تحت رعاية معالي رئيس مجلس الوزراء المصري المهندس شريف إسماعيل
مؤتمر تحلية المياه الحادي عشر في البلدان العربية
UNDER THE PATRONAGE OF THE EGYPTIAN PRIME MINISTER ENGINEER SHERIF ISMAIL
11TH WATER DISALINATION CONFERENCE IN THE ARAB COUNTRIES
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Desalination In Egypt Between The Present And The Future, Industry Or Trade

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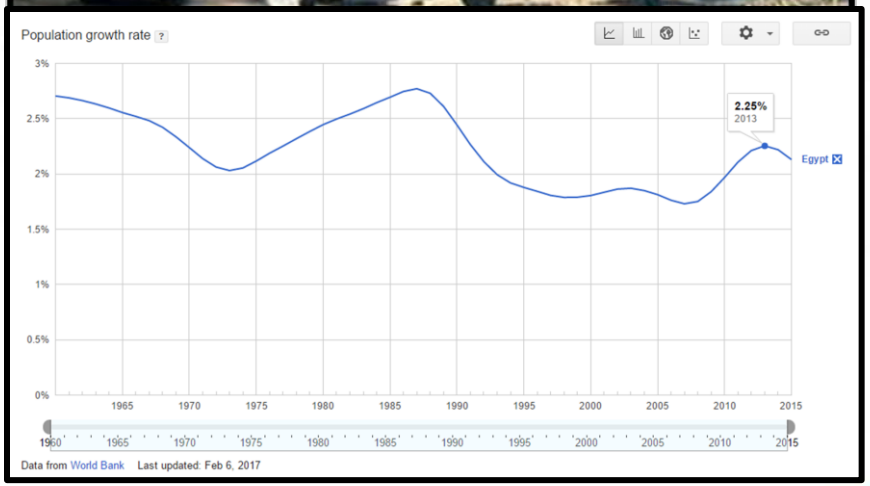
Desalination In Egypt Between The Present And The Future, Industry Or Trade

- Introduction
- History of Desalination in Egypt
- Present of Desalination in Egypt
- Nationalize Of Desalination Industry In Egypt
- Factors Imbedded Progress Of Desalination Industry In Egypt
- Desalination Industry In Egypt
- Conclusion

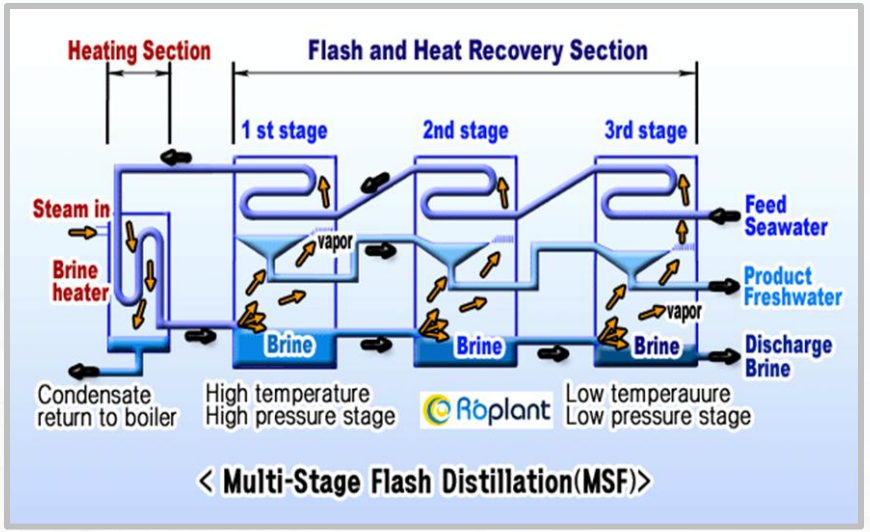
Introduction

- Egypt suffers from a shortage of water for drinking, and other purposes, and that because of the dramatic increase in population, associate with misuse and mismanagement of water in addition to the lack of available resources of water compared with the population increase rate.
- As a result, the amount of desalinated water used for human purposes is expected to reach about 4 million cubic meters per day by 2020, which equal about 14% of the required water for human use in Egypt.



History of Desalination in Egypt

- Historical records show that some civilizations such as the Egyptians, Persians, Greeks have done some studies and were able to get fresh water from sea water.
- In 1912 the largest desalination plant in Egypt (Multi Stage Flash Distillation (MSF)) with production capacity of 75 m3/day is constructed.
- In the late seventies dependence on desalinated water has increased due to start in the development of remote areas and the trend to promoting tourism as a source of national income
- At the beginning of this century, Egypt starts to rely on desalination of water supply of cities, especially in coastal areas and Sinai.



