Water Treatment
with Reverse Osmosis Technology

TEMAK®
TOTAL WATER SOLUTIONS

TEMAK is a leading Greek manufacturing company in the water treatment industry since 1980, operating in the domestic and foreign markets. Our mission is to keep our customers satisfied offering fully integrated water solutions, designed and manufactured according to their customers' 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, at all project stages: Design, manufacturing, installation and after sales support
- High quality services are provided, regardless of the size of the project we are working on

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 everyday 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
- High quality construction with the best construction materials and components
- Well organized, fast and efficient service
- Continuous stock of spare parts
- Modern facilities and infrastructure
- Reference list with numerous satisfied customers
- Guarantee
- Customization

Premises 5.000 m² in Acharnes (Menidi), Athens, Greece

Principle of Reverse Osmosis (RO)

Due to the global increase of impure water, the fastest and most applied widely method of modern water treatment is the Reverse Osmosis.

But what is Reverse Osmosis?

OSMOSIS

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

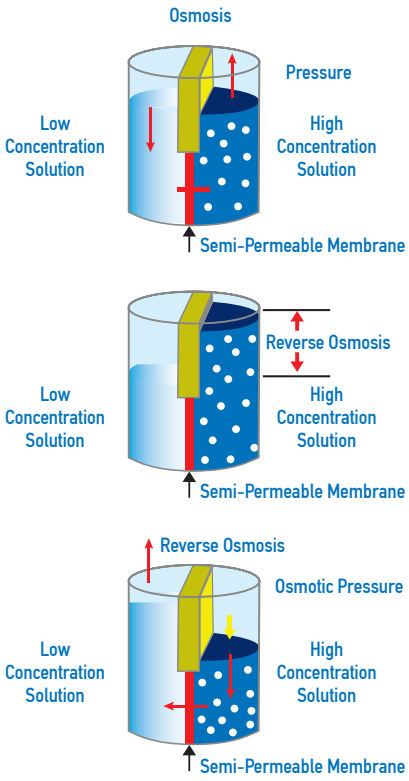
The osmotic flow continues until an equilibrium is achieved, where the level of the higher concentration solution settles at a level higher than the initial one.

The difference between the levels of the two solutions causes the so-called osmotic pressure.

REVERSE OSMOSIS

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

This process is called Reverse Osmosis.



Sectors \ 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
Buildings & Residential	●		●		●	●		●
Chemical Industry				●		●		
Fish Farms	●					●		
Food & Beverages	●	●		●	●	●		
Green Houses			●	●		●		
Hemodialysis Centers				●		●	●	
Hospitals	●	●		●		●	●	
Hotels & Tourist Villages	●	●	●		●	●		●
Laboratories				●		●	●	
Marine	●	●				●		●
Metallurgy & Aluminium				●	●	●		
Municipalities	●				●	●	●	
Paper Industry		●				●		
Pharma & Cosmetics		●		●	●	●		
Photovoltaic Solar Panels				●			●	
Power Plants	●	●		●			●	
Restaurants & Kitchens	●					●		●
Semiconductor Industry				●			●	
Spin, Textile & Dyeing Houses		●		●	●	●		
Washing Stations		●		●	●	●		
Water Bottling	●					●		

Brackish Water RO Units

TBW 1

TBW 2

TBW 3

Model	Max Production (m^3/24hrs)
TBW 11	2,4
TBW12	4,8
TBW 21	7,2
TBW 22	13,9
TBW 23	19,9
TBW 24	25,2
TBW 25	30,2
TBW 26	39,8
TBW 28	50,4

Model	Max Production (m^3/24hrs)
TBW 32	67,2
TBW 33	100,8
TBW 34	127,2
TBW 36	177,6
TBW 38	225,6
TBW 39	276,0
TBW 310	302,4
TBW 312	345,6

Model	Max Production (m^3/24hrs)
TBW 315	432,0
TBW 316	451,2
TBW 318	528,0
TBW 320	588,0
TBW 324	720,0
TBW 330	900,0
TBW 336	1080,0
TBW 340	1248,0

! 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 control panel, separate from the main electric switchboard, with user friendly mimic diagram of the process, provides all necessary information for every part's operation and functions at low voltage 24V for safe information
- Recovery and absorbed power for brackish water RO systems depend on the quality (ppm TDS) and temperature of the raw water

