

ENGINEERING  
TOMORROW

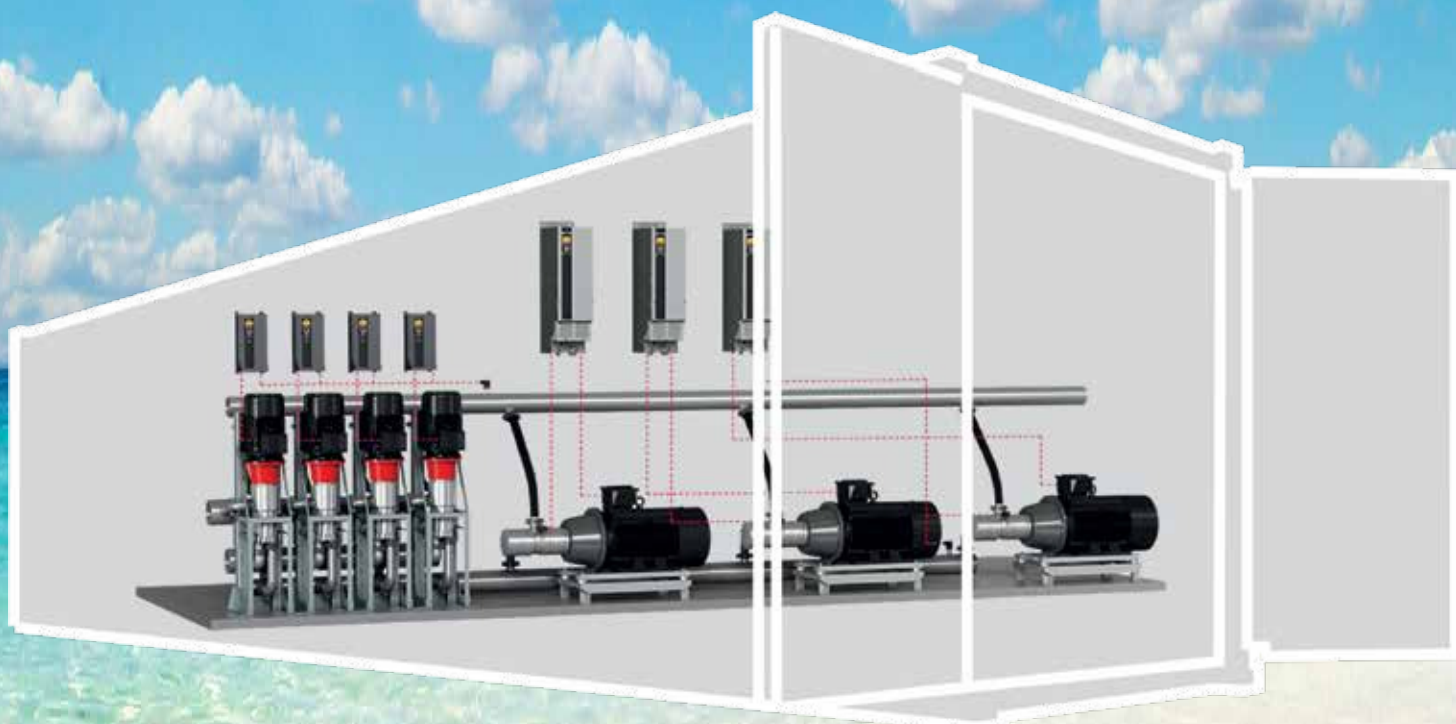
*Danfoss*

Desalination

## **Danfoss solutions for Seawater Containerized Desalination Plants** designed for emergency, temporary, and acute water scarcity situations

**Up to  
2 million**

liters of fresh  
water per day





The Seawater Containerized Desalination plant (SWRO – reverse osmosis system) serves as an ideal solution for **emergency, temporary, and acute water scarcity situations**. This comprehensive potable water solution can be operational **within days**, providing an alternative to fixed-site or stationary desalination plants.

**The typical container has a production capacity of up to 2 million liters (2,000 m<sup>3</sup>/day) of fresh water. This quantity of water covers the needs of up to 8,000 inhabitants per day.**

### What is Seawater Containerized Desalination plant

The seawater containerized desalination plants are constructed inside metal shipping containers. Each container is assembled and fully tested before delivery, eliminating the need for on-site system assembly, pipe

work, electrical wiring, or component mounting – offering simple plug-and-play solutions. These containers are designed for either indoor or outdoor permanent or mobile installations.

