

Seeking to Provide Customers with Optimum Motor Solutions



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LAST year (2010), Hitachi, Ltd., a company whose first product was an electric motor, celebrated the 100th anniversary of its founding. Electric motors are efficient energy conversion devices and have undergone steady progress since one of their archetypes was invented in 1832. Nowadays, motors account for as much as 40% of electricity demand and attention has been focused on improving their efficiency as a way of preventing global warming. Meanwhile, with more focus on energy efficiency there is an obvious trend towards the electrification of the primary source of motive power such as engines, hydraulics, and other mechanisms by using electric motors in drive systems. In particular, progress is being made on the adoption of electric drive in fields such as automobiles, diesel trains, and construction machinery.

At the same time, regulations covering motor efficiency are being imposed around the world and the IEC-60034-30 guidelines for high-efficiency motors proposed by the International Energy Agency (IEA) stipulate a series of motor efficiency class rankings (IE1, IE2, and IE3) each of which requires motor losses to be reduced by about 15% relative to the class below, starting with the standard IE1 class. The USA has introduced rules requiring compliance with IE3 since late 2010, Europe will require IE3 from 2015, and China will require IE2 from 2011. Other countries are also planning to introduce regulations covering high-efficiency electric motors.

To Hitachi, the adoption of electric drive means the application of technologies for using electric motors to drive and control mechanical loads with instantaneous response and high torque. This requires:

- PERMANENT magnet motors with low inertia and high torque
- INVERTERS with excellent control performance at high currents

- BATTERIES or power supplies able to handle high regenerative currents

Hitachi's aim is to supply solutions that combine these components in a system. Its motor solutions for a wide range of applications include home appliances such as air conditioners and refrigerators; industrial applications such as air compressors and pumps; vehicle or transport applications such as automobiles, construction equipment, trains, and escalators and elevators; servo machine tools that required high torque and quick response; and power systems such as those that use large generators, with energy efficiency as their main target.

This issue of Hitachi Review reports on the latest trends in electric motor technology, particularly relating to permanent magnet motors, and describes motor control techniques aimed at improving energy efficiency and drive performance together with non-linear and sensorless control techniques that help make motors smaller. The articles cover simulation techniques that can perform integrated analysis of the motor, control system, and load to enable overall optimization from a system perspective, work being undertaken at Hitachi's research and development laboratories aimed at making motors as small as possible, and the material technologies of the materials companies in the Hitachi Group that support motor technology. Through these technologies, Hitachi aims to supply its customers with optimum motor solutions over its next 100 years based on its Harmonious Motor System concept. By seeking to combine excellent environmental performance in terms of energy efficiency with a high level of drive performance, Hitachi intends to continue contributing to the global environment through a system-oriented approach to technology development that extends from power supplies to motors, inverters, control, and mechanical systems.