On Request

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

Sea Water RO Units

TSW 1 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	15,0	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 34SP	57,6	15,0	5,7	37,5
TSW 34	64,8	18,5	6,5	34,0
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

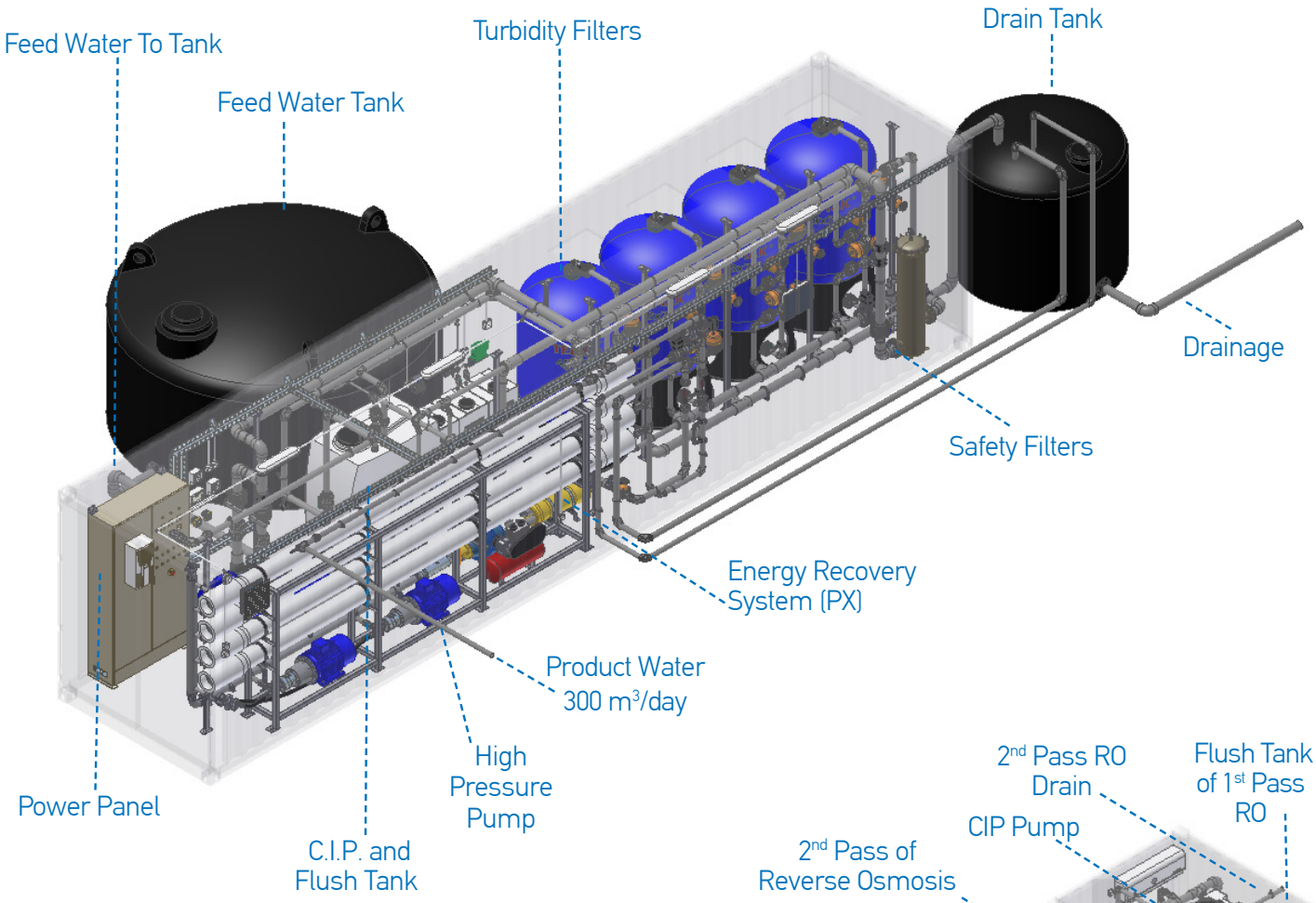
Model	Max Production (m^3/24hrs)	Nominal Power (kw)	Energy (kWh/m^3)	Recovery %
TSW 324HP	381	75,0	4,4	42
TSW 332HP	509	90,0	4,2	42
TSW 340HP	636	110,0	4,1	44
TSW 348HP	763	132,0	3,5	42
TSW 356HP	890	160,0	3,5	42
TSW 364HP	1021	200,0	3,6	42
TSW 38PX	127	20,6	3,0	42
TSW 310PX	153	24,1	3,1	42
TSW 314PX	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

