Developers of electric motor technology win the 2009 Marcus Wallenberg Prize

The esteemed Marcus Wallenberg Prize comes to Finland, for the second successive year. ABB's prize-winning team collaborated closely with the paper industry in developing a direct drive system for paper machines.

The Marcus Wallenberg Prize, which is awarded annually for a significant research breakthrough in the forest industry field, goes to representatives of the Finnish engineering industry in 2009. ABB Oy’s product development managers Jouni Ikäheimo, D.Sc. (Tech.), Vesa Kajander, M.Sc. (Tech.) and Bengt Welin, B.Sc. (Eng.), currently retired, have played the key roles as inventors and leading developers of the Direct Drive System (DDS) for paper machines.

Thanks to them, ABB could also share in the glory – especially in Finland since DDS systems are manufactured and marketed by ABB Finland.

Mr. Welin was previously responsible for ABB’s paper machine drive business in the global market. Mr. Welin and Mr. Kajander invented the application of the DDS technology to paper machines. Mr. Welin made a direct drive project proposal to the company management in 1995. Mr. Ikäheimo has been the leader for the engineering and production of permanent magnet motors at ABB Oy. Motors, and an inventor in the area of permanent magnet motors.

Revolutionising operating technology

The DDS system, which is based on the permanent magnet motor technology, is a prime example of a trailblazing innovation on the industrial scale. It has enabled significant improvements to be made in paper machines' conventional operating technology.

A direct drive system enables higher torque levels, very precise speed control and high efficiency without the need for gearboxes, speed measurement devices or other additional components. In addition to fewer components, the solution requires less space and enables increasing opportunities for production line upgrades and renovations in existing mills and factories. The innovation also provides better reusability, lower energy consumption, lower maintenance requirements and reduced lifecycle costs.

The rotor of a permanent magnet motor uses a magnetic field created by permanent magnets which will follow the stator's revolving magnetic field once the motor has started up. In conventional induction-based electric motors, the movement of the rotating part or rotor is generated by the combined effect of the stator coil induced magnetic field and the electric currents induced by the magnetic field in the rotor.

Since the permanent magnet is free from electric current flows, there is no loss of electric power. This means that the new-generation motor has a higher efficiency level compared to conventional electric motors. Permanent magnet motors can be built for the generation of extremely high torque levels, even at minimal RPM rates. This makes the motor applicable for use in direct drive solutions without gearboxes.

From paper machines to wind power plants

According to the Selection Committee, the trio that led the development and commercialisation of the new motor at ABB Finland has promoted the forest industry's technology development – regardless of the fact that the new-generation electric motors are becoming proportionally more common in wind power plants, compared to paper mills. This primarily indicates the prevailing difference between the two sectors' investment rates, especially in Europe.

ABB's view is that direct drive systems will revolutionise the structure of conventional paper machines. The innovation was developed through cooperation between the Finnish paper industry and local research communities. The forest industry was the first to adopt the use of this innovation. In addition to wind power plants, the same technology has been applied to hydropower plants and ship power transmission systems.

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