SIDEM VEOLIA

The Barrel™

The next generation of RO desalination plants

WATER TECHNOLOGIES

Safe, compact,

Seawater desalination represents an everlasting challenge for engineers. The demand for fresh water is growing while its market prices are going down. Meeting clients' need for lower water costs requires investing in R&D to develop new technologies and smarter solutions.

Safe, Compact, Digital: The Barrel™ is a game changer

The next generation of RO desalination plants must provide:

- **Quality:** Reliable production of the same quality of fresh water but at a lower cost.
- **Safety:** High-pressure systems such as SWRO desalination plants must always be safe.
- **Compactness:** It is generally less expensive to install desalination plants along the seashore where space is often limited. A compact plant also translates to lower CAPEX.
- **Digitalisation:** Information is key and desalination plants must be connected to the best knowledge and expertise for diagnosis, operation recommendations, maintenance strategies and scheduling, etc.

The Barrel™ is a multi reverse osmosis (RO) element vessel which allows the RO process implementation to be strictly identical to that of current RO pressure vessels, ensuring the fresh water produced meets all desalinated water quality standards.

Made of painted high-strength carbon steel, the Barrel™ is a large pressure vessel designed to withstand the pressure required by the RO process. The shell is a regular ASME vessel while the inside is coated with high-grade epoxy paint specifically developed for seawater applications.

Inside, a resin honeycomb structure houses the membranes which can be any type of conventional 8-inch membranes. They are easily inserted via dedicated maintenance manholes at both ends of the shell. Low pressure permeate is collected outside the shell and sent to the next step of the process.

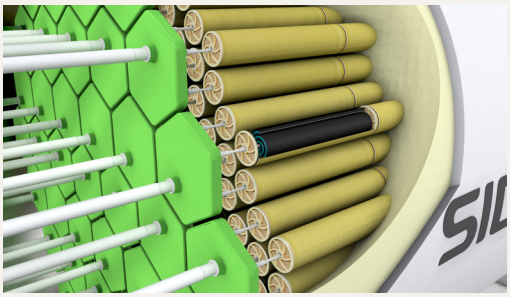
The design of the Barrel™ drastically reduces the number of high-pressure connections which means that operators are less exposed to risks during the maintenance and operation phases, increasing safety on site.

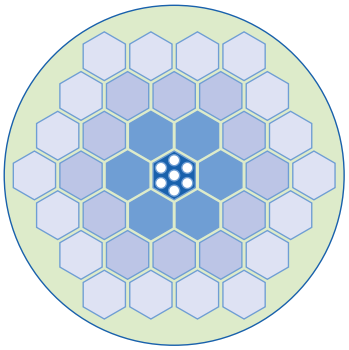
The system is safe and less likely to be affected by corrosion.

digital

A modular product

Hexagonal resin modules form a honeycomb structure within the vessel. Each module is a 7-tube bundle that can produce 800 m³/day of desalinated water. Each tube houses 7 to 8 RO elements in series.





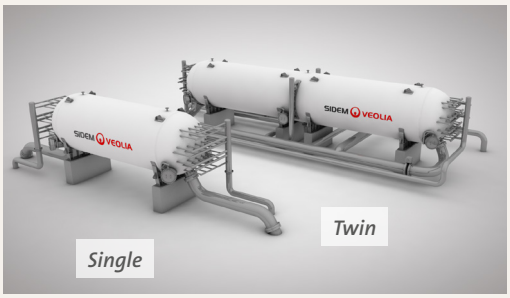
1 key component or 'bundle' - ***670 m³/d***

7 bundles - ***5 000 m³/d***

19 bundles - ***13 500 m³/d***

37 bundles - ***25 000 m³/d***

Thanks to its modular design, the Barrel™ is available in differents capacities ranging from 800 m³/day to 50,000 m³/day in its largest, twin-version configuration.



