

Providing Environmental Value As a Green Enabler

Working to provide environmental value at each stage of the manufacturing process as a green enabler, we recognize our role in enabling customers to reduce their environmental impact through our products as a business opportunity. To provide value as a green enabler, we are working to (1) manufacture products using processes that reduce environmental impact, and to (2) develop environmentally friendly products.

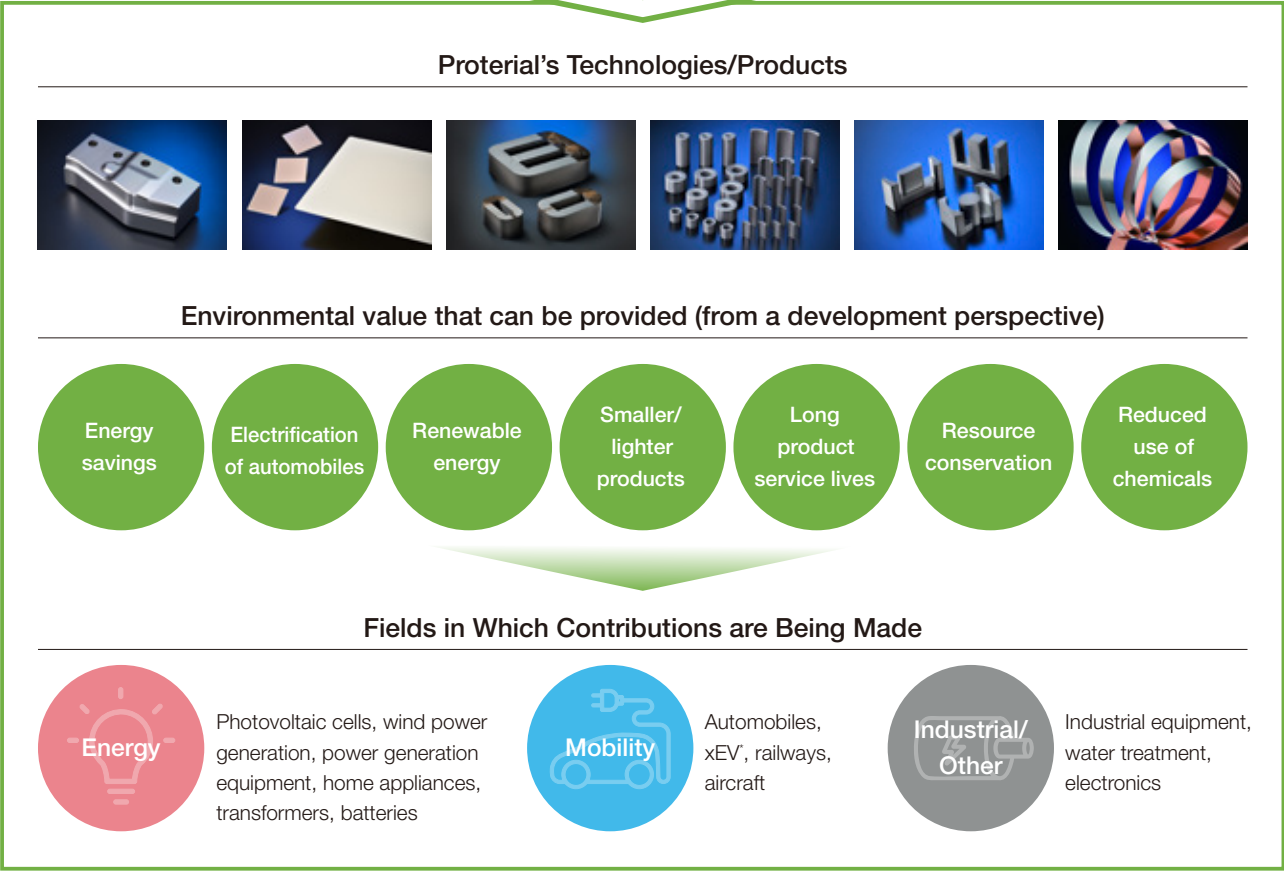
1 Development of environmentally friendly products

As a green enabler, we promote contributions to society through the provision of environmentally friendly products. As an environmentally friendly company, Proterial develops products not only from the perspective of reducing the environmental burden during product use but also from the perspective of giving consideration to resource recycling during the manufacturing process. As an initiative to create environmentally friendly products, we are promoting efforts to implement environmentally friendly design assessments in accordance with the IEC62430 international standard at the start and completion of development in the R&D phase. Involving the use of environmental assessment sheets to evaluate the environmental impact at each product life cycle stage during the R&D and product development phases, environmentally friendly design leads to environmentally friendly products after commercialization.

Product development geared toward reduced environmental impact

Growing importance of strengthening CO₂ reduction and energy saving measures and accelerating the introduction and expansion of renewable energy toward a decarbonized society

In moving toward a sustainable society, the need to move away from mass production/consumption socio-economic activities and shift swiftly to a circular economy that makes efficient use of limited resources



* xEV: A collective term for electric vehicles (EV), hybrid electric vehicles (HEV), and plug-in hybrid electric vehicles (PHEV).



