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Evaluation of a reluctance synchronous motor for use in a mine shuttle vehicle.

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ABSTRACT

Electric motors play an important role in modern societies, and have many applications from causing mobile phone vibration to steering space shuttles. While many industrial applications use the Induction Motor (IM), this motor has the potential to be improved upon by the Reluctance Synchronous Motor (RSM) in specific niche applications like Mine Shuttle Vehicles (MSV). The possibility of these improvements led to a mine shuttle IM's manufacturer to partner with the University of the Witwatersrand to study the improvements that the RSM can offer. A prototype RSM was designed and built, and needed to be tested to assess these improvements.

The RSM was compared with the IM on the following parameters: torque production for the MSV, construction quality and cost of construction. A manufacturing advantage of the RSM is that it can be converted from an IM cheaply and offers greater torque. This prototype RSM was able to produce 3.6% more torque than the IM at the same levels of current. Furthermore due to its improved construction, more current can be supplied to the RSM which allows it to generate 43% more torque. These measurements proved that the RSM is a viable alternative to the IM in the MSV as it provides a higher torque density. While the results show that the IM is still highly efficient, the RSM does improve upon it slightly, in niche applications like the MSV. These results justify future research on the RSM's efficiency.