

MODINE MANUFACTURING RECEIVES THE 2023 NEW PRODUCT INNOVATION AWARD

*Identified as best in class in the North American EV
thermal management systems 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. Modine Manufacturing Company excels in many of the criteria in the EV thermal management systems space.

AWARD CRITERIA	
<i>New Product Attributes</i>	<i>Customer Impact</i>
Match to Needs	Price/Performance Value
Reliability	Customer Purchase Experience
Quality	Customer Ownership Experience
Positioning	Customer Service Experience
Design	Brand Equity

A History of Innovation

Modine Manufacturing Company (Modine) is a developer of thermal management systems. With over a

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- Silvana Rulet
Best Practices Research Analyst

century of experience, Modine delivers innovative solutions for various industries, including transportation, agriculture, construction, heating, ventilation, industrial refrigeration, power generation, and industrial air conditioning. The company builds its success on its commitment to quality, reliability, and exceptional customer service. Modine's cutting-edge technologies and expertise make it a go-to choice for businesses looking to optimize their operations, accelerate

decarbonization, and stay ahead of the competition.

Meeting Clients' Needs through Reliable and Quality Design

Modine invests heavily in research and development and leverages market insights to ensure its solutions align with customer needs. Continuous technology exploration and a thorough analysis of market trends advance the company's commitment to new thermal management system development. For example, this needs-based approach inspired the company to create EVantage™, a suite of products designed to

improve commercial and specialty electric vehicles' (EVs) performance, range, battery life, and safety. Leveraging Modine's extensive 100+ year legacy in thermal management technology, EVantage™ provides plug-and-play solutions that integrate seamlessly into a wide range of vehicles, including school buses, delivery vans, and heavy-duty trucks.

The EVantage™ suite includes two main components:

EVantage Battery Thermal Management System:

- Offers customers full control over battery temperature in various environmental conditions.
- Utilizes multi-stage cooling and heating to optimize the temperature range for the entire battery bank with a single unit.
- Enhances performance and longevity by minimizing power draw while ensuring optimal battery temperature.



Source: Modine

EVantage Electronics Cooling Package:

- Keeps the traction motor and power electronics cool under different loads.
- Provides a complete solution with multi-zone cooling to maintain optimal fluid temperatures for traction motor and power electronics circuits.
- The design is customizable, with fan arrays that adjust to reduce power consumption.

Emphasizing its role in pioneering heat transfer technology, Modine positions itself at the forefront of improving performance and safety in the commercial and specialty vehicle market as it transitions to electrification. The company tailored the EVantage™ suite to meet evolving heat load and environmental requirements, delivering optimal performance for batteries and power electronics in commercial EVs.



Source: Modine

“At New Flyer, we design our products to leverage common platforms and technologies. As a long-trusted supplier for our internal combustion platforms, Modine now delivers a battery thermal management solution aligned with the operational needs of our electric transit bus platform. The EVantage BTMS provides dependability for our customers while meeting our environmental and cooling load requirements. We are proud to collaborate with Modine in building the future of innovative and sustainable mobility solutions.”

- David White, Executive Vice President of Supply Management, New Flyer

Purposeful Innovation

Modine's corporate culture revolves around using purpose to drive innovation. Its product roadmap, e.g., planning, development, and implementation strategies, incorporates customer feedback, ensuring its offerings align with customers' dynamic needs. Customers can acquire products independently or co-develop solutions alongside the company according to their requirements and use cases. Such is the case of Modine's Fuel Cell Stack Cooling Package (FC-SCP) for commercial zero-emission vehicles,

launched in April 2023¹.

Developed as part of the EVantage™ suite, the FC-SCP takes thermal management one step further than

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Consulting Analyst, Growth Advisory

any competing solution. It features a proprietary heat exchanger, a predictive cooling process that anticipates and minimizes temperature changes through algorithms, and a waste heat recovery system to maximize range and longevity while saving on power draw. Moreover, the FC-SCP's components integrate into the vehicle chassis, meaning it can be fully operational immediately without additional elements or adjustments.

Modine's new and purpose-built FC-SCP set it apart from its competitors, with superior design, reliability, and quality as its central pillars.



Source: Modine

Roadmap to Success: Customer-centric, Continuous, Proactive

Modine's thermal management systems go beyond its extensive expertise and best-in-class capabilities, with customer value as a strategic imperative. Through the years, the company has earned a sterling reputation, supporting customers' path toward sustainability. Modine's purpose is Engineering a Cleaner, Healthier World™ by lowering harmful emissions, reducing water and energy consumption, and enabling the implementation of cleaner-running vehicles. To achieve this objective, Modine has introduced the EVantage™ product line, which operates in various types of EVs, thereby promoting a cleaner, more sustainable future. Regulating the vehicle's battery pack's and power electronics' temperature is crucial for optimal performance, increased range, and safe operation.

¹ <https://investors.modine.com/press-releases/press-release-details/2023/Modine-Launches-New-EVantage-Fuel-Cell-Stack-Cooling-Package-for-Commercial-Zero-Emission-Vehicles/default.aspx>

“Strategic partnerships like the one with Modine help us minimize the environmental impact of our products by accelerating the use of alternative energy in the firefighting industry, and do so with reliable and cost-effective solutions for our customers. Modine’s technology is a valuable asset for the all-electric Vector, and we are proud to have them as a partner as we deliver the next generation of specialty vehicles for the customers and communities we serve.”

