

CASE STUDY

Designing for Disassembly:

How Motors Built with ECM Technology Support the Circular Economy

SUMMARY

The electric motor recycling industry is at a crossroads. As recyclers manage legacy motors designed decades ago, they face labor-intensive, hazardous, and inconsistent processes. Materials are difficult to separate, magnets are hard to extract, and disassembly methods vary widely between motor types. Recovering valuable elements—like copper, aluminum, or rare earth magnets—often requires chemical treatment or destruction of components.

Yet in the push toward electrification and sustainability, recycling is no longer a nice-to-have. **It's a necessity.**

At ECM, we believe circular design must begin at the drawing board. Motors developed with our patented PCB Stator architecture and PrintStator software aren't just efficient to operate—they're radically simpler to recycle. And they don't require new harvesting methods.

CHALLENGE: WHAT RECYCLERS ARE UP AGAINST

Electric motors can yield valuable materials—but getting to them is costly. Based on average scrap values and weight content, a typical 100 lb motor might contain:

Metal	Scrap Value per Pound	Weight Content	Scrap Value (100 lb Motor)
Steel (Electrical, cast iron)	\$0.03–\$0.05	80%	\$2.40–\$4.00
Copper (Magnet Wire)	\$0.75–\$3.41	10%	\$7.50–\$34.10
Aluminum	\$1.16–\$1.38	6%	\$6.96–\$8.28
Stainless Steel	\$0.30–\$1.08	3%	\$0.90–\$3.24
Rare Earth Magnets (Neodymium)	\$23.00–\$64.00	1%	\$23.00–\$64.00

Yet magnets are notoriously difficult to extract. Internal permanent magnet (IPM) rotors often epoxy the magnets into steel laminations. Recovery typically involves acid dissolution or hydrogen decrepitation. These are destructive, energy-intensive processes that introduce contamination risk.

Even separating magnet types (e.g., neodymium vs. ferrite) poses problems. Most look identical and are attracted to each other and to surrounding steel. As a result, magnets often end up in the steel stream.

SOLUTION: MOTORS DESIGNED WITH ECM SOFTWARE AND TECHNOLOGY ENABLE A SMARTER END-OF-LIFE

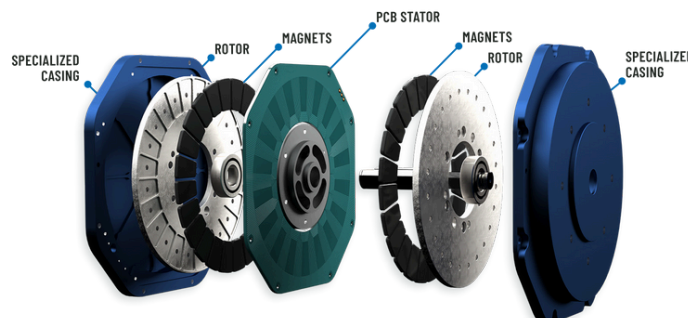
At ECM, we believe circularity starts at the design stage, not the scrapyard. While many recyclers won't encounter ECM PCB Stator motors for another 20+ years, our architecture already considers disassembly, material recovery, and lifecycle impact.

Unlike legacy machines that rely on encapsulated windings or destructive disassembly, motors built with ECM software and hardware are engineered for simplified teardown. Fasteners and non-encapsulating adhesives are applied where appropriate, enabling clean separation of copper, aluminum, and magnet assemblies—without the need for melting, cutting, or hazardous chemicals.

But we take it further. ECM's open motor architecture gives customers more control over the mechanical design of their motors. That means manufacturers can intentionally design for recyclability, adjusting materials and assembly methods based on cost targets, sustainability goals, or downstream requirements. You're not locked into legacy OEM structures that ignore end-of-life realities.

Even in cases where adhesives are used, ECM's axial design allows for magnet recovery using solvent-assisted techniques rather than high-heat or acid-based processing. Components can be separated cleanly, whether manually or through automated systems, preserving material purity and reducing environmental impact.

In short, motors manufactured using ECM's design platform give partners the flexibility to balance performance, cost, and end-of-life outcomes—supporting a more circular future for electric machines.



Motors built with ECM's PCB Stator technology are simple to assemble and disassemble.

A SMARTER PATH TOWARD CIRCULARITY

The path to a circular motor economy doesn't start at end-of-life—it starts with design. Motors developed with ECM software and PCB Stator hardware offer a cleaner, simpler recovery process while delivering best-in-class operational efficiency during use. Our architecture reduces the need for raw materials, simplifies recycling, and enables downstream partners to reclaim high-value elements without reinventing the wheel.

In a world where electric motor use is set to double by 2040, ECM is helping define a smarter, more sustainable path forward.

Interested in the future of recyclable motor design? [Connect with us](#) to explore custom motor solutions that align with your sustainability goals.

[See our simple assembly process video here](#)