### What are the benefits of Seawater Containerized Desalination Plant (SWRO)?

- **Plug-and-play simplicity:** All-in-one solution designed to produce drinking water from a seawater, requiring only feed water intake and electricity to begin water production.
- **Deployable anywhere:** suited for remote installations and various other applications that do not require purpose-built facilities.
- **Rapid deployment:** many OEMs have ready-made containerized plants in stock, while others can quickly configure and build standard or custom solutions. Operational within days.
- **Modular scalability:** Available in 40" and 20" versions, easily scalable up or down according to need.
- **Mobile portability:** Easy to transport by truck, ship, or helicopter.

2 million  
liters of fresh  
water

The production capacity  
of fresh water of the  
typical container per day

8,000  
habitantes

This quantity of water  
covers the need up to  
8.000 habitantes per day

Quick  
installation

Set up the plug-and-play  
plant up to seven days

# 4 core technologies for Seawater Containerized Desalination plant



Danfoss collaborates with partners to build Plug-and-Play containers, providing a unique components portfolio including APP high-pressure pumps, iSave energy recovery devices, drives, and sensors.

Years of field-proven success make the Danfoss advantages **the best on the market:**

- **Market-leading energy efficiency:** The best-in-class energy efficiency of Danfoss APP high-pressure pumps and iSave ERDs reduces the OPEX of any SWRO plant.  
  
For containerized SWRO in remote areas, minimizing energy consumption can be especially important due to higher electricity prices and, if off-grid, the use of diesel generators and renewable energy sources such as solar and wind.
- **Compact, efficient footprint:** Danfoss portfolio for Plug-and-play solution is unique in terms of compactness and efficiency:
  - APP pumps provide far more high-pressure efficiency per m<sup>3</sup> than any other pump type – especially when compared to traditional centrifugal pumps.
  - iSave ERDs’s 3-in-1 design combines a pressure exchanger, booster pump and motor for extremely compact energy recovery.
- **Short lead times:** Many of the Danfoss APP pumps and iSave ERDs most commonly used in containerized SWRO plants are available for immediate delivery or with relatively short lead times.
- **Robust reliability:** easy on-site maintenance and the longest service intervals in the industry.

*Suministros de Agua La Oliva (Fuerteventura, Spain): retrofit of 2,000 m<sup>3</sup> plant reduces the municipality’s energy consumption by 57% ([link to case story](#))*

