

Design and manufacturing of the drying system condenser, plate and shell or diffusion bonded heat exchanger, ESPN N3 classified

Call for Nomination

Purpose

The purpose of this Contract is to design and manufacture a compact heat exchanger which will be used as condenser for the drying system.

The DYS Condenser condenses water vapor from a nitrogen gas stream before sending condensate to drain tanks. It is either is a horizontal shell-and-plate heat exchanger or alternatively a horizontal plate diffusion bonded heat exchanger.

The heat exchanger shall be compliant with the French Order dated 30 December 2015 on Nuclear Pressure Equipment (ESPN) and the 2014/068 EU directive. The drying condenser named 26DY00-CS-1001 is classified as an ESPN equipment level N3.

The ITER Organization will act as Equipment Manufacturer as it pertains to the ESPN, which is the legal entity which assumes responsibility for the design, manufacture and inspection of a product to be marketed under its name as an item of pressure equipment, nuclear pressure equipment, or a nuclear pressure assembly. ITER will liaise with the Agreed Notified Body for the ESPN compliance assessment.

The supplier will be responsible of drafting the Nuclear Pressure Equipment (ESPN) and the 2014/068 EU directive required documentation, such as hazards and risk analysis, design notes and drawings, design notes justifying correct equipment behaviour for each possibility of damage from the different cases of load combinations, instruction manual as well as any other document that can be used to show compliance to the essential safety requirements.

The design parameters of the heat exchanger are the following:

| Parameter | Process fluid (in/out) | Cooling fluid (in/out) |
|------------------------------|-----------------------------------|-----------------------------------|
| Fluid type | Humid nitrogen (**) | Demineralized water |
| Rated Flow rate, kg/s | 17.2 | 28 |
| Rated Temperature, °C | 115.7/38 | 31/45.6 |
| Rated Pressure, MPa | 1.46/— | 0.8/— |
| Allowable pressure loss, kPa | Less than 70 kPa | Less than 100 kPa |
| Fouling, m ² K/W | To be established by supplier (*) | To be established by supplier (*) |
| Heat exchanged, MW | 1.7 | |
| Design pressure, MPa | 5.0 | 5.0 |
| Design temperature, °C | 270 | 90 |

(*) The DYS Condenser shall be designed for an operating life of 20 years at the conditions specified in the technical specification without cleaning

(**) The maximum condensation flow rate is 0.5157 kg/s

The main nozzles are the following:

| Nozzles | | |
|--------------------------------|-----------|----------------------|
| <i>Service</i> | <i>ID</i> | <i>DN / Schedule</i> |
| Humid Nitrogen Inlet | N1 | 250 / 80S |
| Humid Nitrogen Outlet | N2 | 250 / 80S |
| Cooling Supply | N3 | 80 / 80S |
| Cooling Return | N4 | 80 / 80S |
| Cooling Side Relief Header (*) | N6 | 25 / 40S |
| Condensates Drain | N8 | 50 / 40S |
| Cooling Side Drain Header (*) | N10 | 25 / 40S |
| Cooling Side Vent Header (*) | N12 | 25 / 40S |

(*) Alternatively these nozzles can be located on the connection piping

Background

The Tokamak Cooling Water System (TCWS) is the primary coolant system of ITER machine having the aim to remove the power generated by the plasma and transferred to dedicated components of the machine and to release it to the secondary coolant system.

The TCWS is based on three Primary Heat Transfer Systems (PHTSs): VV PHTS for cooling the Vacuum Vessel, IBED PHTS for cooling the in-vessel components and NBI PHTS for cooling the Neutral Beam Injectors.

The TCWS includes auxiliary systems as the Chemical and Volume Control System (CVCS), Draining and Refilling System (DRS), and Drying System (DYS).

The TCWS is designed to reject all the heat generated in the plasma and transmitted to the in-vessel components to the intermediate closed loop CCWS-1 (Component Cooling Water System 1) and then to the environment via the HRS (Heat Rejection System). TCWS release heat also to the Chilled Water System (CHWS).

In the ITER Plant Breakdown Structure (PBS), the Cooling Water System consisting of TCWS, CCWS, CHWS and HRS, is represented by the PBS 26. The level 2 and 3 of PBS 26 and the sub-systems belonging to TCWS are reported in Table 2.1.

The Drying System (DYS) provides removal of water from TCWS that cannot be gravity drained and gas baking of divertor cassettes. The DYS should be (a) capable to dry the in-vessel components of the client systems in preparation for periodic leak testing, maintenance or component replacement; (b) able to blow-out (where required) and dry IBED PHTS and VV PHTS loops to meet operational requirements; (c) able to provide hot nitrogen for gas baking of the divertor cassettes; (d) capable to provide the primary confinement for small amounts of ACP and tritium during drying operations.

The DYS Condenser condenses water vapor present in nitrogen gas before sending condensate to drain tanks. It is either is a horizontal shell-and-plate heat exchanger or a horizontal plate diffusion bonded heat exchanger.

Scope of work

The contract will include design, fabrication, inspection, examination, testing, certification, packaging, and shipping of the drying condenser 26DY00-CS-1001.

Timetable

The tentative timetable is as follows:

| | | |
|------------------------|----------|------|
| Tender submission | May | 2019 |
| Contract placement | October | 2019 |
| Completion of Contract | December | 2021 |

Experience

The contractor and its personnel shall have adequate experience in manufacturing of compact heat exchangers in compliance with the 2014/068 EU directive and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV) Section VIII, Division 2—2015 Edition or equivalent codes.

Candidature

Participation is open to all legal persons participating either individually or in a grouping (consortium) which is established in an ITER Member State. A legal person cannot participate individually or as a consortium partner in more than one application or tender. A consortium may be a permanent, legally-established grouping or a grouping, which has been constituted informally for a specific tender procedure. All members of a consortium (i.e. the leader and all other members) are jointly and severally liable to the ITER Organization.

The consortium groupings shall be presented at the pre-qualification stage. The tenderer's composition cannot be modified without the approval of the ITER Organization after the pre-qualification.

Legal entities belonging to the same legal grouping are allowed to participate separately if they are able to demonstrate independent technical and financial capacities. Candidates (individual or consortium) must comply with the selection criteria. The IO reserves the right to disregard duplicated reference projects and may exclude such legal entities from the pre-qualification procedure.