FROST & SULLIVAN

BEST PRACTICES AWARDS

SIDEM VEOLIA

2020 GLOBAL DESALINATION PLANTS COMPANY OF THE YEAR AWARD

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Background and Company Performance

Industry Challenges

Rapid population and industrial growth further pressures limited freshwater resources around the world. Increasing water scarcity in especially arid regions, such as the Middle East, relied on desalination plants as a critical water source. At the start of the desalination plant market—thermal evaporator-based desalination was the predominant method and the multi-stage flash (MSF) was the dominant technology in the 1970's and the 1980's. However, one of the biggest challenges of the MSF technology was its energy intensity which led to the development of the multi-effect distillation desalination technology in the 1990's, which significantly reduced energy consumption when compared to MSF, also enabling increased plant capacity. These technologies ushered a golden era of desalination plants especially the significantly large number and scale of desalination plants in the Middle East.

Some of the key challenges for the global desalination industry were the financial crisis of 2008 which stalled many of the large desalination projects in the Middle East and coupled with the fact that there was sufficient installed power generation capacity. This posed a significant challenge for the thermal desalination projects that were being developed under the Independent Water and Power Producer (IWPP) model. This was also coupled with the fact that many of the desalination plants especially in the Middle East were aging and water scarcity was becoming a key challenge and led to the market transitioning from thermal desalination to reverse osmosis based seawater desalination.

The onset of seawater reverse osmosis (SWRO) desalination market posed significant challenges especially to engineering procurement and construction (EPC) companies that had been active in the thermal desalination phase of the industry. Part of this was the dominant role of companies with the key technology kit of membranes and related essential equipment which undermined the role and project cost management issues for the EPC's. Beyond the fundamental challenge of the energy efficiency of the SWRO process, another challenge appeared when the desalination plant market was moving towards significantly larger plants. With the reverse osmosis (RO) technology this meant to add an incremental number of small capacity RO units to increase the total capacity, which significantly increased the footprint of the plants. So the move of the future of the desalination plant market like the future of the overall resource market is set to be shaped by a couple of key factors of risks and resilience and the role of digital in increasing resilience, energy efficiency, and overall integration with smart city infrastructure.

Visionary Innovation & Performance and Customer Impact

Founded in 1853, Veolia forged ahead over more than a century to become today's global leader in optimized resource management. In 2019, the company created €27.189 billion in revenue by delivering water, waste, and energy management solutions to further human progress by facilitating access to resources and by preserving and recycling these resources through innovation. During the past year, Veolia's business activities in the water sector enabled the company to supply 98 million people with water and manage

2,835 wastewater treatment plants and 3,548 drinking water production plants to connect 67 million people to wastewater systems. Its current workforce of 178,780 employees continues to serve a broad spectrum of customers through its headquarters in France that receives support from local teams in more than 50 countries across the globe—persistently differentiating itself by pioneering new technologies and contributing to the sustainable development of industries and communities.

SIDEM Continues to Offer Value through Advanced Technologies

Veolia-SIDEM (SIDEM), an entity of Veolia since 1998, developed several desalination solutions during the past 50 years to match all types of customer requirements. Its resolute in-house research and development (R&D) division designed desalination technologies to deliver energy-efficient thermal plants that reduce the energy consumption by a factor of four while it also lowers operating costs and abates environmental impacts. On the back of this success, SIDEM signed a contract in 2007 for the world's largest desalination plant based on multiple effect distillation technology in Marafiq, Saudi Arabia. It consisted of 27 units with an installed capacity of more than 800,000 cubic meters per day (m^3/d).

In 2012, SIDEM merged with a sister company, OTV International, which specialized in extensive engineering, procurement, and construction projects in the water treatment industry. The alliance enhanced SIDEM's capability in SWRO plants, thereby allowing the company to position itself as a global leader of hybrid desalination, combining thermal and RO technologies. Its continuous effort to leverage its R&D competencies enabled SIDEM to become an industry leader of integrated membrane desalination solutions in the current competitive environment. Ranging from modular equipment to large cost-effective plants that produce up to 600,000 m^3 of drinking water per day, SIDEM showcases its ability to adapt to complex environments—and performs consistently. The company also collaborates with specialized partners and suppliers within its network to offer the most appropriate to Veolia's municipal and industrial customers across the globe.

