

Annexure- 1

INSULATION AND CHEMICAL SCIENCES LABORATORY (ICH)

TECHNICAL SPECIFICATIONS FOR SUPPLY OF VACUUM AND TEMPERATURE CONTROLLED EPOXY RESIN MIXING CHAMBER

RMS

The resin-hardener mixing system shall comprise of a cylindrical tank of suitable dimension to accommodate 100 kgs. of resin-hardener mix. It shall be capable of mixing minimum 50 kgs of resin hardener mix. The RMS shall have separate control and monitoring for heating, pressure, mixing and vacuum.

The details of the Vacuum and Temperature Controlled Epoxy Resin Mixing Chamber required below:

Sl. No.	Parameter	Description
1.0	Resin Hardener Mixing System (RMS)	
1.1	Description	Cylindrical Chamber with disc shaped top and bottom.
1.2	Capacity	Container capacity: 100 kg of viscous resin hardener mix Mixing capacity: 50 kg of viscous resin hardener mix
1.3	Mixing system	Motorized controllable mixing arrangement with wide range of RPM to be provided. Thin film degassing mixing methodology to be incorporated for effective mixing of the viscous mix. Speed control of mixing drive for viscous resin hardener mix: Individually adjustable speed control of mixing drive for viscous resin hardener mix via frequency converter, including hard and software to change set values at the monitor. 10 step Speed control system to be provided.
1.4	Heating system	a) Temperature: RMS chamber heating shall comprise of heating by oil through double wall from ambient temperature to 120 degree C.
		b) Regulation: + / - 2 Degree C of the set value.
		c) Heating up time:

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		The RMS shall reach and maintain a steady temperature level of 120 Degree C from ambient temperature in a time interval of 1.0 hour or less.
		d) Cooling time: The RMS shall reach the ambient temperature from set value of 120 Degree C by natural cooling.
		e) The arrangement shall comprise of oil circulating pump of high feed capacity, oil inlet and outlet with suitable valve mechanism, suitable heater mechanism, thermostatic temperature control, over temperature protection, pressure and temperature indicators, over temperature safety mechanism, diaphragm expansion vessel and other essential system/subsystem required for smooth and precise operation of the heating system.
1.5	Vacuum & Pressurisation System	a) Vacuum levels: 0 – 10 mbar atmospheric pressure.
		b) The vacuum system shall comprise of Rotary Vacuum Pump with gas ballast device with suction speed of 40 m ³ /h or better, vapour trap, exhaust filter, anti-suction devices, filler with activated carbon to protect the vacuum pump
		c) Pressurization system: The RMS shall comprise of suitable inlets and valve mechanism to allow pressurization of air/ inert gas inside the chamber at an atmospheric pressure of 7 bar.
		d) Indication: Suitable mechanism and arrangement shall be made to precisely measure and display the following: a. Set value and actual Vacuum pressure inside the chamber b. Set value and actual temperature inside the chamber c. Set value and actual air / inert gas pressure inside the chamber d. Level of resin – hardener mix inside the chamber. The output of the level indicator switch shall display in the MIMIC diagram of the display monitor.

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		e) View glass: Viewing glass with appropriate illumination shall be provided at the top of the chamber for viewing of material inside the chamber.
2.0	Control System:	a) The control cabinet shall have PLC of reputed make like Siemens / GE Fanuc / ABB / Allen Bradley / Mitshubishi / Modicon / Delta / Schneider etc. for programming and control as per user defined algorithm, HMI, suitable software for communication and easy control. b) The cabinet shall also house contactors, SSRs, switches, fuses, regulators etc. required for data acquisition, monitoring, control and display. c) Program for cyclic operation of the resin- hardener impregnation facility shall be provided. d) In case of parameters reaching the desired set values acknowledgeable audio alarms shall be initiated. e) Whenever the system is switched on, automatic health check to be started. Only when the system is Ok and acknowledged by the user the system shall be ready for further operations.
3.0	Protection System:	a) RMS shall have separate and independent data acquisition, monitoring, display, and control system. b) Control cabinet of RMS system shall be of IP 43 standard or better. c) The heating elements of RMS system shall be suitably insulated to avoid any thermal loss or ELCB. d) All mountings of RMS system shall be vacuum leak proof, suitable reinforcement must be incorporated to avoid any vacuum loss. e) The metallic body, cabinets, mountings, accessories shall be suitably grounded as per the applicable standards. f) Protection to avoid any sort of earth fault, phase fault, over / under voltage, over / under current, etc. shall be provided. g) In case of any malfunction, tripping of fuses, opening of doors, fault condition etc. suitable audio-visual alarm shall be provided and the same shall reflect in the HMI display.

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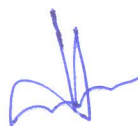
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		h) Emergency stop switch shall be provided for each system.
4.0	PLC & HMI	a) PLC and HMI of reputed make shall be provided along with the system.
		b) The software activation key, passwords, version, warranty details etc. shall be provided by the supplier.
		c) Soft copy of program / ladder logic and instructions required for complete understanding and modification of program if required.
5.0	Documentation	The vendors shall submit the following documents at the time of delivery of the system at BHEL R & D.
		a) Detailed electrical wiring diagram with proper labelling and traceability (wire ferrule system)– 02 copies
		b) Detailed Schematic diagram of RMS systems – 02 copies
		c) Operation manual of RMS system – 02 copies. The operation manual shall comprise all the essential and necessary precaution to be taken at the time of operation of the systems.
		d) Detailed trouble shooting guide to detect, locate and solve any fault or fault conditions during operation of the two systems. – 02 copies
		e) Detailed Bill Of Material (BOM) of the items used in the two system which shall include details like – make, serial number, part number, warranty periods, location of the item in the two systems etc. – 02 copies
		f) Detailed list of essential spares supplied along with the system. – 02 copies
		g) Detailed list of spares to be maintained for un-interruptible operation of the facility, which shall include item name, item description, make, part number, serial number, quantities to maintain at spare etc.
		h) Soft copy of all the above documents shall be provided in CD (02 nos.) / Pen-drive
6.0	General	a) System varnishing: RMS Chamber: Light Grey RAL 7035 - Control Cabinet: Light Grey RAL 7035

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		b) Suitable signage shall be provided for easy identification and traceability of control and power cables. c) Air Compressor for operation / control of pneumatic valves of suitable rating is in the scope of supplier. d) The modification of the existing vacuum chamber shall be carried out at vendor's workplace. BHEL or any of its representatives shall have free access to visit vendor's work place for inspection and access the progress of work. e) All the functional parameters, operation of the systems, protection system, control system etc. shall be verified by BHEL representative at its lab at BHEL R & D, Hyderabad. f) Electrical Input: 3P+1N, 415 V, 50 Hz shall be provided at the site of installation of the system. Suitable cables, earth/ground wires, etc. shall be in the scope of the supplier. g) The offer shall include all accessories required for smooth operation of the systems.
7.0	Erection, Commission and installation	a) The RMS shall be installed at a site in BHEL Corporate R and D as per BHEL requirement and to the satisfaction of BHEL Engineer. b) All industrial safety provisions and precautions to be observed during E & C at BHEL Corporate R & D. c) The equipment or machinery required for Erection / installation like crane etc. shall be in the scope of supplier. d) The E & C shall commence within 7 days of receipt of the items / system at BHEL R & D. A written confirmation via e-mail shall be sent by BHEL in this regard.
8.0	Warranty	Supplier shall provide warranty for 18 months from date of receipt at our stores or 12 months from the date of completion of erection and commissioning whichever is later.

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