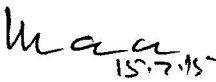




Technical specification for Rubber Injection Moulding Machine


Sl No	Specification	Requirement
1	Purpose	To manufacture Polymer composite Station Post and similar insulators by moulding place technology using the Injection moulding machine with Silicone rubber compound and FRP rods. Refer Annexure – I for GA drawing
2	Description of Operation	The FRP rod on which the metal part is already crimped shall be cleaned and after treating the required surface the component shall be taken up for Injection moulding. The required mould shall be mounted on the machine platen and shall be heated (electrical heating) to achieve requisite temperature. Mould release agent is sprayed on the molding surface and the FRP rod is placed in the mould, the top and bottom halves are closed. The HTV silicone rubber compound is injected into the mould and the sheds are formed. After the pre-set curing time, the component is released from the mould. For lengthy Products injection molding is done by multiple shots.
3.	Scope of Supply	<p>Complete equipment as follows</p> <p>1. Injection molding machine – One number (consisting suitable clamping unit, Hydraulic unit, operation, control unit for CRB, core pullers, clamping , injection unite ejector unit etc with compatibility with the existing Flow control CRB & molds at BHEL)</p> <p>2. Cold Runner Block – One Number (Silicone rubber flow control with machine controls or manual mechanism)</p> <p>3. Molds – Two Numbers (To manufacture all different lengths of the products mentioned in the attached drawings)</p> <p>Mould and Cold runner block as per specification given at 18.0 and 19.0 respectively</p>


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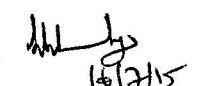

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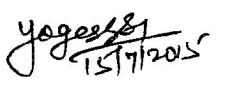

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		<p>Equipment to be supplied along with standard accessories. The list of standard accessories offered shall be provided in Techno-commercial offer Part - A.</p> <p>Detailed technical parameters of the equipment to be quoted are given in clause 13.0 of this specification.</p>
4	Training	Two BHEL engineers are to be trained for acquaintance on operation and maintenance of the equipment at vendors' works during Pre-Dispatch Inspection. Further, training shall be provided to the operators during installation and commissioning at BHEL.
5	Inspection	The equipment shall be inspected in the vendors' works and injection molding as described above is to be demonstrated satisfactorily. The requisite raw material viz., FRP rods crimped with metal parts and silicone compound shall be supplied by BHEL. The Equipment to be dispatched only after final inspection and acceptance by BHEL
6	Utilities Requirement :	Information on requirement of various utilities such as power, compressed air, cooling water, handling facilities such as cranes are to be furnished in the Part - A : Techno-commercial bid.
7	Equipment Layout Plan	Information on the requirements for proper layout plan for installation and commissioning of the equipment and its associated accessories to be suggested by the bidders and the same to be provided in the Part - A : Techno-commercial bid.
8	Manufacturing process Control assistance:	Manufacturer has to assist BHEL in establishing suitable process control parameters during trial run of the injection moulding in the plant using the Silicone material provided by BHEL
9	Commercial Production capacity	Equipment has to be demonstrated for continuous satisfactory operation of 24 hours.
10	DATA acquisition System	Suitable DATA acquisition system to be provided along with the equipment for local/remote monitoring using computer interface.
11	Safety features	Bidders to provide the details of safety devices & features incorporated in the equipment.



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 EPD - BANGALORE	Purchase Specification For Silicone Rubber Injection Moulding Machine- 450 T	SPECIFICATION NO. EP-WEX-IM/2015-16
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12	Any other information	Supplier can furnish any other additional information, considering the overall requirements for better output
13	Clamping unit, Injection Unit and Hydraulic unit.	<p><u>Clamping Unit</u> Installed Vertically, with hydraulic clamping and locking system. Clamping force :Min 4500 kN Heating platen minimum size:810mm x 1450 mm</p> <p><u>Injection Unit</u> Injection volume : 10000 CC or more Minimum Injection Pressure: 1250 bar Opening Stroke(Day light) : Min 830 mm</p> <p><u>Hydraulic Unit</u> Hydraulic Unit compatible to the system specification shall be provided. The hydraulic system integration shall be with preferred make of components as in Sl no 16 provided in this specification. Hydraulic unit shall be with electronically adjustable hydraulic pump and regulating valve for oil supply of the clamping unit and the injection unit. Proportional pressure and proportional flow delivery shall be incorporated.</p>
14	Total connected load in KW	Bidders to specify
15	Operating Control unit	<p>The control unit incorporating PLC controls interfaced with HMI for providing inputs to the equipment, operation of the equipment in auto & manual modes and display of process parameters with a mimic diagram shall be provided. The control unit shall provide information of fault codes and graphic displays for errors / faults / alarms. The indicative requirements of the control unit is described below, bidders may suggest additional / advanced features for improving the operational efficiency of the equipment. Some of the indicative features to be incorporated are :</p> <ul style="list-style-type: none"> - Process data acquisition on USB interface. - Auto programming for re-clamping function during cure time at pre-defined intervals. - Real time temperature trend graphics on HMI - Multi level software password. - Display of Production overview/mimic on HMI

