SPECIFICATION FOR ELECTRO PERMANENT MAGNET BASED HANDLING SYSTEM FOR STEEL PLATES

1. GENERAL:-

Presently, the varying sizes of steel plates (maximum weight of 10 Metric Tons) are handled within the bay of Fabrication block, for loading on the various CNC Flame cutting / Plasma Arc cutting machines by using clamps/slings. This is a very cumbersome, fatigue oriented & risky method of plate handling.

In order to ensure, efficient handling of various sizes of steel plates, some times hot upto 300ºC, of varying thickness and varying lengths a heavy duty, fail safe and practically maintenance free and efficient Electro-Permanent Magnet (EPM) handling system is proposed.

2. CONFIGURATION:-

The proposed system should consist of a telescopic spreader beam, fabricated from high strength steel, suspended from the hook of the EOT crane thru chains / suitable system. Spreader beam should have a fixed structure, around 5.8 m / suitable long, from which 4 Nos. EPM's, of 2 MT capacity each, should be hung from Spring suspension, at a pitch of around 2 m. Further motorised adjustable arms, with pair of 2 MT EPM's hung on each side & stroke of around 1000 mm, are to be provided on the either side of fixed structure. This would enable varying of pitch distance for outer magnets from 6 m to 8 m, which in turn would help in lifting of plates of varying lengths. Thus the system should have the capacity to lift plate of maximum weight 10 MT using all these 8 EPM's. The hanging chains should be made from Grade 80 high strength Alloy Steel chain with a Centre Bull ring for suspending from Crane Hook or Stranded Wire rope. Each Magnet should be suspended with Spring to take care of the bendness of plates for secured lifting. The EPM Telescopic Spreader beam is to be hung from a single hook. All magnets are to be inline.

For feeding the power supply to the EPM system, a suitable coil spring operated cable reeling drum with at least 15-meter cable, fixing bracket, plug and socket, input cable, movable trolleys for input cable etc. are to be provided on each of the two cranes on which the system is proposed to be used. Flexible rubber insulated copper cable with each conductor of 10 sq. mm (with atleast 1 spare conductor) is to be used for the purpose..

A suitable stand is provided to support the spreader beam when EPM system is not in use. The entire system should have an absolute built-in safety in case of any power / cable failure and should be free from battery backup. This safety system should have automatic switching device "Dautanac – System" for prevention of dropping of hanging load. When chains are stretched, it should cuts power supply to the control unit, thus the module cannot be operated during lifting and traversing the load. The demag cycle operates only when the "pull-chains" are slack, that is, when the beam is resting on the job. The system is to be provided with potentiometer control for varying magnetic power to ensure lifting of one plate at a time.

Surface condition of the plates is with mill scales as received from supplier. The duty cycle of the system should be 3 to 4 hours non-stop operation in each shift of 8 Hours (on two shifts working basis). The EPM should have the facility of switching ON/OFF (MAG/

DEMAG cycle) by either Radio Remote Control (RRC) or from a control pendant or from the control panel on the system itself, by means of suitable selector switch.

3. GENERAL REQUIREMENTS:-

1. Electro Permanent Magnets should be made from high quality rare earth magnetic material to give best magnetic properties when energised.

2. Complete circuit diagram shall be furnished along with the literature.

3. EPMs should work on 220 Volts AC, however supply to the control panel will be 415 Volts AC, 3 phase, 3 wire, 50 Hz. Hence a suitable Transformer should be put in the panel.

4. Control Panel should have MCCB & suitable Isolation Transformer etc. One no. of spare control PCB to be mounted in the panel itself.

5. The Magnetisation /Demagnetization through thyristor shall be done using Solid State digital control circuit. Further direct line charging for MAG/DEMAG to be used.

6. Proper interlocks / indicators are to be incorporated into the circuit and should be integrated with system operation so as to ensure that the crane will not lift the plate until all the magnets are actuated and the plate securely clamped by the system.

7. RRC for the system to be provided as optional.

8. Suitable for working in open Gantry

4. SPECIFICATION:-

A. JOB DETAILS:-

1. Max. Length of the plates – 12 m.
2. Max. / min thickness of the plates – 200 mm / 10 mm.
3. Plate width – 1.5 m to 3 m.
4. Plate length – 3m to 12 m.
5. Max. Plate weight – 10 MT.

B. PROPOSED SYSTEM DETAILS:-

1. SWL of the EPM handling system – 10 MT.
2. Max. / min thickness of the plates – As mentioned above.
3. Magnets to be activated in the following configuration:-
   a) Only 4 EPMs on fixed portion of the beam.
   b) All the 8 EPMs including 4 on movable portion of the beam.
4. Length of fixed beam ~ 5.8 m / Suitable.
5. Pitch distance between magnets on fixed beams ~ 2 m
6. Pitch distance between magnets on spreader beams ~ 6 m
   (in closed position)

7. Pitch distance between magnets on spreader beams ~ 8500 mm (in open position)
8. Speed of traverse of expandable section ~ 1000 mm/min (Approx.)
9. Water sealing for all connector joints.
10. Fabricated guards for preventing damage to control panel.

