

REVERSE OSMOSIS



***YOUR PARTNER
IN
TOTAL WATER SOLUTIONS***



TEMAK®

THE COMPANY

TEMAK is a leading Greek manufacturing company, in the water treatment industry since 1970, in the Greek market and abroad. Our mission is to keep our customers satisfied on international level, offering fully integrated water solutions, designed and manufactured upon the customer's needs.

We can be your Reverse Osmosis (RO) ideal partner!

The structure and operation of **TEMAK** is based on the most up-to-date management techniques and practices, so as to promptly and efficiently respond to every need of each customer.

- ➔ The ideal solutions are designed from the very beginning based exclusively upon the special needs and requirements of each customer.
- ➔ These solutions are integrated on a highly professional basis, in all stages: Design, manufacturing, installation and after sales support.
- ➔ High quality services are provided, regardless of the size of the project we are working with.

Based on these principles, **TEMAK** studies, designs, manufactures, installs and supports the proper solution that fits exactly in each specific situation. Besides our know-how, our every day close contact and service to the market is a major point of our offering. This constitutes the basis of our performance and on this basis we gain our customers' trust, because we understand very well their needs, therefore, we can demonstrate the benefit of the solution.

TEMAK PROVIDES:

- ✓ Scientific and technical personnel with many years of experience
- ✓ Surveys, studies and investment proposals
- ✓ Modern installations and infrastructure
- ✓ Best construction of the best construction materials
- ✓ Well organized, fast and efficient service
- ✓ Continuous stock of spare parts
- ✓ Reference list with numerous satisfied customers
- ✓ Guarantee
- ✓ Customization



PREMISES

5.000m³ ACHARNAI (MENIDI) ATHENS



PREMISES

2.600m³ THESSALONIKI NORTH GREECE

PRINCIPLE OF REVERSE OSMOSIS (RO)

Due to the global increase of impure water nowadays, the fastest and wider most applied method of modern water treatment industry is the **REVERSE OSMOSIS**.

But what is Reverse Osmosis ?

OSMOSIS

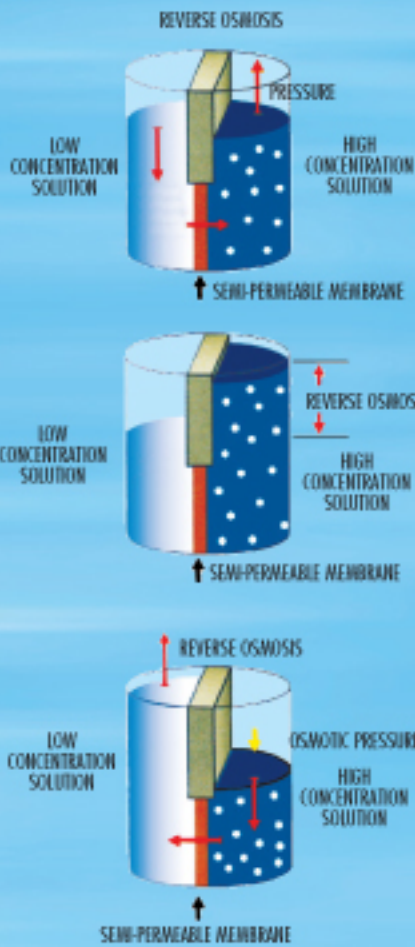
When two solutions of different concentration are separated with a semi-permeable membrane, then pure water is transferred through the membrane from the lower to the higher concentration solution (osmotic flow).

The osmotic flow continues until an equilibrium is settled, where the level of the higher concentration solution settles at a higher than the initial level. The difference between the levels of the two solutions causes the so-called osmotic pressure.

REVERSE OSMOSIS (RO)

Reversing the process, if an external pressure greater than the osmotic one is applied on the higher concentration solution, pure water is transferred through the membrane towards the lower concentration solution.

This process is called Reverse Osmosis.