Nb of bundles	*Arrangement type*	Capacity (in m³/day) / (MIGD)	Length (in m)	Diameter (in m)
1	*Single*	800 / 0.18	12.4	0.8
	Twin	1,600 / 0.36	25	0.8
7	*Single*	5,000 / 1.1	12.4	2
	Twin	10,000 / 2.2	25	2
19	*Single*	13,500 / 3	13.5	3.1
	Twin	27,000 / 6	26	3.1
37	*Single*	25,000 / 5.5	14.6	4.2
	Twin	50,000 / 11	27	4.2

A plug & play system

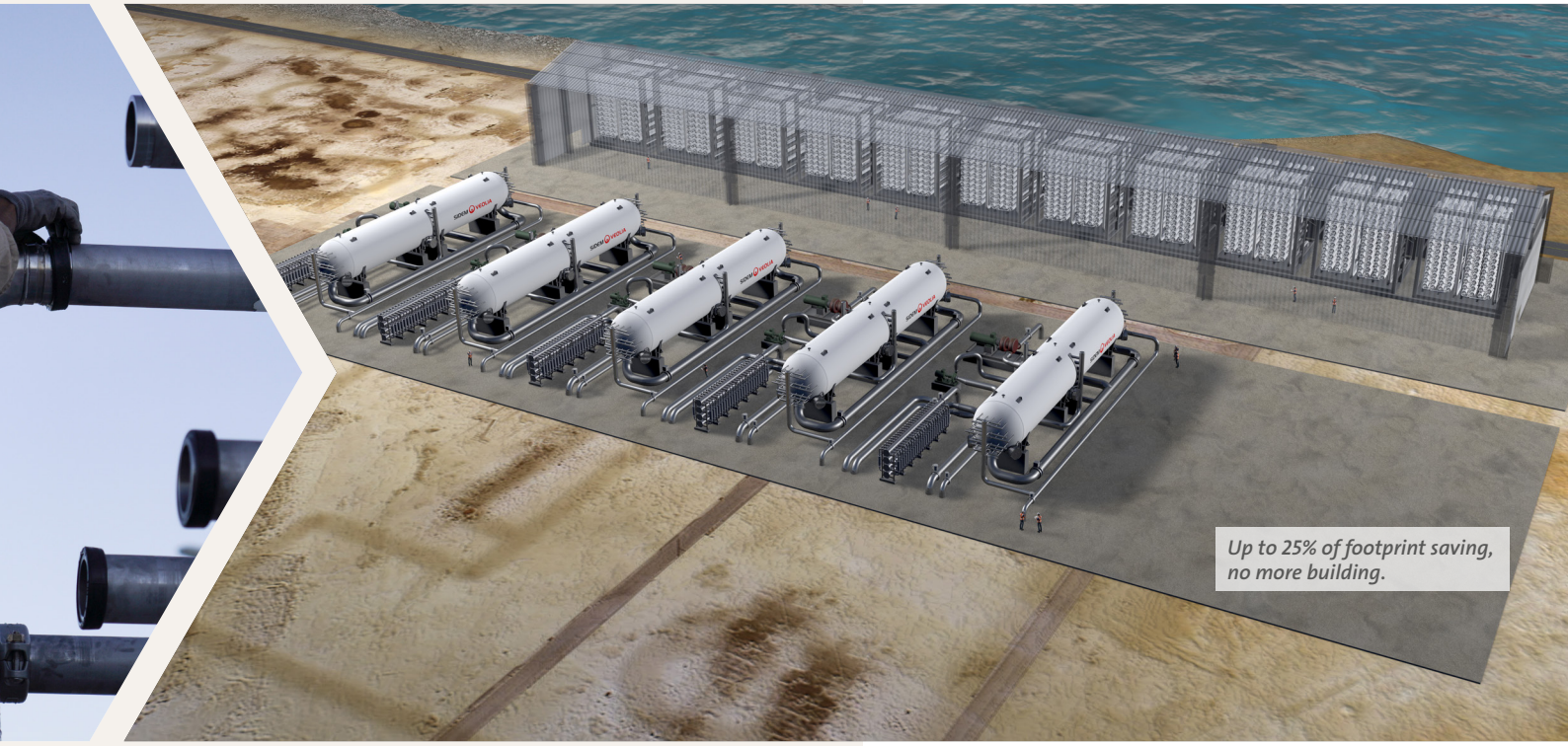
The Barrel™ features a "plug & play" system. The carbon steel pressure vessel is manufactured and tested off-site before being delivered as a single element of the plant. Its installation on site is inspired by large evaporators of thermal desalination plants. This approach secures fast-track schedules for projects and allows for local production.