Product development geared toward reduced environmental impact

Amorphous alloy contributes to energy saving in power transformers

Metglas™ amorphous alloy ribbon

Core materials for amorphous transformers

Power transformers lose power even when in standby mode. To solve that problem, since 2003 we have been providing Metglas™, an amorphous alloy that reduces standby power consumption to about one-third of that of conventional core materials (such as electromagnetic steel sheets) used for transformers. By providing core materials for amorphous transformers, the Proterial Group is aiming to contribute to reducing CO₂ emissions* by approximately 50,000 tons per year (compared with the figure for conventional magnetic-steel transformers). In March 2020, we developed a new amorphous material called MaDC-A™, which will contribute to further improving transformer efficiency.

Reduction of approx. 44,000 tons

Reduction of approx. 49,000 tons

FY2023 FY2030

CO₂ emissions compared with the case of conventional transformers

* Based on shipment volume and difference in transformer energy loss, according to Indian standards. For the CO₂ emission coefficient, we used the IEA's World CO₂ Emissions from Fuel Combustion (2017).

Developed an amorphous alloy laminated adhesive ribbon for motor cores

Amorphous alloy laminate adhesive ribbon

While amorphous alloys can significantly reduce iron loss, mass production is limited to the axial gap type*¹ due to their high hardness and thin material. In response to this challenge, Proterial developed a technology for continuously laminating and bonding multiple amorphous alloy ribbons for radial gap type*² motor cores. Our unique bonding technology has achieved a high packing density of over 90%, enabling lamination without compromising the magnetic properties of the amorphous alloy. It is contributing to the popularization of motors using amorphous alloys by solving the problem of thinness and the challenges presented in the punching process by optimizing the mold material.

*1 Axial gap type: A motor with a stator sandwiched between two disk-shaped rotors.
*2 Radial gap type: A type of general-purpose motor in which the stator surrounds a cylindrical rotor.

Neodymium magnets contribute to the popularization of xEV vehicles

NEOMAX® neodymium magnets

In 1982, our company (Sumitomo Special Metals at that time) invented the neodymium magnet, the magnetic force of which is much stronger. Generally, as the magnetic force of the magnet gets stronger, the performance of the motor gets higher, and the motor can be designed to be smaller and lighter. In particular, in regard to the technological evolution of xEVs*, the magnet plays an important role as an indispensable material enabling motors to be smaller, lighter, more efficient, and more energy efficient. As a permanent magnet boasting the highest magnetic force in the world, the Company's NEOMAX® neodymium magnet is contributing to the improved efficiency and miniaturization of xEV traction motors and generators by providing high-performance neodymium magnets.

Supply volume of magnets for xEVs (FY2023) Approx. **750,000 units*** * Figure is Proterial estimate

Used ferrite magnet motors to confirm that an output of over 100 kW, which is necessary for application to BEV and PHEV traction motors, could be achieved

Rotor equipped with a ferrite magnet

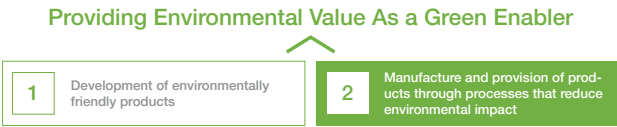
With the growing demand for neodymium magnets used in the traction motors and generators of xEVs, there is a concern that there will be an increase in the resource risk of heavy rare earths, which are particularly limited in supply. In this context, Proterial tested and evaluated a prototype of the high-performance ferrite magnet motor stone (NMF™-15)* and verified that it can be used in BEVs and PHEVs, with an output of over 100kW. Since ferrite magnets have higher electrical resistance than neodymium magnets, they also contribute to the suppression of eddy current loss during high-speed motor rotation, and can be expected to contribute to solving issues faced by customers such as reducing resource risk and controlling costs.

* Proterial's proprietary material that exhibits the world's highest level of magnetic properties for mass-produced ferrite magnets (as of June 2023, according to Proterial's research).

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2 Manufacture and provision of products through processes that reduce environmental impact

We recognize that it is essential to make efforts to reduce environmental impact not only in our own company but also in the value chain. Measures we are advancing include the reduction of CO₂ emissions and of the resources used in each process, the promotion of recycling, and reduction in the use of harmful substances. We are focusing on these initiatives as we believe that products manufactured in processes that reduce the environmental impact indirectly contribute to reducing the environmental impact in the value chains of our customers who use those products. We also made our Scope 3 calculations based on this belief. Going forward, we will proceed with studies on managing CO₂ emissions under Scope 3 based on these calculation results.



* CO₂ emissions in fiscal year 2023 significantly improved compared to the previous fiscal year due to the impact of business portfolio revision, among other things.