

FROST & SULLIVAN

JOHNSON CONTROLS

2022
CUSTOMER
VALUE
LEADER

*NORTH AMERICAN
SMART CONNECTED
CHILLERS INDUSTRY*

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Johnson Controls excels in many of the criteria in the smart connected chillers space.

AWARD CRITERIA	
<i>Business Impact</i>	<i>Customer Impact</i>
Financial Performance	Price/Performance Value
Customer Acquisition	Customer Purchase Experience
Operational Efficiency	Customer Ownership Experience
Growth Potential	Customer Service Experience
Human Capital	Brand Equity

Connected Solutions Drive Energy Optimization in the Built Environment

Driven by a sharpened focus on net-zero emission goals and accelerated by favorable climate change regulations and energy mandates in the United States (after rejoining the Paris Climate Accord), the heating, ventilation, and air conditioning (HVAC) market continues to shift toward control system development. Chillers consume up to 40% of energy in commercial buildings; thus, poorly functioning equipment leads to unplanned downtime, costly shutdowns, and unpredictable maintenance expenses. Other challenges include the high effort to maintain logs, manual methods overlooking key events, limited record-keeping, inconsistent maintenance programs, and difficult repair-or-replace decisions. Hence, it is pivotal to minimize chiller-associated disruptions through data-driven solutions that support predictive

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**- Riana Barnard,
Best Practices Research Analyst**

maintenance and guarantee optimal performance. Also, integrating HVAC equipment with smart building products and platforms enables remote controllability that significantly decreases ownership costs.

From a customer viewpoint, various factors (such as brand reputation, product quality, affordability, technical support, and ease of installation and use) can help companies succeed in this evolving smart connected chiller market. However, the dwindling

number of qualified HVAC staff and insufficient certified professionals on new technologies are causes of concern.

Business and Customer Impact of Johnson Controls

Rooted in more than a century's innovation and bolstered by headquarters spanning three continents, Johnson Controls operates across 17 different verticals. As a global leader in technology, the company's workforce of 100,000 experts serves customers safely, professionally, and ethically. Its building efficiency division provides automation technologies, software, and services in the HVAC space, including building management systems, controls, security, and mechanical equipment. The company also offers best-in-class connected chiller solutions. Additionally, Johnson Controls uniquely leverages its comprehensive digital offering, OpenBlue, to reshape the performance of buildings such as hospitals, schools, data centers, airports, stadiums, and manufacturing plants, displaying an extensive presence in the residential, commercial, industrial, public building, and infrastructure segments. The company is well-positioned to capitalize on new growth opportunities, cementing its leadership in technologically advanced solutions that power intelligent, healthy, and sustainable buildings.

Previously, Frost & Sullivan recognized Johnson Controls as Company of the Year for its state-of-the-art chiller solutions, which maximize energy and water efficiencies, and remains impressed with the company's continuing innovation and sustained leadership.

Customer Service Excellence: The Rosetta Stone

Johnson Control's approach goes beyond its extensive expertise and best-in-class capabilities, with customer value as a strategic imperative. Even though the company has earned a sterling reputation for best-in-class competencies through the years, it knows that the optimum operation of chillers is an art. For this reason, Johnson Controls attentively observes customers' pain points and leverages insights to identify and explore growth opportunities. For example, it uses global customer advisory panels (with

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***- Dennis Marcell Victor,
Industry Analyst,
Energy and Environment***

representation in North America, Europe, the Middle East, Asia, and Australia) and across various customer verticals (such as healthcare, commercial real estate, government, and pharmaceuticals). It creates a roadmap grounded in these customer insights and aligns its product development with prominent themes shared, such as energy waste, the lack of actionable insights to improve efficiency, how to align chiller operation with building loads (due to lower post-pandemic occupancy), and difficulty managing efficiency in real-life conditions (e.g., weather, seasons, occupancy) or according to design principles (fully or partially loaded for peak efficiency). Johnson Controls' Open Blue connected chillers portfolio is a testament to its customer-centric approach. It capitalizes on two opportunities, helping customers achieve their energy and sustainability goals.

Firstly, Johnson Controls focuses on maintenance to improve customers' reliability and performance outcomes. The digitally enhanced maintenance program includes six levels scaling the use of data analytics. It ranges from a reactive level (repair after asset breakdown) to traditional planned services (planning for resources ahead of the job and strategizing maintenance) to a connected smart service with condition-based monitoring, typically used in mission-critical facilities. With its comprehensive service model, maintenance becomes a shared responsibility, shaped through company-wide established key performance indicators and aligned with a robust framework. This proactive approach delivers significant benefits such as improved asset life and uptime, increased reliability (i.e., realizing a 50% downtime cut), and energy savings between 5% and 20%. Moreover, it also mitigates the risk of an aging chiller fleet and a dwindling qualified workforce.