The Barrel™ is delivered on-site as a single element.

The Barrel™ requires only 2 high-pressure piping connections at the seawater inlet and the brine outlet. Larger Barrel™ units will be fed by large painted carbon steel piping instead of solid super duplex.

The permeate is collected at each end of the Barrel™.

Membrane elements are inserted inside the shell of the Barrel through dedicated maintenance manholes.



Up to 25% of footprint saving, no more building.

A compact design

The Barrel™ allows for up to 25% reduction in the footprint of the RO plant compared to current technology. Being an outdoor technology, no building or air conditioning is needed.

The operating temperature of the RO membranes is constantly monitored to ensure that recommendations from membrane suppliers are met.

Significant energy savings

The Barrel™ provides a reduction in electrical consumption in the range of 0,05 kWh/m³ of fresh water produced, bringing considerable value in the case of IWP projects.

Saint Marteen 800 m³/day unit.

The Barrel™ is a patented technology developed by SIDEM. Its concept, robustness and performances have been proven by a 800 m³/d pilot installed in Saint-Marteen in 2017.

A 5,000 m³/d industrial demonstration unit followed suit in Oman in 2019.

In 2020, a commercial 800 m³/d unit was started in Saint-Barthélemy.

A digital system

In order to have a permanent feedback on each membrane condition, smart connectors are installed within the permeate tube, next to standard interconnectors, while loading the membranes.

These passive devices communicate with antennas embedded in the resin structure and provide the monitoring system with local conductivity and temperature of the produced permeate, creating a full mapping of the Barrel™'s permeate network.

The smart connector is a stand-alone product. It transforms the Barrel™ from a simple mechanical arrangement for membranes into a digital process device providing transparency on the performance of each membrane element.

The smart connector is also available to use with conventional RO technology.

SIDEM, Smart Desalination

SIDEM is the most experienced desalination company in the world that provides innovation, effective execution and return on investment to their clients. The secret of its longevity rests in its agility and capacity to innovate. SIDEM has always looked at the desalination market with an innovative mindset.

We believe that performance, life-time and operating costs of a desalination plant can benefit from digital solutions. By providing our technologies with sensors, and by connecting these sensors to databases expert systems and artificial intelligence, we offer our customers a unique opportunity to travel to the heart of their plant.

The next generation of desalination plants needs to take an innovative step to deliver an economically viable, sustainable source of drinking water to millions of people. We believe that by being permanently connected to the best knowledge and expertise will do just that!

The Barrel™ takes the desalination market into the digital world

Smart RO

The innovative design of the Barrel™ translates into a reduction in operating costs as well as capital costs, bringing long-term economical performance to desalination plants.

Thanks to these revolutionary devices, the performance of each membrane is monitored and recommendations regarding optimum operation modes can be made, bringing value to clients over the complete lifetime of the plants.

Smart connectors pave the way for detailed process monitoring. The condition and performance of membranes are monitored automatically and can be accessed remotely, helping operators adopt the most economical strategy in terms of shutdown, rotation, or replacement of membranes.

AQUAVISTA™ DIGITAL SERVICES enabled

AQUAVISTA™ is the Digital offer of Veolia Water Technologies, a complete suite of Digital Services using IOT, advanced analytics and our water treatment know how.

The Barrel™ concept is also available for lower pressure applications such as brackish desalination, re-use or water treatment plants.

Resourcing the world

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