Best-in-class energy efficiency

Compact & efficient footprint

Short lead times

Long service intervals

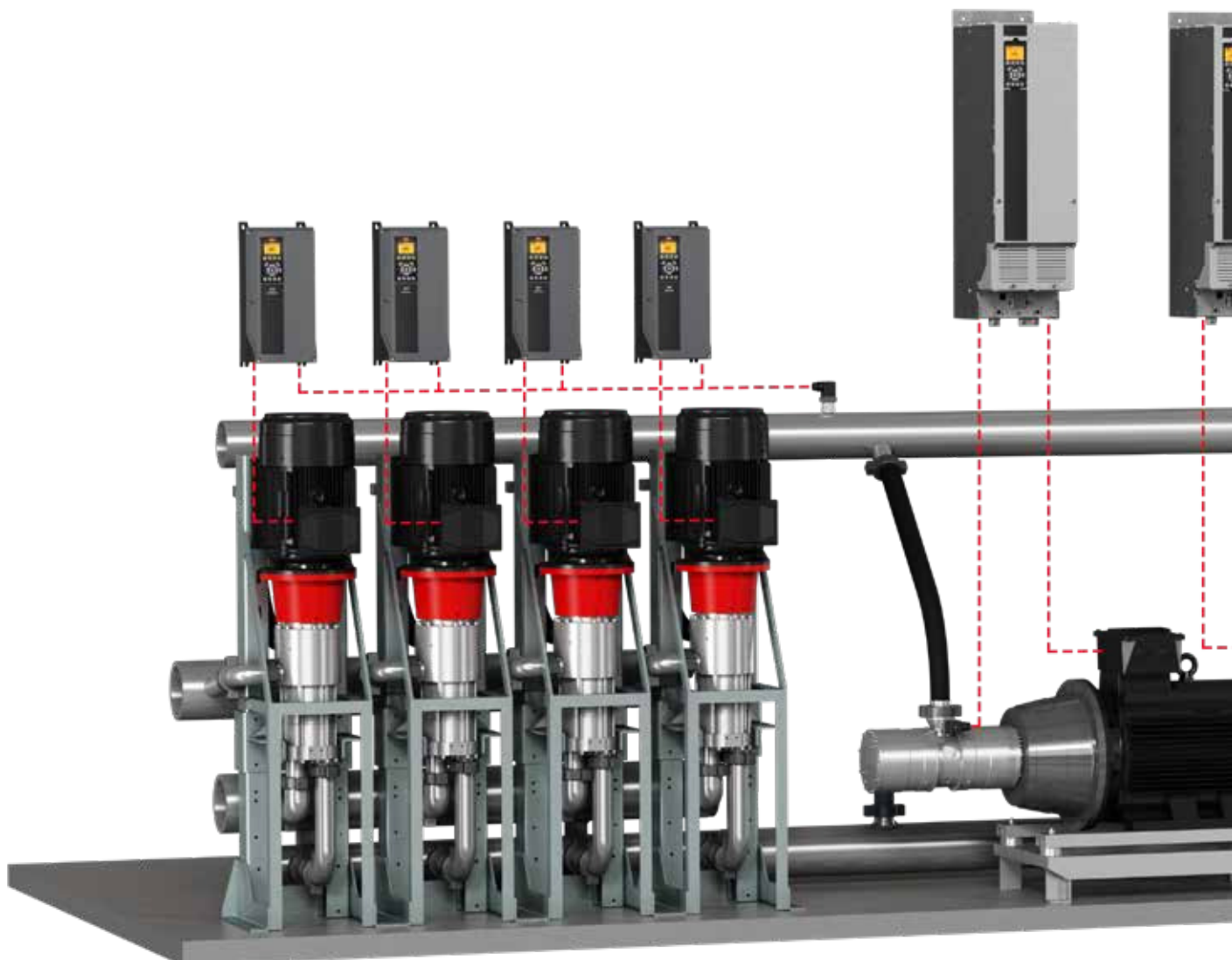
Remote control

Fast installation

# Four **core technologies**

Desalination typically demands a substantial amount of energy to produce fresh, clean water. This is because salt forms a strong chemical bond with water that is difficult to break and requires a significant effort to discard.

**Danfoss combines four core technologies** to provide superior and energy-efficient desalination solutions: High-pressure pumps, drives, energy-recovery devices, and pressure and fluid control devices. These combine into **highly efficient, cost-effective, and lasting water purification** solutions.





