Wolfson School of Mechanical, Electrical and Manufacturing Engineering

Loughborough University

Research Associate in the investigation of the efficacy of bubble curtains in attenuation of impulsive underwater noise

Job Ref: REQ260209

School summary:

The Wolfson School of Mechanical, Electrical and Manufacturing is one of the leading Engineering Schools in the country. With a strong tradition in Manufacturing and in the discovery and application of Materials for applications in a broad range of industrial sectors (e.g., electronics, bioengineering & healthcare, automotive, food industry, etc), we strive for academic excellence and research at the leading edge.

Project Description:

The Department for Energy Security and Net Zero (DESNZ, formerly the Department for Business, Energy and Industrial Strategy) is undertaking an Offshore Energy Strategic Environmental Assessment (OESEA) programme. The Company is contracted to maintain the management of this process on behalf of DESNZ. As part of the SEA programme, studies are undertaken to ensure a sound information base on which to base the assessments.

The issue of UXO clearance sound levels and propagation were raised by various SNCB representatives on the SEA Steering Group as priority research topics as the assessment of risk to marine mammal populations from UXO clearance was highly uncertain. The OESEA programme has previously funded five phases of research with the National Physical Laboratory and Loughborough University to characterise the acoustic fields from various UXO clearance techniques in a controlled setting (quarry) and at sea; this empirical data has underpinned the approach to mitigation using low order techniques now being advocated by DEFRA and the SNCBs.

Further mitigation is available through the use of bubble curtains, and its use is being increasingly suggested as part of consenting for projects resulting in impulsive sounds (e.g. piling, explosive use, UXO clearance). However, it is clear that there is a dearth of information available on the relative efficacy of bubble curtains and the influence of bubble curtain design, configuration, air flow rates, water depth, water current strength etc on the attenuation underwater sound.

The appointment of a post-doctoral research fellow (PDRA) at Loughborough University to work with Professor Paul Lepper to review the current state of understanding of bubble curtain regulatory requirements, configurations and efficacy, to be followed by a range of theoretical and experimental investigations (building on and extending the results from the quarry trials) to inform bubble curtain design and operation under different offshore conditions.

Key Requirements:

The candidate needs to have experience in:

- Experimental design and measurement of underwater acoustic signals as well as acoustic signal processing.
- Use of analytical equipment in a both laboratory and field environments.
- Experience working with appropriate signal processing tools to visualise and process acquired data sets.
- Experience of acquiring, curating and analysing data derived from analytical techniques.
- Demonstrate excellent communication and interpersonal skills
- Demonstrated experience working in a lab and during field work, including the preparation of risk assessments and COSSH forms to ensure a safe working environment

Job Description

Job Family and Grade: Specialist and Supporting Academic Grade 6

Job Purpose

To advance understanding in the area of underwater noise mitigation, by investigation of the efficacy of bubble curtains in attenuation of impulsive underwater noise through a series of experiments in a controlled environment (flooded quarry) and LU / NPL test facilities to provide empirical evidence of the influence of a range of variables; this work is being undertaken by National Physical Laboratory and Loughborough University.

Job Duties

- Review of bubble curtain requirements for use in different countries, specifications, equipment, configuration, operation under different conditions, and evidence of sound attenuation
- Investigation of bubble curtain configuration / depth versus air flow / bubble distribution etc versus attenuation achieved i.e. how much air / infrastructure is needed and the cost benefit versus attenuation for different depths and currents?
- Consideration of water column versus sediment borne contribution to far field signal from impulsive sound sources and consequences to bubble curtain operation.
- Attenuation effects of bubbles on different impact metrics of impulsive sound sources such as SEL, peak, kurtosis etc. For example, to investigate the importance of peak pressure loudness and spectral distribution of impulsive sources to what is known about hearing damage in marine mammals. How small (cheaper/simpler/easier to handle) can the bubble curtain arrays be made, and for example how does underwater explosive bubble generation and bubble curtain interactions affect efficiency – would small (few metres (<10m) radius) bubble curtains be effective? And what influence does a double bubble curtain array have?
- Investigation of particle velocity characteristics from underwater detonations in relation to fish and invertebrate hearing.
- Evaluation of optical methods for detection of floating marine debris (if time allows).
- To conduct research of academic rigour and scientific standard, carry out authoritative literature reviews, and publish in top quality journals, consistent with the School's and Research Lab's quality and ambition.
- Write up regular progress reports and present outcomes to all Investigators and Collaborators (incl. those located at other Institutions), making recommendations for next steps.
- Demonstrate excellent self-management and organisational skills and a committed approach to work
- To work as part of a multi-disciplinary, multi-location team that addresses different aspects of the design, manufacturing, validation cycle of porous materials and structures.
- To attend and contribute to conferences, seminars, webinars and other events of interest to the team.
- To contribute to project promotion and public engagement events.
- To contribute ideas for new research and impact directions.
- To always maintain confidentiality and ensure that intellectual property (IPR) generation is safeguarded, and agreements are not violated.
- To assist the academic staff in the project team with the supervision of undergraduate, MSc or PhD project work and day-to-day supervision and support of other researchers.
- To engage in training programmes in the University (or elsewhere) that are consistent with the needs and aspirations of the project and those of the Lab.
- To undertake other duties as may be reasonably requested and that are commensurate with the nature and grade of the post.
- To undertake some responsibility and assist for aspects of joint group research activities for example activities related to UAV operations and optical imagery research in marine environment.

