Fiscal 2015 Report—Research and Development

Combining its core technologies in power semiconductors and power electronics with instrumentation and control systems, Fuji Electric is focusing R&D activities on the creation of optimization solutions for the energy and environment fields.

R&D Policies

- **Expand and strengthen core technologies of power semiconductors and power electronics**
- **Accelerate new solutions and product development though technology synergies between thermal, machinery, and instrumentation and control systems**
- **Promote open innovation**

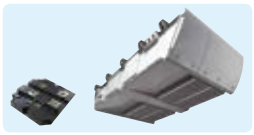
Major Initiatives in Fiscal 2015

Expand and Strengthen Core Technologies of Power Semiconductors and Power Electronics

In fiscal 2015, Fuji Electric pushed forward with the development of highly reliable, high-performance next-generation SiC power semiconductor modules while also creating power electronics products that take advantage of the ability to reduce losses and function under high temperatures that is characteristic of such devices.

3,300V Wistand Voltage Hybrid Modules

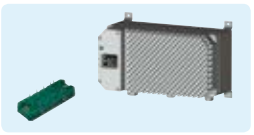
The Company succeeded in developing a 3,300V wistand voltage hybrid modules that utilized SiC-SBD and sixth-generation V-Series IGBT modules. In addition, we developed a drive system converter-inverter equipped with this hybrid module for the Central Japan Railway Company. Running tests with this module installed on N700 Series Shinkansen trains are currently under way, representing the world's first practical case of a drive system for a rapid-transit railway using SiC power semiconductor modules.



Hybrid module and converter-inverter

SiC Module-Equipped Waterproof and Dustproof Inverter

Fuji Electric has developed an inverter featuring a completely closed, self-cooling structure by exploiting the low-loss characteristics of SiC modules to reduce heat production and eliminate the need for a cooling fan. This inverter can be used in environments with high levels of water, steam, or dust, where installing an inverter would have previously been difficult. For this reason, we anticipate that this inverter will be used in food processing, machining, and other equipment.



SiC module and inverter

Accelerate New Solutions and Product Development through Technology Synergies between Thermal, Machinery, and Instrumentation and Control Systems

The Company accelerated the development of new products by leveraging synergies created by combining the thermal, machinery, and instrumentation and control system technologies it has developed to date.

Crane Control Solutions

By combining state-of-the-art sensor and inverter technologies with a programmable logic controller software package, Fuji Electric has developed crane control solutions that realize industry-leading levels of conveyance accuracy through the cooperative control of crane positioning, anti-sway, and anti-skew. These solutions contribute to better automated control for cranes and thereby help realize labor savings.

Nine crane control solution sets delivered to Asyaport Liman A.Ş., of Turkey

Fuel-Saving Solutions for Boilers Ultra Low Excess Air Ratio Combustion Control

Fuji Electric's fuel-saving boiler combustion solutions combine laser type carbon monoxide (CO) gas analyzers capable of high-speed measurement of boiler exhaust gas CO process values with ultra low excess air ratio combustion control systems based on CO process values. Boiler combustion control solutions to realize maximum efficiency can contribute to reductions in fuel consumption of approximately 1%.

Products comprising fuel-saving boiler combustion solutions (monitoring display and controller)

Revolutionary Solutions Employing IoT Technologies

The Company has created cloud-based supply and demand management solutions to meet the needs of electricity retailers arising from electricity system reforms. We are also working to develop big data analysis technologies to utilize various types of factory data that have been collected for supporting factory operation and diagnosing and predicting abnormalities.

Promote Open Innovation

Fuji Electric has been engaged in open innovation activities through collaboration with Zhejiang University to facilitate the development of new products for the Chinese market. In fiscal 2015, we stepped up this collaboration through the establishment of the Zhejiang University-Fuji Electric Innovation Center, a move conducted to aid in efforts for creating new businesses.