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1. PURPOSE

1.1 The Department for Transport Dangerous Goods Division (DGD) intends to let a contract for research into the development of a sub-surface technique for the inspection of aluminium welds of petroleum road fuel tankers. It is anticipated that the outputs from this research will underpin UK guidance, technical codes and/or proposals for test procedures to be included in the relevant standards and/or regulations.

1.2 The petroleum road fuel tankers research project proposes to take forward work to improve the safety of petroleum road fuel tankers. The project is broken down into five work packages. This appendix focuses on Work Package 2 (WP2), which contains a specific extension of activities related to the non-destructive inspection of welding defects of aluminium tankers. Specifically, the feasibility of using the eddy current testing method, a non-contact electromagnetic technique, to accurately determine the size and location of imperfections in welds. Further validation, building on previous research, may make the method viable and it is envisaged that the new work will likely require the following:

1.2.1 A review of the feasibility of eddy current inspection of aluminium tanker welds to identify possible improvements in the estimation of the height of defects in aluminium tanker welds.

1.2.2 Development of eddy current models to investigate the optimal probe parameters to find the best probe size and configuration and increase the sensitivity of the test.

1.2.3 An increase in the information that can be obtained from the impedance plane by using a wider range of known reference notches. Eddy current models can also be used to obtain this information, but partial validation of the models would be necessary.

1.2.4 Sectioning of the scanned areas of weld samples to validate the eddy current information to better determine the capabilities of the technique.

1.2.5 Field trials in order to demonstrate the real world feasibility of the technique.

2. BACKGROUND TO THE CONTRACTING AUTHORITY

2.1 DGD leads on the policy for the safe and secure carriage of dangerous goods by road and rail and also has oversight of the sea and air modes. Goods that are classified as hazardous are vital to the economy and a modern way of life, and can include chemicals for industry, fuel to heat and light our homes, or batteries which power our gadgets. Movement of such goods is essential, but it has to be carried out in a way which minimises the risk of harm to people, property or the environment.

2.2 The Division's objective is therefore to ensure that the regulations continue to safeguard the carriage of dangerous goods, but in a manner that is proportionate and does not needlessly hinder trade, and that the UK compliance and enforcement framework is as effective as possible.

2.3 The DGD research programme derives from recent experience with non-compliant petrol tankers which could have led to the failure of some fuel deliveries. The programme supports implementation of lessons learned and further proportionate improvements to the design, construction, testing and inspection of tankers, so as to reduce the risk of non-compliance and avoid further issues. It will also support the UK negotiating position at international standards fora, minimising the risk of disproportionate regulations and backing the UK interest.

3. BACKGROUND TO REQUIREMENT/OVERVIEW OF REQUIREMENT

3.1 Currently, tanker welds are required to be non-destructively tested by radiography or ultrasound. However these methods present some problems in that the height of sub-surface flaws in welds cannot be measured, and access can be restricted in areas known as exclusion zones. The eddy current method is a non-contact electromagnetic technique which requires minimum surface preparation and does not have the same limitations as radiography and ultrasound.

3.2 The eddy current testing method is primarily used to detect cracks on the surface or sub-surface of aluminium structures in the aerospace industry. DfT have previously commissioned research to investigate the feasibility of using this method to detect lack of fusion in aluminium welds. The research report, written by TWI Ltd, is available on request.

3.3 The Department considers that further research relating to eddy current inspection techniques, has the potential to facilitate an improvement in the transport of dangerous goods, specifically the safety of petroleum road fuel tankers.

3.4 Previous research on eddy current inspection of aluminium tanker welds concluded that there is a good correlation between the positions of flaws detected in eddy current scans of aluminium tanker weld samples when compared with the position of flaws detected in radiography images. Impedance plane information from eddy current inspections provides some depth information, but currently the height of flaws cannot be accurately measured using the eddy current technique. Further work and validation is necessary to be able to estimate the height of defects found in aluminium tanker welds.

