

**Scope of work / Major activities to be carried out for Major Overhauling & burner retrofitting of Varnishing plant
(13/B/2005) in Press shop division**

Sl. no.	Description of BHEL Requirement	Remarks- Vendor compliance/Deviations
	The re-conditioning work needs to be done for 13/B/2005 Varnishing plant under PRM division. The function of machine is to Varnish various hydro stator laminations. The Varnishing plant has two zones viz. (i) Pre-heating zone & (ii) Heating zone. These zones are further sub-divided into two areas- heating & cooling. Each area has chain-based conveyor. The function of pre-heating zone is to remove oil-based impurities from lamination surface so that the varnish coat sticks properly on lamination and does not peel-off easily. The temperature of heating area of pre-heating zone is approximately 200-300 degree Celsius. The laminations after passing from cooling area is passed on to varnishing area where CPV coating is done of laminations through varnishing rubber rollers. After varnish coating is applied onto the laminations, the laminations are then transferred to heating area of heating zone. The function of heating zone is to cure the varnish coat on lamination and then transport it to the cooling area for stacking thereafter. The temperature of heating area is maintained continuously at 350-450 degree Celsius. The varnishing plant is being run continuously for 10-12 shifts at a stretch and hence material selection is critical for this application. Each shift is of 8 hours duration. Material to be varnished is 0.5 to 0.65mm thk CRNGO & CRGO hydro stator laminations. CPV varnish is used to varnish hydro stator laminations with coating thickness of 9 to 14 microns.	
	Following are the major activities for overhauling/retro-fitting work-	
	Mechanical Scope of work	
A	Retro-fitting of burner system including solenoid valves, temperature control system with latest design and safety interlocks with automation	
B	Overhauling of Combustion including replacement of insulation, refractory, blowers, ducts, dampers etc.	
C	Major overhauling of oven & ducts including replacement of insulation, cover sheets, strengthening of structure etc.	
D	Removal of non-functional damaged automatic lamination stacking arrangement.	
E	Fabrication of new Varnish storage tank & related piping.	
F	Cleaning of Varnish below Varnishing roller arrangement. Fabrication of new set of mounting brackets arrangement to stop leakage of Varnish from Varnish roller mounting brackets.	
G	Installation & commissioning of calibrated PNG flowmeter and pressure gauge at inlet of Pre-heating & Heating ovens.	
H	Heat resistant paint to be applied on all steel structure and all other components wherever required. Heat resistant paint to be applied only after complete removal of existing paint by sanding/scrapping/grinding.	
I	Restoration of de-burring unit with new feeding conveyor. De-burring machine should satisfactorily de-burr the lamination for burr level below 30 microns.	
J	ELECTRICAL & ELECTRONIC SCOPE OF WORK	
J.1	New operating and control panel for Varnishing plant heating and pre-heating zone for auto & manual operation & to incorporate suitable safety logics in operation.	
J.2	PLC with HMI/MMI for interlocking of following with machine operation- a) Pressure switches for gas & air pressure b) Fuel flow (instantaneous & cumulative consumption) c) Auto & manual operation through HMI & Push buttons on control panel, d) Control dampers opening f) Display of important parameters for operation & fault indication/maintenance g) Hot air blower, combustion blower, exhaust blower on/off indication, h.) flame indication, i.) gas accumulation, j) Temperature indication (all points), h) Temperature vs time graph for heating zone with time stamp, k) air-fuel ratio indication, i) Control valve opening indication	
J.3	Re-routing of electrical cables, cable trays & any other component as required to be done.	
J.4	Installation of new thermocouples & temperature controller for both Heating & pre-heating zone for accurate temperature reading in all the zone including (4 no's in heating oven, 1 no. each at hot air blower outlet & inlet duct, 2 no's thermocouples for varnish temperature)	
J.5	Suitable arrangement for temperature recording for heating/curing zone temperatures with time stamp.	
J.6	Real time temperature feedback from all thermocouples. All temperatures to be suitably displayed on HMI & 1 large display with channel selection to be installed overhead for heating & pre-heating zone.	
J.7	Flowmeter should be such that it displays totalized (cumulative) and instantaneous fuel consumption. Flowmeter should be suitably calibrated with accuracy of +/- 1%. Display on HMI to be provided for the same.	

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K	Safety Arrangements	
K.1	Machine should have adequate and reliable safety interlocks / devices to avoid damage to the machine, workpiece and the operator due to the malfunctioning or mistakes. Machine functions should be continuously monitored and alarm / warning indications through lights/alarm and messages (with device identification) on HMI/MMI display and panels should be available.	
K.2	<u>Combustion flue gases at chimney outlet should be compliant with latest CPCB & MPPCB norms. Arrangement for treatment of VOCs, NOx etc. to be incorporated suitably by supplier</u>	
L	GENERAL	
L.1	The machine structure has to be re-painted with 2 coats of high temperature resistant Silver paint . Before re-painting the old paint peels, dust etc shall be scrapped off completely.	
L.2	ALL installation, erection & commissioning work to be done at BHEL-BHOPAL ONLY. Machine will not be sent to vendor works for any work whatsoever. Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation / layout drawings. EOT Crane shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	
L.3	<u>Time period for completion of reconditioning work in all respect shall be 4 months from date of WO.</u>	
L.4	Operation , Maintenance & Programming Manuals manual of Machine, Detailed Maintenance manual of machine with all drawings of machine assemblies/sub-assemblies/parts including Electrical, Pneumatic, Coolant, Hydraulic, lubrication circuit diagrams, damper controller and position feedback system. shall be supplied with the machine.	
M	SCOPE OF SUPPLY	
M.1	Refractory bricks for combustion chamber, Ceramic Insulation & cover sheets, Blowers, ducts, solenoid valves, filters, piping, dampers, ducts for heating and pre-heating zone	
M.2	Temperature controller, large temperature display unit, Flowmeters, pressure gauges, thermocouples, instrumentation	
M.3	New rollers (rubber & abrasive), feeding conveyor, motor for de-burring machine of Varnishing plant as per A.18	
M.4	New electrical /electronic control panel with PLC-HMI with Panel AC for cooling for auto & manual operation of pre-heating & heating zone of varnishing plant.	
M.5	All the materials/items/consumables etc. including above which are required for satisfactory operation of Varnishing plant shall be in the scope of contractor.	
M.6	Installation, Commissioned, Drawing & Proving.	
M.7	Set of operation & Maintenance Manuals with Circuit Diagrams.	
M.8	Accessories & Training	
M.9	Training of BHEL Personnel at BHEL-Bhopal.	
N	PERFORMANCE & ACCEPTANCE	
	Successful varnishing of 0.5 to 0.65mm thick hydro- stator laminations with desired coating of 9-14 microns & IR value of class F as per BHEL requirement. The coating thickness and IR value tests will be conducted at BHEL TSD lab.	
O	GUARANTEE	
O.1	The re-conditioned Varnishing plant is to be guaranteed in respect of design, material construction, operation and against any manufacturing defects for a period of 24 months from date of commissioning & acceptance at BHEL.	
O.2	Machine parts like burners, conveyor chains, combustion blowers, hot air blowers, HMI-PLC, control dampers & process instruments like temperature controllers, flowmeters, pressure gauges, thermocouples etc. shall be periodically checked for signs of damage. Hence these are to be comprehensively covered under warranty.	

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