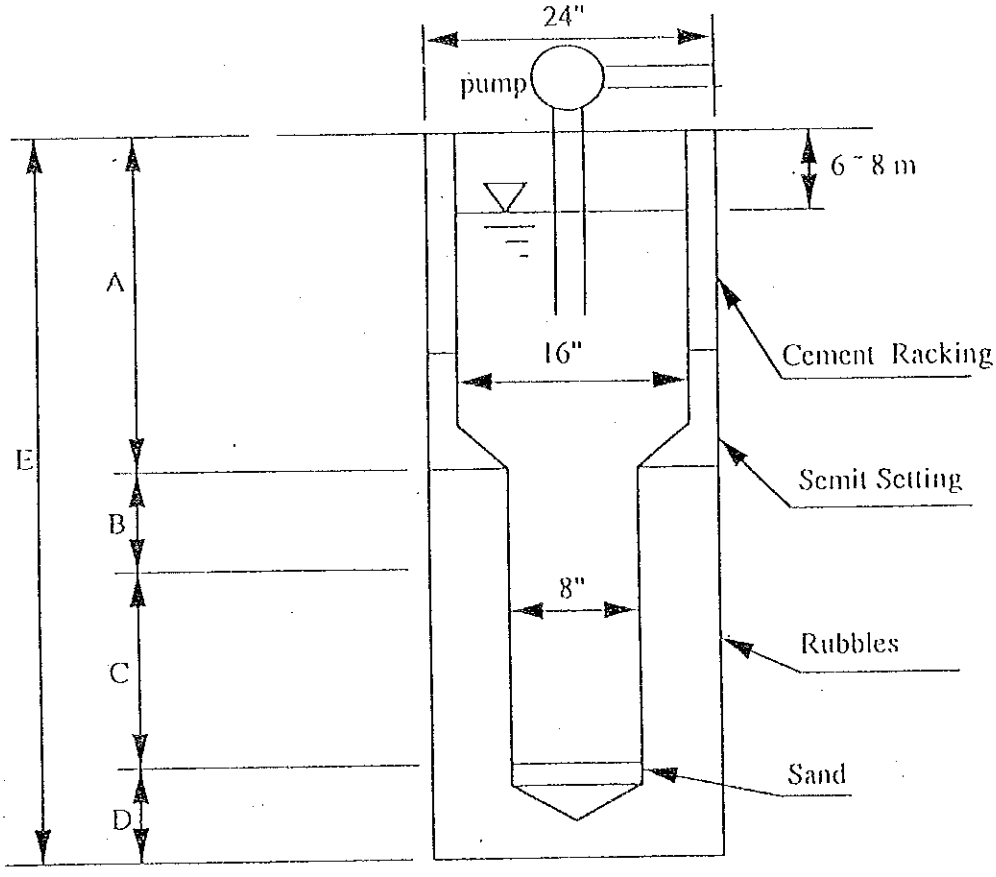
$$\frac{\text{Number of wells surpassing the standards during the said year}}{\text{Number of used wells during the said year}} \times 100$$

Figures putting in parentheses show the percentage calculated by W. H. O guideline.



