

ECM INSIGHTS



Strengthening U.S. Manufacturing with PrintStator Motor CAD and PCB Stator Technology

Today's volatile market environment favors an agile and asset-light approach to product development, design and manufacturing, this also the case with electric motors.

Pairing advanced CAD to disruptive printed circuit board technology enables that – offering U.S. companies geographic flexibility to mitigate tariff and supply-chain risks, while onshoring production.

CHALLENGE: OVERCOMING SUPPLY CHAIN VULNERABILITIES AND TARIFF PRESSURES

Before elaborating on that solution, let's first size up the challenges. To start, the U.S. manufacturing sector faces mounting risks from global supply chain disruptions, heavy reliance on foreign-made components, and unpredictable tariffs on imported goods *i*. These factors have led to rising costs, production delays, and decreased competitiveness for domestic manufacturers *ii*.

For industries dependent on electric motorssuch as industrial automation, HVAC, and renewable energy-offshoring has historically been the only option due to limited domestic production capabilities *iii*. However, shifting trade policies and supply chain bottlenecks highlight the urgent need to bring manufacturing back to the U.S. iv Onshoring production is now a critical strategic move to ensure long-term stability, cost control, and job creation v.

SOLUTION: ECM'S AXIAL FLUX PCB STATOR Motor Technology

ECM combines a revolutionary CAD platform, <u>PrintStator</u>, to patented <u>PCB Stator</u> electric motor technology. Together, the two enable the design of premium efficiency machines with scalable, and cost-effective domestic manufacturing.

Instead of using traditional copper windings and iron laminations, ECM's designs employ a printed circuit board stator –that can be optimized to precise performance and dimensional specs – and manufactured at any PCB facility. This offers a lightweight, highefficiency alternative ideal for mass production in the U.S.

Supporting Onshoring and Supply Chain Resilience

There are three primary ways ECM's model promotes supply chain agility and relocating production back to U.S. soil:

• Domestic Manufacturing Feasibility – ECM's PCB stator technology simplifies motor production, reducing reliance on overseas supply chains. The streamlined design allows for U.S.-based manufacturing at competitive costs, strengthening the country's industrial base.



- Tariff Mitigation By producing motors domestically, manufacturers can bypass high import tariffs on foreign-made components, ensuring cost predictability and reducing exposure to trade fluctuations.
- Supply Chain Diversification ECM's approach reduces dependency on limited overseas suppliers, making it easier for companies to source components locally and avoid disruptions caused by geopolitical tensions.



CONTINUED BENEFITS

Two additional domestics upsides to adoption of PrintStator CAD and PCB Stator technology include the following:

- Circular Economy ECM's motor topology integrates well with established recycling streams for Printed Circuit Boards, magnets, steel, and aluminum. Magnets in ECM's rotor design are easily accessible and easily separated from the plain carbon steel rotors. Further, the magnets are secured with minimal adhesive and are ready for recycling without elaborate disassembly procedures, as compared with radial flux ring magnet rotors or Internal Permanent Magnet rotors.
- Job Creation and Economic Growth Establishing motor production in the U.S. generates skilled jobs and supports local economies, reinforcing national economic security.

COMPETITIVE EDGE: HIGH EFFICIENCY AND COST SAVINGS

Paralell to mitigating supply-chain risk and fostering domestic production, ECM's PCB Stator innovation offers numerous design and bottom-line benefits to electric motor OEMs.

Those include:

- Lightweight and Compact The innovative stator design allows for motors that are up to 70% lighter than conventional motors, simplifying logistics and installation.
- Scalability for Various Applications ECM's motors are well-suited for industrial machinery, HVAC systems, and renewable energy applications, making them a versatile solution for multiple sectors.
- **Energy Efficiency** ECM's axial flux PCB Stator motors can achieve up to mid-90% efficiency, reducing energy consumption and operational costs for end users.

CONCLUSION: A FUTURE-PROOF APPROACH TO U.S. MANUFACTURING

ECM's PCB Stator technology, and software defined approach to motor design, provide a pathway for American manufacturers to regain control over their supply chains and reduce tariff exposure. As the U.S. prioritizes industrial resilience, ECM offers a scalable solution that aligns with national economic and energy efficiency goals.

By adopting ECM's next-generation design software and motor technology, companies can not only enhance performance but also play a key role in reshoring essential manufacturing operations-building a more secure and competitive future for the U.S. industrial sector.

By ECM CEO Brian Casey

i National Association of Manufacturers, 2024 ii Federal Reserve Bank of St. Louis, 2024 iii Manufacturing Institute, 2023 iv U.S. Department of Commerce, 2024