## Reduce your desalination costs with Danfoss' four core technologies

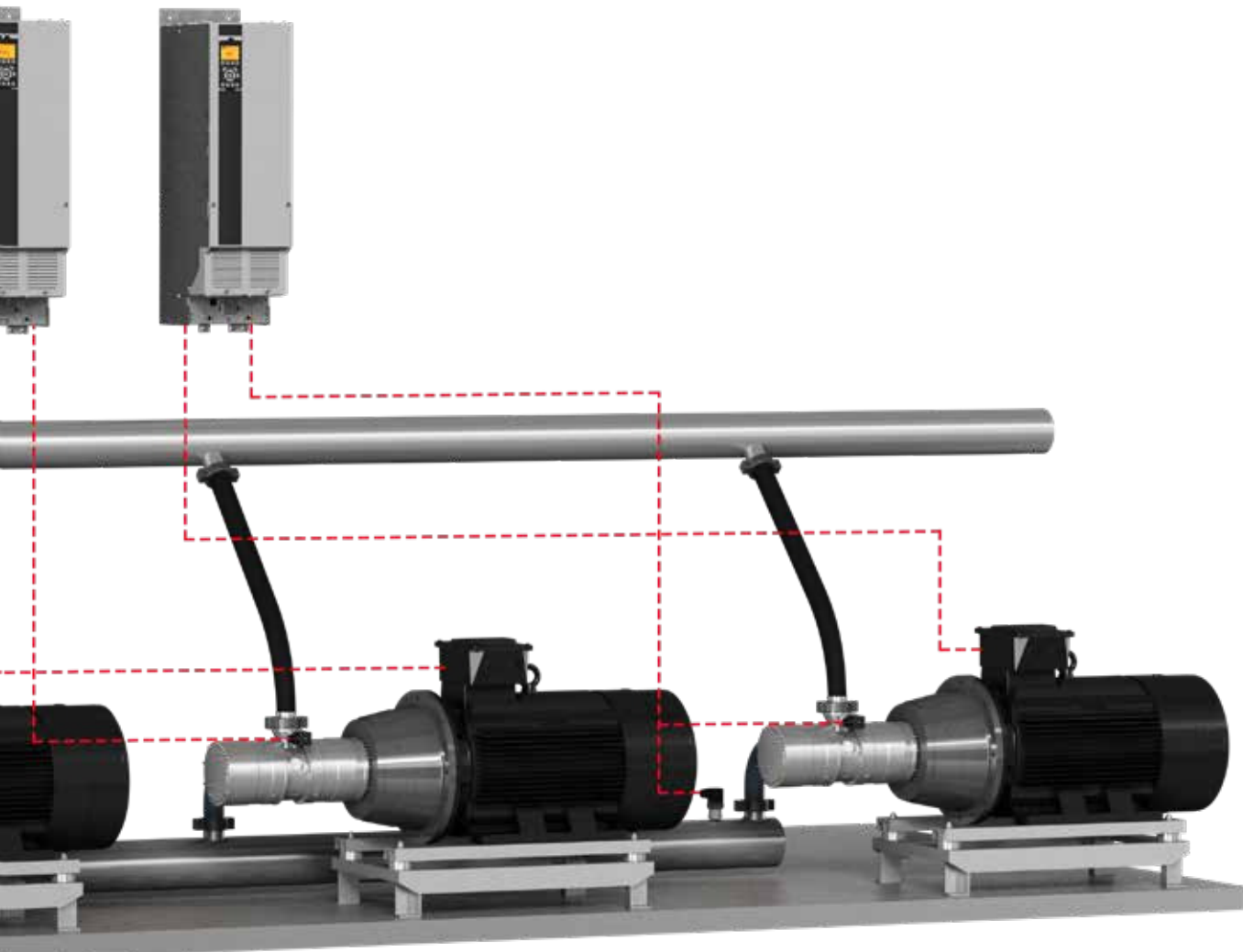
### Up to 15-25% of energy savings:

Savings on desalination systems with Danfoss high-pressure pumps, Danfoss pressure transmitters, and Danfoss drives compared to centrifugal pumps with drive. Energy savings depend on the size of the plant.

### Up to 65% of energy savings:

Savings on desalination systems with Danfoss high-pressure pumps, Danfoss pressure transmitters, Danfoss drives and Danfoss energy-recovery devices (iSave) compared to desalination plants with centrifugal pumps and without energy-recovery devices and drives.

**Our dedicated team of experts is committed to advising you and optimizing your system.**



# Dedicated APP high-pressure pumps

Danfoss APP pumps are at the heart of more than 22,000 seawater reverse osmosis systems around the world – often used at remote hotels and resorts. A simple design with few moving parts ensures easy maintenance, long service intervals, and the highest efficiency rates – with up to 92% efficiency, depending on pump sizes.



## Easy installation

Small and compact pump in a light design. The pump is powered directly by electric motors and offers easy installation that requires little space and minimum piping.



## Energy efficiency

The highly efficient pump design provides the lowest energy consumption of any comparable pump on the market. It offers energy-efficiency rates of up to 92% and constant efficiency regardless of flow and pressure.



## Simple and flexible design

The pump design consists of few moving parts, which makes it less complex. The small and compact design is lighter than alternatives, which makes transport to remote areas much easier.



## Low maintenance

The simplicity of the design increases the interval between service visits. No oil is required as the pumped medium provides the necessary lubrication, making the pump easy to service.



## Easy to use

The pumps offer constant flow regardless of pressure changes. The simple pump design makes on-site servicing possible, which is especially useful in remote areas. Additionally, the pumps are easy to run in parallel.



## Long service life

All pumps are made of highly corrosion resistant materials (Duplex/Super Duplex) enabling a long service life. The proven and reliable technology is currently installed in thousands of SWRO plants worldwide.