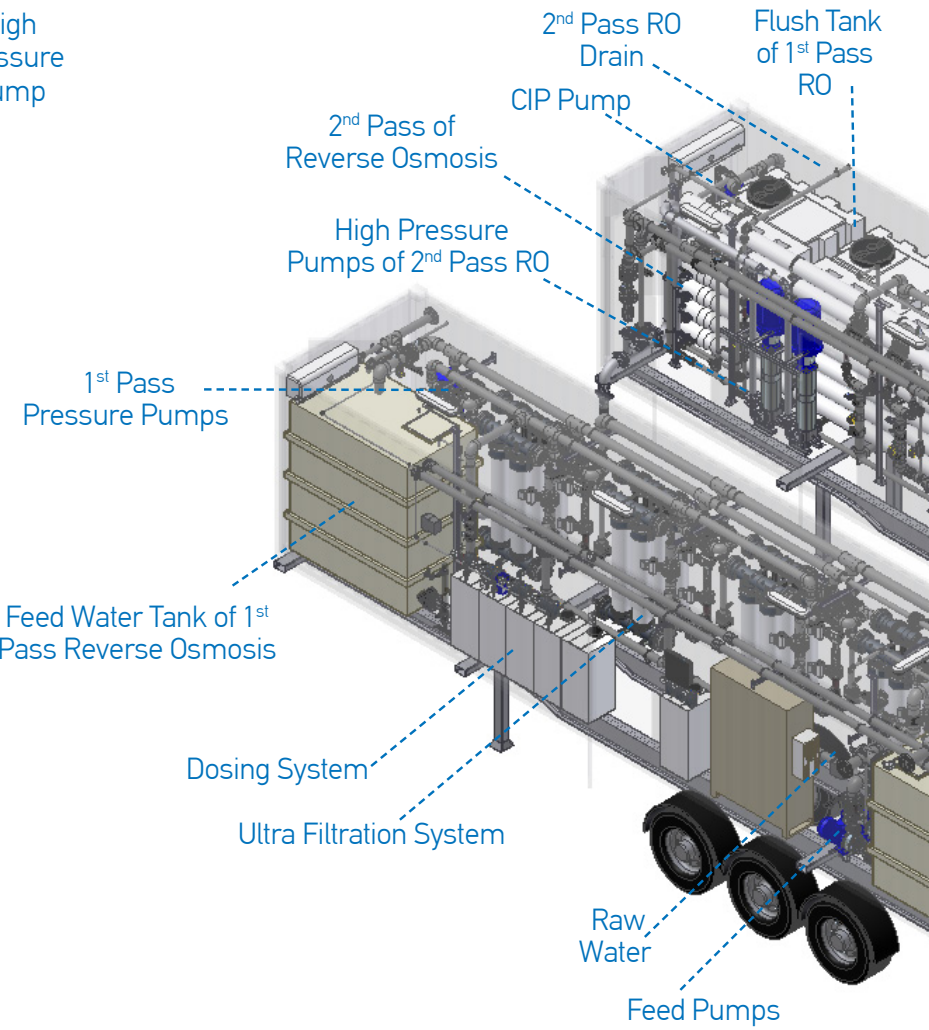
On Request

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

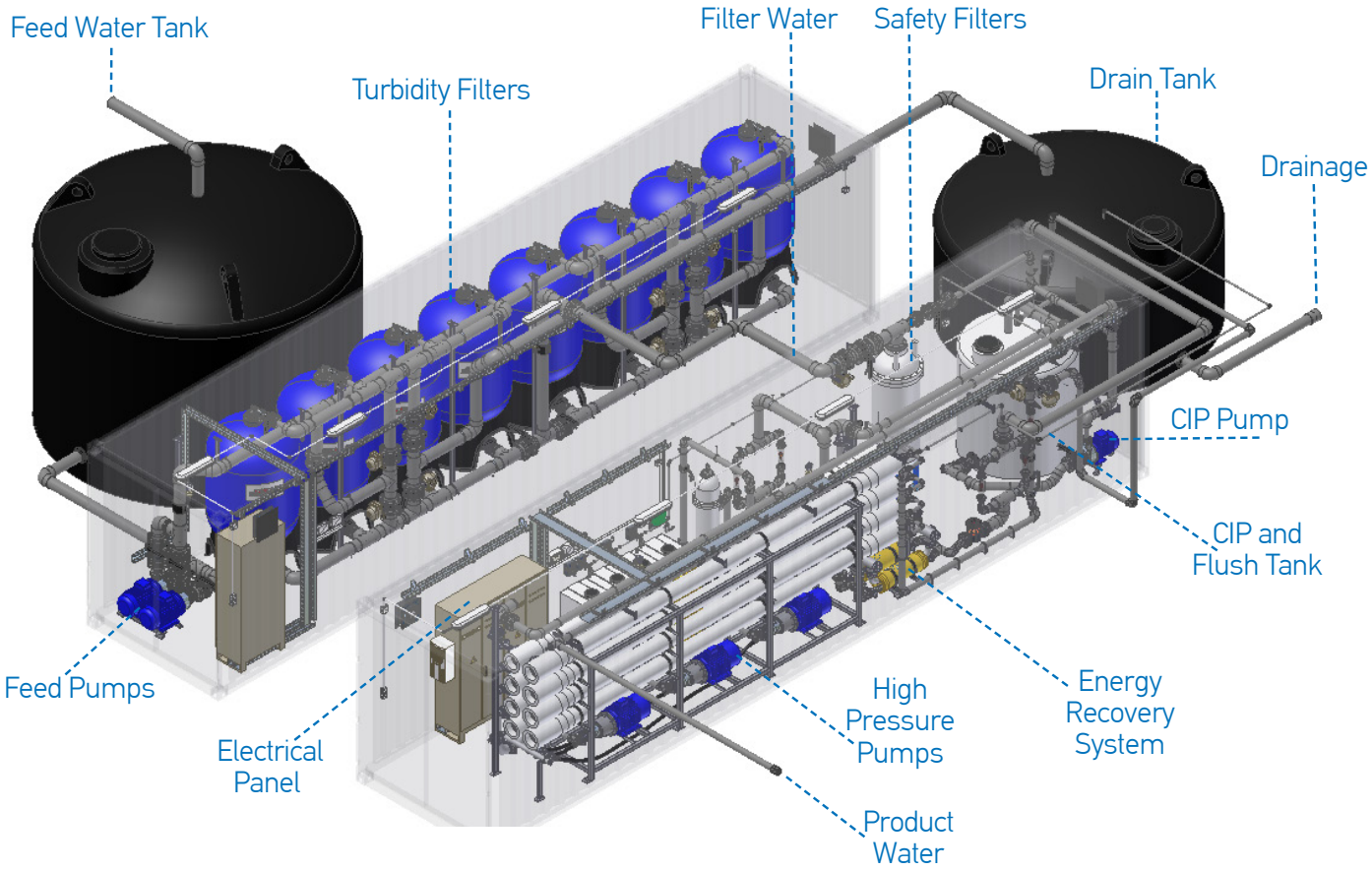
- Max production flow rate and energy consumption are calculated for TDS = 42,000 ppm, Temp = 20^0 C and fouling factor = 0.85
- High pressure piping by super duplex stainless steel SAF 2507
- High pressure pump by super duplex stainless steel SAF 2507
- Pressure Exchangers for specific power consumption 2.8 kWh/m^3 of product water
- Electronic control panel, different than the main electric power switchboard, with user friendly mimic diagram of the process, provides all necessary info for every part's operation and functions at low voltage 24V for safe operation
- The specific energy consumption depends on the feedwater quality (ppm TDS) and temperature. It is calculated separately in each application

