TECHNICAL SPECIFICATIONS TO BE FOLLOWED IN THE OPEN TENDER PROCEDURE FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF CNC FILAMENT WINDING MACHINE INCLUDING TOWPREG PROCESSING AND AUTOMATED TAPE LAYING HEAD.

1. PURPOSE OF THE CONTRACT

The purpose of this document is to define the technical conditions that must govern the supply, installation and commissioning of a working cell to produce composite cylinders or tanks combining filament winding (FW) technology with automated tape laying (ATP) technology.

The equipment would be suitable for wet and towpreg winding processes, as well as tape placement of thermoset UD slit prepreg tapes.

Also, it will be the object of the contract, without any additional cost:

- The after sales support, two years, from the reception of the equipment. Such after sales support shall include, in addition to the work to be carried out, the costs of labour force and displacement, in their entirety.
- Fundación Cidetec technical staff training.

The CPV code for the contract is the following: 38540000-2 (Machines and equipment's for testing and measurements).

2. SCOPE OF SUPPLY

In addition to the supply, installation and commissioning of the equipment, the scope of supply enclose the after sales support previously detailed.

3. WARRANTY

A warranty period of 2 years is established from the date of reception of the equipment with the agreement of the CIDETEC technical managers. The warranty includes travel, labour, parts and consumables necessary for the repair, as well as the installation of any new software version of the equipment that is developed during the warranty period and the annual preventive maintenance recommended by the manufacturer.

If during the aforementioned warranty period the existence of faults or defects in the goods supplied is demonstrated, CIDETEC will have the right to demand from the contractor the replacement of the defective goods or their repair if that is considered sufficient.

If CIDETEC considers, during the warranty period, that the supplied product is not fit for its intended purpose, as a consequence of the faults or defects observed in it and attributable to the contractor, and there is a presumption that the replacement or repair of the product will not be sufficient to achieve such purpose, it may, before the expiration of said period, request the replacement of the unit with a new one.

4. TECHNICAL REQUIREMENTS

The working cell has to be integrated into a safety zone, and has to include at least these elements:

1. **CNC FW machine basic configuration:**
    a. Number of controlled axes: 8
        i. Robot: 6
        ii. Rotational: 2 (spindle and payout eye)
    b. Spindle:
        i. Number of spindles: 1
        ii. Speed ranges: 0-90 rpm
    c. Mandrel parameters:
        i. Winding diameter: up to 300 mm
        ii. Winding length: up to 1500 mm
        iii. Max Part weight: 180 kg

2. **Fibres tape guiding and winding eye for the wet winding process.**
3. **Winding head and delivery system for towpreg for the dry winding process:**
    a. Minimum fibres for the towpreg winding head: 2 fibres.
    b. Minimum width of the towpreg rolles and delivery system: 6 mm.
4. **Impregnation resin bath**:
    a. Suitable for carbon, glass and/or aramid fibers.
    b. Minimum number of tows: 2
    c. With inner circulation of hot water for heating up to 80ºC.
    d. Resin pick-up adjustment with doctor blade.
    e. Equipped with sensor and alarm signal for low level of the resin.
5. **Fibre creel and tension system:**
    a. For carbon (12K, 24K), glass and aramid fibres for towpregs.
    b. Minimum two spools with individual electronic control of the tension with motor drive system, tension range between 5-50 N/tow.
    c. Bi-directional function of tension system to keep the fibres always under tension.
    d. Unwinding motor drive system on every spool.
    e. Spool diameter sensor.
    f. Broken fibre detection
6. **FW programming:**
    a. Software package for editing, creating and simulating the winding programs.
    b. Two free of charge product lifetime licenses.
    c. Exports data for FEA Analysis packages.
    d. Software features:
        i. Winding path and pattern simulation.
        ii. Collision detection and warnings.
        iii. Burst pressure calculator for pressure vessels.
        iv. Volume calculator according to the mandrel dimensions.
7. **Single tape automated tape laying head for thermosets (ATL)**
    a. For a minimum of one carbon or glass fibre UD prepreg tape.
    b. Areal weight of the prepreg tape: 150-300 g/m2.
    c. Width of prepreg slit tape: 12.7 mm.
    d. Lay-up of 2D or mild 3D forms appropriate for the tape width.
    e. Tape placement capability for prepreg tape with or without release foil.
    f. Compaction system:
        i. Minimum force: 200 N

ii. Pressure obtained with pneumatic cylinders with continuous control of the pressure.

g. Prepreg spool creel:
   i. Slit tape with parallel winding with or without release foil.
   ii. Tension range: 4-8 N/tow.
   iii. Spool diameter sensor.

h. Heating system:
   i. Minimum power: 400 W
   ii. Infrared IR heating system.
   iii. Heating power programmable based on the actual lay-up speed.

i. Location of the tooling using ball measuring probe.

