WOLONG

Power your future

PM-SynRM

Ultra Premium Efficient Motor Technology

The history of reluctance motors is long, but several innovations have been recent.

The switched reluctance motor was invented in 1838, while the first synchronous reluctance motor (SynRM) was invented in 1923. However, it took almost 90 more years for the right technology to become available for accurately controlling SynRM's.

Only with the advent of advanced variable frequency drives (VFD), SynRM's can now be operated reliably and consistently, with all the technical benefits they bring. The first modern industrial synchronous reluctance motors became available in the 1990's. They have higher efficiencies and higher power densities than induction motors. But unfortunately, the power factor is low.

Compared to this, Permanent Magnet Assisted Synchronous Reluctance Motors (PM-SynRM) have all SynRM benefits plus a much higher power factor (>0.9) making them more useful for challenging industrial applications.

Top electric car manufacturers have recently been adopting internal PM-SynRM's. And today, IE5 efficient industrial and commercial motors are being developed using a non-rare earth permanent magnet material.

Motor Technology Background

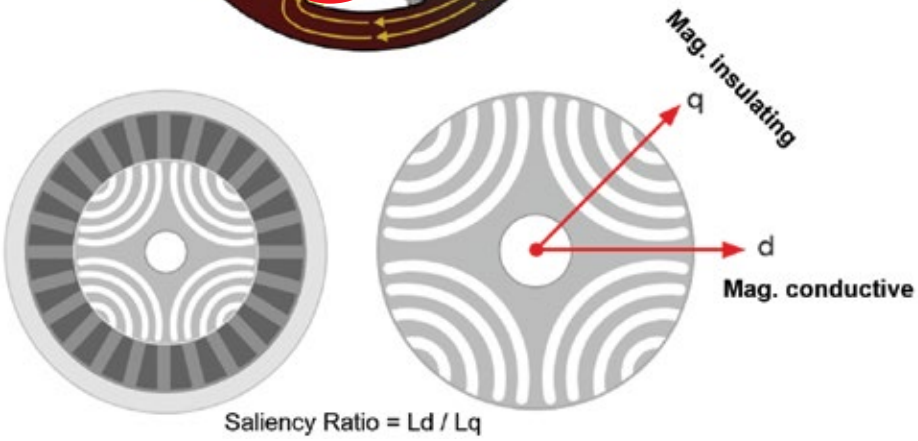
Reluctance and Torque

Reluctance in motors is defined as opposition to magnetic flux lines between opposite poles. Magnetic flux always tends to flow through the path of least reluctance. Therefore, maximum flux passes between opposite poles that are closer together and the reluctance is low. Reluctance torque is created when opposite electro-magnetic poles from the rotor and stator are attracted causing rotation.

Reluctance Motors

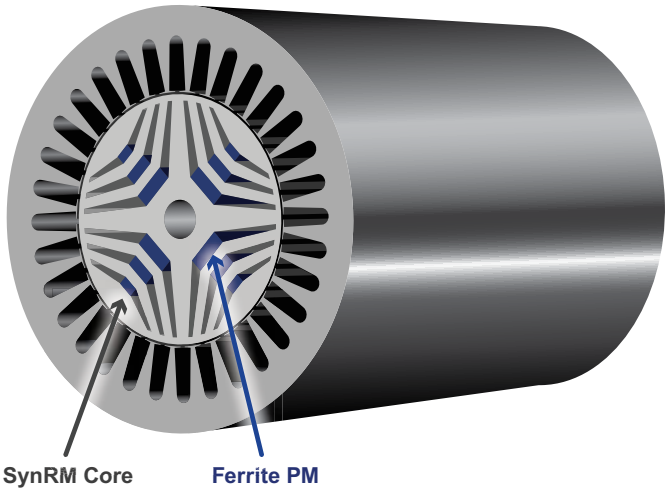
Reluctance motors generate torque through magnetic reluctance, without windings, by inducing non-permanent magnetic poles on a ferromagnetic rotor core.

Types of reluctance motors include synchronous, variable, switched, and variable stepping.



Synchronous Reluctance Motors (SynRM)

These machines have an even and equal number of stator and rotor poles, typically 4 or 6. The projections on the rotor are stamped with holes that act as internal flux “barriers” directing magnetic flux along direct axis generating rotating reluctance torque.



Permanent Magnet assisted Synchronous Reluctance Motors (PM-SynRM)

Synchronous reluctance motors had many attractive application benefits, but had low power factors making them undesirable for many industrial and commercial applications. That has recently changed with permanent magnet assisted technology to increase to the same PF levels or higher (>0.9) than induction motors. Now, with the inclusion of non-rare earth ferrite magnets, the technology is now a viable option to apply super high efficient LV motors for most industrial applications.