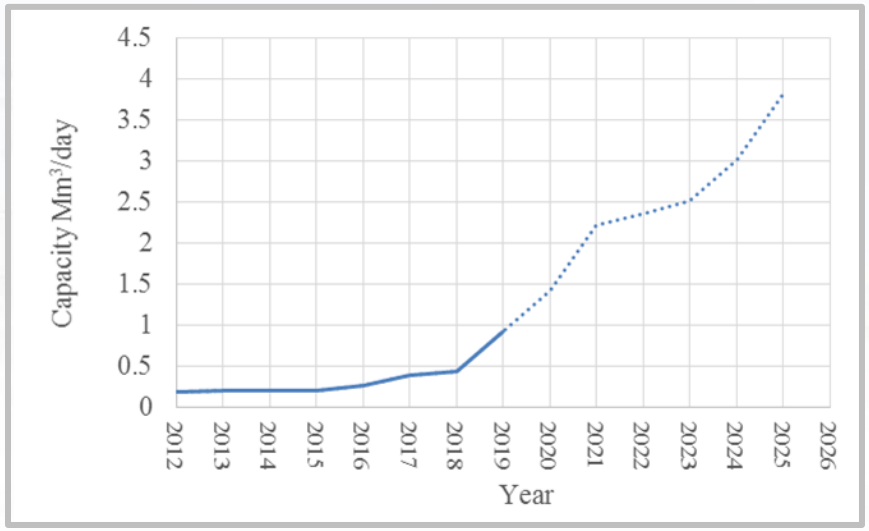
Present of Desalination in Egypt

- For the time being within the framework of the government plan for development, especially in the coastal and remote areas, Water Requirements increased in these areas.
- Studies have shown the need to resort to seawater and wells desalination technologies to overcome the water gap. Especially in these areas, prompting the government to construct many of desalination plants to secure these areas with water, such as North and South Sinai, Matrouh and the Red Sea, rely Reverse Osmosis (RO) for both sea water and brackish water at different capacities from 100 m^3/day up to 150,000 m^3/day.
- At the same time another visibilities study to construct more desalination plants at higher capacities in other regions.

No	Project Name	Capacity (m^3/day)	Technology	State	note
1	El Saloum	1,500	SWRO	Completed	
2	Sidi Barani (I)	4,500	SWRO	Completed	
3	Sidi Barani (II)	2,000	SWRO	On going	
4	Cleopatra	4,500	SWRO	Completed	
5	El Remila (I)	48,000	SWRO	Completed	
6	El Remila (II)	12,000	SWRO	On going	
7	Baghosh	24,000	SWRO	Completed	Up to 300000 m^3/day
8	El Alamein	150,000	SWRO	On going	
9	Rafah (I)	6,200	SWRO	Completed	
10	Rafah (II)	5,000	SWRO	Completed	
11	El Shiekh Zwaied (I)	5,000	SWRO	Completed	
12	El Shiekh Zwaied (II)	6,000	SWRO	On going	
13	El Arish (I)	5,000	SWRO	On going	
14	El Arish (II)	5,000	SWRO	On going	
15	El Arish (III)	12,000	SWRO	On going	
16	El Arish (V)	5,000	SWRO	On going	
17	Nekhel	400	BWRO	Completed	
18	El Akor	200	BWRO	Completed	
19	El Kharoba	200	BWRO	Completed	
20	Al Hasana	400	BWRO	Completed	
21	El Shalak	200	BWRO	Completed	
22	Abo Tawila	200	BWRO	Completed	
23	Abu El Gloud	250	BWRO	On going	
24	Towila	250	BWRO	On going	
25	Al Ried	200	BWRO	On going	
26	Sadr Al Haytan	200	BWRO	On going	
27	Qriea	200	BWRO	On going	
28	Al Qosimah	500	BWRO	On going	
29	Abo Redies	3,000	SWRO	Completed	
30	Ras Sedr	10,000	SWRO	On going	
31	Abu Zenima	10,000	SWRO	On going	
32	Dahab	10,000	SWRO	On going	
33	Nuweibaa	10,000	SWRO	On going	
34	El Tor	30,000	SWRO	On going	
35	Taba	1,500	SWRO	Completed	
36	Ras Malab	1,500	SWRO	Completed	
37	Ras Sider	1,500	SWRO	Completed	
38	East Port Saied	150,000	SWRO	On going	Up to 250000 m^3/day
39	El Galala	150,000	SWRO	On going	
40	El Yousr	80,000	SWRO	On going	
41	Safaga	6,000	SWRO	Completed	
42	Marsa Alam	6,000	SWRO	Completed	
43	Hamata	200	SWRO	On going	
44	Shalateen	3,000	SWRO	On going	
45	Abo Ramad	1,500	SWRO	On going	
46	Halaieb	1,500	SWRO	On going	