SIDEM: Differentiation through a Disruptive Technology

Together with the rapidly increasing demand for water, communities and industries insist on more affordable pricing when it comes to desalination. In its attempt to address this need, SIDEM relied on its strengths—innovation and technology—to create a next-generation solution, namely the 'barrel.' With a two-meter diameter and ten-meter length, this cylinder produces 5,000 m^3/d.

The carbon steel multi-element pressure vessel—manufactured and tested off-site before deployment—is easy to install in a plug-and-play approach, thereby providing a unique, safe, and compact desalination solution. As no building is required to house the barrels, customers can deploy it in a fast-track schedule, especially where space is often limited. Inspired by the model of large evaporators in a thermal desalination plant, this approach allows a ground footprint reduction of up to 25% when compared to traditional technology. Furthermore, seawater leakage sources often found on the multiple high-pressure connections of traditional RO skids are costly. The barrel's limited high-pressure

connections are essential to ensure lower operating expenses (OPEX), while the risk of corrosion on the piping is also restricted. Such a compact plant translates to lower capital expenditure; additionally, it cuts maintenance costs and extends a plant's lifetime. Most importantly, the technology produces the same quality of water as a conventional desalination plant, but at a lower cost of ownership. SIDEM revealed that the unique architecture reduces the average cost of a desalination plant between 3% and 5%, while it saves 1.5% of energy when compared to traditional SWRO systems.

SIDEM addresses another key customer consideration by offering a solution that digitally monitors membrane performance. Desalination plants require granular information on the condition and operating temperature of RO membranes to ensure premium quality, sustained reliability, and continuous OPEX optimization. Hence, SIDEM equipped its barrel with smart connectors within the permeate tubes, next to standard interconnectors. These devices communicate with antennas molded in the resin structure to provide a distributed control system with local conductivity and temperature. As a result, remote access to a full mapping of the Barrel's permeate network is always available for instant diagnosis, operation recommendations, maintenance strategies, and scheduling.

Veolia Attains Global Growth through Best Practices Implementation

In the last financial year, Veolia reported robust revenue growth (i.e., the company's net income increased by 13.5%), accelerated through its fast-growing businesses outside France. This commercial momentum, fueled by the company's ability to address critical environmental issues with next-generation solutions, allows favorable pricing. This price/performance value benefit enables Veolia to rise above its competitors in stiff market conditions.

In 2019, Veolia strengthened its brand in the Middle East by winning a series of contracts in the very dynamic desalination market—Rabigh 3 IWP SWRO desalination project for the 600,000 m^3/d plant in KSA, Al Dur 2 IWPP SWRO plant in Bahrain with a capacity of 227,000 m^3/day and Umm Al Quwain IWP SWRO desalination plant of 681,900 m^3/day—the latest contract valued at $255 million. Another key milestone is the deployment of Veolia's 'barrel' at the Sur plant, located in the east of the Sultanate of Oman. By applying its advanced technology, Veolia extracts water from coastal wells at a depth of 80 meters to produce more than 130,000 m^3 of drinking water per day to serve 600,000 inhabitants across the entire Sharqiyah region. Along with its pioneering spirit, Veolia also shows the commitment and capacity to adapt to local regulatory requirements. Five years ago, Veolia built a desalinated water treatment plant with a production capacity of 6,000 m^3/day for BP (an oil and gas company) on the Khazzan gas site. Over time, Veolia increased the proportion of Omani technicians in its teams to 80%. The strategic decision to invest in local skills development, staff training, and retention influenced BP's decision to renew the existing contract for another five-year term. Although it was signed in March 2019, it still serves as a testament to Veolia's devotion to responsible consumption and production (as articulated in Sustainable Development Goals 12).

Conclusion

An entity of Veolia since 1998, SIDEM developed a next-generation solution—the 'barrel'—that addresses two key customer considerations to disrupt the industry. With a ground footprint reduction of up to 25%, it also cuts the average cost of a desalination plant by 3% to 5% while it saves 1.5% of energy when compared to a desalination system housed in a building. Furthermore, the barrel monitors membrane performance digitally to facilitate instant diagnosis, operation recommendations, maintenance strategies, and scheduling.

