

ABOUT LOUGHBOROUGH UNIVERSITY

**WOLFSON SCHOOL OF MECHANICAL, ELECTRICAL AND MANUFACTURING
ENGINEERING**

**RESEARCH ASSOCIATE IN SMALL SMART SUSTAINABLE SYSTEMS
FOR FUTURE DOMESTIC HOT WATER**

REQ16573

April 2016

As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.

JOB DESCRIPTION

Project Description:

Loughborough University (CREST) in collaboration with Warwick University and the University of Ulster have been awarded funding from the EPSRC to undertake research to address the challenge of providing domestic hot water (DHW) using low carbon heat pump technology. Given the overwhelming trend away from conventional hot water tanks in homes and the inability of present heat pumps to provide instant hot water we intend to develop a suite of heat pump / storage / control technologies, using either electricity or gas that function without conventional storage cylinders and can deliver energy efficient affordable hot water at the desired rate to a wide range of dwellings well into the future.

The main areas of research to be performed at CREST relate to the development and characterisation of a compact thermal energy storage system that can achieve the high rates of heat output that are necessary to meet typical domestic hot water requirements. CREST will also develop and characterise vacuum/aerogel insulated stores of different geometries that can be installed in available spaces that are not currently used, for example dead spaces under kitchen units.

This is a fixed term project until the 28th February 2019.

Job Grade: Research Grade 6

Job Purpose:

The Research Associate will be involved in the design, development, modelling, analysis and experimental characterisation of Phase Change materials (PCM) based thermal energy storage systems suitable for use with gas and electrically driven heat pumps that can meet the demand requirements of domestic hot water. In addition they will work on advanced insulation products that can be used to minimise heat losses from thermal stores.

Job Duties:

To be responsible for undertaking the main research activities as follows:

- Screening and characterisation of candidate PCM's using Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA)
- Design and undertake experiments to determine the effect of liquid PCM motion (natural convection) on PCM crystallisation.
- Develop and experimentally validate appropriate thermal store simulation tools to enable effective prediction of thermal store performance and analysis of design limitations.
- Develop and commission experimental thermal storage test systems and characterise the performance of a range of prototype laboratory scale thermal energy storage systems using anticipated charge and discharge cycles simulated by using controlled thermal baths
- Undertake cycling and long term durability tests on selected store designs with different suitable PCMs,
- Identify optimal store operational strategies when used with electric heat pumps to successfully deliver domestic hot water.
- Identify and help address any issues of integration with the hot water supply and heat pump system.
- Investigate the installation options and scalability of storage capacity and heat delivery rate possible for compact heat storage systems.
- Develop / test Vacuum Insulation and aerogel panels and assess suitability and performance when used for store/ cylinder insulation.
- Develop control algorithms for charge, discharge, top-up based on models of multiple stores and undertake charge discharge tests.
- To assist in the dissemination of results arising out of the project.
- To travel to collaborators' locations within the UK and report on the progress of the project.

- To provide feedback to the project team on progress and assist in preparing interim and final project reports.
- To work as a committed member of the project and university team.
- To make presentations to industry and academia.
- To publish the outcomes of research in international journals and conferences.
- To assist in tutorials and laboratory sessions for students if needed.

Other

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at: <http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html>.

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: <http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html>). In addition, the University is supportive, where operational needs allow, of flexible working arrangements.

We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see <http://www.lboro.ac.uk/services/hr/athena-swan/>.

**WOLFSON SCHOOL OF MECHANICAL, ELECTRICAL AND
MANUFACTURING ENGINEERING
PERSON SPECIFICATION**

Job Title: Research Associate

Job Grade: Research Grade 6

	Essential	Desirable	Stage to be Assessed
Experience	<p>Background in Engineering or Science related to thermal engineering</p> <p>Experience of designing and undertaking a complex programme of experimental work</p> <p>Practical experience of working with thermal energy storage systems in particular phase change material stores</p> <p>Practical experience of experimental analysis techniques</p> <p>Experience of developing and using detailed simulation models</p> <p>Experience of developing simple simulation models</p> <p>Experience of</p>	<p>Current or recent relevant work experience at post-doctoral level in an academic or industrial environment</p> <p>Experience of modelling thermal energy storage systems</p> <p>Experience of developing complex models for heat transfer and fluid flow</p> <p>Experience of modelling thermal energy systems</p> <p>Knowledge of advanced insulation systems</p> <p>Experience of authoring original work for academic journal papers, conference</p>	<p>All at stages 1 and 3</p>

	having produced technical reports and / or guidance materials on engineering or science topics	papers or technical reports for industry	
Skills and abilities	<p>Knowledge of heat transfer and fluid mechanics</p> <p>Knowledge of experimental techniques associated with heat transfer studies</p> <p>Excellent written and oral communication, and IT skills</p> <p>Self-motivated with ability to meet deadlines</p> <p>Ability to work independently and as part of a team, interacting with different academic and industrial partners</p> <p>Excellent interpersonal, and organisational skills</p>	<p>Ability to assist in teaching of undergraduate or postgraduate students</p> <p>Working knowledge of a range of software packages and excellent ability in a programming language</p> <p>Previous experience of detailed experimental test campaign and data analysis</p> <p>Previous experience of model validation and performance of a parametric analysis</p> <p>Previous experience of producing reports</p>	All at stages 1 and 3
Training	Demonstrate evidence of having undertaken further training		
Education and Qualifications	A good honours degree in Engineering, Physics,	Relevant PhD in an Engineering discipline preferably	1

	Chemistry or Materials Science, Building Services or other suitable subject	related to thermal engineering (or equivalent experience)	
Equality and Diversity	Evidence a good working knowledge of equal opportunities and understanding of diversity in the workplace		1, 3
Other	Commitment to observing the University's Equal Opportunities policy at all times. (1,3)		1, 3

Stages in assessment: 1: Application form at shortlisting, 2. Selection test, 3. Interview

Conditions of Service

The appointment will be on a full time fixed term contract until the 28th February 2019. Salary will be on a Research grade 6 £28,982- £36,672 per annum, at a starting salary to be confirmed on offer of appointment.

The appointment will be subject to the University's normal Terms and Conditions of Employment for **Academic and Related** staff, details of which can be found at: <http://www.lboro.ac.uk/services/hr/a-z/>

Informal Enquiries

Informal enquiries should be made to Professor Philip Eames by email at: p.c.eames@lboro.ac.uk or by telephone on +44 (0)1509 635347

*We have a commitment to gender equality and support the Athena SWAN charter. We encourage women to apply for this position as they are under-represented. All appointments will be made on merit. (applicable to Engineering role)

Applications

The closing date is **21 September 2016**.