4. DEFINITIONS

Expression or Acronym	Definition
ADR	Accord Dangereux Routier (regulations concerning the international transport of dangerous goods by road)
DGD	Department for Transport Dangerous Goods Division
WP2	Work package 2 - Research on the feasibility of eddy current inspection of aluminium tanker welds
GMH	Department for Transport, Great Minster House, 33 Horseferry Road, London, SW1P 4DR.

5. SCOPE OF REQUIREMENT

5.1 The scope of this work package is to take forward findings from the previous research on eddy current inspection of aluminium tanker welds. In particular, further validation of the feasibility of eddy current inspection of aluminium tanker welds is needed if the height of defects are to be estimated. The amplitude of a defect signal can be used to give an estimation of flaw depth, however it is not an absolute indicator for depth measurement because the signal also depends on the width, morphology and scanning parameters (i.e. probe pressure on the surface). It should be noted that the outputs of this research should be of a quality that would, if appropriate, underpin proposals for amending or creating new standards/regulations. To further validate the method and take the work forward, this research is likely to require the following:

5.1.1 A review of the feasibility of eddy current inspection of aluminium tanker welds to identify possible improvements in the estimation of the height of defects in aluminium tanker welds.

5.1.2 Development of eddy current models to investigate the optimal probe parameters to find the best probe size and configuration and increase the sensitivity of the test.

5.1.3 An increase in the information that can be obtained from the impedance plane by using a wider range of known reference notches. Eddy current models can also be used to obtain this information, but partial validation of the models would be necessary.

5.1.4 Sectioning of the scanned areas of weld samples to validate the eddy current information to better determine the capabilities of the technique.

5.1.5 Field trials to demonstrate the real world feasibility of the technique.

5.1.6 Supporting policy and technical leads in the DGD at domestic and international discussions regarding the co-ordination of the research with other research elsewhere, dissemination and potential proposals for the implementation of the research findings in standards and /or regulations.

5.2 The work will inform the UK view on any new proposals for inspection guidelines issued by the Vehicle Certification Agency. Subject to the agreement of the relevant working groups, any new proposals for non-destructive testing will be submitted for any future changes to EN 12792.

5.3 In respect to paragraph 5.1.6 it is anticipated that the supplier will need to provide support and participate at the following domestic and international meetings:

5.3.1 Meetings with domestic stakeholders responsible for design, construction, testing and inspection of petroleum fuel tankers (normally held in a mutually convenient location in the UK). Support and participate at such meetings on three occasions.

5.3.2 Meetings of national experts and relevant standards working groups; usually held at BSI (Chiswick) and VdTUV (Berlin). Support and participate at such meetings on six occasions.

5.3.3 The UN ECE Joint Meeting Informal Working Group on the inspection and certification of tanks (normally held in London or by exception elsewhere at a mutually convenient location for the Contracting Parties of the European agreement on the ADR) or the UN ECE Joint Meeting Working Group on tanks (normally held in Geneva in September and Bern in March). Support and participate at such meetings on three occasions.

6. THE REQUIREMENT

6.1 The Supplier will undertake the further work to develop the eddy current testing method as a suitable non-destructive testing technique to detect defects in aluminium tanker welds. Where appropriate, proposals are to be suggested to improve the quality of inspections, either by way of national guidance, a technical code or a new EN standard.

6.2 The Supplier may be required to present their findings at domestic and international meetings (see key milestones) and a final report will be required which encompasses the results of the research and if appropriate, text proposals for national guidance, a technical code or a new EN standard.

7. KEY MILESTONES

7.1 The milestones outlined below are synchronised with the deliverables required for the project and the dates of key meetings at which the research will be disseminated.