Photograph 2 - 18 Well

FIGURE 2 - 6 STANDARD WELL



A = Approximately 30 meters

B + C = Approximately 35 meters

D = 2.5 meters

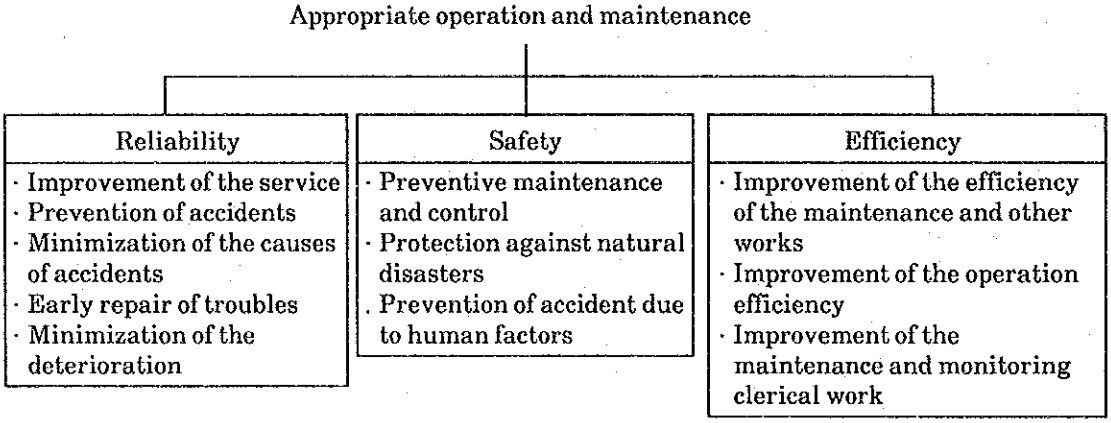
E = Approximately 67.5 meters

Standard pumping rate : 200 m^3/hr (= 4800m^3/d)

2 - 4 Operation and Maintenance Plan

In order to maintain the functions of the Amyria Plant, including the rehabilitated facilities, for long time, it will be necessary to introduce the preventive maintenance and control system shown in Figure 2-7. This preventive maintenance and control system have the object of improving the reliability, safety and performance, in addition to carrying out appropriate operation maintenance. Efforts related to the periodic revision of the organization, personnel, operation and maintenance techniques, as well as improvement of the technical skill will be required in order to realize the said goals.

FIGURE 2 - 7 APPROPRIATE OPERATION AND MAINTENANCE



2 - 5 Technical Cooperation

The technical level of GOGCWS staff is rather high, which consists of many university graduates majoring in mechanical engineering, electric engineering, chemistry, civil engineering, etc., many of whom have M. Sc. and Ph. D. degrees obtained in Europe and the U. S.

In connection with the rehabilitation to be carried out within the context of the Project, it is known that facilities of the same kind are being operated and controlled in other water treatment plants of GOGCWS, with no

problem from the standpoint of the water supply volume, the water quality and the technical level. Moreover, it is presumed that the Amyria Plant is in satisfactory conditions on the organization, the technical personnel and the operators, and therefore it is concluded that no technical cooperation will be required for the sake of operating the water treatment plant after its rehabilitation.

As for the water quality inspection techniques, the Central Water Quality Test Laboratory equipped with state-of-the-art facilities is scheduled to start its operation at the Fostat Water Treatment Plant in April 1994. Training courses for chemists will be carried out in this laboratory, and it is presumed that it will be possible for the technical personnel to acquire all of the required technical qualifications as a result of these training programs.

CHAPTER 3. BASIC DESIGN

CHAPTER 3 BASIC DESIGN

3 - 1 Design Policy

(1) Policy

The policy to be referred in the basic design, defined as a result of the discussions and the field survey, are shown in the followings.

1) The supply of 430,000 m^3/d of water of superior quality will be secured in the Amyria Plant.

2) Treatment process will be given priority for securing the water quality, instead of flocculation- sedimentation.

3) The major purposes of the filter basin will be the filtration of water out of the sedimentation.

4) The required measuring instruments of water quality will be equipped.

5) The water quality monitoring facilities will be provided not only of materials and equipment for water quality analysis, but also analytical laboratory equipment and centralized indication of the basic water quality.

6) The site of the Amyria Plant will be put in order from the standpoints of the aesthetic appearance, safety and hygiene.

7) The implementation shall be carried out without interrupting the operation of the existing facilities in order to always keep the quality water.

(2) Considerations on the design policy

The following subjects concerning the water treatment mechanism were studied and considered in the basic design.

1) Characteristics of the influent water

Since the Aswan High Dam started its operation, both the water level and the flow rate of the Nile River are stable at the intake point, and moreover the degree of turbidity of the raw water has remained at low levels within the limits of 3.4° to 32°. It must be remembered, however, that the concentration of vegetable plankton contained in the raw water is very high, at the levels ranging from 2,000 units/ml to 27,200 units/ml according to data referring to the period comprehended from 1991 to 1993.

