Contract

Contract for the Supply and Installation of an Aqueous Mechanical and Corrosion Testing Loop with in-situ Irradiation Capability to the University of Birmingham

UNIVERSITY OF BIRMINGHAM

F03: Contract award notice
Notice identifier: 2022/S 000-011378
Procurement identifier (OCID): ocds-h6vhtk-030041
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Section I: Contracting authority

I.1) Name and addresses

UNIVERSITY OF BIRMINGHAM

Chancellors Close

BIRMINGHAM

B152TT

Contact

Susanna Ting

Email

s.y.ting@bham.ac.uk

Country

United Kingdom

Region code

UKG31 - Birmingham

Internet address(es)

Main address

www.birmingham.ac.uk/index.aspx

I.4) Type of the contracting authority

Body governed by public law

I.5) Main activity

Education

Section II: Object

II.1) Scope of the procurement

II.1.1) Title

Contract for the Supply and Installation of an Aqueous Mechanical and Corrosion Testing Loop with in-situ Irradiation Capability to the University of Birmingham

Reference number

SC9516/21

II.1.2) Main CPV code

- 38970000 - Research, testing and scientific technical simulator

II.1.3) Type of contract

Supplies

II.1.4) Short description

The University of Birmingham invites tenders for supply of An Aqueous Mechanical and Corrosion Testing Loop with in-situ Irradiation Capability. The University operates an MC40 Cyclotron and a neutron beam facility is currently being built. The MC40 Cyclotron can produce the proton beam energies in the range of 3~38 MeV.

To support the nuclear research in the UK, the University has been awarded a project by EPSRC to develop a system which will enable the mechanical testing of materials under aqueous environment relevant to the current and future nuclear reactor applications, and with the capability of in-situ irradiation.

In summary, the aqueous system needs to enable the stress corrosion cracking experiments in the normal PWR conditions and also super-critical water conditions, with and without proton and/or neutron irradiation.

II.1.6) Information about lots

This contract is divided into lots: No

II.1.7) Total value of the procurement (excluding VAT)

Value excluding VAT: £458,880.62

II.2) Description

II.2.3) Place of performance

NUTS codes

- UKG31 - Birmingham

II.2.4) Description of the procurement

Specification:

8(A) specifications of the aqueous system:

1. A hydrogen (& its isotopes) injecting, monitoring and control system that enables the control of dissolved hydrogen in aqueous-based coolant (up to a minimum of 2000 cc/kg) and monitoring in the coolant up to maximum pressure, temperature, and flow rate is requested.

The hydrogen injection rate should be able to control and increase up to 5 bar equivalent of injection rate. The control should be as precise as possible. Please provide the information of the achievable injection precision.

Please provide, as options, the cost for the monitoring systems that based on DH sensor and conductivity. The monitoring system should be able to monitor the DH continuously.

2. Confirm that the pressure range of the feed tank provided, which should enable the system to operate at both PWR and SCW conditions.

3. An oxygen injection, monitoring and control system is requested that enables the control of dissolved oxygen in aqueous-based coolant and monitoring in the coolant up to maximum pressure, temperature, and flow rate.

The oxygen injection rate should be able to control and increase up to 5 bar equivalent of injection rate and the control should be as precise as possible. Please provide the achievable injection precision.

Please provide, as options, the cost for the monitoring systems that based on DO sensor and electrochemical based. The monitoring system should be able to monitor the DO continuously.

4. Aqueous coolant chemistry measuring, and monitoring system should be suitable for continuous tests.

The system should take advantage of the chemical addition to the pump operation using at least the conductivity, pH and other measurements.

5. pH monitoring system should be included in the test loop. It is preferred to be able to measure the pH values before and after the autoclave.

6. A conductivity monitoring system is essential.

It is preferred to have the sensor located opposite the proton beam tube and adjustable. The sensor insert-able depth should be adjustable. The maximum insert depth should be 10 ?m from the centre axis of the load cell.

