



SASKATCHEWAN ENERGY MANAGEMENT TASK FORCES

TECHNOLOGY INFORMATION SHEET

ADVANCED MOTOR TECHNOLOGY

Background

Continuing research into motor technologies has produced new motor designs that are gaining acceptance for specific applications. Their performance has been good enough to broaden their use and this has resulted in lower prices.

Switched reluctance motors and electronically commutated permanent magnet motors are two designs that have reached commercial status.

Switched Reluctance Motors

Switched reluctance (SR) motors are electronically commutated DC motors. The rotor in a SR motor rotates in complete synchronization with a rotating stator field. The rotor is made entirely of laminated iron. SR drives rectify the 3-phase AC power supply to DC. They are programmable so that the motor output can be closely matched to the system load requirements.

SR motors maintain a much higher torque and are more efficient over a wider range of loading than inductance motors. Because their torque is much greater than that of induction motors, a size reduction is possible if a substitution is made.

SR motors have a simple design and offer great durability. Their costs are equivalent to those of induction motor-adjustable speed drive systems and although they compete for a similar type of market, they offer the advantage of having a wider range of speed adjustability (100:1) whereas adjustable speed drives have only a 10:1 range of adjustability.

SR motors are currently used in automotive cruise controls and computer plotters in North America and larger sized versions are in use in the United Kingdom.

Electronically Commutated Permanent Magnet Motors

A permanent magnet (PM) motor is a DC motor that has permanent magnets bonded to its rotor that create a constant DC field without external power input or regulation. The PM stator has conventional windings that produce the motor's rotating field. The rotation of the rotor is synchronous with the rotating field so there is no slip. The rotating field is switched from coil to coil by an electronic commutator that is controlled by a position sensor on the rotor.

Because there are no rotor windings, there are no brushes (and their associated friction), no rotor maintenance, and no voltage drop.

PM motors offer excellent efficiency over a wide range of loads and speeds. Their power factors are higher than induction motors and they operate at low temperatures so that resistive load losses and lubricant and insulation breakdown are low. PM motors are easy to manufacture and they are programmable for features such as soft start capability, constant speed, and constant torque.

PM motors are comparable in price to induction motor-adjustable speed drive systems (200 - 400 \$/HP). They are available from Powertec International and GE up to 600 HP in size. Over 100,000 units are in use in the U.S. in OEM applications such as HVAC fan drives and small appliances.