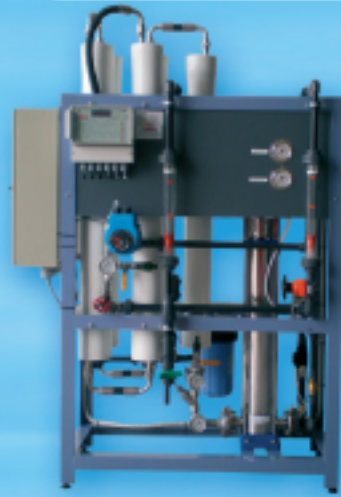
APPLICATIONS

	Potable water production	Boilers feed water	Irrigation	Deionization for the applications demands	Final stage of biological treatment	Network/equipment protection from scaling	Ultra-pure water production	Ice production
Food & Beverages	•	•		•	•	•		
Water Bottling	•					•		
Spin, Textile & Dyeing Houses		•		•	•	•		
Paper Industry		•				•		
Chemical Industry				•		•		
Metallurgy & Aluminium				•	•	•		
Pharma & Cosmetics		•		•	•	•		
Semiconductor Industry				•			•	
Photovoltaic Solar Panels				•			•	
Fish Farms	•					•		•
Washing Stations		•		•	•	•		
Green Houses			•	•		•		
Hotels & Tourist Villages	•	•	•		•	•		
Buildings & Residential	•		•		•	•		
Restaurants & Kitchens	•					•		
Hospitals	•	•		•		•	•	
Haemodialysis Centers				•		•	•	
Power Plants		•					•	
Laboratories						•	•	
Marine	•	•				•		
Municipalities	•				•	•	•	

BRACKISH WATER (RO) TEMAK UNITS



TBW 1



TBW 2



TBW 3

MODEL	MAX PRODUCTION (m ³ /24hrs)	MODEL	MAX PRODUCTION (m ³ /24hrs)
TBW 11	2.4	TBW 38	225.6
TBW 12	4.8	TBW 39	276.0
TBW 21	7.2	TBW 310	302.4
TBW 22	13.9	TBW 312	345.6
TBW 23	19.9	TBW 315	432.0
TBW 24	25.2	TBW 316	451.2
TBW 25	30.2	TBW 318	528.0
TBW 26	39.8	TBW 320	588.0
TBW 28	50.4	TBW 324	720.0
TBW 32	67.2	TBW 330	900.0
TBW 33	100.8	TBW 336	1080.0
TBW 34	127.2	TBW 340	1248.0
TBW 36	177.6		

*Complete Water Treatment Systems
For
Haemodialysis Centers*

*certified
According to Annex V of the
Medical Device Directive
93/42/EEC*

- ➔ High pressure pipes of TBW 21 up to TBW 28 for high brackish water are made of stainless steel duplex SAF 2205 & 316Ti.
- ➔ Electronic panel, different than the electric panel, with user friendly mimic diagram of the process, provides all necessary info for every part's operation and functions at low voltage 24V for safety.
- ➔ Recovery and absorbed power for brackish water RO systems depend on the quality (ppm TDS) and temperature of the raw water each time.

ON REQUEST:

- ✓ Mobile desalination stations ergonomically installed in steel containers with sound and thermal insulation.
- ✓ Custom-made desalination plants designed on customers specifications.
- ✓ Instrumentation's output signal transmission to a control room or to a PC for supervision from distance (SCADA). Automatic notification on your mobile phone in case of a system alarm.