Secondly, Johnson Controls leverages advanced system automation to address the energy waste in chiller operations. Its connected chiller program is active in over 20 countries, targeting about 16,000 chillers. It starts with smart maintenance, leveraging data-driven key performance indicators to evaluate the customer portfolio's asset performance. Expert technical support comprises virtual inspections and advisory services where assigned specialists provide guidance on a phone-a-friend model coupled with around-the-clock availability. From a technology viewpoint, high precision meters register over 250 data points to provide rich data sets on dashboards, featuring the chiller performance index and the chiller stability index. The system's model-based optimization is underpinned by over 200 patents, allowing it to identify the most efficient points over a future time horizon. Moreover, a digital twin in the cloud capacitates a comparison between real-life events and the model's predicted value to facilitate prioritized recommendations. Thus, Johnson Controls' autonomous plant optimization helps customers focus on outcomes and actions, not alarms. The solution's four key differentiators add customer value:

It is flexible, i.e., supporting a broad spectrum of equipment and configurations.

It is predictive, i.e., incorporating multiple variables, such as weather forecasts, future utility rates, and load predictions.

It is solving for dollars, i.e., operating the plant by minimizing the cost over a future time horizon (also allowing for carbon optimization toward net-zero goals).

It does learn, i.e., utilizing machine learning to predict the load needed in the future, based on equipment's true efficiency under different operating conditions and mapping this curve over time.

Two recent use cases in the health sector showcase the value of Johnson Controls' condition-based maintenance program:

In December 2021, the system identified a Variable Frequency Drive at Hospital Client 1. When receiving the notification, Johnson Controls' technical support team conducted an on-site inspection, detected the root cause, and fixed the issue rapidly to save the hospital chain \$75,000 and eight weeks of downtime.

In February 2022, the system identified a power failing warning at Hospital Client 2. During an on-site inspection, Johnson Controls' technical team detected a failing variable orifice actuator and changed the entire compressor component, saving the client \$70,000 (compressor failure) and \$2,000 per month in energy savings.

Proven Leadership Attracts More Customers

As a testament to the company's high client satisfaction rate, Johnson Controls acquires many of its customers through word-of-mouth accolades, fueled by its exceptional customer-centric line of action and cutting-edge solutions. Johnson Controls' YORK® YZ chiller, launched in 2018, received numerous industry awards (including Frost & Sullivan's 2020 Company of the Year recognition in the North America smart connected chillers industry), positioning the company to revolutionize the HVAC industry. Since then, Johnson Controls has added more solutions to its global product line, highlighting its dedication to sustainability and innovation. For example, its YORK® YZ Magnetic Bearing Centrifugal chiller utilizes R-1233zd(E), a next-generation low-global warming potential refrigerant. Furthermore, Johnson Controls is the first company to receive ISASecure product certification for the YORK® YK and YZ chillers, demonstrating its leadership in cyber-resilient solutions for the smart buildings market.

Conclusion

Customer-centric strategies help companies safeguard leading positions in markets, but only if the approach is authentic and the implementation is seamless. Johnson Controls incorporates customer-focused strategies and exemplifies best practice implementation. The company capitalizes on two opportunities, helping customers achieve their energy and sustainability goals. Firstly, it focuses on digitally enhanced maintenance programs to improve reliability and performance outcomes. Secondly, Johnson Controls leverages advanced system automation to address the energy waste in chiller operations. Building on the success of its artificial intelligence-based fault detection and prevention capabilities, the company aims to improve its mobile user experience and expand language localization to solidify its leadership position. This overall customer-first approach offers immense value to existing and new customers and solidifies Johnson Controls' reputation in the smart connected chillers market.

For its strong overall performance, Johnson Controls is recognized with Frost & Sullivan's 2022 North American Customer Value Leadership Award in the smart connected chillers industry.

What You Need to Know about the Customer Value Leadership Recognition

Frost & Sullivan's Customer Value Leadership Award recognizes the company that offers products or services customers find superior for the overall price, performance, and quality.

Best Practices Award Analysis

For the Customer Value Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

Customer Impact

Price/Performance Value: Products or services provide the best value for the price compared to similar market offerings

Customer Purchase Experience: Quality of the purchase experience assures customers that they are buying the optimal solution for addressing their unique needs and constraints

Customer Ownership Experience: Customers proudly own the company's product or service and have a positive experience throughout the life of the product or service

Customer Service Experience: Customer service is accessible, fast, stress-free, and high quality

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at <http://www.frost.com>.

The Growth Pipeline Engine™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.

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Key Impacts:

- **Growth Pipeline:** Continuous Flow of Growth Opportunities
- **Growth Strategies:** Proven Best Practices
- **Innovation Culture:** Optimized Customer Experience
- **ROI & Margin:** Implementation Excellence
- **Transformational Growth:** Industry Leadership



The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- **Mega Trend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

