

**Title:** Additive and Advanced Manufacturing of High-Performance Electric Engines (Machines, Motors) in collaboration with Jaguar Land Rover

Are you an electrical or mechanical engineer looking to apply your background to next generation electrical technologies in pursuit of Carbon Net Zero? We are seeking a motivated PhD candidate to join The Electrical Machine Works, to develop advanced design and manufacturing tools necessary to realise step changes in high-performance electric engines (machines or motors). The successful candidate will develop technology in collaboration with Jaguar Land Rover for premium automotive applications.

**Context:**

Step improvement in electrical machine power density (kW/kg) is essential to the success of future More- and All-Electric transport initiatives and in achieving Carbon Net Zero targets. The Electrical Machine Works seeks to exploit the design freedom of metal Additive Manufacturing (AM) and other advanced manufacturing technologies to simultaneously improve efficiency, thermal management, and electrical insulation systems, Fig. 1, [1]. This PhD opportunity will see the development of leading-edge design tools to take full advantage of new manufacturing approaches and will result in a series of physical prototypes to experimentally inform and validate the design methodologies.

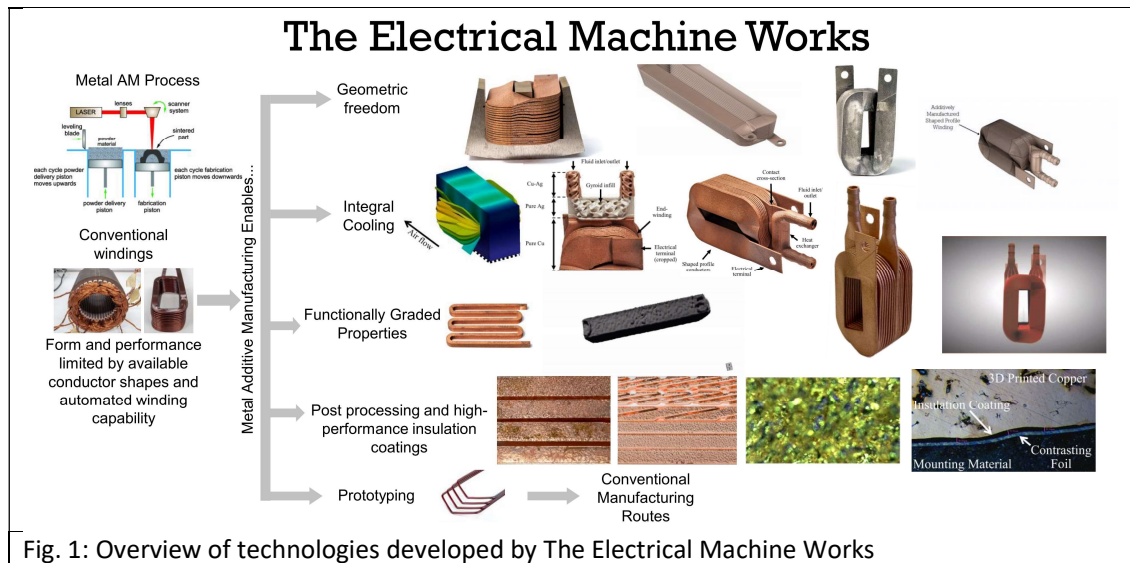


Fig. 1: Overview of technologies developed by The Electrical Machine Works

[1] N. Simpson et al., "Additive manufacturing of shaped profile windings for minimal ac loss in electrical machines," IEEE Transactions on Industry Applications, May 2020. doi: 10.1109/TIA.2020.2975763

[2] N. Simpson, J. Jung, A. Helm and P. Mellor, "Additive Manufacturing of a Conformal Hybrid-Strand Concentrated Winding Topology for Minimal AC Loss in Electrical Machines," 2021 IEEE Energy Conversion Congress and Exposition (ECCE), Vancouver, BC, Canada, 2021, pp. 3844-3851, doi: 10.1109/ECCE47101.2021.9595059.

[3] N. Simpson, S. P. Munagala, A. Catania, F. Derguti and P. H. Mellor, "Functionally Graded Electrical Windings Enabled by Additive Manufacturing," 2022 International Conference on Electrical Machines (ICEM), Valencia, Spain, 2022, pp. 1477-1483, doi: 10.1109/ICEM51905.2022.9910912.

### **What will I be doing?**

The successful candidate will join The Electrical Machine Works under a multidisciplinary supervisory team who will provide training and project supervision. Example activities (to be refined as the project progresses) include:

1. Learning relevant underpinning multidisciplinary concepts, and application context.
2. In-depth literature review and electrical machine technology mapping.
3. Development of software design tools including 3D modelling, simulation, and Design for Manufacture.
4. Practising advanced manufacturing techniques including metal Additive Manufacturing, metal Laser cutting and CNC machining.
5. Undertake component and system level characterisation and experimental testing.
6. Collaboration with the industrial partner, Jaguar Land Rover, including an on-site placement period.
7. Regular dissemination of findings via internal and external meetings and events.
8. Publication of findings at appropriate international conferences and in journal proceedings e.g. IEEE Energy Conversion Congress and Expo (ECCE) typically held in North America.
9. Play an active role in the research group community for your own development and development of others.

### **Should I apply?**

You should apply if you are a motivated, collaborative engineering graduate (or related field) at 2:1 or above with a desire to apply your background to highly multi-disciplinary problems with real world impact potential in stepping toward Carbon Net Zero. The successful applicant will have the opportunity to work in a highly multi-disciplinary team, undertake direct work with industry, including placements, and present research at international conferences.

**Closing Date:** 8<sup>th</sup> September 2023 – contact Dr. Simpson to discuss **before** this date.

**Earliest start date:** September 2023

**Funding:** £22,800 p.a. for 4 years subject to eligibility status and confirmation of award

**Eligibility:** To be eligible for a full award the student must have no restrictions on how long they can stay in the UK and have been ordinarily resident in the UK for at least 3 years prior to the start of the studentship (with some further constraint regarding residence for education). To be considered for funding Candidates must:

- Be a UK National (meeting residency requirements)
- (or) Have settled status
- (or) Have pre-settled status (meeting residency requirements)
- (or) Have indefinite leave to remain or enter.

### **Further Information:**

<https://www.metal-am.com/ukri-fellowship-scheme-funds-research-into-metal-am-for-electrical-machines/>

<https://gow.epsrc.ukri.org/NGBOViewGrant.aspx?GrantRef=EP/T02125X/1>

**How to apply:** If you meet the eligibility criteria, please direct enquiries to Dr. Nick Simpson via [nick.simpson@bristol.ac.uk](mailto:nick.simpson@bristol.ac.uk) in the first instance.