7. A DPCD crack growth monitoring system is essential. This system should be able to communicate with the loading system. The loading device software should be able to continuously read the DCPD data. The crack growth monitoring system should be able to measure continuously until a limit is reach.

8. The system should be able to operate in the temperature range of 250°C~ 650°C, and the pressure up to 30 MPa.

9. The mass flow rate in the system should allow testing up to 15 kg/hr.

10. Two load cell designs should be provided that optimise for testing different sample dimensions for up to (1) a maximum 5kN load and (2) a maximum of 25kN load testing.

It is desirable that the load cell could enable ASTM A370 test types and strain rate to ISO

6892-1 and ASTM E8.

The design of the sample mounting system between load cell and samples should be common mounting design as per ASTM A370; Including the tread-based design is preferred.

11. It is highly desirable that the sample mounting system should allow different sample geometries, with one typical geometry being thin flat sample of no more than 2mm thick, less than 10mm wide, less than 20mm gauge length.

It is desirable that the system can test SSJ type tensile sample, tube based.

12. The proton beam tube insert-able depth should be adjustable. The proton tube (and ideally its window) should be able to reach 10 ?m from the centre axis of the load frame.

The tube window should be as thin as possible but able to sustain the maximum pressure, temperature and mass flow rate of the autoclave that listed above. It is preferred to the window made from light materials, e.g. with atomic number

It is highly desirable that the distance of the proton beam tube window and the test sample can be measured.

Dimensions of the window should be designed such that it is as thin as possible yet provide sufficient strength to sustain the pressure applied, with the effective area of at least of 20 mm2.

As the tube window will be subjected to irradiation and deteriorate with time, it is essential the window or the tube itself as a whole needs to be replaceable.

Supplier is also requested to provide the cost per tube should the purchaser requesting more than one proton beam tube during the purchase.

Supplier is requested to provide the complete design drawings of tube, window, adjustment and replacement mechanisms, for evaluation.

13. Please specify the supplies required to maintain the operation of the system.

14. It is highly desirable that the connection between test loop and autoclave should be common design that can be replaced with off-the-shelf units.

8(B)

The supplier is also requested to respond to the following as an optional upgrade to the aqueous system requested in Section 8(A), in order to perform tests for gas coolants.

Price for this section should be listed separately as an optional upgrade to the basic system detailed in Section 8(A) above.

1. To operate using gas as coolant instead of water. Gases should be used are carbon dioxide, nitrogen and helium. Please specify if other gases can also be used.

2. Ability to operate at temperature up to 650°C for carbon dioxide and nitrogen. for helium, it should be able to operate at temperature up to 500°C is desirable.

Please specify as optional the additional cost required if would like to test temperature up to 650°C with Helium as coolant. Note that pressure and flow rate can be sacrifice-able parameters in achieving higher testing temperature; Please specify the lowest achievable pressure and flow rate when operate at 650°C.

3. Confirm if it is feasible to heat up sample locally. Specify the cost, as an option and the heating mechanism recommended.

4. Ability to test at pressure up to 35MPa when running the following coolants, i.e. Carbon dioxide, and Nitrogen, while operating at temperature of 650°C and flow rate of 5kg/hr. For helium, the minimum pressure is 10MPa while operating at temperature of 500°C.

Please specify the highest pressure can be achieved without much re-engineering or significant additional cost to upgrade the pump; Please specify as optional the

additional cost required to push for higher pressure at operating temperature of 500°C.

5. Able to operate and monitor within the maximum temperature and pressure range listed above for carbon dioxide, nitrogen and helium.

6. Ability to apply static and dynamic stress during the corrosion test; stress up to 25kN;

7. Ability to programme the frequency of the dynamic stress testing.

Please specify the highest frequency can be achieved and the type of cyclic profile can be programmed.

