

## Technical Review Special Edition: Logistics, Thermal & Drive Systems

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Welcome to the special edition of our technical review featuring the Logistics, Thermal & Drive Systems.

While the coronavirus infection appears to have subsided for the time being, the international tensions triggered by the breakout of conflict in Ukraine, making the world more precarious. Furthermore, the business environment is also changing considerably as a result of technological innovations such as electrification, automation and machine intelligence, as well as the progress towards digital transformation.

Facing these changes, the Mitsubishi Heavy Industries Ltd. (MHI) Group has undertaken the challenge of "MISSION NET ZERO" with the aim of achieving carbon neutrality by 2040. Our dual approach is taken from the following viewpoints: decarbonization on the energy supply side through energy transition, and energy conservation, less labor-intensiveness and decarbonization on the energy use side by making social infrastructure smart. In the Logistics, Thermal & Drive Systems, we also follow this approach when developing technologies and products. This special edition presents some of our efforts.

First, in the logistics business, we address product development for electrification and less labor-intensiveness. Specifically, this includes; development of laser-guided AGFs for  $-25^{\circ}$  C freezer; middle size electric counter-balanced forklift truck "EDiA XL" with automatic travel boost function; and development of new "ELETRUCK", high-speed climbing and high-power 2-ton battery-turret-truck.

Second is product development in the thermal system business for the achievement of a decarbonized society and consideration towards the environment and comfort. This includes; overview of the development of the SRK\_23S series of residential air conditioners with improved heating capacity to achieve carbon neutrality; large-capacity, high-efficiency centrifugal chiller that enables significant reduction in CO<sub>2</sub> emissions; new "JHT-Y" series of centrifugal chillers with low-GWP refrigerants contributing to carbon neutrality; direct-driven transport refrigeration unit TDJS/TDS series contributing to suppressing global warming in the cold chain; and development of heating system for electric vehicles combining refrigerant and coolant circuits.

In the engine and energy business, the following products and technologies contributing to decarbonize society are presented; combustion chamber shape optimization for small diesel engines by coupling CFD and AI; development of electronic control emergency generator engine for data

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center; CO<sub>2</sub> reduction by gas engine cogeneration system; and accuracy improvement method for engine large-scale assembly analysis using vibration data during actual operation.

Lastly, in the turbocharger business, we introduce our decarbonization efforts, global technological development and production system by presenting the following; high-efficiency electric compressor that improves decarbonization technology and fuel cell performance; development of turbocharger dedicated to series-hybrid engines; development of high-performance turbocharger turbine under exhaust pulsation for next-generation hybrid vehicles; and Mitsubishi Turbocharger manufacturing and technical support center for North American market.

In the Logistics, Thermal & Drive Systems, technologies and products required for the realization of a sustainable world are developed in cooperation with Mitsubishi Logisnext Co., Ltd., Mitsubishi Heavy Industries Thermal Systems, Ltd. and Mitsubishi Heavy Industries Engine & Turbocharger, Ltd. We would appreciate your continued support.