

News Release

July 22, 2025
Proterial, Ltd.

Proposing Permendur YEP[®]-2V for motor cores for electric vertical take-off and landing (eVTOL) aircraft

Proterial, Ltd. (hereinafter, Proterial) has confirmed the excellent properties of Permendur (soft magnetic material with a high magnetic flux density) YEP-2V (hereinafter, Permendur YEP-2V) as a motor core material for electric vertical take-off and landing (eVTOL) aircraft (hereinafter, eVTOL) in demonstration tests, and will therefore begin to fully propose it for use in motor cores. By using Permendur YEP-2V for the motor core of eVTOLs, which are attracting attention as a next-generation form of mobility, the company will seek to make a significant contribution to making motors smaller, lighter, and higher in torque. In addition to eVTOLs, the company will also actively propose Permendur for other motors that require small size, light weight, and high torque.

1. Background

In order to achieve carbon neutrality, it is expected that electrification of various forms of mobility (mobility capabilities, means of transportation) will accelerate in the future. In this context, eVTOLs are gaining interest as the next-generation of mobility. Development of motors for eVTOLs that are smaller and of higher torque is progressing, and a motor core material that fulfills these properties is required.

Permendur YEP-2V, produced and sold by Proterial, is based on an alloy containing 50% each of iron (Fe) and cobalt (Co), with 2% vanadium (V) added to improve workability. Its composition is described as Fe-49Co-2V, and is a representative composition of Permendur. Compared to high-performance electromagnetic steel sheets (high-performance non-oriented electromagnetic steel sheets), which have attracted attention as a motor core material, Permendur YEP-2V has a higher saturation magnetic flux density and has the advantage of being able to reduce the current (applied current) required to produce the same torque. This makes it possible to reduce the size and weight of motor cores and improve energy efficiency (to address heat generation) compared to motor cores made from high-performance electromagnetic steel sheets, particularly for high-torque motor applications. In addition to the above, it has the added benefit of lower iron loss compared to general non-oriented electromagnetic steel sheets, which are the mainstream material for motor cores, allowing for higher energy efficiency.

2. Overview

Proterial focused on eVTOL motors, which are gaining increasing interest, and decided to evaluate Permendur YEP-2V, which has excellent properties as a core material. A motor core using the material Permendur YEP-2V was designed and prototyped* at Proterial and installed in a motor (eVTOL mock-up motor) intended for use in eVTOLs as a demonstration test. The test demonstrated that the motor had a 14% higher torque at the same current value, and a 14% lower current at the same torque value, than a motor equipped with a motor core made from a high-performance electromagnetic steel sheet. The test also verified that the current became lower at the same torque value, so the motor generated less heat and reduced the rise in its temperature, improving energy efficiency (See 3. Evaluation motor specifications and results).

Proterial was able to confirm the excellent properties of Permendur YEP-2V as a material for eVTOL motor cores in the demonstration tests, and has therefore decided to begin full-scale proposals for its use in eVTOL motor cores. Furthermore, in addition to eVTOL motors, the company will proactively propose Permendur YEP-2V for other motors that are required to be smaller, lighter, and higher in torque, and will work towards mass production through collaborative creation with customers.

Proterial, Ltd.

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www.proterial.com/e

In the motor-related field, Proterial provides optimal materials and solutions, including Permendur YEP-2V as well as amorphous alloy Metglas™, neodymium magnets NEOMAX®, ferrite magnets NMF®, magnetic wedges, and enameled wire, to meet the needs for high performance motors, and will contribute to achieve a decarbonized society. Permendur YEP-2V and other motor-related technologies and products will be exhibited at our booth (booth number 1-T03) at Techno Frontier 2025 to be held (at Tokyo Big Sight) from July 23rd to 25th, 2025.

*The motor core was designed and prototyped with the cooperation of Yamada Power Unit Co., Ltd. (Headquarters: Himeji City, Hyogo Prefecture).

