

| | THE UNIVERSITY OF MANCHESTER |
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| | PARTICULARS OF APPOINTMENT |
| F | ACULTY OF SCIENCE AND ENGINEERING |
| DEPARTMENT | OF MECHANICAL, AEROSPACE & CIVIL ENGINEERING |
| | DEPARTMENT OF MATERIALS |
| RESEARCH ENGINE | ER IN MATERIALS AND COATINGS FOR AIR FOIL BEARINGS |
| | (KTP Associate) |
| | VACANCY REF: S&E-016655 |
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| Salary: | £32,816 to £40,322 per annum (depending on experience) |
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| Start/duration: | 24 months |
| Probation period: | 6 months |
| Based at: | Cummins Turbo Technologies, Huddersfield |
| Responsible to: | Dr Philip Bonello, Reader in Engineering Dynamics and an appointed Industrial Supervisor at Cummins Turbo Technologies |
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Enquiries about the vacancy, shortlisting and interviews:

Name: Dr Philip Bonello

Email: philip.bonello@manchester.ac.uk

BACKGROUND

Cummins Turbo Technologies (CTT) has identified (oil-free) air-foil bearings (AFBs) as important to the development of future products. The University of Manchester has been at the forefront of <u>AFB research</u> over the past decade. This KTP project is a collaboration between CTT and UoM that has the overall aim of developing, embedding and exploiting expertise in advanced engineering materials and coatings for novel air foil bearing components to be used in automotive applications.

The Department of Mechanical, Aerospace and Civil Engineering (MACE) at UoM is one of the largest departments of its kind in Europe and is a leader in dynamics research through its



<u>Dynamics</u>, <u>Vibrations and Earthquake Engineering group</u>, which conducts research in: rotordynamics (including foil-air bearings); vibration control; energy harvesting and wireless sensing; structural and machine condition monitoring; structural vibration. It has extensive laboratory facilities for mechanical testing at its disposal and considerable technical support and manufacturing facilities (including facilities to make foil structures for bearings e.g. precision electrical discharge machining for making dies for bump foil, heat treatment,..etc).

The Department of Materials at UoM is the largest university Materials activity in Europe and houses state of the art facilities for the processing and characterisation of materials. The development of the <u>Henry Royce Institute</u>, with its hub at the University of Manchester, ensures that the Department remains at the forefront of materials research and innovation, providing new opportunities for collaboration with industry and academia. Particularly relevant to the present project are facilities for coating using physical vapour deposition (PVD) and the Bruker *UMT TriboLab* tribometer facility.

<u>Cummins Turbo Technologies</u> designs, manufactures and distributes automotive turbochargers and other air handling products for commercial on and off highway OEM applications. The Cummins Turbo Technologies product portfolio includes products and services branded under the "Holset" name, which holds a leading position in air handling solutions for the Global commercial vehicle market.

Overall Purpose of the Job

The Research Associate (PDRA) is required undertake a 24 month project which has an overall aim of developing, embedding and exploiting expertise in advanced engineering materials and coatings for novel air foil bearing components to be utilised within automotive air handling applications. This is an interdisciplinary project that adds materials engineering expertise to mechanical engineering expertise in air foil bearings and develops it for use on CTT's projected zero emissions-enabling powertrains. This presents the Associate with a set of diverse challenges that would typically be addressed by more than one individual. The Associate will not only be responsible for setting up/designing/building/commissioning facilities for testing the bearing samples, but will also be responsible for making the samples and conducting their testing and critical analysis. Making the samples involves the design and manufacture of the foil structure and coating the relevant surfaces of the bearing to minimise wear. The coating aspect involves the formulation and investigation of selected coatings from the literature. The execution of these tasks requires close working with technical staff at both University of Manchester and CTT. In addition to presenting at scholarly conferences, the Associate will be required to organise seminars and workshops for CTT staff which are necessary for embedding the knowledge transferred from this project.

Knowledge Transfer Partnerships (KTP) is Europe's leading programme helping businesses to improve their competiveness and productivity through the better use of knowledge, technology and skills that reside within the UK knowledge base. Throughout the KTP you will;

- Receive a competitive salary
- Gain excellent experience of managing a high profile project
- Receive formal management training
- Have access to a £4000 professional development and training budget



• Receive mentoring and support from academic staff and industry professionals

Further information on KTP, including case studies, can be found at; <u>http://www.manchester.ac.uk/collaborate/business-engagement/knowledge-</u>exchange/transfer-partnerships/

Key Responsibilities, Accountabilities or Duties

The range of duties will include:

- Undertake all tasks needed to achieve the objectives of the project, as detailed in the project work plan, including, but not limited to:
 - o conducting literature and database searches;
 - making air foil bearing samples i.e. design and manufacture of the foil structure and coating the relevant surfaces of the bearing to minimise wear (including the formulation and investigation of selected coatings from the literature);
 - setting up/designing/building/commissioning facilities for testing the bearing samples;
 - o conducting the testing and critical analysis of the bearing samples;
 - documenting all research work and results, producing all reports specified in workplan;
 - organising seminars and workshops for CTT staff to embed the knowledge transferred from this project;
 - preparing papers for presentation at scholarly conferences and publication in high quality academic journals.
- Work under the direction of the Project Steering Group comprising the four key stakeholders from University of Manchester (UoM) and CTT i.e. Department of Mechanical, Aerospace and Civil Engineering (UoM), Department of Materials (UoM), Materials Engineering team (CTT), Rotor Systems team (CTT).
- Work closely with technical staff from the above four key stakeholders.
- Contribute to the planning of research projects.
- Present information on research progress and outcomes to bodies supervising research
- Prepare papers for steering groups and other bodies.
- Liaise with research colleagues and support staff on routine matters.
- Make internal and external contacts to develop knowledge and understanding and form relationships for future collaboration.



- Provide guidance as required to support staff and any students who may be assisting with the research.
- Assist in the supervision of student projects related to this field of research.
- Actively participate as a member of a research team.
- Attend and contribute to relevant meetings.
- Make use of standard research techniques and methods.
- Deal with problems which may affect the achievement of research objectives and deadlines.
- Contribute to decisions affecting the work of the team.
- Analyse and interpret the results of own research and generate original ideas based on outcomes.
- Plan own day-to-day research activity within the framework of the agreed programme.
- Co-ordinate own work with that of others to avoid conflict or duplication of effort.
- Continue to update knowledge and develop skills.

PERSON SPECIFICATION

Essential:

- At least one (preferably both) of the following qualifications
 - a minimum of a 2:1 degree (or equivalent) in the field of mechanical engineering or closely related discipline
 - a PhD in a relevant area (particularly mechanical engineering with focus on rotating machinery dynamics including bearings and associated tribology, or materials science/materials engineering with focus on surface engineering and tribology)
- Practical experience of designing and building test facilities for performance testing of rotating machinery and/or their bearings
- Practical experience of developing CAD design (e.g. in Solidworks)
- Background in tribological testing and analysis
- Background in coating techniques
- Proficiency in programming (e.g. Matlab)
- Experience in research methods and techniques relevant to the project's field of research
- Excellent communication and interpersonal skills



Knowledge Transfer Partnerships

- Excellent time management and organisational skills
- Ability to work independently and as part of a team
- Ability to liaise confidently and effectively with a range of individuals
- Flexible approach to dealing with research problems as they arise
- Willingness to learn and develop
- Ability to present in both written and oral publications
- Ability to meet deadlines
- Strong journal publication record.
- The ability to evaluate complex data