Nationalize Of Desalination Industry In Egypt

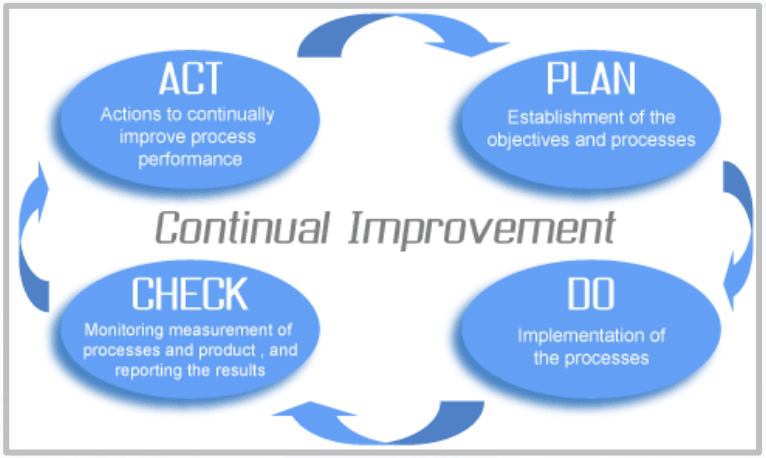
- As a result of the plane for construction of governmental desalination projects for the last five years with production capacities up to 774,600 m^3/day with already existing projects of capacities about 150,000 m^3/day.
- In addition, considering the planned projects with capacities up to 2,090,000 m^3/day, the amount of desalinated water used for human purposes is expected to reach about 4 million cubic meters per day by 2025, which equal about 14% of the required water for human use in Egypt.

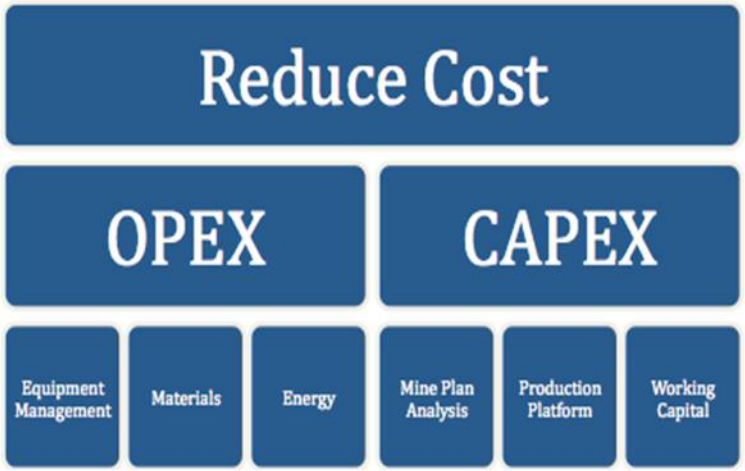


Expected desalination plants capacity

Nationalize Of Desalination Industry In Egypt

- The government facing a challenge to minimize the cost of production of fresh water from desalination by:
  - Optimum usage of fresh water
  - Excellent management of fresh water
  - Reduction of the CAPEX / OPEX without affecting technical specifications and product water quality.





Nationalize Of Desalination Industry In Egypt

- In order to reduce the CAPEX and OPEX without affecting technical specifications and product water quality nationalize of the desalination industry in Egypt has to be done.
- The proper way to nationalize the desalination industry is through six main sequential and parallel steps as follow:
  - Education.
  - Training.
  - Engineering studies.
  - Design optimization.
  - Economic studies.
  - Research and development.

Nationalize Of Desalination Industry In Egypt

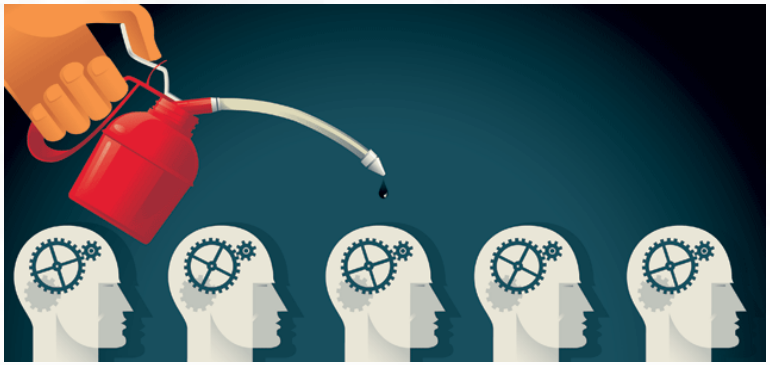
Education

- Desalination industry requires a specialized water engineers familiar with the particular needs from the point of view of chemical, mechanical, electrical, control and civil requirements.
- Therefore, it is essential that the Egyptian universities to the introduction of this specialty with the necessary curriculum to prepare water engineers.
- These water engineers are specialist in process, erection and operation and maintenance.
- This considered as a long plane, a short plane for education is to depend on the existing branches in universities with modifications in education courses in various disciplines at the same time the graduation projects to be in existing water plants with different treatment methods to be practical graduation projects.
- The same steps has to be done for Technical Education to have qualified technicians as the case we have in technical school in Red Sea Governorate. The aim from this step is to have qualified Engineers and Technicians.