7.2 The Potential Providers should note the following project milestones that the Authority will measure the quality of delivery against, however there will be scope to propose alternative dates and milestones:

Milestone	Description	Timeframe
WP002/01	Presentation on review of feasibility of the eddy current inspection method as a non-destructive testing technique for aluminium tanker welds. (See 5.1.1)	Delivery within 4 weeks of contract award
WP002/02	Presentation on eddy current models, optimal probe parameters and best probe size and configuration (See 5.1.2)	Deliver by Feb 2019
WP002/03	Presentation on additional information from the impedance plane using either a wider range of known reference notches or validated eddy current models (See 5.1.3)	Deliver by May 2019
WP002/04	Presentation on the sectioning of scanned areas of weld samples to validate the eddy current information and determine the capabilities of the technique (See 5.1.4)	Deliver by August 2019

WP002/05	Draft text proposals for national guidance, technical code(s) or new EN standards (if/as appropriate).	Deliver by September 2019
WP002/06	Support DGD at the meetings specified in section 19 in disseminating and taking forward the research findings.	Deliver by Sep-Oct 2019
WP002/07	Presentation on initial feedback from field trials.	Deliver by Jan 2020
WP002/08	Support DGD at meetings specified in section 19 in disseminating and taking forward the research findings.	Deliver by Sept-Oct 2019
WP002/09	Presentation on the final feedback from field trials.	Deliver by May 2020
WP002/10	Delivery of draft WP2 report	Deliver by June 2020
WP002/11	Support DGD at the meetings specified in section 19 in disseminating and taking forward the research findings.	Deliver by Sep-Oct 2020
WP002/12	Delivery of final report.	Deliver by Dec 2020

8. AUTHORITY'S RESPONSIBILITIES

8.1 The Authority is responsible for providing all necessary start up information to allow the Supplier to commence the activities set out in sections 5 and 6 above. The supplier will be given access to the previous work and any available related research that is deemed necessary.

9. REPORTING

9.1 The Supplier shall submit a monthly report to the DfT project officer providing an update on progress of the deliverables and the status of any issues identified. It is anticipated that this report shall be in the form of an email and include a single internal document, updated each month, summarising key points of the research.

9.2 Quarterly project meetings will be arranged at either the Suppliers site (if appropriate) at any other site(s) where the research may be conducted or at GMH. These will be arranged at mutually convenient times once the contract is in place.

10. CONTINUOUS IMPROVEMENT

10.1 Changes to the way in which the Services are to be delivered must be brought to the Authority's attention and agreed prior to any changes being implemented.

11. SUSTAINABILITY

11.1 Potential Providers should be mindful during their submissions of the Department's priority to deliver safe, secure and sustainable travel. The submissions should detail any specific impacts on the sustainability of the transport of dangerous goods that are to be considered as part of this research.

12. QUALITY

12.1 The Potential Provider is required to be certified to operate an ISO 9001 accredited management system. Certification to other management systems such as health and safety and/or environment are desirable and should be referenced in the submission.

13. FINANCIAL ASPECTS

13.1 Please include a cost profile showing the anticipated expenditure for each deliverable (set out in the milestones in section 7.2 of this document) in your proposal along with overall cost. The final invoice should be at least 10% of the full cost of the contract and prices should be inclusive of all expenses and exclusive of VAT. Any Prices shall remain firm until the end of the contract.

13.2 Travel and accommodation costs shall be booked by the supplier. The cost for all travel and accommodation will be included in the contract value and shall not exceed civil service staff rates without prior agreement from the project officer. Guidance on the applicable rates will be provided by the project officer.

Prices are to be submitted on the Price Schedule document via the AWARD e-portal separately from the quality evaluation and should exclude VAT.

14. STAFF AND CUSTOMER SERVICE

14.1 The work should be undertaken by a reputable independent body with skills, knowledge and experience in the quality of welded repairs, and non-destructive testing and inspection of welds on road fuel tankers. The Supplier should have strong international presence in the standards making community and sufficient strength and depth to ensure appropriate representation at meetings of the relevant standards working groups.

14.2 The Supplier will work with the Authority both in and outside discussions with members of the working groups, presenting the work as however may be appropriate to both the standards and legislative bodies. The skills and experience of those who are to undertake the work may be demonstrated by referencing publications, conference presentations, professional qualifications and descriptions of previous projects or case studies.

14.3 The Department considers the essential skills and experience required of those who are assigned to the contract are as follows:

14.3.1 Competence with welding methods, weld acceptance criteria and non-destructive testing methods particularly in aluminium.

14.3.2 Understanding of standard design, structural strength and fatigue calculations for tankers and pressure equipment in the transport industry.

