The Permanent Magnet (PM) Motor saves energy directly by increased motor efficiency as well as indirectly by reduced vehicle weight. Further environmental improvements can be achieved when a larger portion of the braking is done electrically, resulting in noise reduction and improved tunnel air quality.

The added value
The compact BOMBARDIER* MITRAC* PM motor system is tailor-made to meet the highest demands on drive systems for traction applications: Torque in a wide speed range where the motor is especially competitive at high speed and low voltage, environment variations and stress as well as safety requirements. This has been achieved with a minimum of hardware and software changes to other parts of the propulsion system, and design re-use of the well proven and highly reliable conventional MITRAC induction motors.

Second motor generation for selected applications
• Improved overall vehicle optimization
• Optimized energy efficiency
• Reduced volume and weight

In addition, the vehicle life cycle cost will typically be reduced when changing from induction motors to PM motors. Many vehicles will also weigh less. The high motor performance also opens up the possibility to shift braking power from the mechanical to the electric system resulting in reduced operational costs as well as reduced environmental impact.

The PM motor technology
The key feature of the Permanent Magnet Motor is that the rotor creates its own flux since it incorporates magnets, while an induction motor relies on the flux created by the current in the stator winding. The magnet flux presents a number of opportunities to be explored at vehicle level, for example
• Reduced energy consumption
• Less requirements on motor cooling
• Higher performance than the same size induction motor
MITRAC Permanent Magnet Motor

The Bombardier PM motor initiative
Bombardier is introducing the PM motor technology on a solid technology base. The chosen PM motor concept has now been established as a standard for automotive industry applications. Based on this, a greater synergy is possible to reduce cost and ensure highest level of reliability. Also, the PM motor concept of Bombardier has gone through extensive testing in authentic environments where its benefits have been validated and quantified. Also, the Bombardier PM solution is providing an economically sound concept and can be justified not only on its ecological benefits.

Development and testing
Bombardier has for years closely monitored the development of PM technology based on a tight cooperation spanning over the Bombardier Sites in Europe and also several leading academic institutions. Since 2006, activities have been intensified with the testing of prototypes, confirming the advantages of technology and design.

As a second stage, during the Summer of 2008, two self-ventilated PM motors replaced four out of the in total 8 induction motors in the BOMBARDIER* REGINA* train utilized for the Gröna Täget tests performed in Sweden. The successful tests verified that two induction motors could be reduced provided the same performance for the REGINA train.

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