Nationalize Of Desalination Industry In Egypt

Training

- Desalination training is essential to gain more detailed understanding of how desalination works and what is the science behind it, in order to make the existing desalination plants sustainable and cost effective and enable developers to create new methods
- Training should include all the staff working in desalination such as people involved in policy and planning of desalination facilities, people involved with the procurement of desalination plants, people involved in operations and maintenance and research and academics involved in desalination projects.
- Training has to be for all levels from beginners up to exports and have to be continues to be familiar with all updates.
- Desalination training gives good understanding in science, engineering, and management aspects of desalination, from the chemistry of water in the process and cost analysis of water.
- Training will improve knowledge, proficiency, and provide a theoretical and practical understanding of maintenance procedures and practices.
- Training secures the desalination industry investment.



Nationalize Of Desalination Industry In Egypt

Training

Nationalize Of Desalination Industry In Egypt

Engineering studies

- Engineering studies are a key to have desalination industry.
- Desalination include five main sections as follows: intake and outfall structure, pretreatment, desalination method, post treatment and control system.
- Each section has a wide range of techniques; the selection of the proper technique in each section differs from project to project, and depends on several items such as raw water characteristics, required product water characteristics, the site conditions, the skills of the staff in the project and the country regulations.
- As a concept desalination and generally water treatment engineering is case by case, so that engineering studies are essential to determine the optimum desalination process, engineering studies should consider the available capabilities in the country and how to improve it.

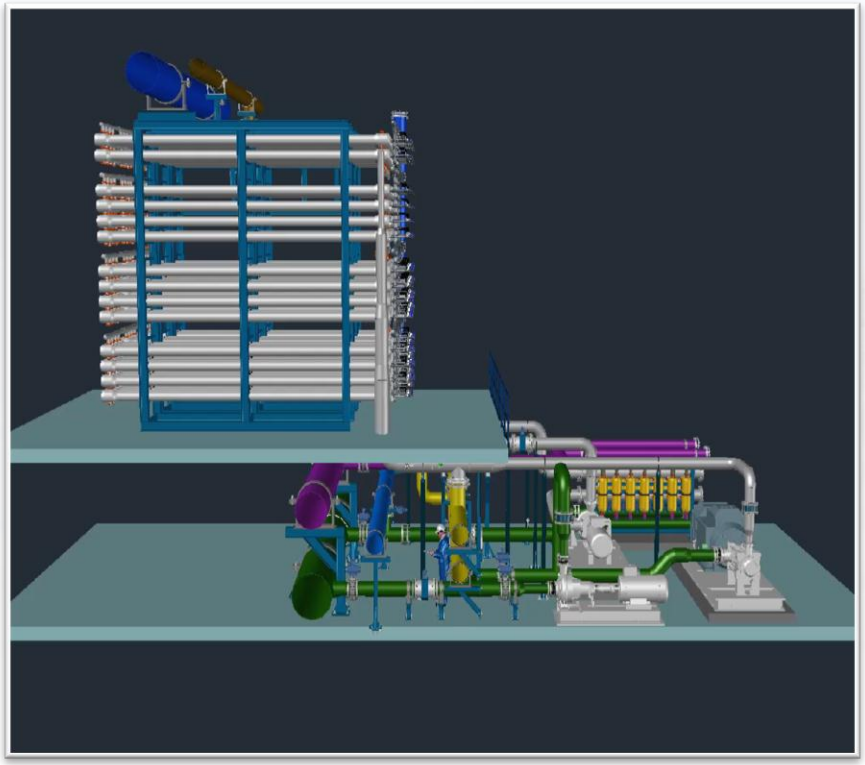
Nationalize Of Desalination Industry In Egypt