14.3.3 Good inter-person skills and a tactful and diplomatic approach

14.4 The Department considers the desirable skills and experience required of those who are assigned to the contract are as follows:

14.4.1 Experience in deformation, mechanical properties and damage mechanisms of metallic materials, in particular aluminium alloys.

14.4.2 Experience in project participation, national and international cooperation (in particular on codes and standards) and quality management.

14.4.3 Experience of working in a technical capacity with the Department for Transport and / or an agency such as Highways England.

15. SERVICE LEVELS AND PERFORMANCE

15.1 The Authority will measure the quality of the Potential Provider's delivery by:

15.1.1 Delivery of proposals, presentations and reports as detailed in the Milestones section, see section 6 above.

KPI/ SLA	Service Area	KPI/SLA description	Target
#1	Delivery timescales and quality requirements for deliverables WP002/01,02,03,04, 05,07,09,10,12	The presentations, proposals and reports set out in the milestones table in section 7.2	Delivery to the dates and quality requirements set out in section 5.1 and the milestones table in section 7.2
#2	Delivery timescales and quality requirements for deliverables WP002/06,08,11,12	Support DGD at the meetings set out in the milestones table in section 7.2	Delivery to the dates and quality requirements set out in section 5.1 and the milestones table in section 7.2

16. SECURITY REQUIREMENTS

16.1 The work undertaken is at official level and therefore no specific security requirements are necessary.

16.2 "Official" level work is classified by the Department as including routine business operations and services, some of which could have damaging consequences if lost, stolen or published in the media, but are not subject to a heightened threat profile.

17. INTELLECTUAL PROPERTY RIGHTS (IPR)

17.1 The Department for Transport will own all Intellectual Property Rights (IPR) generated during performance of the contract. Potential Providers shall clearly state in their submission any relevant IPR generated before the contract is agreed that is to remain the property of the current owner.

18. PAYMENT

18.1 Payment can only be made following satisfactory delivery of pre-agreed products and deliverables.

18.2 Before payment can be considered, each invoice must include a detailed breakdown of work completed and the associated costs. Where reimbursement for any travel, accommodation and or subsistence is being claimed, invoices or similar evidence must be provided.

18.3 To ensure prompt payment, a draft copy of invoice must be provided to the Project Officer for clearance before the final invoice is submitted.

18.4 Once agreed with the project officer, the final invoice shall be sent, within 10 days of the end of the month to the period which the claim relates, to: Shared Service Centre, Accounts Payable Team, Sandringham Park, Swansea Vale, Swansea, SA7 0EA.

19. ADDITIONAL INFORMATION

19.1 The Supplier responsible for the work required will need to be able to participate as appropriate in the following domestic and international meetings:

19.1.1 Meetings with domestic stakeholders responsible for testing and inspection (normally held in a mutually convenient location in the UK),

19.1.2 Meetings of national experts and of the relevant standards working groups (normally held at BSI),

19.1.3 The UN ECE Joint Meeting Informal Working Group on the inspection and certification of tanks (normally held in London or by exception elsewhere at a mutually convenient location for the Contracting Parties of the European agreement on the carriage of dangerous goods by road),

19.1.4 The UN ECE Joint Meeting of the RID/ADR Committee of Experts,

19.1.5 The Working Group on tanks (normally held in Geneva in September and Bern in March beside the UN ECE Joint Meeting of the RID/ADR Committee of Experts), and

19.1.6 The Working Party on the Transport of Dangerous Goods.

19.1.7 One member of staff will be required to attend the meetings. They will last 2 to 3 days, however the Supplier may not be required to attend the entire meeting.

19.1.8 Travel and accommodation costs shall be booked by the supplier. The cost for all travel and accommodation will be included in the contract value and shall not exceed civil service staff rates without prior agreement from the project officer. Guidance on the applicable rates will be provided by the project officer.

20. LOCATION

20.1 The Supplier responsible for the work needs to be able to travel to meetings which may be held in Great Minster House, 33 Horseferry Road, London, SW1P 4DR or at the base of the Supplier.