2) Considerations on the water treatment mechanism

As a general rule, in the treatment of this kind of raw water an appropriate quantity of chlorine is injected in the pre-chlorination process to kill the vegetable plankton, followed by the clari-flocculation process with injection of flocculant, and after that water is purified by high-speed filtration. It must be remembered, however, that the efficiency of the clari-flocculation process is presumed to be low, because the raw water has low degree of turbidity, and the flocs resulting from the clari-flocculation process have light weight.

3) Quantity of chlorine to be injected in the pre-chlorination process, and quantity of flocculant to be injected in the clari-flocculation process

The injection of chlorine in the pre-chlorination process increases the risk of generating trihalomethane and other kinds of organic chlorinated chemical substances that exert noxious influence on the human health. On the other hand, it must be remembered that the injection of flocculant shortens the durability of the filter media. Studies must be carried out in such a way to limit the injection of both substances to a minimum indispensable quantity.

4) The clari-flocculation treatment

The high-speed clari-flocculator that exist currently in the Amyria Plant have a simple mechanism, and in reality they do not have the function of high-speed clari-flocculator in the strict sense of the word. In order to give them clari-flocculation functions, it is necessary to install anew the mixing/flocculation basin in separate. Moreover, since the flocs formed as a result of the clari-flocculation process carried out here is very small, a sedimentation effect of high efficiency can not be expected even when modifications are made in the sedimentation basin. In view of the reasons mentioned above, in connection with the high-speed clari-flocculator existing in the Amyria Plant, it is regarded as a wise policy to carry out only the minimum extent of rehabilitation and upgrading regarded as indispensable for coping with abnormal increases in the degree of turbidity.

5) The filtration process

i) The filtration process

Since the purification effect realized as a result of the clari-flocculation process is not so much conspicuous, purification effect can be easily expected to be realized by the filtration treatment carried out in the Amyria Plant.

ii) Degree of turbidity of the filtered water

According to the statistical data referring to the matter collected so far, the degree of turbidity of the filtered water was within the limits comprehended from 0.5° to 1.5° in 1991, from 0.3° to 2.5° in 1992, and from 0.2° to 3.5° in 1993. In order to keep the degree of turbidity at the "water quality standard tap" of Egypt at values under 5° , it is desirable to keep the degree of turbidity of the filtered water at value under 2° , by taking into consideration the possibility of increase of turbidity of the porable water when it passes through the distribution pipe.

iii) Defects of the filtration treatment mechanism and corrective measures

As things now stand, the sand of the filtration system is flowing out through the drainage trough during the washing operation that is being carried out by making use of the combination of air and water. This is because the filter sand particles become light due to the effect of the air during the washing operation carried out by making use of the combination of air and water. In order to solve this problem, a backwashing flow adjustment valve shall be installed in the backwashing pipe, so as to adjust the volume of backwashing water in such a way to prevent the flowing out of the sand during the execution of the washing operation carried out by making use of the combination of air and water, and to increase the volume of the backwashing water during the backwashing operation carried out by using only water that is carried out subsequently with the object of draining the washing waste water.

Since the water collecting plate located at the lower part of the filtration system is superannuated and partially damaged, and the masonry joint is missing at some parts, the filter sand is dropping through the parts where the water collecting plate is damaged, and is accumulating beneath it. Moreover, the strainer installed in the water collecting plates is improperly shaped, unevenly installed, and partially damaged. Such being the case, the filtration system is unable to carry out even filtration, the washing operation is not bringing about satisfactory results, and those factors are contributing to worsen the quality of the filtered water. In order to solve these problems, it is desirable to substitute the water collecting plates and the strainers.

Since the spacing between the drainage troughs is large, the bilge is retained at the upper part during the backwashing and is not drained. Moreover, since the drainage troughs located at the side walls have a small capacity, they get immersed underwater and they are not capable of giving play to their bilge drainage function. As a consequence, bilge separated from the filter sand is being returned to the sand layer, and that is lowering the effects of the washing operation. In order to solve these problems, it is desirable to install anew 5 transversal drainage troughs for every half filter basin, with these new drainage troughs oriented toward the central trough with sufficient drainage capacity.

As things now stand, single layer filtration is being carried out in the Amyria Plant through a filter media consisting exclusively of sand, but it is desirable to install anew a gravel layer with thickness of 200 millimeters, for the sake of realizing uniform filtration, uniform washing and other positive effects.

