Date 27-Aug-2011

EXPRESSION OF INTEREST FOR

REGENERATIVE LOAD TEST SET-UP for 650kW 703rpm Induction Motors connected back-to-back

1. Introduction

M/s Bharat Heavy Electricals Limited (BHEL) is one of the leading Navratna Public Sector Undertakings of Government of India. The company has an annual turnover of US$ 7.8 billion having outstanding order book of US$ 33 billion. The main business of company includes Thermal and Hydro power plants and one of the major business segments is transportation equipments which mainly comprises of propulsion system electrics. We are planning to establish a regenerative load test setup for three phase induction motors meant for traction application. For more information on BHEL, you can visit our website www.bhel.com

2. Purpose

To establish a regenerative type loading test set-up for full load testing of a 650 kW rated power, 703 rpm rated speed, three phase induction motors connected back-to-back. The speed of the traction motors will be varied from 0 to 3320 rpm with the help of an IGBT based variable voltage variable frequency type power electronic converter feeding the motor, while the other induction motor, of the same rating, will operate in a regenerative mode delivering the power to another power electronic converter. Both converters will operate from the same DC link and a front end converter should maintain the DC Link voltage and feed the losses occurring in the system. The test motor and the regenerative machine should develop the required torque-speed characteristics.

3. Scope of work

The Expression of Interest should include the total regenerative loading set-up required for testing the complete torque speed characteristics of two traction motors connected back-to-back on a common base frame. This set-up includes:

a. Front end converter:

   This converter takes input supply from a 3-phase grid of 3300 V line to line, at 50Hz, and feeds to the DC link maintained at 3000 V DC.

b. Drive Motor side converter:

   This converter supplies power to the 650kW, 1600V, 703rpm, 4-pole induction motor which operates in variable speed to deliver the required torque speed characteristics, shown in the figure.

c. Regenerative drive side converter:

   This converter feeds the power back to the DC link and thereby implements the desired load and torque on the motor. The outputs of the converter will the same as two similar capacity motors are used on the test bed.

d. Converter panel:

   The three converters should be mounted in single control panel with operator pendent switches, rotary knobs and analog meters for local control of the whole drive system.

e. Mechanical arrangement of loading:

   The drive motor and regenerative machine will be directly coupled with an inline type torque sensor mounted in between the two machines. The complete rotating machine system will be assembled on a common base frame. The base frame should be designed and suitably engineered for Static, Dynamic and Transient conditions. The schematic of the assembly is shown in the accompanying figure.

f. Torque and speed sensor with measuring equipment:

   Suitable rating In-line type calibrated torque transducer along with a speed sensor and with measuring equipment will be provided.

g. Computer for supervisory control and monitoring :

   A computer with Windows based Graphical User Interface (GUI) to operate the test rig in Auto mode from 5 m distance and with a provision to implement the desired torque speed characteristics and dynamics of tests.

h. Shaft, Torque transducer couplings, power cables and other system required miscellaneous items are in suppliers scope.

i. Civil works and foundation

The required civil works and foundation will be arranged by BHEL at out site work.

j. The offer should include one year free warranty and cost for two years extended warranty separately with list of recommended spares.

The specifications and schematic diagram listed below.

4. Association of BHEL engineers

The supplier for establishing loading set-up should conduct a meeting with BHEL engineers at BHEL R & D during engineering finalization for jointly work out the final design to meet the specification requirements. BHEL engineers may provide the support regarding the in-house requirements of the test set-up at BHEL R & D.

5. Specifications of 650 kW Regenerative loading test set-up

a. Regenerative type.

b. Input supply 3300 V line to line AC, 50 Hz, 3 Phase Supply to panel.

c. Supply to motor, 650 kW, 0-1900 Vll AC, 0-200 Hz.

d. Nominal torque 8825 Nm, maximum torque 10850 Nm, starting torque 8825 Nm. Constant torque of 8825 Nm up to 703 rpm, constant power of 650 kW from 703 to 1500 rpm, field weakening from 1500 to 3320 rpm.

e. Parameters required to be monitored: Drive Motor Input Line Voltage, Drive Motor Input Current, Drive Motor Input Power, Drive Motor Efficiency, Drive motor power factor, speed, torque, regenerating machine voltage, current, power factor, power, efficiency are required to be displayed on computer monitor.

f. Drive Motor and regenerating machine temperature display on screen with respect to time and with over load and temperature protection.

g. Temperatures display on screen with RTDs
    i. Stator winding RTDs – 2 No.s
    ii. Stator Core temperature RTD – 1 No.
    iii. Rotor winding RTDs – 2 No.s
    iv. Rotor core temperature RTD – 1 No.
    v. Bearing temperature RTDs – 2 No.s
    vi. Air outlet temperature RTD – 2 Nos.