C. ELECTRO PERMANENT MAGNETS DETAILS:-

1. Generated Magnetism to be greater then 1600 Gauss
2. No. of poles **
3. Electrical input, 415 Volts, 3 phase, 3 wire, No neutral, 50 Hz.
4. Wattage required Watts**
5. Class of insulation E/F
6. Thyristor rating 1200 PlV
7. Protection IP 54
8. Clamping Force to be greater then 20 Kg/Sq.cm**
9. Stitching force 20 Kg/Cm Sq. **
10. Contact area ** Max. to be specified

** (Marked values are to be mentioned in the offer itself and it should be as per relevant international standards) (Drawing of the system to be sent with the offer.)

D. SAFETY ASPECTS OF THE SYSTEM:-

a) The supplier has to give safety guide lines for the use of magnets and the lifting system to be followed by the user.
b) The safety arrangements should confirm to relevant Inter-national/lndian Standards and references should be furnished in the offer along with full technical details.
c) When the crane is in operation suitable electrical, electronic, mechanical interlocks, overload protection, overheating protection and audio-visual alarms/signals etc, should be incorporated in the system to prevent any damage / mishap due to inadvertent operation / functioning of the supplied system and for the complete safety of the operating personnel and its surrounding staff.
d) Type testing of the magnets should be as per IS / International Standard. Each magnet would be type tested as per VDE 0580 for 3 to 1 performance. Further the mechanical structure should follow standards for below the hook equipment and are to be tested for 2 to 1 performance. Further routine safety tests like keeping a 10 MT plate hung for 24 hours would also be carried out.

E. MAKE OF B.O. ITEMS:-

a) Make of bearings - FAG/SKF only
b) Gearbox / geared motor - Bonfiglioli / Elecon / Radicon only
c) Electrical control elements - Siemens only
d) Make of motor - Bharat Bijlee / ABB / Siemens only.
e) RRC – STROMAG/ TELECRANE / ITOWA.

5. SCOPE OF SUPPLY:-

a) 10 MT Electro Permanent Magnet (EPM) based telescopic plate handling system with lifting tackle as per our specification and comprising broadly of 8 Nos. EPM, 2 MT each, with spring suspension & mounted on expandable structure etc. – 1 Set.
b) Thyristorised Control panel complete with its controls including suitable length steel reinforced armoured conduit connecting the EPM system controller. – 1 No.
c) Pendant control complete with suitable length wires routed through steel reinforced armoured conduit. – 1 No.
d) Radio Remote Control with battery charger & batteries - 1 Set.
e) Spare control PCB to be mounted in the panel itself. – 1 No.
f) Spring Operated Cable Reeling Drum with around 15 Mts flexible Cable having copper conductor of 4 x 10 sq. mm with Rubber insulation & incoming cable with cable travel arrangement/ trolleys/ brackets etc. on cranes - 1 Sets
g) Supporting fabricated stand for the system - 1 No.
h) Operating & Maintenance manuals. – 4 Sets
i) Test & Guarantee certificates. – 4 Sets
j) Erection, Commissioning and proving on actual jobs.

N.B.:- All the fabricated parts and brackets used in the system should be made out of structural steel. Motor control circuit elements such as contactors, relays, fuses, etc to be of Siemens make. Limit switches to be from Siemens / Bhartiya Cutler Hammer. All the bearings required in the system should be of self-aligned type and to be life lubricated of SKF/FAG make only.

6. CONTROLS:-

All controls should be available on the Main Control panel, on an operator's pendant suitably located on the system & to be of a small sized box separate from main control panel so that there is a flexibility to operate the system from the actual plate lifting point, by the operator. The control pendant should have the controls of Spreader Beam adjustment thru EXPANSION / CONTRACTION, SELECTOR SWITCH for selecting 4/8 magnets actuation, Alarms, Blonkers, Emergency Stop. Further the same are to be replicated on RCC pendant. The controls are to be Heavy-duty series with provision of PICK-UP / FULL MAGNETIZATION / DEMAGNETIZATION / SAFE / ADJUSTABLE POWER CONTROL selection and it gives provision to the operation of the system from outside the working area and away from the load. Change over facilities and also supply of 2 nos. rechargeable batteries & battery charger with remote control (110 or 220V).All panels shall be IP: 52 protection class. All controls to be digital.

7. DESIGN:-

Design of the system should be according to the latest standard keeping latest trends and developments in mind. Manufacturer may examine the existing sole plate welding process and should design the system after seeing the site conditions. Before taking up manufacture, the Manufacturer should get the G.A. Drawing of their proposed system duly concurred by us. However, the responsibility of proving the system on our actual jobs would lie with the manufacturer.

8. LUBRICATION:-

Suitable arrangement for lubrication is necessary. Provision is to be made for the above by providing nipples etc. at strategic places wherever required.