SEA WATER (RO) TEMAK UNITS



TSW1 MARINE



TSW 2



TSW 3 MARINE

MODEL	MAX PRODUCTION (m ³ /24hrs)	NOMINAL POWER (kw)	ENERGY (kWh/m ³)	RECOVERY %
TSW 01	0.84	1.8	42.8	5.8
TSW 02	1.68	1.8	21.4	11.7
TSW 03	2.4	1.8	15	16.7
TSW 11	2.1	2.2	30.3	9.0
TSW 12	4.1	2.2	16.4	17.0
TSW 13	5.7	2.2	11.7	24.0
TSW 14	6.9	2.2	9.5	29.0
TSW 16	9.1	2.2	7.4	38.0
TSW 18	10.6	2.2	6.5	44.0
TSW 19	11.0	2.2	6.2	46.0
TSW 22	10.5	7.5	13.6	17.6
TSW 23	14.4	7.5	9.8	24.0
TSW 24	17.7	7.5	8.0	29.6
TSW 26	22.0	7.5	6.3	36.8
TSW 24A	21.1	15.0	13.6	17.6
TSW 26A	28.8	15.0	9.8	24.0
TSW 28A	33.6	15.0	8.1	28.0
TSW 32SP	33.6	15.0	9.2	22.0
TSW 32	38.4	18.5	10.7	20.0
TSW 33SP	44.2	15.0	6.9	28.7
TSW 33	52.8	18.5	7.9	27.5
TSW 34	64.8	18.5	6.5	34.0
TSW 34SP	57.6	15.0	5.7	37.5