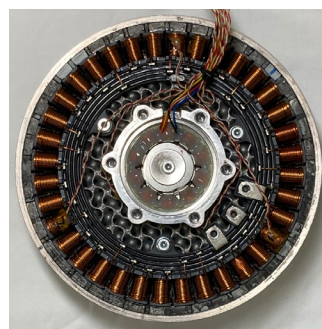
3. Evaluation motor specifications and results

(1) Motor specifications

Motor structure	Outer rotor
Number of poles	42 poles
Core material	YEP-2V, high-performance electromagnetic steel sheet
Thickness of material	0.1mm
Core size	150 mm circumference x 42 mm thickness
Output	15 kW [torque: 70 Nm] *When using YEP-2V
Rated speed	2000rpm
Magnet	Neodymium magnet NEOMAX / Halbach array
Cooling method	Air cooling



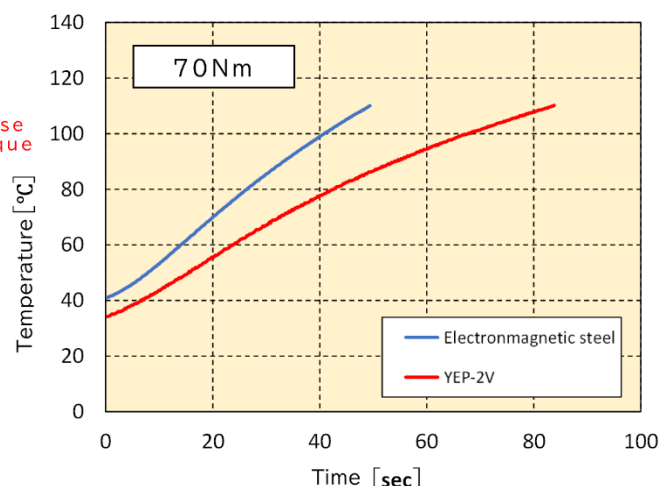
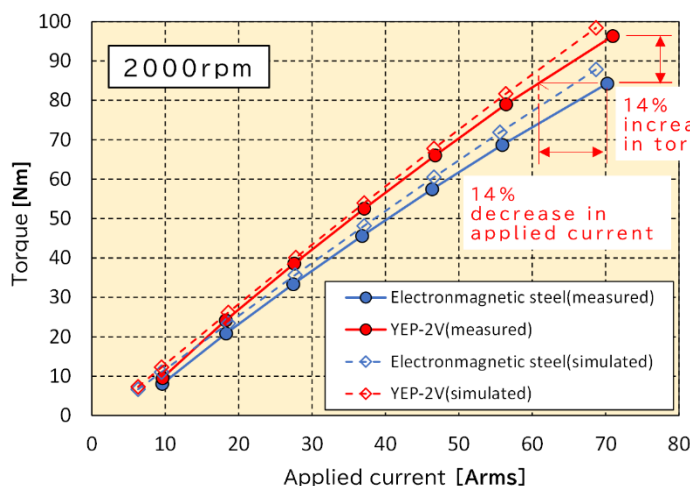
Rotor side



Stator side

eVTOL mock-up motor

(2) Motor evaluation results



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4. Manufacture base

Yasugi Works, Specialty Steel Business Unit (Yasugi city, Shimane Prefecture, Japan)

Media Inquiries: Corporate Communications Dept.

https://www.cntct.proterial.com/contact/publish/inquiry_eng?g=01&c=001-01

Customer Inquiries: Industrial Materials Dept., Specialty Steel Business Unit

https://www.cntct.proterial.com/contact/publish/inquiry_eng?g=01&c=003

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■About PROTERIAL

PROTERIAL

“Proterial” reflects the essence of our corporate philosophy, which consists of three elements: Mission: “Make the best quality available to everyone;” Vision: “Leading sustainability by high performance;” and Values: “Unfaltering integrity” and “United by respect.” It combines “**pro-**” with the word “**material.**”

“Pro-” represents our “three pros”:

- **Professional — work that exceeds expectations**
- **Progressive — a spirit that keeps challenging**
- **Proactive —an enterprising attitude**

“Material” refers to the high-performance materials that our original technologies produce and underpinned by the three pros. With our focus on solving customer issues and bringing new levels of value, we promise to contribute to the realization of a sustainable society through the products and services that embody our philosophy.

■Proterial, Ltd. — Company Overview

Established: April 1956

Head office: Toyosu Prime Square, 5-6-36 Toyosu, Koto-ku, Tokyo 135-0061, Japan

Capital : 310 million yen (as of March 31, 2025)

Representative : Sean M. Stack

Representative Director, Chairperson, President, & CEO

Sales revenue: 768.6 billion yen (Term ended March 2025)

History: 1910: Founded as Tobata Foundry Co.

1937: Merged with Hitachi, Ltd.

1956: Established separately as Hitachi Metals Industries, Ltd.

2023: Renamed from Hitachi Metals, Ltd. to Proterial, Ltd.

Proterial is a participant of the United Nations Global Compact and adheres to its principles-based approach to responsible business. In January 2025, Proterial received a Silver rating in the EcoVadis Sustainability Assessment.

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