8. Ability to change and monitor mass flow rate before the autoclave.

Minimum mass flow rate for:

Carbon dioxide: 5 kg/hr

Helium: 1kg/hr

Please specify the maximum stable mass flow rate achievable for gas coolant mentioned above, i.e. for carbon diaoxide and nitrogen, it will be at temperature of 650°C and 35MPa; for Helium, it will be the stable mass flow rate achievable at 500°C and 10MPa)

Please specify as optional the additional cost required for higher achievable flow rate for

(1) Carbon Dioxide and Nitrogen at 650°C and 35MPa

(2) Helium at 500°C and 10MPa

9. Ability to inject up to a minimum of 3 other 'alien' gases, especially hydrogen or deuterium, in the test loop during experiment when coolants are either aqueous or gas.

Please specify the precision of the control achievable in ppm, and the controllable range of the injection rate.

10. Ability to monitor chemistry of the coolant, i.e. aqueous or gas.

Please provide the list of chemical elements/compounds can be monitored in each type of coolant, i.e. aqueous or gas. Hydrogen and deuterium are the type of element preferred to be detected. This is essential and can be optional for future upgrade - but the design should enable easy upgrade in the future.

Please list it as optional item and provide cost for this upgrade.

11. Ability to maintain small amount of alien gases, especially hydrogen or deuterium, in the test loop during experiment when coolants are either aqueous or gas. Essential and can be optional for future upgrade - but the design should enable easy upgrade in the future.

Please list it as optional item and provide cost for this upgrade.

12. Ability to extract/ bleed gas coolant to be analysed by mass spectrometer before and after the autoclave (mass spectrometer as an option to be added by the purchaser). It is important to note that the coolant should 'bleed' into a low-pressure line or expansion chamber for safe mass spectrometer operation, i.e. 1 atm. The mass spectrometer will be provided by a separate company. This is essential and can be optional for future upgrade - but the design should enable easy upgrade in the future. Please list it as optional item and provide cost for this upgrade.

13. Coolant must be able to recirculate; i.e. 1 recirculating tank for the operating gas-based coolant.

14. Ability to have the option to bleed the coolant instead of recirculating; I.e. to allow non-

recirculating experiment. Essential; can be optional for future upgrade - but the design should enable easy upgrade in the future

Please list it as optional item and provide cost for this upgrade.

Please provide cost for a mean to collect the coolant after a single pass through the autoclave for coolant chemistry analysis

15. Safety - pressure relief to a tank that can be used for aqueous or gas.

16. Ability to filter coolant right after autoclave, before recirculating back to the loop. (if can operate safely; as future upgrade?). This is essential and can be optional for future upgrade - but the design should enable easy upgrade in the future.

Please list it as optional item and provide cost for this upgrade

II.2.5) Award criteria

Quality criterion - Name: Compliance to the Specifications / Weighting: 40

Quality criterion - Name: After Sales and Technical back up / Weighting: 10

Quality criterion - Name: Delivery and Training / Weighting: 10

Quality criterion - Name: Sustainability and Environmental / Weighting: 5

Quality criterion - Name: Standard Supplier Questionnaire (SQ) / Weighting: 10

Price - Weighting: 25

II.2.11) Information about options

Options: No

Section IV. Procedure

IV.1) Description

IV.1.1) Type of procedure

Open procedure

IV.1.8) Information about the Government Procurement Agreement (GPA)

The procurement is covered by the Government Procurement Agreement: Yes

IV.2) Administrative information

IV.2.1) Previous publication concerning this procedure

Notice number: 2021/S 000-030922

Section V. Award of contract

A contract/lot is awarded: Yes

V.2) Award of contract

V.2.1) Date of conclusion of the contract

11 April 2022

V.2.2) Information about tenders

Number of tenders received: 1

The contract has been awarded to a group of economic operators: No

V.2.3) Name and address of the contractor

Cormet Oy

Vantaa

Country

Finland

NUTS code

- FI1B - Helsinki-Uusimaa

The contractor is an SME

Yes

V.2.4) Information on value of contract/lot (excluding VAT)

Initial estimated total value of the contract/lot: £458,880.62

Total value of the contract/lot: £458,880.62

Section VI. Complementary information

VI.4) Procedures for review

VI.4.1) Review body

University of Birmingham

Birmingham

B15 2TT

Email

s.y.ting@bham.ac.uk

Country

United Kingdom