8. ATL programming

a. Software package for offline programming, analysis and simulation of layers.
b. One seat floating product lifetime license.
c. Software features:
   i. Capability to import typical composite design modulus.
   ii. Capability to import/export standard formats.
   iii. Capability to export layup geometry for FEA/FEM analysis.
   iv. Post processor including definition and generation of the machine path and NC code for a particular machine movement.
   v. Simulation: visualization of the complete kinematic movement for each ply separately or for the entire NCE code and generation of detailed collision report.

9. Stands for the two heads (FW head and ATL head), including programming and calibration.

10. Control system:

a. CNC- computer control system for FW and ATL.
b. Control cabinet with HMI display and keyboard with trackpad.
c. Industrial PC, Windows platform.

11. Quality control and management system for data acquisition and management of important parameters.

12. Power supply 220V or 380V 50 Hz

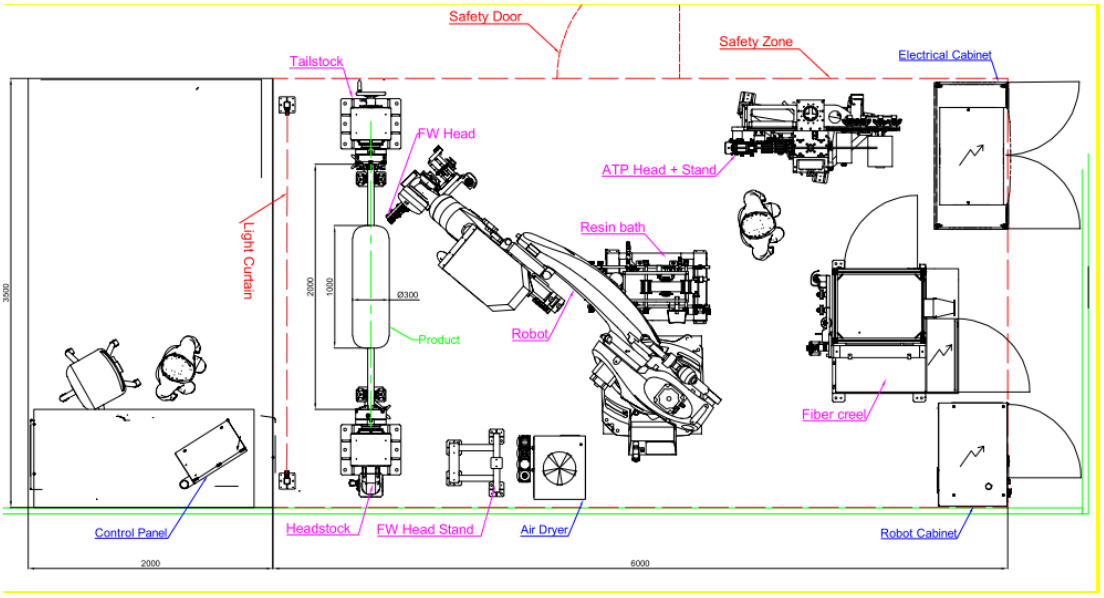
13. Air pressure: 6 bar.

14. Maximum dimensions of safety cell: W3800× L6500 × H 2000mm (smaller

better). These dimensions do not include operator control room.

15. **Machine colour: To be determined.**
16. **All accessories and components will be first brands with technical support in Spain.**
17. **Documentation: It will be necessary one copy in paper format in Spanish, and another in electronic form.**
18. **The equipment must have CE marking.**

Attached possible concept distribution proposal.



5. TRANSPORTATION, INSTALLATION AND TRAINING

The packing, transport, commissioning of the equipment supplied will be the responsibility of the successful bidder and will not involve any additional costs whatsoever.

The successful bidder will provide the necessary training with qualified personnel of the company that guarantees that the staff of FUNDACIÓN CIDETEC will be able to correctly use the acquired equipment.