- Roger Lackore, Senior Director of Product Development, REV Fire Group

Furthermore, Modine introduced an environmental policy in February 2023² affirming its dedication to global operations that are both responsible and sustainable. This commitment involves:

- Actively addressing environmental concerns
- Educating and training staff and management on eco-friendly practices
- Integrating environmental considerations into product development
- Conserving resources
- Reducing energy consumption
- Preventing pollution
- Minimizing waste and harmful chemical use
- Meeting compliance standards
- Consistently enhancing its environmental performance

Additionally, the company’s manufacturing facilities adhere to the Occupational Health and Safety Assessment Series 18001 and International Organization for Standardization 45001 regulations for safety management systems.

Unlike competitors, Modine builds its products and services by collaborating closely with a range of stakeholders and partners to evolve alongside market needs and trends. The company engages with clients and potential customers through various communication channels, including in-person meetings, email, and web-based interactions. During development and maintenance, Modine offers industry best practices and guidance to optimize the value and performance of thermal management systems. Furthermore, it provides essential resources, including webinars, blog posts, and other helpful materials, enabling the public to understand the benefits of electrification and how to contribute to a greener world.

“Together with Modine, we are powering a generation of sweepers that pollute less to deliver truly cleaner and greener streets across North America. We are excited for this partnership and the integration of advanced thermal management technology to continue delivering uncompromised performance for heavy-duty cycle sweeping applications.”

- Tim Letts, Project Manager, Elgin Sweeper

² https://www.modine.com/wp-content/uploads/2019/12/GP05_EN.pdf

The company's transparent, seamless approach and close relationships position it as a partner of choice and preferred vendor.

Positioned for Growth

Since its inception, Modine has gained praise through its noteworthy customer-centric approach. Over the years, it added a range of new customers to its established base. Moreover, based on its June 2023 report, Modine's EVantage™ product family gained significant traction among customers within a year of its launch, securing twenty-five new product orders and a \$1500 million peak revenue boost³.

One of the key factors in the company's growth has been geographical expansion. It has over 11,000 employees in North America, South America, Europe, and Asia. In October 2023, Modine announced plans to manufacture its EVantage™ products in Pontevico, Italy, starting in 2024⁴. This expansion allows the company to reach new markets and customers, driving significant revenue growth.

Another crucial growth driver for Modine has been strategic partnerships with industry players, such as with the Shyft Group (Shyft)⁵. Modine developed a custom EVantage™ thermal management system for the Blue Arc™ EV Solutions Class 3 electric delivery vehicle. This system, designed for commercial fleet applications, focuses on three main aspects: battery thermal management, power electronics cooling, and passenger comfort. The in-rail system design enhances safety for the Blue Arc™ chassis and allows for more customization and cargo space. The collaboration leverages Shyft's expertise in custom chassis and work truck bodies with Modine's experience in EV thermal management for medium-duty trucks, aiming to meet the high expectations of commercial electric fleet customers.

“The Blue Arc platform is a first-of-its-kind commercial EV chassis that leverages the strength of Tier-1 suppliers like Modine to deliver critical vehicle systems to meet the high expectations of our customers. The collaboration between Shyft and Modine builds on each company's strengths. Our expertise in developing and manufacturing custom chassis and work truck bodies through our Shyft Work-Driven Design™ process combined with Modine's deep experience in EV thermal management for medium-duty trucks means we can help ensure safety and functionality for our commercial electric fleet customers.”

- Eric Fisher, Senior Vice President and General Manager, Shyft Innovations, The Shyft Group

Frost & Sullivan believes the company is well-positioned to drive the thermal management systems for EVs space into its next growth phase, capturing market share and sustaining its leadership in the coming years.

³ <https://investors.modine.com/financials/annual-reports/default.aspx>

⁴ <https://investors.modine.com/press-releases/press-release-details/2023/Modine-Expands-Manufacturing-and-Engineering-Presence-in-Europe-for-EVantage-Product-Line/default.aspx>

⁵ <https://investors.modine.com/press-releases/press-release-details/2022/Modine-Selected-to-Supply-Thermal-Management-Solution-for-Shyft-Group-Blue-Arc-Commercial-EV/default.aspx>

Conclusion

To create a new thermal management system, a company needs to understand the market's needs and deliver a solid solution designed and embedded with high-quality and reliable performance. Frost & Sullivan finds that Modine Manufacturing Company embodies this concept. The EVantage™ suite includes a Battery Thermal Management System and an Electronics Cooling Package, providing plug-and-play solutions that enhance performance and longevity while minimizing power draw. Moreover, the company's Fuel Cell Stack Cooling Package features a proprietary heat exchanger, predictive cooling algorithms, waste heat recovery, and seamless integration with the vehicle chassis. Furthermore, Modine integrates a customer-centric approach to ensure its offering addresses users' needs.

For its strong overall performance, Modine Manufacturing Company is recognized with Frost & Sullivan's 2023 North American New Product Innovation Award in the electric vehicle thermal management systems industry.

What You Need to Know about the New Product Innovation Recognition

Frost & Sullivan's New Product Innovation Award recognizes the company that offers a new product or solution that uniquely addresses key customer challenges.

Best Practices Award Analysis

For the New Product Innovation Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

New Product Attributes

Match to Needs: Customer needs directly influence and inspire product design and positioning

Reliability: Product consistently meets or exceeds customer performance expectations

Quality: Product offers best-in-class quality with a full complement of features and functionality

Positioning: Product serves a unique, unmet need that competitors cannot easily replicate

Design: Product features an innovative design that enhances both visual appeal and ease of use

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

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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)**