TSW 36	79.2	18.5	5.3	41.0
TSW 38	105.6	22.0	5.2	43.0
TSW 312	158.4	37.0	5.3	41.0
TSW 316	211.2	44.0	5.2	43.0
TSW 324	316.8	66.0	5.2	43.0

UNITS WITH ENERGY RECOVERY DEVICE

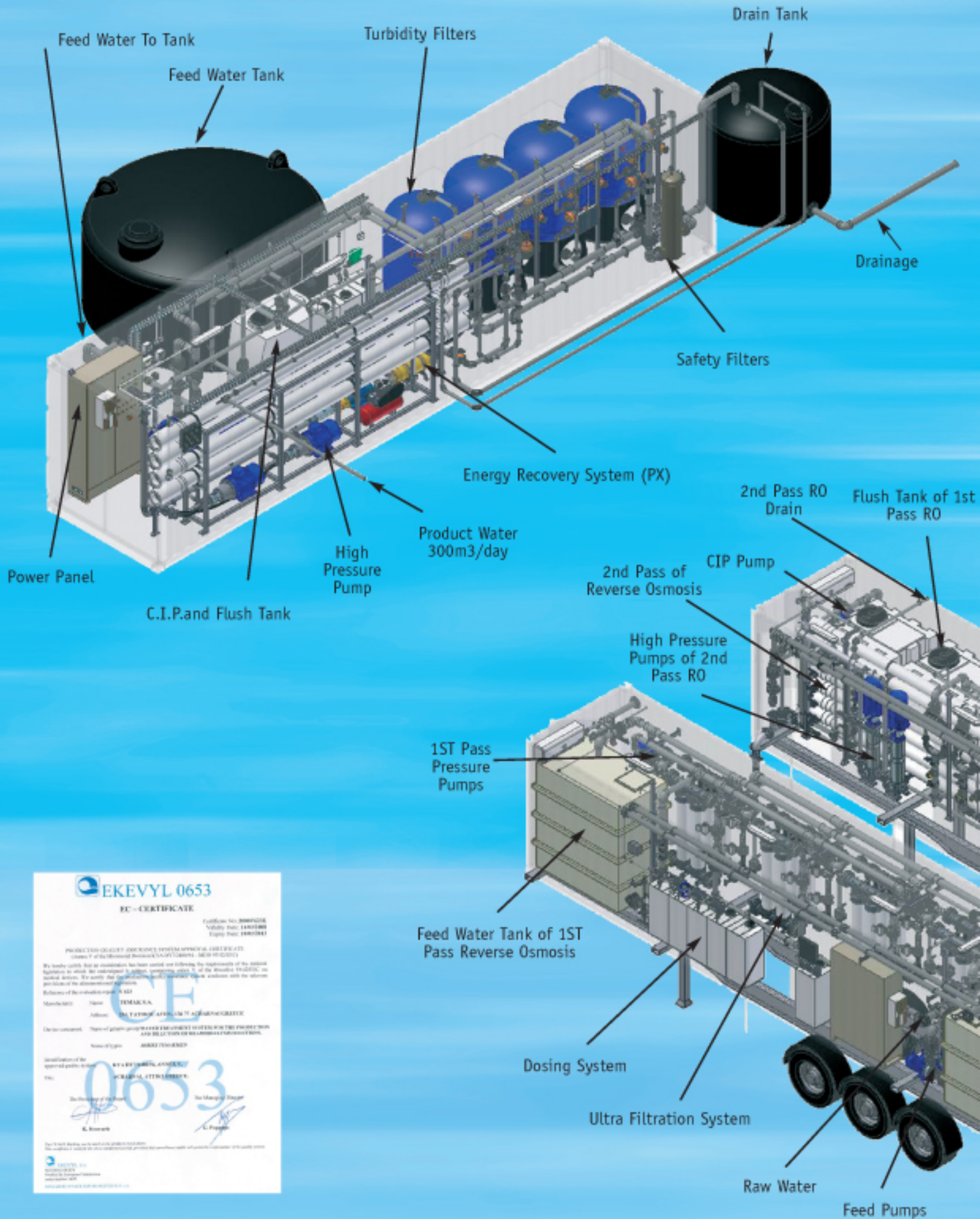
MODEL	MAX PRODUCTION (m ³ /24hrs)	NOMINAL POWER (kw)	RECOVERY %	ENERGY RECOVERY
TSW 324HP	381	75.0	4.4	42
TSW 332HP	509	90.0	4.2	42
TSW 340HP	636	110.0	4.1	44
TSW 348HP	763	132.0	3.5	42
TSW 356HP	890	160.0	3.5	42
TSW 364HP	1021	200.0	3.6	42
TSW 38 PX	127	20.6	3.0	42
TSW 310PX	153	24.1	3.1	42
TSW 314PX	211	25.8	2.8	42
TSW 316PX	262	38.5	2.8	42
TSW 324PX	381	59.5	2.8	42
TSW 332PX	509	76.5	2.8	42
TSW 340PX	636	97.0	2.8	42
TSW 348PX	763	117.0	2.8	42
TSW 356PX	890	132.0	2.8	42
TSW 364PX	1021	172.0	2.8	44

