Faujour also highlights the environmental benefits of RO. "Aside from the need to dispose of brine, RO has a negligible environmental impact and the technology makes minimal use of chemicals. However, brine must be carefully disposed of in order to avoid environmental impacts."

Another benefit is the lower maintenance downtime of membrane plants. Harris adds: "Thermal plants contain large units with many parts. Membrane facilities are essentially just pumping system so the maintenance is in the pump itself."

Yet despite the financial and environmental benefits of RO – demonstrated by the fact that it constitutes more than 60 per cent of installed capacity worldwide – it is not the preferred desalination method in the GCC region. Indeed, the UAE has the world's largest installed capacity of thermal desalination but only the sixth largest for reverse osmosis.

A MATTER OF QUALITY

Harris explains that this trend is primarily due to the quality of water in the Arabian Gulf. He adds: "The two types of solids you have in water are suspended solids – particles or silt – and dissolved solids which can be salts and ionic metals. Membrane systems are designed to separate dissolved solids efficiently, but they can't really take the abuse of suspended solids. This is an issue here in the Gulf, where the water supply is warm and saline with lots of suspended particles."

"This means that a key issue for RO systems in this region is pre-treatment. The water requires filtration, coagulation or separation systems which remove the suspended particles before passing the water through the membranes to remove the salts."

Faujour agrees that pre-treatment is a regional stumbling block for RO, and also points out that the Gulf's high level of salinity increases the cost of the RO process. "The seawater in the Arabian sea is one of the saltiest seawaters worldwide, therefore the energy needed to retrieve the salt by RO is higher here than elsewhere. In contrast, thermal desalination is independent of the salinity of the seawater, and is also more tolerant to the seawater quality, thus providing a robust, energy-efficient, reliable seawater desalination system. This is important in a country where most potable water is obtained from desalination plants."

Another disadvantage of reverse osmosis is the complexity of operation. Faujour adds: "The operation of a RO plant requires a high-quality standard for materials and equipment, and there is often a need for foreign assistance to design, construct, and operate plants. An extensive spare parts inventory with membrane replacement schedule must be maintained, especially if the plants are of foreign manufacture."

A common modus operandi in the region is to locate a thermal desalination plant next to a power plant. This method is employed in the world's largest desalination facility, the Jebel Ali Desalination Plant (Phase 2) in Dubai, capable of producing 300 million cubic metres of water per year. The desalination facility utilises waste heat from the neighbouring power plant.

A TOUGH SELL

Harris concedes that many membrane systems "failed miserably" in the GCC due to inadequate pre-treatment. He adds: "It's a very tough sell here. Dubai Electricity and Water Authority (DEWA) had a bad experience with membrane technology and it doesn't want anything to do with it again. It has gone back to a form of thermal technology – multiple-stage flash – which is considered by some to be early desalination technology. But they like it because it is predictable – they know what to expect even if it is more capital intensive."

Yet membrane technology is still being explored in some pockets of the region. Harris elaborates: "Sharjah Electricity and Water Authority (SEWA) has invested a tremendous amount into membrane technology in the last five years.

In fact, the plant at Laya has the most diverse selection of desalination technology in any facility in the world. They have multiple-stage flash, multiple-effect distillation – both thermal process – as well as seawater reverse osmosis and seawater nano filtration. They are very forward-thinking and open to new technology. The emirates of Umm Al Quwain and Ras Al Khaimah are also exploring membrane technology."

COMPANY FOCUS

Saudi-based company AES Arabia is handling the water treatment requirements of a mixed use tower in Dhahran, and has been playing a key role in the project from the early stages.

Having been involved in the design, fabrication, supply, installation and commissioning of a 50 cu m/day reverse osmosis plant, the company has also been tasked with providing the same service for two 500 cu m/day RO plants, as well as a chilled water system treatment plant for the prestigious landmark.

Fawaz Malki, AES Arabia

Discussing the project, AES Arabia's CEO Fawaz Malki said: "In addition, we will supply operation chemicals for the RO plants, and treatment chemicals for the chilled water system and cooling towers."

"While the AES seawater RO desalination plants are primarily designed to produce potable water, the company is able to modify the standard design to suit specific customer requirements, or for other applications," he continued.

With a 7,000 sq m manufacturing facility in Riyadh, AES has executed projects across the Middle East, and is committed to improving water quality through innovative technologies.

"Realising the diversity of needs, environmental conditions, economics, and geography in different countries, we will continue to seek innovative ways to adapt to new and challenging environments and circumstances," says Malki.

> "Aside from the need to dispose of brine, reverse osmosis has a negligible environmental impact."
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> **Bassem Halabi, Metito Overseas Ltd**