

News Release



BorgWarner Receives 2018 Automotive News PACE Award for Innovative Electric Motor Technology

- *Annual award honors superior innovation, technological advancement and business performance among automotive suppliers.*
- *BorgWarner's proprietary wire forming process enables high-volume production of high-voltage electric motors for hybrid and electric vehicles.*
- *First-of-its-kind 300-volt S-wind motor will deliver high torque density in a compact, low-mass, cost-effective package for global automakers.*
- *The technology is expected to help drive growth in P2 hybrid applications.*

Auburn Hills, Michigan, April 10, 2018 – Automotive News awarded BorgWarner with a prestigious 2018 PACE Award for its groundbreaking S-wind wire forming process for electric motors and alternators. The game-changing manufacturing process enables high-volume production of high-voltage electric motors up to 350 volts. Already in production on a 12-volt alternator for Hyundai Motor Company, BorgWarner expects to launch the technology in a first-of-its-kind 300-volt S-wind motor for an on-axis P2 hybrid vehicle from a major global automaker in late 2019. The compact, high power density technology is particularly well-suited for P2 hybrids, which BorgWarner expects will become a dominant hybrid architecture.

“On behalf of everyone at BorgWarner, we are incredibly honored to receive our tenth PACE Award. Thank you to Automotive News and the judging panel for recognizing the hard work, creativity and innovation of our engineers,” said Dr. Stefan Demmerle, President and General Manager, BorgWarner PowerDrive Systems. Sponsored by Automotive News, the annual PACE Awards honor superior innovation, technological advancement and business performance among automotive suppliers. Known around the world as the industry symbol of innovation, PACE stands for Premier Automotive Suppliers' Contribution to Excellence.

First developed in 2010, BorgWarner has produced its patented and proven S-wind stator for alternator applications. The new proprietary, low-impact manufacturing process enables the

high power density and space-saving advantages of S-wind technology for high voltage hybrid and electric vehicles because there is less stress to the wire insulation. This manufacturing process innovation enables BorgWarner to produce smaller, more powerful high-voltage electric motors on a mass scale and will help drive growth in the hybrid and electric vehicle market, resulting in more environmentally-friendly vehicles on the road.

Enables Cost-effective Production of High-voltage Motors

S-wind stators feature continuous copper wire segments formed into a zig-zag S-shape which are then inserted into the stator assembly. Traditionally, wire conductors for S-wind stators are formed using a pneumatic anvil punching process. However, the striking action may stress the wire insulation, and the inconsistent final shape causes additional stress on the wire during assembly into the stator. While acceptable for 12-volt applications, a process resulting in less stress to the insulation system is desired for high-voltage applications in order to maximize motor durability and reliability. To create an S-wind stator for high-voltage motors, BorgWarner's engineers developed a proprietary low-impact forming process to create a nearly perfect zig-zag S-shape that minimizes stress on the wire insulation and eliminates additional stress during assembly.

The proprietary manufacturing process achieves significantly faster cycle times, reduces scrap and requires less floor space. This competitive advantage allows BorgWarner to produce a high-volume, cost-effective solution for automakers.

Smaller, More Powerful Electric Motors for Variety of Applications

BorgWarner's compact and power-dense solution is well-suited for P2 hybrid electric vehicles, where installation space is very limited. BorgWarner's S-wind stator is nearly 30 percent shorter and delivers more than 50 percent higher torque density than a concentrated-wound stator, establishing a new standard in P2 hybrid electric vehicle applications. Lower mass and a more efficient manufacturing process reduce complexity and cost, while rectangular wire improves slot fill density and heat transfer. Distributed winding offers better cooling and reduces torque ripple—the periodic increase and decrease in torque output as the motor shaft rotates—for smoother rotation and less noise, vibration and harshness (NVH), a key property during pure electric propulsion.

Since the wire-forming process can accommodate wires of various sizes, the S-wind stator configuration is applicable across many 48-volt to 350-volt motor applications. In BorgWarner's portfolio, the technology will have a positive impact on a variety of products including alternators, integrated belt alternator starters (iBAS), electric all-wheel drive (eAWD)

technology, P2 modules, electric drive motors and ePropulsion systems, depending on the application requirements.

About BorgWarner

BorgWarner Inc. (NYSE: BWA) is a global product leader in clean and efficient technology solutions for combustion, hybrid and electric vehicles. With manufacturing and technical facilities in 66 locations in 17 countries, the company employs approximately 29,000 worldwide. For more information, please visit borgwarner.com.



BorgWarner received a 2018 Automotive News PACE Award for its S-wind wire forming technology for alternators and electric motors, an innovation that enables high-volume production of high-voltage electric motors for hybrid and electric vehicles.

Statements contained in this press release may contain forward-looking statements as contemplated by the 1995 Private Securities Litigation Reform Act that are based on management's current outlook, expectations, estimates and projections. Words such as "anticipates," "believes," "continues," "could," "designed," "effect," "estimates," "evaluates," "expects," "forecasts," "goal," "initiative," "intends," "outlook," "plans," "potential," "project," "pursue," "seek," "should," "target," "when," "would," variations of such words and similar expressions are intended to identify such forward-looking statements. Forward-looking statements are subject to risks and uncertainties, many of which are difficult to predict and generally beyond our control, that could cause actual results to differ materially from those expressed, projected or implied in or by the forward-looking statements. Such risks and uncertainties include: fluctuations in domestic or foreign vehicle production, the continued use by original equipment manufacturers of outside suppliers, fluctuations in demand for vehicles containing our products, changes in general economic conditions, as well as other risks noted in reports that we file with the Securities and Exchange Commission, including the Risk Factors identified in our most recently filed Annual Report on Form 10-K. We do not undertake any obligation to update or announce publicly any updates to or revision to any of the forward-looking statements.

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