- ➔ Max production flow rate and energy consumption are calculated for TDS = 42,000ppm, Temp = 20°C and fouling factor = 0.85
- ➔ High pressure pipes made of stainless steel duplex SAF 2205
- ➔ High pressure pipes made of stainless steel super duplex 2507 or 904L
- ➔ Pressure Exchangers for specific power consumption 2.8kWh/m³ of product water.
- ➔ Electronic panel, different than the electric panel, with user friendly mimic diagram of the process, provides all necessary info for every part's operation and functions at low voltage 24V for safety.
- ➔ The specific energy consumption varies with the feedwater quality (ppm TDS) and temperature and is calculated separately each time.

ON REQUEST:

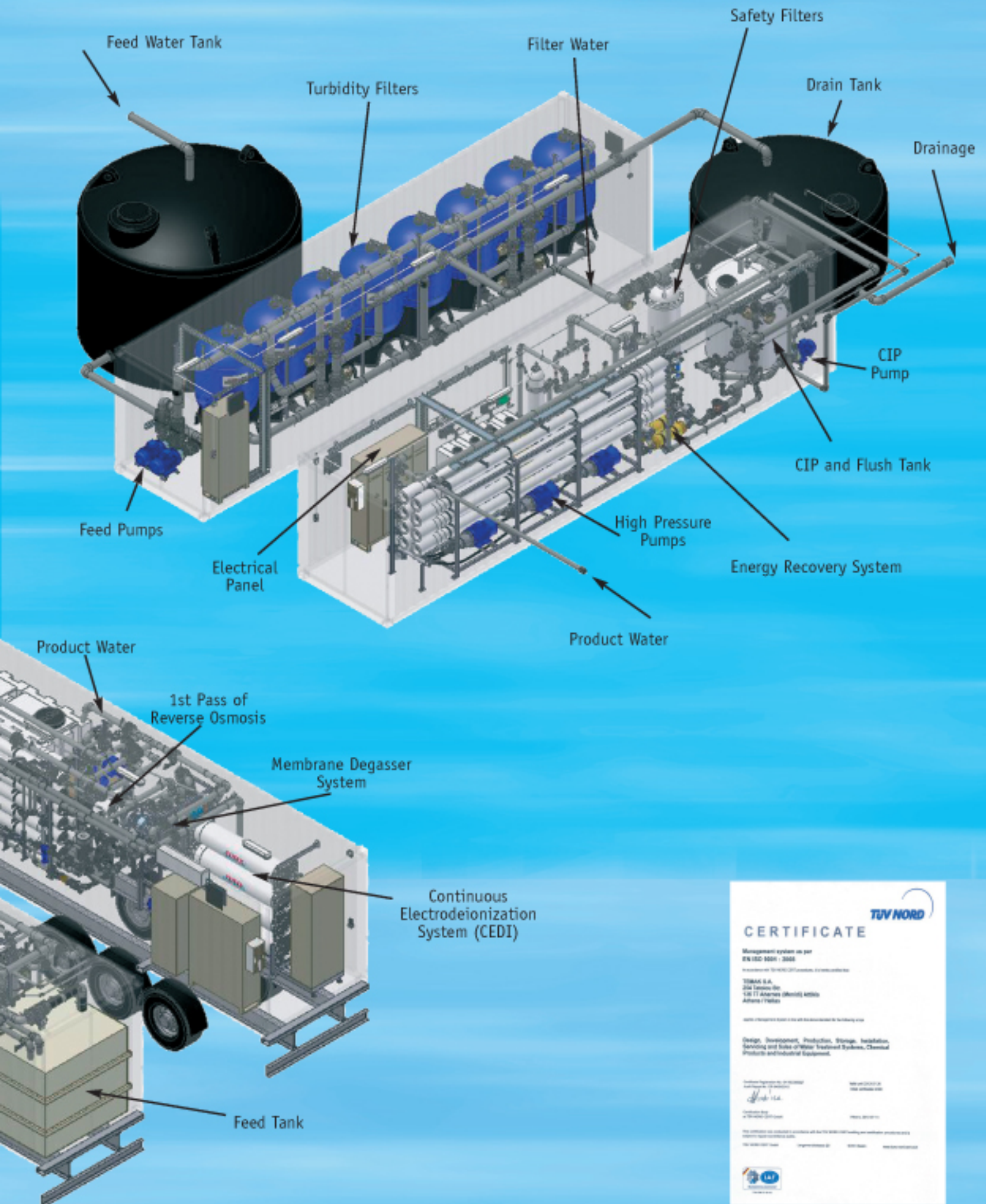
- ✓ Mobile desalination stations ergonomically installed in steel containers with sound and thermal insulation.
- ✓ Custom-made desalination plants designed on customers specifications.
- ✓ Instrumentation's output signal transmission to a control room or to a PC for supervision from distance (SCADA). Automatic notification on your mobile phone in case of a system alarm.
- ✓ Marine type desalination stations, specially designed for the vessels' restricted space.

300m³/water FOR GENERAL USE o MOBILE CONTAINERIZED SEA WATER REVERSE OSMOSIS SYSTEM WITH ENERGY RECOVERY (TDS = 55.000 ppm)



R E V E R S E O S M O S I S

600m³/water FOR GENERAL USE ◊ MOBILE SEA WATER REVERSE OSMOSIS SYSTEM WITH ENERGY RECOVERY (TDS = 55.000 ppm)



PRE-TREATMENT EQUIPMENT (RO)



Dosing Pump



Multimedia Pressure Filter



Ultra Filtration



Rehardening Filter



Double Pass Reverse Osmosis

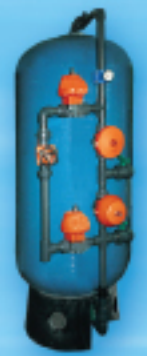


Clean in Place System and Flush Tank

- ➔ Dosing systems for chlorination, antiscaling protection and de-chlorination.
- ➔ Multimedia pressure filters for removal of turbidity, suspended solids, iron, manganese and other pollutants from the feed water to protect the membranes.
- ➔ Filters, UF (modern water treatment method by special membranes) for the removal of bacteria, viruses, organic load, big molecular weight proteins, turbidity and suspended solids.
- ➔ Dechlorination for the protection of the membranes from the oxidation caused by the free chlorine, either by dosing sodium metabisulphite or by active carbon filters.
- ➔ Final filtration of the water before entering the membranes

The pre-treatment equipment mentioned above, as well as the appropriate filtration materials recommended by **TEMAK**, should be used in order to secure the safe and continuous operation of the desalination plant.