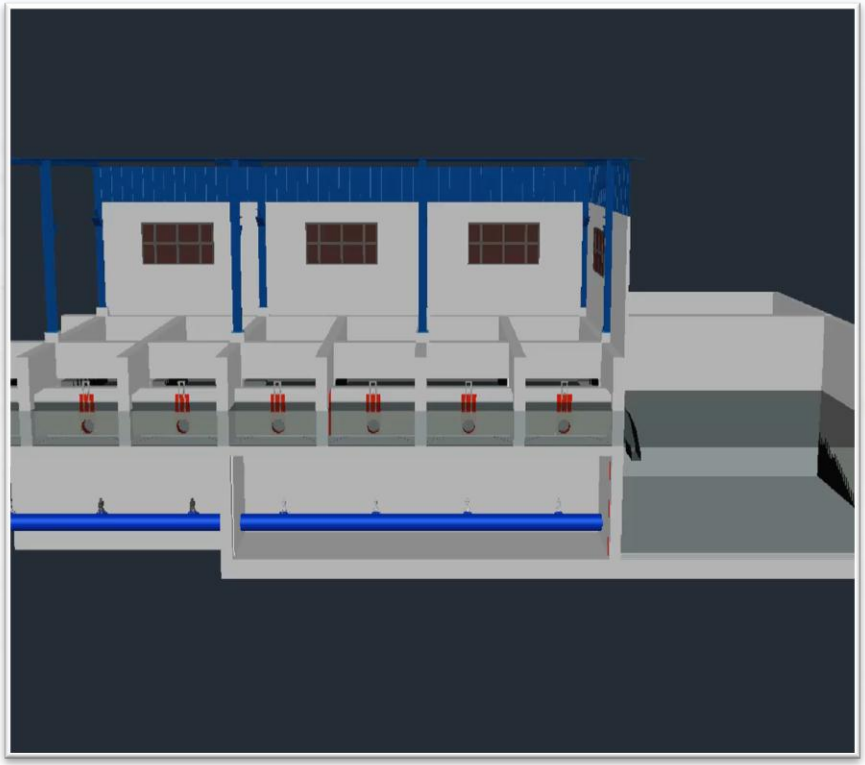
Design optimization

- Desalination is one of the most cost and energy consumption methods for fresh water production, optimal design of such systems is not an easy task.
- Simulation models are applied to optimize the overall cost of unit produced fresh water. The simulation models not only consider the operation conditions and technical specifications, but also consider the accessibility for operation and maintenance to reduce the shutdown time.

Nationalize Of Desalination Industry In Egypt

Design optimization





Nationalize Of Desalination Industry In Egypt

Economic studies

- Economic studies for desalination projects is very important to minimize the water production cost, for desalination industry nationalization economic studies are required to decide which items to be designed and manufacturing locally and how to be done to minimize the cost without affecting the performance.

