Culligan®

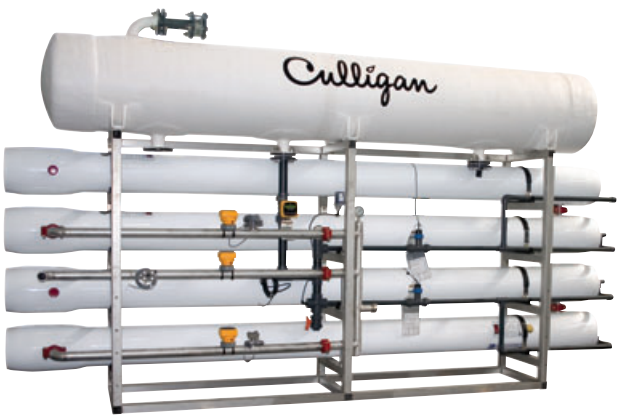
Desalination of sea and brackish waters

CULLIGAN: WORLD LEADER IN THE WATER TREATMENT

CE *Designed and manufactured according to CE Directives in force*

DESALINATION

New replies to an old question.
In many parts of the world, the scarcity of freshwater is becoming a major emergency. The reasons for this are many and vary according to the particular situation: prolonged periods of drought caused by climatic changes (which in turn are the result of the notorious greenhouse effect), intensive farming practices, which exhaust water resources by failing to respect the natural rhythm of the seasons, the gradual pollution of groundwater through industrial and agricultural activity, and the concentration of enormous masses of people in holiday resorts during the summer months.
All this must be added to the now exponential growth in world population: 2.5 billion human beings inhabited the earth in 1950; now there are 6 billion; and forecasts predict 9.5 billion by 2050.
Because the quantity of natural supplies of freshwater is finite (and the quality is always on the decline), the problem is how to meet the constantly growing demand; the answer lies in desalination of seawater or brackish water.
Over the last fifty years a variety of different desalination techniques have been developed and applied, but the process increasingly taking hold is that based on the principle of **Reverse Osmosis**, the reasons for its growing popularity being the excellent quality of the results obtained, its optimum cost/benefit ratio, its low environmental impact, simple management and total system modularity.



THE RESULTS

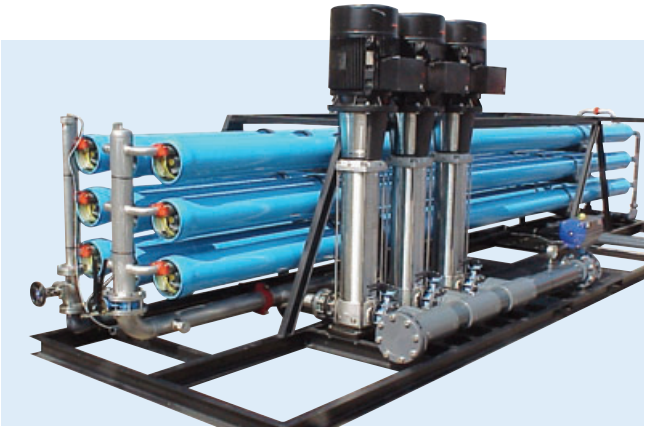
Modern osmotic membranes afford excellent performance: the recovery ratio (the quantity of drinking water produced relative to the amount of water treated) can be as high as 50% (seawater) or 80% (brackish water), while the salinity of the water is reduced by more than 99%.

PLANT MANAGEMENT

By using the latest technologies, we can build a very high degree of automation into our plants, thereby reducing the requirement for specialised personnel to a minimum.
The day-to-day running of the plants can therefore be entrusted to non-specialists, backed up by the extensive Culligan technical assistance network, which can provide first-class service anywhere in the world.

THE COSTS

The high performance of modern reverse osmosis plants means that the cost of each cubic metre of water produced is significantly lower than produced using other processes.
Providing it is appropriately dimensioned and managed, a reverse osmosis desalination plant can continue to supply water of excellent quality for many years before the membrane has to be renewed.
It is important to note that, in order to reduce operating costs to a minimum (of which the electrical power required to pressurise the water flow accounts for a large part), an energy recovery system may be used to recoup energy that would otherwise be lost from the concentrated salt water that leaves the system.



In addition to the aforementioned economic and qualitative advantages, there are other reasons why reverse osmosis is to be preferred over the other technologies currently available, and these relate to practicality of the system and its management: reverse osmosis plants are characterised by their flexibility, compact design and modularity.
Flexibility: a reverse osmosis plant can be activated with just a few simple operations, and can be deactivated and put on stand-by just as quickly, making it easy to adapt the supply of drinking water to suit changes in the effective demand. **Compact design:** the dimensions of reverse osmosis plants are a lot smaller than plants that use distillation processes. **Modularity:** it is always possible to add extra membranes and pumps to an existing system in order to meet the growing needs of a community.
To all these benefits, which are common to reverse osmosis plants of all makes, we can add those advantages peculiar to Culligan systems, derived from 70 years of experience as a leader in the water treatment industry and the fact that we were one of the first manufacturers to adopt reverse osmosis technology on a large scale.
We can therefore add another advantage to those previously mentioned: the renowned **reliability** of Culligan products, backed up by our worldwide technical assistance network.