The guarantee offered by **TEMAK** is valid only under the above preconditions.



Multimedia Pressure Filter



Carbon Steel Multimedia Filter



Safety Filter



Acid Dosing Pump



Ultra Violete Disinfection System



TDOS

POST-TREATMENT EQUIPMENT (RO)

The post treatment equipment depends on the specifications for the product water of each application.

Indicatively it could be:

- ➔ Rehardening filters for the enrichment of the product water with the necessary hardness and alkalinity, where needed (ex. drinking water). pH regulation by use of acid and/or soda, depending on the specifications.
- ➔ Double pass reverse osmosis, where the application requires water of extremely low conductivity ex. pharmaceuticals, haemodialysis centers, power plants etc.
- ➔ Disinfection system by dosing sodium hypochlorite or UV, so that the finally produced water is protected from any microbial growth.

OPTIONAL EQUIPMENT (RO)

- ➔ Clean in Place system for the chemical cleaning of the membranes, when needed. The same system can be used for the automatic flushing of the reverse osmosis unit with clean water, when it stops.
- ➔ On-line measuring instruments for pH, Redox, free chlorine, conductivity at the critical points of the procedure.
- ➔ TDOS dosing system installed for the continuous control of the dosing frequency and the level of chemical in the solution tank.

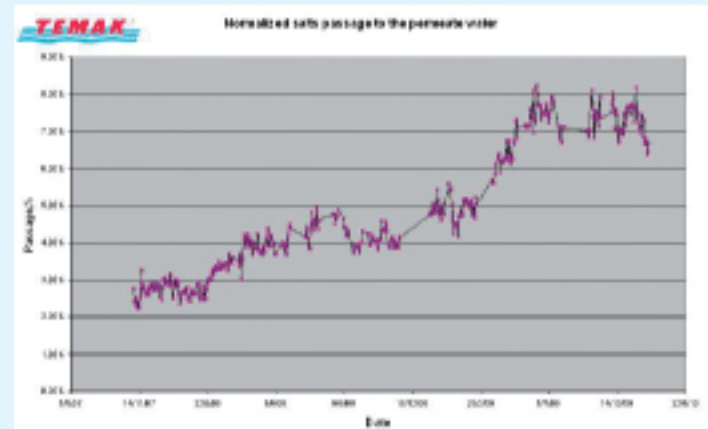
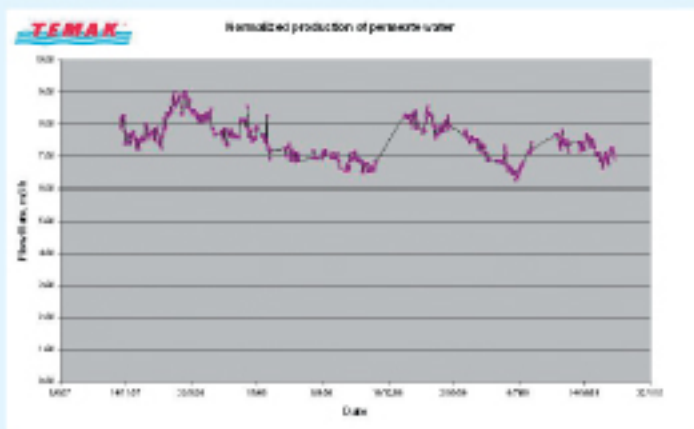
MONITORING THE RO OPERATION

TEROC is software developed exclusively by TEMAK to follow on the operation and efficiency of any water desalination plant, by the method of Reverse Osmosis.