Nationalize Of Desalination Industry In Egypt

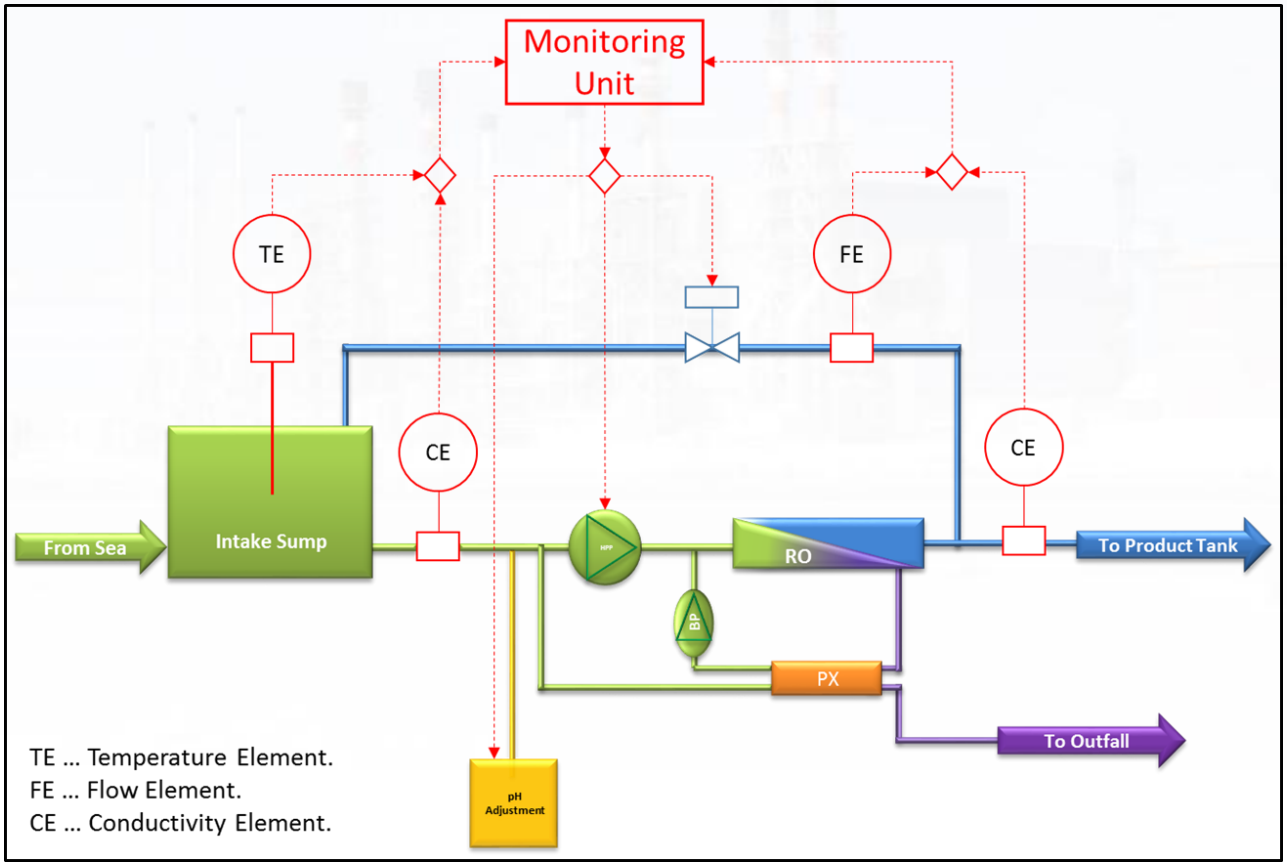
Research and development

- R&D has two primary models either tasked to directly developing of new products or tasked to product development and improvement, in desalination industry both models are important, R&D in desalination should focus mainly on:
  - Improve the performance of the existing projects either to reduce the production cost or to increase the production using existing facilities.
  - Visible locally manufacturing of system components.
  - Create new technologies or integrated techniques to minimize the energy cost depending on renewable energy sources such as wind and solar energy.

Nationalize Of Desalination Industry In Egypt

Research and development

Partial permeate recycle using SWRO to improve permeate quality at high boron and water temperature



Factors Imbedded Progress Of Desalination Industry In Egypt

The economic situation and the psychological state of the owner

- The confidence in the foreign product than local product, finishing quality and the final shape of the foreign product.
- Some local companies resort to cost-cutting in order to get projects regardless the quality of the product
- Some of non-specialist companies enter the field of manufacturing of desalination plants without experience or knowledgeable.
- Operational problems resulting from the contractual method due to the difference of the desalination than the other water applications.

Factors Imbedded Progress Of Desalination Industry In Egypt

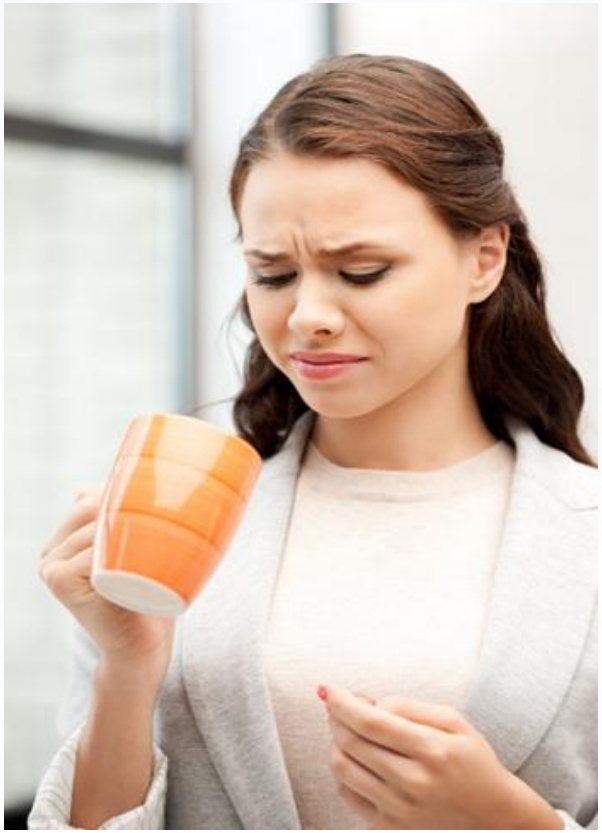
The economic situation and the psychological status of citizens

- The establishment of desalination plants in remote areas which suffer from lack of water and the low level of education.
- Water supply of the population depends in these areas through water transfer carts and handling water bottles.
- Sale and distribution of water is considered source of income where some of people control it , and at the same time is Considered source of an economic burden on the other population.