6) Considerations on the design policy from the standpoint of the water treatment mechanism

As a result of the analytical work carried out in Japan, from the standpoint of the water quality, it was decided to carry out the rehabilitation and upgrading works limited to the extents regarded as indispensable for securing the current water quality (installation of new screen fences, substitution of the raw water screen, substitution of the filter sand, installation of the backwashing water volume adjustment valve, substitution of the post-chlorination facilities, installation of the water quality meter).

On the other hand, it was decided to attach priority to the items of the rehabilitation and upgrading work aimed at securing a potable water supply capacity of 430,000 m^3/d. In addition, it was also decided to carry out the rehabilitation and upgrading of the facilities that are obsolete and improper for practical use. The reasons leading to the said decisions are mentioned in the followings.

The quantitative effects of the rehabilitation and upgrading of the water collecting devices located at the lower part of the filter basin and other components are not clearly known.

3 - 2 Study and Examination of Design Criteria

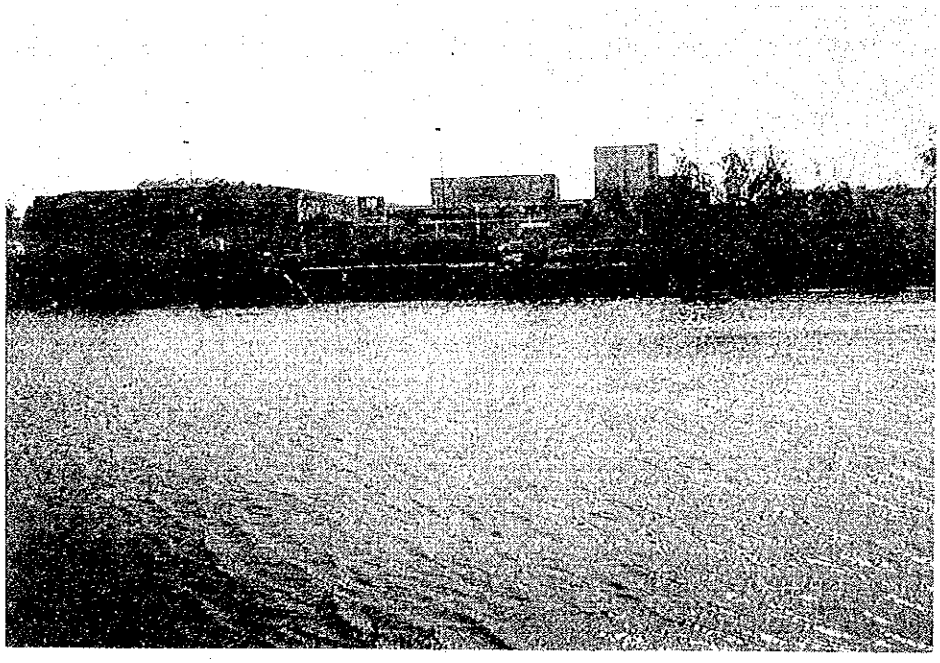
(1) Natural conditions

1) Temperature and humidity

The maximum atmospheric temperature prevailing during the summer season (period comprehended from April to October) at the Amyria Plant, which is the Project site, mounts to 33°C in average. The heat is quite severe, because the temperature during the day mounts to values of the order of 40°C to 45°C. On the other hand, since the annual average humidity is of the order of 53 %, the design must be in conformity with these conditions.

2) Water temperature of the Ismailia Canal

The water temperature of the Ismailia Canal is of the order of 15°C during the winter season and approximately 29°C during the summer season. Thus, the design must be in conformity with these conditions.



Photograph 3-1 Amyria Plant Intake

Photograph 3-2
Shared used water tap in the Amyria water supply area

Photograph 3-3
Manhole of the sewer receiving waste water from the shared used tap shown in the photograph above

(2) Matters related to the work

1) Increase of the volume of water to be treated at the Amyria Plant and its influence

The additional volume of water to be taken from the Ismailia Canal at the Amyria Plant site as a result of the implementation of the Project mounts to 130,000 m^3/d. Since the flow rate of the Ismailia Canal is of the order of 4.0 million m^3/d to 13.5 million m^3/d, the influence of the intake is of the order of 3 % to 1 %, which can be reared as negligible.