# Powerful Danfoss iSave ERDs

The Danfoss iSave energy recovery devices are designed and optimized for sea water reverse osmosis applications – on land, at sea or on the move. Based on patented and field-proven technology, Danfoss iSave is a fully integrated 3-in-1 solution that can be scaled to provide unrivalled energy savings and constant flows in SWRO applications of any size and type.



## Effortless installation

Danfoss iSave is much simpler to install than other ERDs. As a compact and integrated 3-in-1 solution that can be installed both horizontally and vertically, iSave requires less installation space, less lifting and less pipework.



## Smart and flexible design

System designers get more freedom with Danfoss iSave. The compact iSave provides greater design flexibility with less pipework and boasts a wide range of flow options, which can safely be extended to cover even larger flows by running two or more iSaves in parallel.



## Simple to use

Danfoss iSave is designed for automatic operation and is virtually fail-safe. Rotor-spin is controlled by the electric motor, completely eliminating the risk of overflow/overspin during start-up and operation. This makes iSave the ideal solution if your SWRO application is operated by changing staff with varying skill levels.



## Low maintenance

Danfoss iSave is a very reliable and low maintenance performer. With its direct-drive electric motor and its self-lubricating and pipe-free 3-in-1 design, the iSave is not only very easy to service – it can also be done on site. Expected service interval is minimum 2 years within our specified parameters.



## Long service life

The Danfoss iSave is based on a field-proven recovery principle and built from corrosion resistant high-grade Duplex/Super Duplex stainless steel or polymer components. The design also eliminates the need for a high-pressure shaft seal and uses a single low-pressure mechanical shaft seal instead. All design decisions have been made to ensure that the Danfoss iSave range boasts an impressively long service life.



## Constant flow

Using a positive displacement pump as a booster pump ensures that the iSave will provide constant flows at all times – regardless of pressure changes. Where other isobaric ERDs will struggle to produce even flows in the concentrate line if differential pressure changes, the iSave will just keep on supplying the perfect membrane feed.





**30%**

cost reduction in first year compared to traditional drive systems

## Optimal performance in demanding environments

The VLT® AQUA Drive FC 202 is designed to provide the highest level of performance of AC-motor-driven water and wastewater applications. The drive offers a wide range of powerful standard features and a host of expandable features, making it equally suited for new and retrofit projects. Additionally, the VLT® AQUA Drive FC 202 offers first year cost savings of 10-30% compared to traditional drives – as well as easy installation, low energy consumption and economical cost of ownership.



### Cost benefits

- Energy-efficient design
- Intelligent heat management
- Automatic adaption to application
- Energy-efficient harmonic mitigation
- Optimal control of all motor types



### Installation benefits

- Less panel space
- Direct outdoor installation
- Long cable capability as standard
- Reduced air-conditioning investment
- Integrated harmonic mitigation
- Printed circuit board protection as standard
- Easy commissioning
- Minimum 10-year lifetime



### Lifetime benefits

- User friendliness
- Flexibility
- Reliability
- Energy savings
- Pipe and plant asset protection
- Reduced maintenance
- Optimize system uptime thanks to integrated condition-based monitoring



# Maximum energy efficiency

## Danfoss VLT® AQUA Drive FC 202

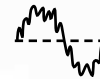


The substantial daily load variations in fresh water and wastewater treatment plants make it economically advantageous to install AC drives on rotation equipment such as pumps and fans. The Danfoss VLT® AQUA Drive FC 202 offers a quick and user-friendly setup of water and pump settings that significantly reduces installation time and ensures maximum energy efficiency.



### Protected by software

Assets are protected thanks to a specially designed software that prevents various forms of wear action, for example, water hammering.



### Reduced interference and distortion

Electromagnetic interference and harmonic distortion are reduced thanks to the builtin, scalable RFI filter and integrated DC link chokes.



### Less heat loss – greater energy efficiency

Energy efficiency is maximized as a result of the drives' control algorithms and design which focus on reducing heat loss.



### Freely programmable alerts

Perfect system integration and adaptation to the application are possible due to freely programmable warnings and alerts.



### Unique back-channel cooling

High energy savings related to air conditioning due to the unique backchannel cooling concept that transfers 90% of heat away from the room.



### Condition-based monitoring

Optimize system uptime and predict maintenance needs, using integrated condition-based monitoring functionality.