Factors Imbedded Progress Of Desalination Industry In Egypt

The economic situation and the psychological status of citizens

- Beneficiaries in these areas conflict depends on the impact of the psychological state of the citizens by spreading the rumors of desalinated water, depending on the following:
  - Difference in the taste of desalinated water from the taste of the Nile water.
  - Spreading rumors of desalinated water damages (leading to kidney failure).
  - Problems facing operating desalination plants in addition to the failure of some of the projects



Factors Imbedded Progress Of Desalination Industry In Egypt

The environmental laws

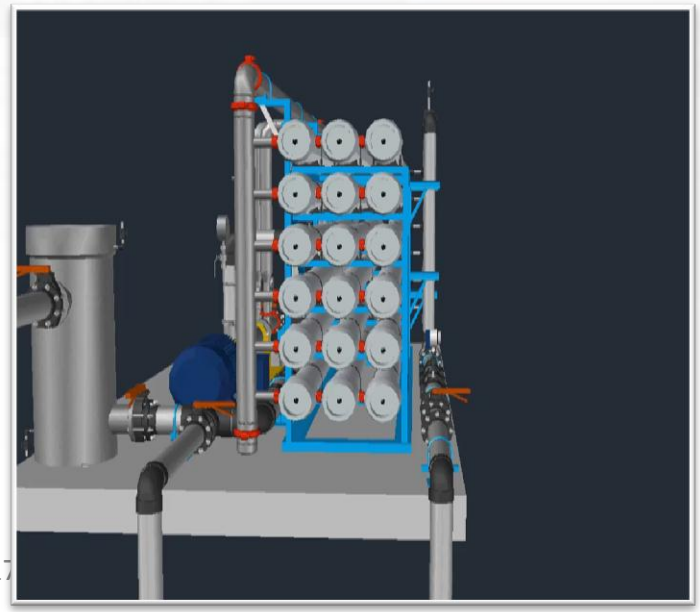
- The need to re-examine the environmental laws relating to desalination industry, especially after the rapid technological evolution of desalination technology.

The taxes and customs

- The need to re-examine the laws relating to the import and export of equipment related to the desalination industry in order to achieve encouraging the establishment of national desalination industry.

The manner of tendering desalination projects

- The Need to reconsider the manner of tendering water desalination plants to fit nature of desalination plants in order to achieve the goal of establishment a project and get benefits from it.



Desalination Industry In Egypt

Case 1: Baghosh SWRO

- Two pass system, capacity of 24,000 m^3/day (six trains) located at the North Cost.
- The raw water source is Mediterranean Sea, intake type; seawater open intake, pretreatment unit; multimedia filters, chemical treatment and five-micron cartridge filters. RO unit; 1st pass Reverse Osmosis rake, 1st pass High Pressure Pumps and Pressure Exchanger (PX). Energy Recovery Device (ERD), post treatment unit; partial 2nd pass Reverse Osmosis train, 2nd pass High Pressure pumps, calcite contactor and chemical treatment, outfall in the sea, product pumping station and power and control system.
- The local and foreign items in this project as shown

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No	Item	Manufacturing			
		Engineering	Procurement	Assembly	Erection
1	Process Flow Diagram	L / F	--	--	--
2	P&ID	L / F	--	--	--
3	Intake sea bed screen	L	L	L	L / F
4	Intake moving screen	L / F	F	L / F	L
5	Filter feed pumps	L / F	F	L / F	L
6	Multimedia filter	L	L	L	L
7	Pre dosing systems	L / F	L / F	L	L
8	Cartridge filters	L / F	F	L / F	L
9	1st Pass HPP	L / F	F	L / F	L
10	1st Pass RO train	L / F	F	F	L
11	PX ERD skid	L / F	F	F	L
12	2nd Pass HPP	L / F	F	L / F	L
13	2nd Pass RO train	L / F	F	F	L
14	Calcite contactor	F	L / F	L	L
15	Post dosing systems	L / F	L / F	L	L
16	Product pumping station	L / F	F	L	L
17	Power and Control	L / F	L	L	L
18	Supervision	L / F	L / F	L / F	L / F
19	Commissioning & startup	L / F	L / F	L / F	L / F
	L : Locally				
	F : Foreign				

Desalination Industry In Egypt

Case 2: Shalateen, Abo Ramad and Halaieb SWRO

- One pass system, Shalateen capacity 3,000 m^3/day (two trains) with intake up to 20,000 m^3/day, Abo Ramad capacity 1,500 m^3/day (one train) with intake up to 10,000 m^3/day and Halaieb capacity 1,500 m^3/day (one train) with intake up to 20,000 m^3/day located at south red sea. Raw water source is Red Sea, intake type; sea water open intake, pretreatment unit; multimedia filters, chemical treatment and five micron cartridge filters, RO unit; Reverse Osmosis rake, High Pressure Pumps and Pressure Exchanger (PX) Energy Recovery Device (ERD), post treatment unit; chemical treatment, outfall in the sea, product pumping station and power and control system.
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4	Intake moving screen	L	F	L / F	L
5	Filter feed pumps	L	F	L / F	L
6	Multimedia filter	L	L	L	L
7	Pre dosing systems	L	L / F	L	L
8	Cartridge filters	L	F	L / F	L
9	HPP	L	F	L / F	L
10	RO train	L	F	F	L
11	PX ERD skid	L	F	F	L
12	Post dosing systems	L	L / F	L	L
13	Product pumping station	L	F	L	L
14	Power and Control	L	L	L	L
15	Supervision	L	L	L	L
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Desalination Industry In Egypt