The backwashing waste water and the sludge will be discharged to the Ismailia Canal, mainly in the form of natural flow. Since the additional quantity of backwashing waste water and sludge to be discharged as a result of the incremental water volume taken in connection with the execution of the Project will be of the order of 6,500 m^3/d, the overall quantities of the matters resulting from the Amyria Plant that are being discharged into the Ismailia Canal are very small in comparison with the flow rate of the Canal, and it is presumed that for the time being there will be no problem at all. Since the water quality of the Ismailia Canal is worsening year by year, and that large amounts of water of this Canal are being used for irrigation and other purposes at the downstream areas, it will be presumably necessary to take measures of some kind of other in the future in order to cope with the problem.

If the volume of potable water supplied by the Amyria Plant is increased, the volume of waste water discharged from the households of the supply area will increase accordingly. Since 85 % of the Amyria water supply area is served by sewer systems, however, most of the waste water resulting from the potable water system will be treated at the sewage treatment plants. Thus, the noxious influence on the environmental conditions are presumed to be negligible.

2) Applicable standards and criteria

The technical standards, design standards, labor standards, customs and the like of the Arab Republic of Egypt referring to potable water supply facilities shall be taken into consideration in the facilities object of the Project.

The procedures required in connection with the additional volumes of water to be taken from and discharged into the Ismailia Canal shall be carried out by the Egyptian counterparts in charge of the matter.

3) Applicable legislation and regulations

The legislation and regulations related to the implementation of the Project are listed in Table 3-1. These legislation and regulations shall be duly taken into consideration in the Project.

TABLE 3-1 LEGISLATION AND REGULATIONS RELATED TO THE IMPLEMENTATION OF THE PROJECT

Legislation/Regulation	Description
Import & export regulation	Import prohibition clauses
Labor law	Labor & employment condition law
General turnover tax	Law on the consumption tax enforced in May 1991

(3) Utilization of Egyptian companies, commodities and equipment

1) Egyptian construction companies

In connection with the civil construction field, the local firms have sufficient experience as subcontractors of foreign companies in such works as the Aswan High Dam project, which is one of the largest civil engineering works carried out in this field, the large-sized construction works related to the Suez Canal, in addition to flood control projects, irrigation projects, water projects and sewer projects of various kinds, and there is no problem at all from the technical aspects related to the execution of the works themselves. In connection with the construction of water treatment facilities and other kinds of plants, there are no Egyptian companies possessing the design know-how related to the matter. Such being the case, there are no local companies with engineering capacity and machinery and equipment manufacturing capacity. Anyway, they have experience as subcontractors of foreign firms, and there is no problem related to the work execution technique itself.

2) Construction materials and equipment

As for the heavy construction machinery, ordinary ones are available in Egypt on leasing or rental basis, and they should be utilized. As for the special machinery required for executing the work without interrupting the supply of water, they should be brought from Japan, if any. Many general-purpose products manufactured in European countries are available on the Egyptian market, and they should be regarded as equivalent to the local ones for the sake of procurement. When there are problems related to the specifications, quality and quantity available on the market, however, and the products can not be obtained within the required deadline, they should be brought from Japan.

3) Quality and availability of local commodities and equipment

Since plant equipment to be procured in connection with the execution of the Project will be designed and manufactured in conformity with individual specifications, they can not be procured in the form of general- purpose products on the Egyptian market. Thus, they will be procured in Japan in view of the requirements related to the specifications and terms of delivery. As for materials accompanying the plant equipment, in principle they will be procured locally as long as practicable. When the combination of Japanese products is regarded as indispensable from the standpoint of the execution of the work, the design should be carried out by assuming the use of Japanese materials.

The categories of procurement based on the local procurement criteria are shown in the followings. No procurement will be carried out in third countries.