9. ELECTRICALS:-

All electricals should have suitable safety devices such as thermal overload trip devices, current limiting devices, electronic shear pin, fuses etc. Electrical power supply available is 415 V, 3¬, 3 wire only at 50 Hz. (No neutral is available). Hence if there's any requirement of 220/110 Volts, suitable transformers may be incorporated.

All wiring to be suitably numbered / ferruled for easy maintenance. All electrical components should be of Siemens make.

ICTP to be included in the operator cabin on the crane as the supply shall be given at this point. Cable from supply point to ICTP on panel shall be in BHEL scope. All other cables/ wires are to be done by the supplier.

10. SPARES:-

Spares such as bearings, chains, reed switches, control elements and other items for successful running of system for atleast 2 years should be incorporated in the Scope of supply. This may be quoted separately.

11. PAINTING:-

System is to be painted after Red oxide primer with heat resistant paint of Yellow & Black Colour strips, as per IS Standards of industrial trolleys.

12. GUARANTEE:-

The system should be guaranteed for successful and reliable performance and for free replacement of faulty material or components /defective workmanship for a period of 12 months from the date of commissioning.

13. INSPECTION & SYSTEM CHECKS:-

Inspection of the handling system will be carried out at the manufacturer's works before dispatch of the system for satisfactory performance of the system and for the accuracies mentioned in this specification. Broadly following items shall be checked before dispatch:
(a) Scope of Supply. (b) Make / Rating of all BO components such as Motor / Gearbox / Chains / Control Elements, etc. (c) Workmanship. (d) Ergonomics. (e) Structural Stability. (f) Joint Strength. (g) Maintainability. (h) Controller Layout / components used / tolerance level built in. (i) Dimensional checks. (j) Load/ No-load trials as far as possible.

Confirmatory Tests:-
a) Before using the magnets, the entire plate handing system should be tested physically and individual certificates from certified agencies is to be furnished in triplicate.
b) The entire system is to be tested on load at the supplier’s works for witnessing the performance prior to its dispatch. Final reliability tests can be given at our works after the system is being erected, commissioned and proved at our works.

14. LITERATURE:-

Four copies of Operation & Maintenance manuals, Test & Guarantee Certificates, General Arrangement drawings, Electrical circuit diagrams, Lubrication charts are to be supplied with the system.

15. INSTALLATION, COMMISSIONING AND PROVING FOR PERFORMANCE:-

The installation, commissioning and proving of the handling system, for desired performance, on our actual jobs is to be done by the supplier at our works. Supplier may quote charges for the above, separately.

Manufacturer should comply with the following during Erection, Commissioning and proving:-

(a) Experienced & qualified team headed by a team leader fully conversant with the work scope should only be deputed. Labours, if required should be brought or arranged locally.
(b) E & C work has to be completed in one go except where it is agreed with mutual consent.
(c) Any help required from BHEL during E & C has to be indicated in the offer itself . Except where agreed , rest has to be organised by the manufacturer should arrange required hand tools etc.
(d) Manufacturer's team is required to comply with general discipline, indl. safety rules and workshop norms while doing the work. Any work with safety hazards etc should not be done in any case. No work should be done without proper authorisation or permission.

16. DETAILS TO BE INCLUDED WITH THE OFFER:-

Following details must be supplied with the offer:-

a. Parties, who have supplied and commissioned at least 5 Nos. of similar or higher capacity EPM plate handling system for similar applications in the past and the system is presently working satisfactorily for more than one year after commissioning should quote. However, if such system has/had been supplied to BHEL, then such system should be presently working satisfactorily for more than six months after its commissioning and acceptance, should quote. The Name of the Customer/Company, their Contact details with contact person where similar systems have been supplied, is to be furnished. This is required from all the parties for qualification of their offer.
b. The supplier has to furnish a schematic detailed drawing with lifting tackle, spreader beam, spring operated cable reeling drum etc. for a system. Weight of the magnets and its allied items should be taken into account when specifying the maximum weight to be handled by the magnets to ensure that crane capacity is not exceeded at any time.
c. Full technical details / specifications, electrical schematics, etc.
d. Digital control circuit scheme is to be submitted.
e. Material specifications which are used in the manufacturing of the equipment.
f. Overall dimensions and space requirements.
g. Power and compressed requirements.
h. List of customers to whom similar / identical system / equipment have been supplied.

i. Point wise reply to each & every point of our specification is a must. It not complied, then the offer will not be considered.

17. OTHER UTILITIES AVAILABLE WITH BHEL:-

Compressed air available at 4 Kg / Sq. cm (Max.) and regular water supply.

18. AMBIENT CONDITION & TROPICALISATION:-

All electronic components should be tropicalised to withstand environmental temp. Variation from 4 to 50 degree C and RH variation from 5 to 95 %.

19. STRESS RELIEVING OF ALL FABRICATED ITEMS:-

All fabricated bracketories are to be stress relieved.

20. MATERIAL & HEAT TREATMENT FOR MAJOR COMPONENTS:-

All wear components (in motion) needs to be properly heat treated for maximum durability.

21. TRAINING:-

Training should be imparted to our operators and maintenance people for 3-4 days so that they should be in a position to run the system, independently.

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