   The rotor temperatures will be measured through special slip-ring.

h. Speed measurement by the help of encoder

i. Torque measurement by in line torque sensor

j. Temperature sensing by the help of contact type temperature sensor

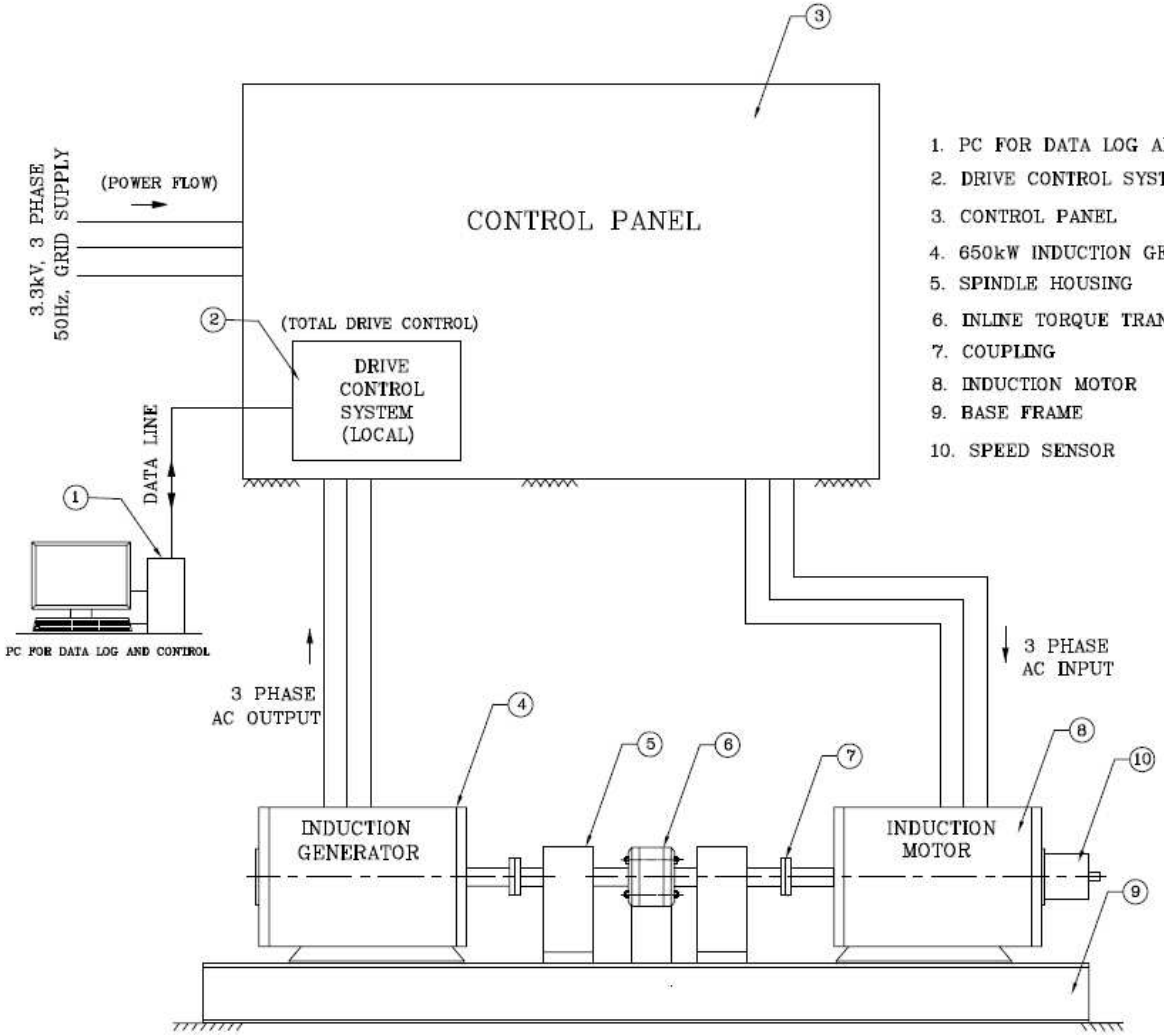
k. All above mechanical components mounted on common base frame – fabricated – suitably engineered for Static, Dynamic and Transient conditions.

l. Control panel with inbuilt control system which incorporates with operator pendent switches, rotary knobs, LED lights showing the mains on, drive healthy status and for other status indications, analog meters for local control of the whole drive system in case of remote failure, AC drive, Switch Fuse Unit (SFU) and other necessary electrical & electronics components for system desired operation.

m. Automation should be with RT controller with the help of PC with customized software to control log data.

n. Windows based GUI to operate the test rig in Auto mode with provision to line up the sequences of the tests and in Manual mode.

o. The supplier should have at least two such regenerative loading systems supplied experience in India or abroad and should furnish the details certified from such customers.



SCHEMATIC DIAGRAM OF 650kW INDUCTION MOTOR TEST SET–UP

NOTE: ITEM Nos 4 & 8 ARE NOT IN SUPPLIER'S SCOPE

6. Composition of budgetary offer

The supplier for establishing loading set-up should submit a proposal for above in two parts:
1) Technical proposal and
2) Commercial proposal separately indicating the overall price including the breakup with respect to the scope of work.

The total composition of offer shall include:

a) Price for the offer including a breakup with respect to activities defined in Scope of Work (SOW).
b) Data sheets of all components in loading set-up.
c) Date of start after receipt of order.
d) Terms and conditions of offer.
e) Credentials and previous experience of similar kind of establishment of regenerative loading test set-up activities.

In case you require any further clarifications, please do contact us.

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