Will We See One Type of Electrical Machine Dominate?

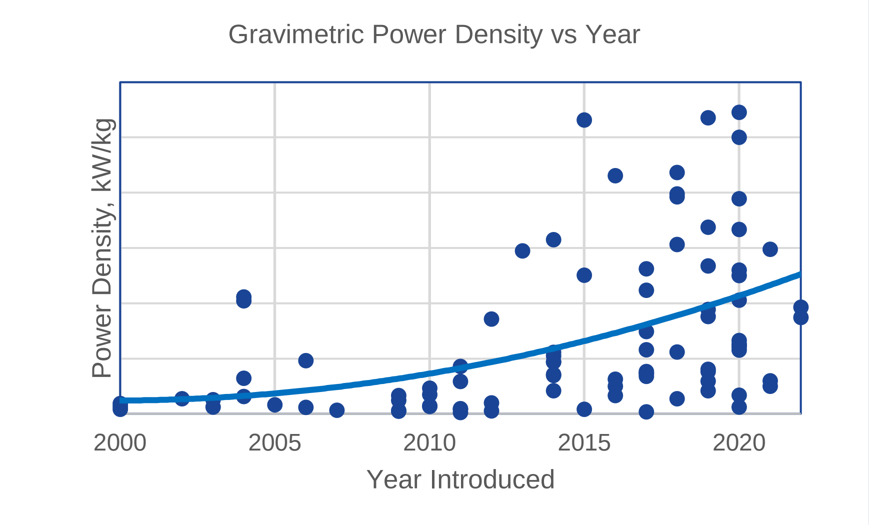
Vehicle Electrification Expo, Birmingham

Stuart Bradley

The Permanent Magnet Synchronous Motor Dominates Automotive Applications

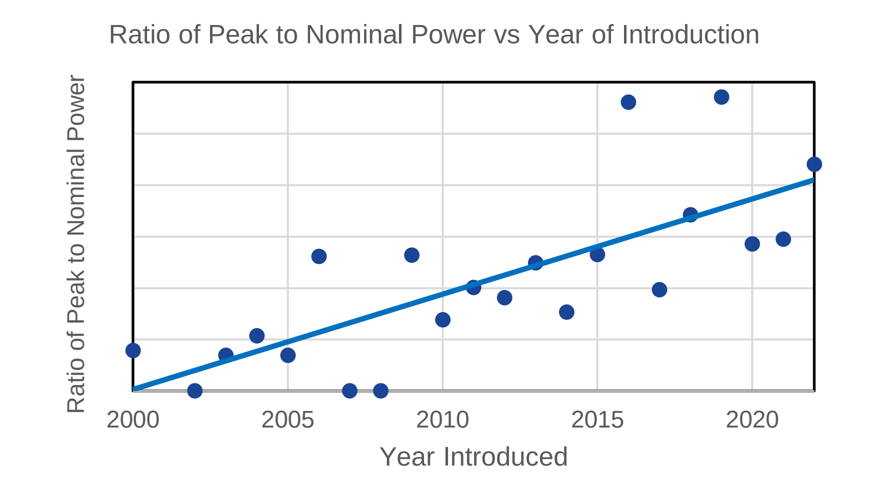
E-Machines are becoming more power dense, taking up less space and mass for a given power rating. This trend is due to;

- Powerful Permanent Magnets
- Advanced Design Tools
- Improved Thermal management
- Superior materials
- Higher rotational speeds



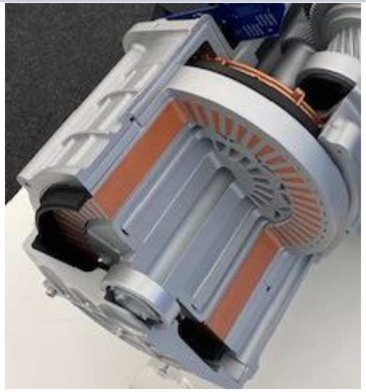
Machines are increasingly able to cope with overload demands

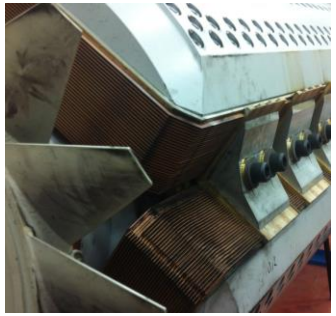
- High performance sports cars for 10s
- Heavy Duty trucks and Off-Highway for 60 to 200s
- Leads to improved robustness and reliability
- Lower overall costs for the driveline system can be achieved



Which Motor Topology can be used in which Sector?

	PMSM	SynRel	Induction	EESM
PassCar A/B	XXXX	XX	XXX	XXX
PassCar C+	XXXX	XX	XXX	XXX
SUV	XXXX	XX	XXX	XXX
LCV	XXX	XXXX	XXX	XXX
HGV	XXX	XXX	XXXX	XXXX
Off Highway	XX	XXXX	XXXX	XX
Rail	XX	XX	XXX	XXXX



Manufacturing Future Electric Machines needs Innovation and Investment

Improved materials leading to process standardisation

- Stator winding and insulation
- Thermal management systems
- High-speed rotor construction

Advanced manufacturing data collection

- In-process test and process monitoring
- End-of-line testing
- In-service monitoring
- End-of-life decision making
- Improved evidence for design validation

Higher speed rotors are feasible

- Rotor reinforcement and containment
- Mass reduction achievements
- Precision engineering and manufacturing

Supply Chain Developments

- Risk reduction – cost and time
- Remanufacturing opportunities
- Assembly of motor, transmission, inverter, control and software

Integration Offers Cost Benefits and Scalability Opportunities

- Common Assembly of the electrical drive unit – being a motor, transmission, control and software and at the heart – the inverter
- Packaging for optimised cooling improves over a baseline
    - Mass reduction of 8%
    - Volume reduction of 8%
    - Cost reduction of 13%
- Scalability can be made using a common motor / inverter platform
- Finally - Can one type of machine dominate?