Case 3: El Yousr SWRO

- Two pass system, capacity of 80,000 m^3/day (twelve trains) located at Hurghada the raw water source is Red Sea, intake type; sea water open intake, pretreatment unit; multimedia filters, chemical treatment and five micron cartridge filters. RO unit; 1st pass Reverse Osmosis rake, 1st pass High Pressure Pumps and Pressure Exchanger (PX) Energy Recovery Device (ERD). Post treatment unit; partial 2nd pass Reverse Osmosis train, 2nd pass High Pressure pumps, calcite contactor and chemical treatment, outfall in the sea, product pumping station and power and control system.
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Desalination Industry In Egypt

Case 4: El Arish Cement Factory BWRO

- inter-stage turbo charger system with iron and manganese removal, capacity of 3,600 m^3/day (two trains) located at North Saini the raw water source is deep wells, intake type; brackish water deep wells, pretreatment unit; iron and manganese removal unit, multimedia filters, chemical treatment and five micron cartridge filters. RO unit; two stages Reverse Osmosis rake, High Pressure Pumps and Turbo charger. Energy Recovery Device (ERD), post treatment unit; chemical treatment, reject in evaporation bond, and power and control system.
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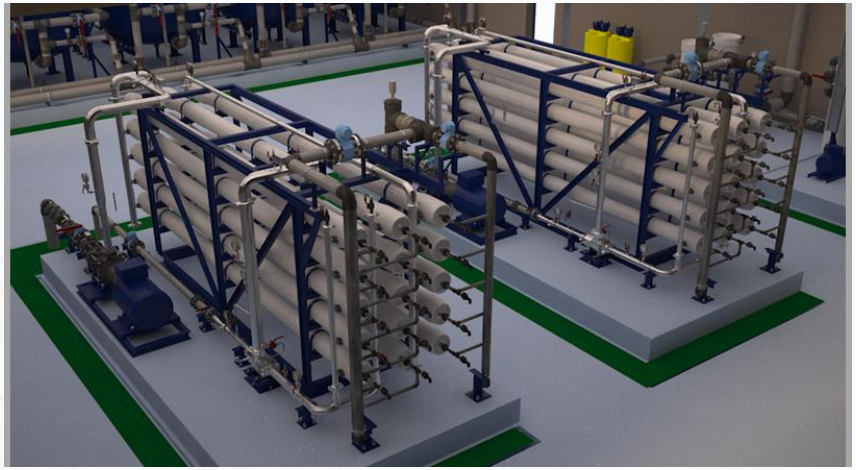

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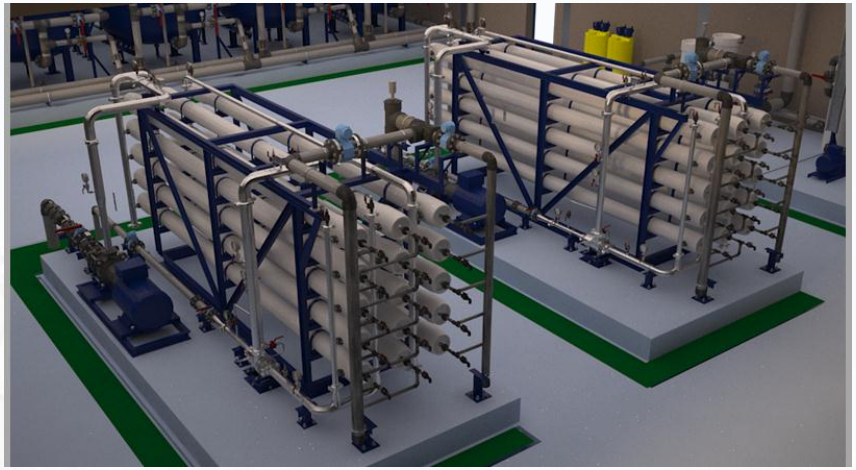

CONCLUSION

- Desalination becomes one of the important sources to secure supplying of water in Egypt.
- The shift of desalination in Egypt from trade to industry become a necessity not a luxury.
- The stability and continuity of the desalination industry achieved through six main sequential and parallel steps as follows; education, training, engineering studies, design optimization, economic studies, and research and development.
- The impact of desalination industry nationalization is the following:
  - Reducing of the construction and operating costs of cubic meter of desalinated water.
  - Creation of feeding industries.
  - It will become a source of national income.
  - Export of skilled labors in the desalination field.
  - Social Security
- The development of a future vision to increase the national manufacturing components ratio for desalination plants is essential.

Thank You

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