Most importantly, Veolia advances human progress by facilitating access to resources and by preserving and recycling these resources through innovation. Frost & Sullivan lauds Veolia for its forward-looking initiative to develop, train, and retain local citizens, thereby creating value for communities and promoting long-term sustainability.

With its visionary innovation, best-in-class implementation, outstanding financial performance, and unwavering commitment to sustainability, Veolia earns Frost & Sullivan's 2020 Global Company of the Year Award in the desalination plant industry.

Significance of Company of the Year

To receive the Company of the Year Award (i.e., to be recognized as a leader not only in your industry, but among non-industry peers) requires a company to demonstrate excellence in growth, innovation, and leadership. This excellence typically translates into superior performance in three key areas—demand generation, brand development, and competitive positioning—that serve as the foundation of a company's future success and prepare it to deliver on the 2 factors that define the Company of the Year Award: Visionary Innovation and Performance, and Customer Impact).

Understanding Company of the Year

Driving demand, brand strength, and competitive differentiation all play critical roles in delivering unique value to customers. This three-fold focus, however, must ideally be complemented by an equally rigorous focus on Visionary Innovation and Performance to enhance Customer Impact.

Key Benchmarking Criteria

For the Company of the Year Award, Frost & Sullivan analysts independently evaluated two key factors—Visionary Innovation & Performance and Customer Impact—according to the criteria identified below.

Visionary Innovation & Performance

Criterion 1: Addressing Unmet Needs
Requirement: Implementing a robust process to continuously unearth customers' unmet or under-served needs, and creating the products or solutions to address them effectively

Criterion 2: Visionary Scenarios through Mega Trends
Requirement: Incorporating long-range, macro-level scenarios into the innovation strategy, thereby enabling "first-to-market" growth opportunity solutions

Criterion 3: Implementation of Best Practices
Requirement: Best-in-class strategy implementation characterized by processes, tools, or activities that generate a consistent and repeatable level of success.

Criterion 4: Blue Ocean Strategy
Requirement: Strategic focus on creating a leadership position in a potentially "uncontested" market space, manifested by stiff barriers to entry for competitors

Criterion 5: Financial Performance
Requirement: Strong overall business performance in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Impact

Criterion 1: Price/Performance Value
Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience
Requirement: Customers feel they are buying the most optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience
Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

Criterion 4: Customer Service Experience
Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity
Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

	STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1	**Monitor, target, and screen**	Identify Award recipient candidates from around the globe	• Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies	Pipeline of candidates who potentially meet all best-practice criteria
2	**Perform 360-degree research**	Perform comprehensive, 360-degree research on all candidates in the pipeline	• Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates	Matrix positioning of all candidates' performance relative to one another
3	**Invite thought leadership in best practices**	Perform in-depth examination of all candidates	• Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps	Detailed profiles of all ranked candidates
4	**Initiate research director review**	Conduct an unbiased evaluation of all candidate profiles	• Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles	Final prioritization of all eligible candidates and companion best-practice positioning paper
5	**Assemble panel of industry experts**	Present findings to an expert panel of industry thought leaders	• Share findings • Strengthen cases for candidate eligibility • Prioritize candidates	Refined list of prioritized Award candidates
6	**Conduct global industry review**	Build consensus on Award candidates' eligibility	• Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates	Final list of eligible Award candidates, representing success stories worldwide
7	**Perform quality check**	Develop official Award consideration materials	• Perform final performance benchmarking activities • Write nominations • Perform quality review	High-quality, accurate, and creative presentation of nominees' successes
8	**Reconnect with panel of industry experts**	Finalize the selection of the best-practice Award recipient	• Review analysis with panel • Build consensus • Select winner	Decision on which company performs best against all best-practice criteria
9	**Communicate recognition**	Inform Award recipient of Award recognition	• Announce Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10	**Take strategic action**	Upon licensing, company able to share Award news with stakeholders and customers	• Coordinate media outreach • Design a marketing plan • Assess Award's role in future strategic planning	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS

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