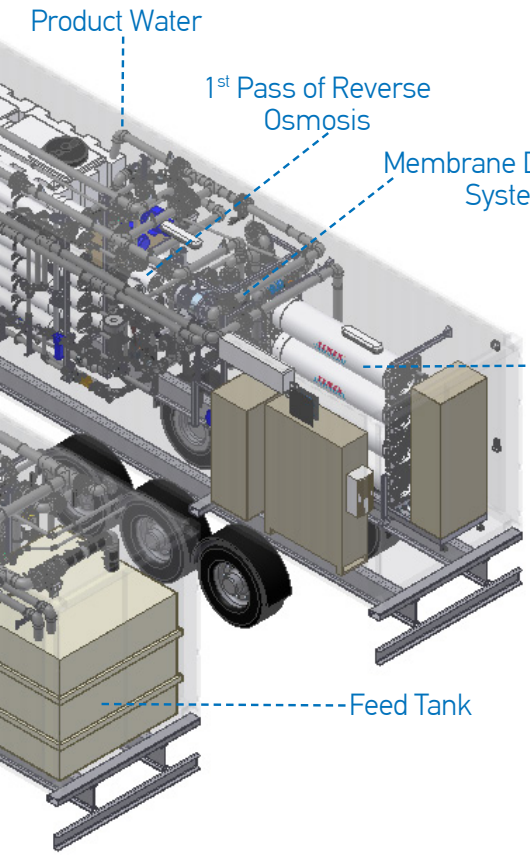
300 m³/day water for general use - Mobile Containerized Sea Water Reverse Osmosis System with Energy Recovery (TDS = 55,000 ppm)





600 m³/day water for general use - Mobile Sea Water Reverse Osmosis System with Energy Recovery (TDS = 55,000 ppm)





1,200 m³/day Ultrapure Water to Feed Boilers in Power Plant
Mobile Containerized Brackish Water Reverse Osmosis System

PRE-TREATMENT EQUIPMENT (RO)

- Dosing systems for chlorination, scaling 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 filtration 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 oxidation caused by free chlorine, either by dosing sodium metabisulphite or by active carbon filters. Active carbon filters are also used for removal of organic substances
- Final filtration of the water before entering the membranes

Dosing Pump

Multimedia Pressure Filters

Ultra Filtration

Carbon Steel Multimedia Filter

Safety Filter

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.

POST-TREATMENT EQUIPMENT (RO)

The Post-Treatment Equipment depends on the specifications for the product water of each application. Indicatively, this could include:

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

Rehardening Filter

Double Pass Reverse Osmosis

Acid Dosing Pump

Ultra Violete Disinfection Systerm

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 stops
- On-line measuring instruments for pH, Redox, free chlorine, conductivity at the critical points of the process

Metering Controlers

ADVANTAGES

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

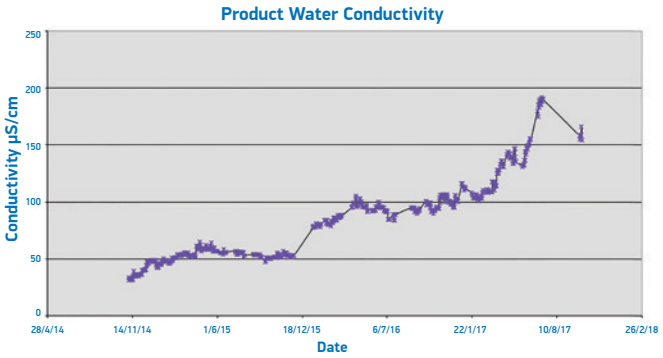
MONITORING THE RO OPERATION

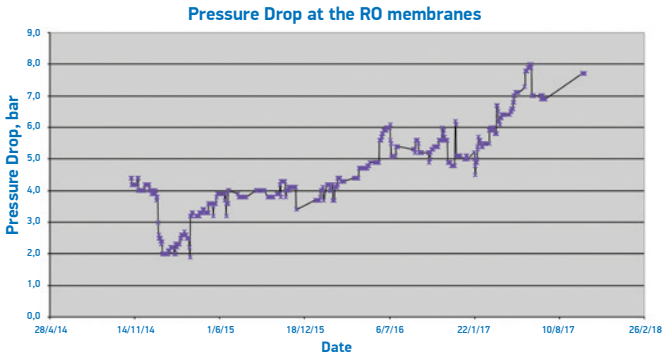
TEROC is a software developed exclusively by **TEMAK** to monitor the operation and efficiency of any water desalination plant, using the method of Reverse Osmosis.