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		<ul style="list-style-type: none"> - I/O diagnostic in graphical fashion - Display of actual and set process parameters. - Stroke measurement for injection cylinders and for mold movement via potentiometric transducers or non-contact linear transducer of suitable resolution. - Microprocessor terminal for closed loop control of Pressure. - Variable adjustment of the machine sequence Through program input via HMI.
16	Preferred make of components	<ul style="list-style-type: none"> -PLC : Siemens, Schneider, ABB, Allen Bradley, OMRON -Hydraulic components: Vickers, Rexroth -Pneumatic components : Festo, SMC - Electrical components: L&T, Siemens, ABB
17	Basic Machine features	<p>Basic Machine must comprise stable construction of the main RAM having mould opening and closing by vertical UP and down movement controlled by potentiometric transducers / non-contact linear transducer measurement with effective resolution. Hydraulic movement must provide clamping force as specified minimum.</p> <p>Machine must have stuffing box to feed silicone rubber, followed by mechanism to inject the required volume of the rubber in the mould placed at the centre of the machine on the platen through the nozzle from top. Volume of the material must be controlled by the potentiometric transducers / non-contact linear transducer measurement with effective resolution.</p> <p>Construction of this machine must have mechanism to control temperature of various parts of the machine mainly plunger, the nozzle portion, CRB and any other area depending upon the design of the machine. Heating / cooling through the temperation unit to various part of the machine must be oil based.</p> <p>Indicative construction features required are as mentioned below, however bidders may suggest any improved features :</p> <p>Oil temperation Unit for Injection Unit Oil temperation Unit for Cooling system Stock Temperature Indications for Injection unit</p>

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		<p>Vacuum device complete with pump integrated to the Injection Moulding Cycle in auto mode</p> <p>Digital display of vacuum pressure with PLC Interlock</p> <p>Three Zones heating & controls in both heating platens.</p> <p>Core Puller arrangement to avoid warping of FRP rod during moulding sync with machine program</p> <p>Hydraulic and cooling arrangement of flow control CRB</p> <p>Silicone stuffing device with hydraulic opening and closing with volume matching the specification. Silicone rubber flow pattern FIFO type</p> <p>Safety curtain at front and rear end of the machine for operator safety.</p>
18.0	Mould Specification (Refer Annexure I for Product drawing)	
18.1	Mould Description	Flexi-mould suitable for manufacturing of silicone based composite Insulators of varying length by Injection moulding of HTV solid silicone rubber
18.2	Purpose	Mould to be used for formation of sheds for composite insulators as per drawing No 398713 70100M & 3-987-13-70200M by HTV silicone Rubber injection molding. These moulds shall have flexible arrangements to add and remove the inserts contributing the shed formation to manufacture the insulators of required length as per drawing.
18.3	Scope of Supply	<p>Design, manufacturing and supply of mould to manufacture composite Insulator as per Drawing No mentioned in slno 18.2 consisting of following.</p> <ul style="list-style-type: none"> ✓ Silicone nozzle point positioned at the top ✓ Silicone flow guide ✓ Flow controlled Cold Runner Block ✓ Insulation slab between Cold runner block and Top half of mould ✓ Heating arrangement to heat top half of mould and three zone temperature control. ✓ Top half of the mould with flexi sheds arrangement, vacuum connection to each shed of the insulator cavity and internal ejectors ✓ Bottom plate with flexi sheds arrangements, vacuum connection to each shed of the

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		<p>insulator cavity and internal ejectors.</p> <ul style="list-style-type: none"> ✓ Lifters for easy ejection of the component. ✓ Core puller arrangement (pins) to keep the FRP rod at the center during injection moulding (if applicable) ✓ Suitable sliding type ejector mechanism to support the overhanging of insulator & easy mounting and removal of component from the machine (enclosed photo or sketch of this mechanism in Techno commercial bid)
18.4	Drawing Approval	Master list of drawings used for manufacturing/assembly and detailed drawing of critical components are to be approved by BHEL before manufacturing.
18.5	Overall Dimensions	It should match to the Injection moulding machine with sufficient gap between the upper half and lower half of the mould to mount & remove components from the machine during operation.
18.6	Injection Moulding Length	Mould shall be so designed to produce 1350 mm length of Insulator in one cavity. (Ref drawings in annexure)
18.7	Silicone flow guide	These guides are to make the silicone injection from the centre till the required cavity. There should be arrangement to use the mould in any combination so as to use any one cavity OR both cavities at any time (in case of 2 cavity mold)
18.8	Insulation slab between Cold runner block and Top half of mould	This insulation slab stops the heat transfer from the hot mould portion to the CRB Block.
18.9	Heating arrangement & Power Supply	Bidders to Indicate
18.10	Top half of mould with flexi sheds arrangement, Heating coil and thermo-couple arrangement, injection holes	Top half of this mould shall have arrangement for adding and removing the inserts which contributes the shed formation in Injection moulding. To heat mainly the top half of the mould (below CRB) heating elements shall be in built in CRB plate suitably with thermocouple arrangement for Mould heating, temperature measurement & control. It must be Interfaced with the Machine control unit. Heating element and thermocouple connection must have plug IN type arrangement. Top half must have effective internal ejector for proper release of the component from the mold cavity.
18.11	Bottom plate with flexi sheds arrangements,	Bottom half of this mould shall have arrangement for adding and removing the inserts which contributes the shed formation in Injection moulding.

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