TABLE 3 - 2 LOCAL PROCUREMENT

Category	Product
Plant materials	Cast iron pipe (straight pipe sized less than ø 1000), PVC pipes, filter sand
Civil engineering materials	Cement, sand, reinforcing bar, form materials (plywood, crosspieces)
Heavy construction machinery	Cranes, bulldozers, backhoes, vehicles (local leasing)
Others	Gasoline, oil

TABLE 3 - 3 PROCUREMENT IN JAPAN

Category	Product
Plant equipment	Pump, valve, chlorinator, cast iron pipe (straight, bent), steel pipe, steel materials, water quality analysis equipment, electric switchboards, instrumentation
Civil engineering materials	Scaffolding, form materials (auxiliary materials, form ties, etc.)
Construction equipment	Generator, welding machine, submerged pump, pipe cutter, hand tools, etc.

3 - 3 Basic Plan

3 - 3 - 1 Site and Layout Plan

The layout plan of rehabilitation/upgrading of the Amyria Plant and summary of facilities to be improved is illustrated in Figure 3-1.

3 - 3 - 2 Equipment Plan

The table 3-4 shows the contents of the plan to be rehabilitated and or be upgraded.

As for the water quality analysis equipment to be provided, there are 6 chemists including the chief who is a doctor in the chemical section and 14 skilled worker, totaling 20 persons, in the Amyria Plant. They will carry out a physics and chemistry test, jar test and another necessary water quality test.

Distribution shaft and Clari-Flocculation facilities rehabilitation

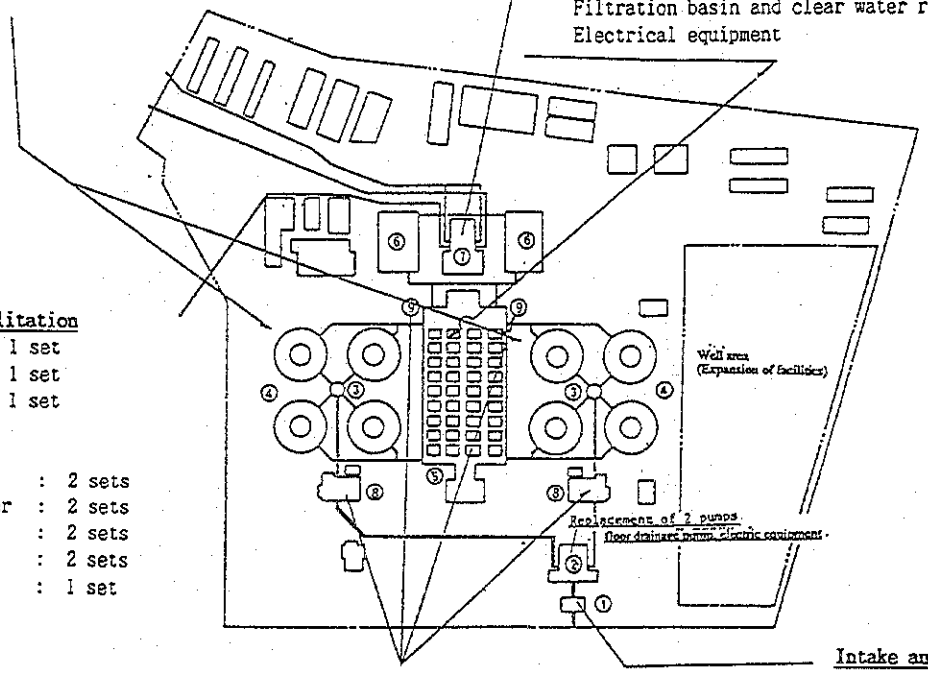
Distribution shaft and Clari-Flocculation facilities interconnection piping	: 1 set
Sedimentation basin flash mixer removal	: 1 set
Sedimentation basin underground floor drainage pump change	: 8 sets
Flocculation and sedimentation basin and filtration basin piping	: 1 set
Electrical equipment	: 1 set

Treated water pump facilities

Floor drainage pump change	: 2 unit
Electrical equipment	: 1 set

Filtration facilities rehabilitation

Filtration facilities rehabilitation (filter media, valves)	: 1 set
Backwashing pump room floor drainage pumps change	: 2 units
Filtration basin and clear water reservoir piping	: 1 set
Electrical equipment	: 1 set



Common electrical equipment rehabilitation

Central monitoring panel	: 1 set
DC power supply board	: 1 set
Low voltage switch board	: 1 set