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:

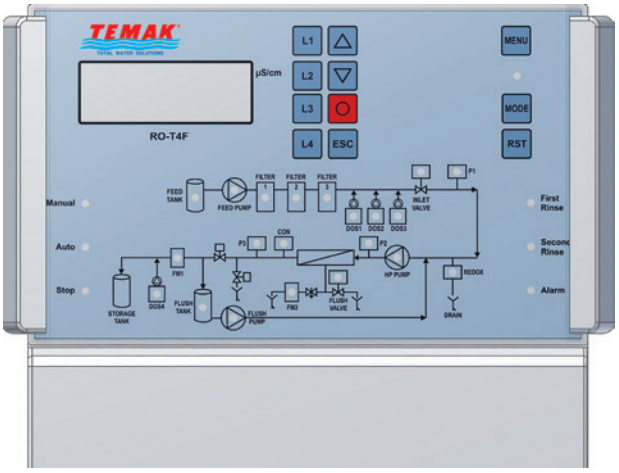




CONTROLLING THE RO SYSTEM

The **RO-T4F panel** controls the Reverse Osmosis System and its main characteristics are:

- Automation and Control System for Reverse Osmosis Water Treatment Plants
- Low Voltage Panel (24VAC) - Separate from the electrical panel - User Safety
- Menu in two languages, English and Greek
- Communication through four lines display and through mimic diagram on the panel front view
- Possibility of connection with a PC (for remote monitoring)
- Connection to GSM
- Ability to update with a message to up to three phone numbers if alarm occurs



Complete Reverse Osmosis Systems (RO)

SYTBW 1

SYTBW 2

SYTBW 3

Brackish Water	
Model	**Max Production (m^3/24hrs)**
SYTBW 11	2,4
SYTBW 12	4,8
SYTBW 21	7,2
SYTBW 22	13,9
SYTBW 23	19,9
SYTBW 24	25,2
SYTBW 25	30,7
SYTBW 26	39,8
SYTBW 28	50,4
SYTBW 32*	67,2
SYTBW 33*	100,8
SYTBW 34*	127,2
SYTBW 36*	177,6
SYTBW 38*	225,6

Sea Water	
Model	**Max Production (m^3/24hrs)**
SYTSW 11	2,1
SYTSW 12	4,1
SYTSW 13	5,7
SYTSW 14	6,9
SYTSW 16	9,12
SYTSW 18	10,56
SYTSW 19	11,04
SYTSW 22	10,5
SYTSW 23	14,4
SYTSW 24	17,7
SYTSW 26	22,0
SYTSW 32*	38,4
SYTSW 33*	52,8
SYTSW 34*	64,8
SYTSW 36*	79,2
SYTSW 38*	105,6

* Pre-treatment filters are not included and selected according to each project specifications (concerning SYTBW3 & SYTSW3 models)

- The reject water quantity and absorbed power depend on the quality (TDS) and temperature of the feed water. Exclusive design, manufacturing 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

Note: Brackish Water Systems are offered with the option of blending the permeate water from the Reverse Osmosis Unit with of feed water

TEMAK's Indicative Installations

Municipality
Capacity: 10.000 m³/day
Feed Water Quality: Brackish Water
Product Water Quality: Potable

Municipality
Capacity: 4.700 m³/day
Feed Water Quality: Brackish Water
Product Water Quality: Potable

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

Hotel
Capacity: 700 m³/day
Feed Water Quality: Brackish Water
Product Water Quality: Potable

Hospital
Production: 35 m³/day
Feed Water Quality: Network
Product Water: Hemodialysis Standards

Pharmaceutical
Capacity: 4 m³/h
Feed Water Quality: Brackish Water
Product Water Quality: Ultrapure

Municipality
Capacity: 1.800 m³/day
Feed Water Quality: Sea Water
Product Water Quality: Potable

Residence
Capacity: 125 m³/day
Feed Water Quality: Sea Water
Product Water Quality: Potable

"Experts in Processing Water"

TEMAK®
TOTAL WATER SOLUTIONS

WATER VALUE AMBASSADOR
• ATHENS 1980 •

ISO 9001 · ISO 14001 · ISO 45001 · ISO 50001 · ISO 22000 · ISO 22301 · ISO 13485

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