Points To Note

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility outlined in the document.

Organisational Responsibility
Reports to the: Prof Paul Lepper, Principal Investigator on the Grant.

Person Specification

Your application will be assessed based on the essential and desirable criteria listed below.

Applicants are strongly encouraged to explicitly demonstrate how they meet each essential (and desirable) criteria at the application stage. The criteria that you need to demonstrate in your application will be listed as Stage 1 in the table below.

Stages of assessment are as follows:

1 – Criteria measured at Application
2 – Criteria measured at Test/Assessment Centre/Presentation
3 - Criteria measured at Interview

Essential Criteria:

	Criteria	**Stage**
Experience	Experience within a high-quality research or development environment	1, 3
	Authoring original work for academic journal papers, conference papers or technical reports	1
	Experience of working with underwater acoustic measurement systems in both a laboratory and field-marine environments	1, 3
	Knowledge of Health & Safety procedures, risk assessments, COSHH forms, safe disposal routes, etc	1, 3
	Experience underwater acoustic signal processing and data management.	1, 3
	Experience of using software such as Matlab etc.	1, 3
	Experience of technical operation within regulatory framework of complex systems such as UAV operations	1, 3
	Demonstrate excellent self-management and organisational skills and a committed approach to work	1, 3
Skills and abilities	Ability to organise resources to support and further own research activities within the scope of their work, including liaising with third parties	1, 3
	Ability to work independently to meet deadlines	2, 3
	Excellent written and oral communication skills in English	1, 2, 3
	Excellent interpersonal and organisational skills	1, 3
	Ability to write project reports and make technical presentations to industrial and academic research groups	1, 3
Training	Evidence of having undertaken further training and a willingness to be trained if necessary to fulfil the requirements of the job	1, 3
Qualifications	PhD in a related subject or equivalent industrial experience	1
Other	Commitment to observing the University's Equal Opportunities policy at all times.	3

Desirable Criteria:

Area	**Criteria**	**Stage**
Experience	Working with acoustic transducers and associated instrumentation	1, 3

	In the maintenance and operation of UAV systems	1.3
	Working knowledge of underwater acoustic principles	1, 3
Skills and abilities	A self-starter who can operate effectively with minimal supervision, liaising with members of the team on own initiative	3
	Presentation skills of technical and non-technical aspects of the project to various audiences (i.e. academic and industrial collaborators, and general public dissemination of results and impact)	1,3
Other	Able to travel to academic and industrial collaborators' sites	1, 3
	Willingness to work at sea	1,3

Conditions of Service

The appointment will be subject to the University's Terms and Conditions of Employment relevant to the job grade.

Shared University Responsibilities

As a member of the Loughborough community, you are expected to:

- Take reasonable care of yourself, others and the environment, and to prevent harm by your acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Sustainability Policies & Procedures.
- Support and contribute to the University's commitment to Equity, Diversity, and Inclusion (EDI), while carrying out all duties in a way that respects these principles and upholds the right to free expression. Further information about EDI at Loughborough and our strategic aims is available on our website

Our Purpose, Vision, and Values

Our purpose, Vision and Values underpin all that we do and shape how we work together at Loughborough.

We're proud to promote our values: **Adventurous**, **Collaborative**, **Creative**, **Authentic** and **Responsible**. Our people bring these values to life every day, and they are central to the positive and supportive culture that makes Loughborough unique.

If you join us, you'll be encouraged to bring these values to life in your own work and contribute to the positive, supportive culture that makes Loughborough unique.

Read more about our **vision and values**.

Our Accreditations

We 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.

We are proud to be a Race Equality Charter Member. The Charter aims to improve the representation, progression and success of all minority ethnic staff and students within higher education and address issues of racism within higher education institutions (HEIs).

We are proud to be a Disability Confident Employer and have adopted a proactive approach to employing disabled people and to creating a more diverse workforce. We ensure that our recruitment processes are inclusive and accessible. We guarantee to offer an interview to all applicants who have declared themselves with a disability, provided they meet the essential criteria for a role. We proactively anticipate and provide reasonable adjustments and support existing employees who acquire a disability or long-term condition to thrive in the workplace.

We are a real living wage employer, and our Living Wage Employer Mark shows our commitment to paying our staff according to the cost of living.

We are proud supporters of the City of Sanctuary movement and delighted to be recognised as a University of Sanctuary. This national network brings together, university staff, lecturers, academics and students, who together work to make Higher Education institutions place of safety, solidarity and empowerment for people seeking sanctuary.

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.