Common instrument facilities

Raw water flow meter	: 2 sets
Treated water flow meter transmitter	: 2 sets
Clear water reservoir level meter	: 2 sets
Water quality meter	: 2 sets
Instrument panel	: 1 set

Water quality analysis equipment
Site building repair

Chlorination facilities rehabilitation

Pre-chlorinator change	: 1 set
Post-chlorinator change	: 1 set

Intake and inlet channel facilities

Raw water filter change	: 2 units
Screen fence	: 1 set
Electrical equipment	: 1 set

FIGURE 3-1 LAYOUT

TABLE 3 - 4 CONTENTS OF THE PLAN

(1) Electrical facilities

No.	Name of facilities	Specifications of materials		
		Name	Specifications	Quantity
E 1	Raw water screen Electric facilities	Mechanical screen operation panel	Steel plate, indoor, wall-hung type	2
		Loss head meter	Electronic type	2
		Wires, cables, conductors		1
E 2	Raw water pump Electric facilities	Raw water pump, 3.3 kv board	Steel plate, indoor, self-standing, enclosed type	1
		Raw water pump low tension control board	Steel plate, indoor, self-standing, enclosed type	1
		Drainage pump operation panel	Steel plate, indoor, wall-hung type	1
		Grounding terminal board (for high voltage)	Steel plate, indoor, wall-hung type	1
		Grounding terminal board (for low voltage)	Steel plate, indoor, wall-hung type	1
		Lighting switchboard	Steel plate, indoor, wall-hung type	1
		Raw water pump pit level switch	Float with contact type	2
		Drainage pit level switch	Float with contact type	2
		Wires, cables, conductors		1
E 3	Clari-flocculator Electric facilities	Clari-flocculator control panel	Steel plate, indoor, self-standing, enclosed type	2
		Drainage pump operation panel	Steel plate, outdoor, wall-hung type	8
		Drainage pit level switch	Float with contact type	8
		Clari-flocculator outlet level switch	Float with contact type	8
		Wires, cables, conductors		1
E 4	Filter basin Electric facilities	Filter basin high-voltage panel	Steel plate, indoor, self-standing, enclosed type	1
		Filter basin low-voltage control panel	Steel plate, indoor, self-standing, enclosed type	1
		Backwashing pump operation panel	Steel plate, indoor, wall-hung type	1
		Backwashing blower operation panel	Steel plate, indoor, wall-hung type	1
		Backwashing mains valve operation panel (machine side)	Steel plate, indoor, stand type	2
		Backwashing mains valve operation panel (operation gallery)	Steel plate, indoor, stand type	36
		Drainage pump operation panel	Steel plate, indoor, wall-hung type	1
		Sludge pump operation panel	Steel plate, indoor, wall-hung type	1
		Grounding terminal board (for high voltage)	Steel plate, indoor, wall-hung type	1
		Grounding terminal board (for low voltage)	Steel plate, indoor, wall-hung type	1
		Lighting switchboard	Steel plate, indoor, wall-hung type	1
		Backwashing water shaft level switch	Float with contact type	1
		Back washing pit level switch	Float with contact type	1
		Sludge drainage basin level switch	Float with contact type	1
		Wires, cables, conductors		1

No.	Name of facilities	Specifications of materials		
		Name	Specifications	Quantity
E 5	Treated water pump Electric facilities	Drainage pump control panel	Steel plate, indoor, wall-hung type	1
		Drainage pump pit level switch	Float with contact type	2
		Wires, cables, conductors		1
E 6	Common electric facilities	WTP central monitoring panel	Steel plate, indoor, self-standing, enclosed type	1
		DC power board	Steel plate, indoor, self-standing, enclosed type	1
		Low-voltage switchboard	Steel plate, indoor, self-standing, enclosed type	1
		Wires, cables, conductors		1
E 7	Instrumentation facilities	Raw water pump room instrumentation panel	Steel plate, indoor, self-standing, enclosed type	1
		Chemicals room instrumentation panel	Steel plate, indoor, wall-hung type	2
		Water distribution room monitoring & instrumentation panel	Steel plate, indoor, self-standing, enclosed type	1
		Raw water flow meter	Ultrasonic type, electronic type	2
		Clear water reservoir water level meter	Submerged type, electronic type	2
		Distribution water flow meter	Ultrasonic type, electronic type	4
		Treated water pH meter	Glass electrode type, electronic type	2
		Treated water residual chlorine meter (free chlorine)	Metal electrode type, electronic type	2
		Wires, cables, conductors		1
		Back wash water flow meter	Ultrasonic type	2