TEROC can electronically record, print, calculate and create graphs of the:

- ➔ Feed water quality
- ➔ Drop of pressure across the RO membranes
- ➔ Duration of the RO operation
- ➔ Aging of the membranes through the normalization of the permeate water flow rate and the salts' passage

Samples of the graphs are shown below:



ADVANTAGES

- ➔ Modern and advanced design, custom made solutions
- ➔ Excellent quality of construction materials
- ➔ Automatic multimedia pressure filters, specific to each system
- ➔ Complete control of the correct dosing by the system TDOS
- ➔ Low energy consumption
- ➔ Low cost of operation
- ➔ Design adapted to available space
- ➔ Automations and control systems by PLC and option of remote control of the plant (SCADA)
- ➔ Timely and immediate technical support

COMPLETE WATER REVERSE OSMOSIS SYSTEMS (RO)



SYTBW12



SYTBW26H1



SYTBW33L1

BRACKISH WATER	
MODEL	MAX PRODUCTION
	(m ³ /24hrs)
SYTBW11	2.4
SYTBW12	4.8
SYTBW21	7.2
SYTBW22	13.9
SYTBW23	19.9
SYTBW24	25.2
SYTBW25	30.7
SYTBW26	39.8
SYTBW28	50.4
SYTBW32 *	67.2
SYTBW33 *	100.8
SYTBW34 *	127.2
SYTBW36 *	177.6
SYTBW38 *	225.6

SEA WATER	
MODEL	MAX PRODUCTION
	(m ³ /24hrs)
SYTSW11	2.1
SYTSW12	4.1
SYTSW13	5.7
SYTSW14	6.9
SYTSW16	9.12
SYTSW18	10.56
SYTSW19	11.04
SYTSW22	10.5
SYTSW23	14.4
SYTSW24	17.7
SYTSW26	22.0
SYTSW32 *	38.4
SYTSW33 *	52.8
SYTSW34 *	64.8
SYTSW36 *	79.2
SYTSW38 *	105.6

* Pre-treatment filters are not included and selected accordingly

- ➔ The reject water quantity and absorbed power depend on the quality (TDS) and temperature of the feed water, every time. Exclusive design, manufacture and assembly by specialized personnel
- ➔ Desalination units completely pre-fabricated and fully tested for operation and control, ready to be installed and set in operation
- ➔ High quality materials used
- ➔ Reliability and guaranteed efficiency
- ➔ Easy installation and space saving
- ➔ Minimal cost of installation and operation
- ➔ Brackish water systems are offered with the option of blending the permeate water from the reverse osmosis unit with a regulated quantity of feed water

SOME OF **TEMAK'S** INDICATIVE INSTALLATIONS



WATER FOR CEMENT PRODUCTION (UNITED ARAB EMIRATES)
 CAPACITY: 200 m³ /day
 FEED WATER QUALITY: SEA WATER
 PRODUCT WATER QUALITY: 500 ppm TDS



POWER PLANT
 CAPACITY: 960 m³/day
 FEED WATER QUALITY: SEA WATER
 PRODUCT WATER QUALITY: 300µS/cm



POWER PLANT – RO with Electrodeionization System (CEDI)
 CAPACITY: (2 x 243) m³/day
 FEED WATER QUALITY: BRACKISH WATER
 PRODUCT WATER QUALITY: ULTRAPURE WATER TO FEED BOILERS



FOOD INDUSTRY (ROUMANIA)
 CAPACITY: 720 m³ /day
 FEED WATER QUALITY: 1000 ppm TDS
 PRODUCT WATER QUALITY: 250 µS/cm



FARMACEUTICALS
 CAPACITY: 4 m³/hr
 FEED WATER QUALITY: BRACKISH WATER
 PRODUCT WATER QUALITY: ULTRAPURE



MUNICIPALITY
 CAPACITY: 1.000 m³/day
 FEED WATER QUALITY: SEA WATER
 PRODUCT WATER QUALITY: POTABLE



MUNICIPALITY
 CAPACITY: 2000 m³ /day
 FEED WATER QUALITY: SEA WATER
 PRODUCT WATER QUALITY: POTABLE



HOTEL
 CAPACITY: 700 m³ /day
 FEED WATER QUALITY: 4000 - 7000 ppm TDS
 PRODUCT WATER QUALITY: POTABLE



TEMAK[®]

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