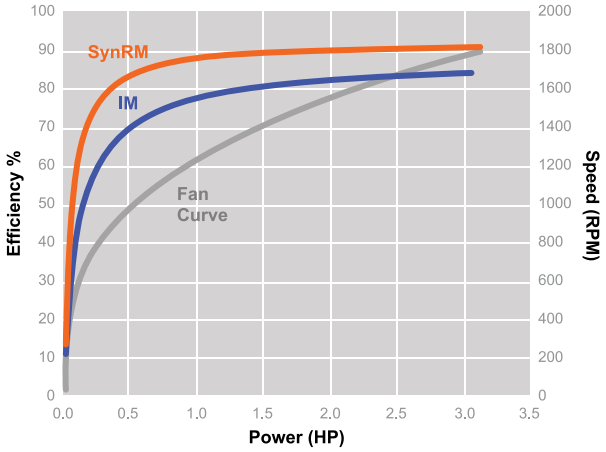
Application Benefits

Technical and Application Advantages of PM-SynRM's Over Induction Motors

PM-SynR motors are getting much more attention in North America for their energy saving properties in low voltage industrial applications for compelling reasons.

Efficiency Comparison

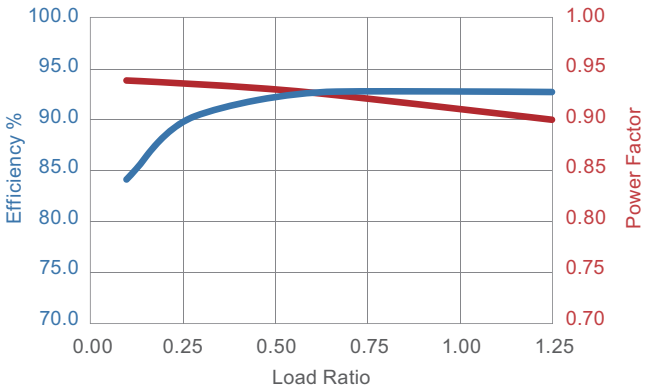
3 HP Fan Application

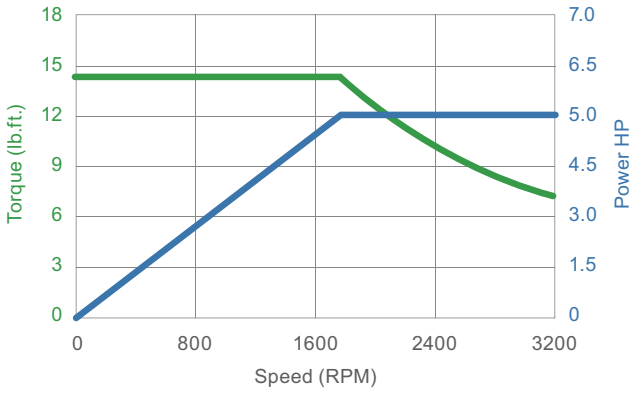


Even compared to premium efficient induction (IE3) motors up to 15 kW run with VFD's, PM-SynRM's have roughly a 3-5% efficiency improvement at 25-100% load. This gives a very quick payback in energy savings.

Power / Efficiency Curves

Bulldozer Series 184 Frame, 5 HP Motor, 1800 RPM

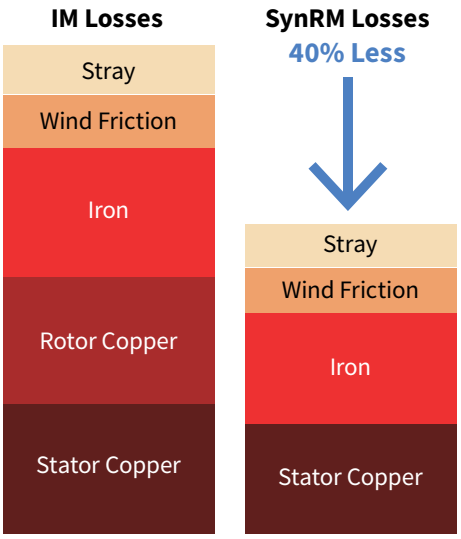




Motor Technology Comparisons

User Requirements	Induction	SynRM	PM (Rare-Earth)	PM-SynRM (Ferrite)
Overall Efficiency	=	+	++	++
Compactness	=	+	++	++
Reliability	=	=	=	+
Easy Maintenance	=	+	=	+
VFD Size	=	-*	=	=

* SynRM's have a low power factor and high current draw. This makes it necessary to select a VFD based on the motors rated current, not its power rating.



The innovative low component rotor design of a PM-SynRM offers 40% lower energy losses compared to induction motors.

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