(2) Mechanical works

No.	Name of facilities	Specifications of materials		
		Name	Specifications	Quantity
M 1	Intake facilities			
M 1-1	Screen fence installation	Fence	L30m×H3m Mesh 100×100	1
M 1-2	Water canal remodeling	Interconnection gate	Gate valve W2,000mm×H2,000mm	1
		Stop log	Steel (150×200×3,950)×64units	1
M 1-3	Raw water screen change	Raw water screen	3mW×Basin height 6.9m	2
M 2	Raw water pump facilities			
				2
M 2-1	Raw water pump additional installation	Raw water pump	Vertical shaft centrifugal pump $1980m^3/hr \times 16m \times 90kw \times 3150V \times 50Hz$	2
		Check valve	Diameter 500	2
		Motor operated discharge valve	Motor operated butterfly valve diameter 500	2
		Stop valve	Manual butterfly valve diameter 500	1
		Pipe materials	STPY, CIP	1
		Chain block	Manual chain block with geared trolley 5,000 kg	2
M 2-2	Floor draiange pump change	Floor drainage pump	Submerged pump 0.3 m^3/min×15 m 2.2 kw×380 v×50 Hz	1
		Pipe materials	SGP	
M 3	Distribution shaft and Clari- floculator facilities			
M 3-1	Distribution shaft interconnection remodeling	Open Channel	Concrete structure	1
M 3-2	Flash mixer removal		Unable weir	
M 3-3	Floor drainage pump change	Floor drainage pump	Submerged pump 0.3 m^3/min ×15 m 2.2 kw×380v×50Hz	8
		Pipe material	SGP	1
M 3-4	Filter basin interconnection pipe remodeling	Stop valve	Manual butterfly valve 1,000 diameter	8
		Pipe materials	CIP	1
M 4	Filter basin facilities			
M 4-1	Filter media change	Filter media	Effective diameter: 0.9mm layer depth: 600mm	36
M 4-2				
M 4-3				
M 4-4	Backwashing mains remodeling	Main valve	Motor operated butterfly valve diameter 500	2
		Water flow meter	Orifice type	2
		Pipe materials	SGP, STPY	1
M 4-5				
M 4-6	Floor drainage pump change	Floor drainage pump	Submerged pump 0.3 m^3/min×15 m 2.2 kw×380 v×50 Hz	2
		Pipe materials	SGP	1
M 4-7	Treated water interconnection pipe remodeling	Stop valve	Manual butterfly valve, diameter 1200 diameter	4
		Pipe materials	CIP	1
M 5	Distribution pump facilities	Floor drainage pump	Submerged pump, 0.3 m^3/min ×15 m 2.2 kw×380 v×50Hz	2
		Pipe materials	SGP	1
M 6	Chlorination facilities			
M 6-1	Pre-chlorine facilities	Injector	150 kg/hr	4
		Vaporizer		2
		Manifold		2
		Pipe materials	STPG, VP	1
M 6-2	Post-chlorine facilities	Injector	40 kg/hr	4
		Manifold		2
		Pipe materials	STPG, VP	1

(3) Water quality analysis equipment to be provided

Name & Specification	Quantity	Unit
Analytical equipment (water quality)		
Sterilized incubator	2	sets
Pipet washer & drier	3	units
Pipet sterilization box	3	units
Thumb pump for pipet	20	units
Distiller	1	unit
Laboratory equipment washer	1	unit
Vibrating screen	1	unit
Analytical balance	2	units
Digital conductivity meter	1	unit
Stainless steel dessicator	2	units
Hot plate	2	units
Incubator	2	units
Automatic coliform bacillus counter	2	units
Digital DO meter	1	unit
pH meter	1	unit
Centrifugal separator	2	units
Magnetic staller	5	units
Spectrometer	2	units
Microscope	2	units