### Automatic energy optimization

3-8% energy savings are achieved as a result of automatic energy optimization.

# Pressure transmitters for fresh water

MBS 3000 pressure transmitter is a compact, heavy-duty pressure transmitter with optional pulse-snubber when used on the suction side of the pump.

MBS 3000 is designed for use in fresh water applications with severe medium influences, such as cavitation, liquid hammering or pressure peaks.



## DST P40I pressure transmitter

The Danfoss DST P40I is a robust and accurate pressure transmitter designed specifically to meet requirements in corrosive industrial environments – such as desalination systems, sea water cooling, and chemical processing.

The transmitter housing is machined from a single titanium rod to eliminate any structural weakness. The pressure-sensing element is made from 96% Al<sub>2</sub>O<sub>3</sub> ceramic with superior chemical immunity. The pressure transmitter uses the piezo resistive principle, and the Wheatstone Bridge is printed directly on the inside of the ceramic diaphragm to ensure fast response time and a high degree of measurement precision.



### Solutions for harsh environments

DST P40I is designed to perform under pressure. Full titanium body and ceramic pressure elements ensure high resistance to corrosion from salt water, acids, alkalis, and chlorates.



### Longer lifetime expectations

Built from selected materials, the pressure transmitter offers high tolerance to mechanical shocks and vibrations – resulting in longer lifetime performance.



### Superior quality

Highest enclosure degree (IP67) ensures peak level of water ingress protection resulting in minimal maintenance



### High burst and over-pressure abilities

The body of the DST P40I is processed from a single bar of titanium to avoid any structural weakness in the transition between the pressure connection and the transmitter house.



### Excellent stability

Zero drift due to excellent long-term stability ensures the safety of the machine.



### Robust design

High resistance to continuous vibrations and cavitation in reverse osmosis desalination pump systems. Tested by FORCE according to IEC 600068-2-6 & 27.



## Direct feedback from our customers



*"Because these plants are designed to be deployed anywhere – also in locations that are very far from the beaten path – operational reliability is critical. Sending maintenance staff on short notice is not a viable option. Of course, Danfoss's long maintenance intervals are clearly an advantage in this regard, but their suitability for remote monitoring is also extremely helpful. Once the containerized plant is connected to the internet, we can monitor all key parameters via the cloud. This helps us help our customers not only troubleshoot any issues that arise unexpectedly, but also to perform predictive maintenance."* ([Link to case story](#))

**Massimo Bongiani, Metis Water**



*"The combination of Danfoss APP pumps, iSave ERDs and Vacon 100 Flow AC drives results in extremely significant energy savings. As we have seen elsewhere, the relatively short payback time makes a very compelling case for retrofitting older RO plants. When you also consider the advantages of improved reliability and lowered CO<sub>2</sub> emissions, it's clear that such retrofits are appealing to many RO customers."* ([Link to case story](#))

**Pedro Viera, Veolia Water Technologies Iberica**



*"Space was at a premium, and all components would have to be as compact as they were high performing. In fact, we've created a new way of expressing this, an output capacity per container size ratio: the plant was installed inside two 12-foot containers with the standard maritime exterior dimensions of 12.2 m x 2.59 m x 2.44 m, giving a total cubic space for both containers of 144.2 m<sup>3</sup>. With its total capacity of 1800 m<sup>3</sup> of desalinated water produced every 24 hours, the Puerto de Mogán plant's output capacity per container size ratio is thus 12.48 m<sup>3</sup> of desalinated water output per day per m<sup>3</sup> of container space. The higher the ratio, the more compact the plant."* ([Link to case story](#))

**Adex Bruno Torres Rodríguez, Canaragua**



*"Danfoss high-pressure pumps enable us to create systems that are not only energy-efficient but also extremely compact and can be placed in a container. Thanks to their small size and simplified internal design, they can be installed even when space is limited. Just as importantly, they require very little periodic maintenance. iSave ERDs devices, which drastically reduce energy consumption, are also extremely compact and are easily integrated with Danfoss high-pressure pumps."*

*"We have come up with an innovative solution based on Danfoss's advanced technologies, and this has enabled us to achieve success and the full satisfaction of our end customer."* ([Link to case story](#))

**Pietro Tota, D&C manager at ACCIONA Agua**