THE TREATMENT PROCESS

The seawater desalination process used in Culligan systems normally includes the following stages:

- **Pretreatment**
- **Chemical conditioning**
- **Reverse osmosis plant**

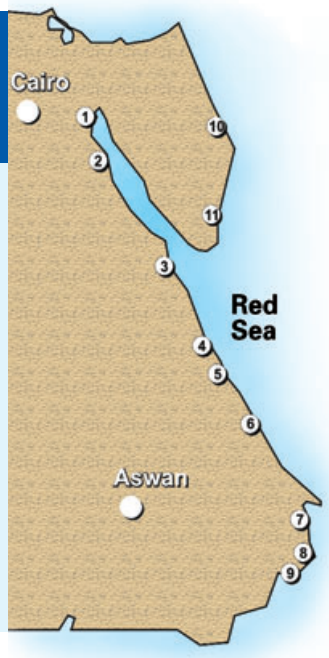
The specific characteristics of each plant, the type of membrane, supply pressure, etc., are determined on a case by case basis according to requirements and analysis of the untreated water. The plant includes a system for rinsing the modules at each shutdown, also in the case of a sudden electrical power failure.

- **Remineralization** where appropriate, to bring the treated water up to the desired final quality
- **Final disinfection**

There are numerous Culligan seawater or brackish water desalination plants currently in use throughout the world.
Among the seawater desalination plants are those along the coast of Sardinia, in the localities of La Maddalena, Carloforte and Villasimius (with capacities of respectively 500, 1,000 and 1,500 m^3/day), the large-capacity systems in use on the island of St. Maarten, in the Dutch Antilles (17,000 m^3/day) and Antigua (approx. 30,000 m^3/day), and those located along the Red Sea coast, which provide drinking water for the numerous tourist resorts that have sprung up in this area over the last decade (see map).

Culligan: Sea Water R.O. desalination plants on the Red Sea

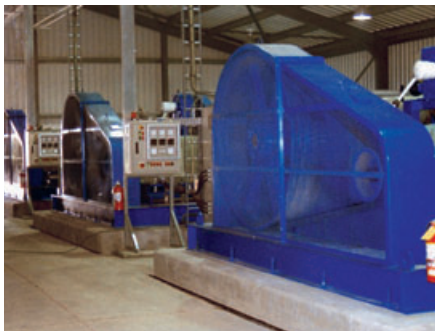
❶ Ain El Sokna		2x1000m^3/d
❷ Ras Ghareb		2x500m^3/d
❸ Hurgada		1x500m^3/d
❹ Marsa Alam	1x100m^3/d	1x500m^3/d
❺ Marsa Hamata	1x100m^3/d	
❻ Marsa Hemera	1x100m^3/d	
❼ Shalatin	1x100m^3/d	1x500m^3/d
❽ Abu Ramad	1x100m^3/d	1x500m^3/d
❾ Halayeb	1x100m^3/d	1x500m^3/d
❿ Dahab		4x500m^3/d
⓫ M.F.O. (Multi National Force and Observer) South Camp		1x200m^3/d

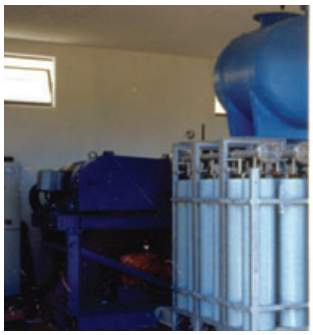


REFERENCES

Customer	City, Nation	Capacity (m^3/day)
Antigua Water Power Authority	Crabbs, Antigua	27250
Radisson Cable Beach Resort	Nassau, Bahamas	1090
M.F.O. (container)	Sinai, Egypt	250
Swiss Riviera Hotel	Hurgada, Egypt	500
Muncipality of	Ain El Sokhna, Egypt	2 x 1000
Megisti Dodekanissos	Megiste, Greece	50
Nirefs Fish Farm	Chios, Greece	1920
Muncipality of	Mikonos, Greece	2000
Muncipality of	Tinos, Greece	500
Muncipality of	Paxos, Greece	1x150 - 1x500
Muncipality of	Hermoupolis, Greece	500
Ministry of Civil Protection (2 containers)	Rome, Italy	1160
Knauf	Castellina M.ma (PI), Italy	480
Muncipality of	La Maddalena (SS), Italy	500
Muncipality of	Carloforte (CA), Italy	1000
Muncipality of	Villasimius (CA), Italy	1500
Marriott Hotel	Bermuda	378
Britannia Golf & Country Club	Grand Cayman Islands	680
Ramada Turquoise Reef Hotel	Provo, Turks and Caicos Islands	180
Muncipality of	St. Maarten, Dutch Antilles	17000
Hyatt Regency Hotel	Saipan, Japan	545
Ekarem Waterworks	Ekarem, Turkmenistan	1000
Esenguli Waterworks	Esenguli, Turkmenistan	2 x 750

Other installations supplying private users, hotels and holiday clubs are spread throughout the Caribbean, the Red Sea and all around the coasts of Italy, Spain, Tunisia, Greece and many other countries.





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