Government of India
Ministry of Railways
Research Designs & Standards Organisation
Manak Nagar , Lucknow - 226011

No; EL/3.2.70/J3 Dated 15-12- 1992

SPECIAL MAINTENANCE INSTRUCTION NO. RDSO/ELRS/SMI/152

1. **TITLE :**

General guidelines to follow for balancing of rotor and blower impellars.

2. **APPLICATION :**

i) Rotor of all auxiliary motor fitted on Electric locomotive.

ii) Impellars of all blowers used for cooling traction motor, transformer oil smoothing reactor and rectifiers.

3. **OBJECT :**

3.1 Squirrel cage rotors when repaired and fitted alongwith the impellars of blowers, abnormal sound or delivery of less quantity of air have been reported by Railways. Investigation reveals that is happened due to unbalanacing of rotor and impellar individually as well as collectively.

3.2 This SMI indicates the general method to be followed for balancing of rotor, and impellers separately and then collectively.

3.3 The method which have been described in the following paragraphs shall exclusively for Blue Star make of balancing machines. However, main procedure and the balancing parameter shall be almost common to every balancing machine.

3.4 In case any difficulty is experienced, the matter may be clarified from RDSO/ Electric Loco shed, GZB.

4. **INSTRUCTION DRAWING :**

RDSO SK. EL. - NIL

5. INSTRUCTIONS

5.1 For details instruction on balancing machine type FIE/DBM/MD-1000 marketed by M/s Blue Star, Bombay shall be followed. This machine is installed at Electric Loco Shed, Northern Railway, Ghaziabad.

5.2 PRINCIPLE OF BALANCING

The rotor is placed on a work-support which is rigidly fixed by side plates. They prevent any movement of rotor while rotating. Motor rotates around it shaft axis. The centrifugal force resulting from the unbalance is observed the 'work support'. A pressure transducer senses the centrifugal forces transmitted by the work support and produces an electrical signal, which is proportional to the rotor/impellar unbalance.

5.3 The electrical signal is further amplified to in various stages and processed through the analogue computer to read the angle of unbalance and the amount of unbalance on two different meters.

5.4 By means of 'Plane Selector Switch' unbalance readings of both left and right places are measured during a single run of rotor.

5.5 The other control on the control panel are provided to feed the dimensional data of the rotor / impeller to the computer.

5.6 All the adjustment shall be done as per the SMI mentioned under para 5.1.

5.7 Description of the operating elements as per SMI mentioned under para 5.1.

5.8 BALANCING METHOD

5.8.1 After the rotor is mounted and coupled to the spindle shaft, the following procedure should be followed :

i) Select the position of programme selector switch 1 according to the position of the 'correction planes' and the bearing places.

ii) Dial the controls 'A, B, C' accordingly.

iii) Dial the control R1 and R2 as per correction radius.

iv) Keep the sensitively switch on maximum weight range.

v) Make the amplifier on by operation of 'ON-OFF SWITCH' of the control panel. The dial lamp will glow up.

vi) Start the machine by pressing green push button.

vii) Let the reading on meters respective to 'Plane Selector Switch' should be steady.

Then change the plane selector switch to other plane (the previous plane meter reading are stored) Let the meters indicated the steady reading. Then stop the machine by 'OFF BUTTON' on the starter.

(The meter reading for the plane also get stored). Apply the brake and stop the rotor/impellar.

viii) Apply corrections according to the meter readings on left and right correction plane. For re-checking un-balance in rotor, repeat the procedure.

ix) If unbalance is found beyond balancing tolerance follow procedure stated above under 7, 8 until the rotor is balanced within limits.

5.8.2 Sensitively of the machine shall be calculated as following

For the determination of the sensitively of the machine for a particular rotor, the same is balanced first as described in para 5.8.1. A known unbalance is then introduces at a distance from the rotating axis. The unbalance is then recorded in a number of division of the meter reading. The following formula can be used for calculating the sensitively of the machine for the said rotor.

Sensitively of machine per division of meter reading = (U x r) / (W x M) Microns

When U = Unbalance in grams (Meter is calibrated in gms.)

r = Distance of unbalance 'U` from rotating axis of rotor in mm.

W = Weight of rotor in kgs.

M = Number of division of meter reading.

5.8.3 Care and Maintenance lubrication schedule shall be followed as laid down in Maintenance Instruction of balancing machine type FIE/DEM/HD 1000

5.8.4 Following procedure shall be adopted for balancing of coupling Adopter with Rotor (Index Balancing Procedure)

i) Verify that clearance between adopter bore and rotor shaft is minimum under worst condition it should not be more than 0.04 mm

ii) Verify that motor shaft which is connected to adopter is co-centre with reference to shaft (Journal) axis within 0.005 mm. This can be checked by dial gauge on machine itself by moving on roller/Vee bearing of machine.

iii) Balance rotor with adoptor and coupling etc. making connection on rotor at two planes of rotor with in 1 meter division at max. required sensitivity range (multiplier position)

iv) Index rotor with shaft axis by 180^0C for this purpose make a common mark on adopter and end of rotor shaft and also take reference of graduated disc for accurate indexing.

v) Then take unbalance meter reading of plane I and note down amount in No. of division and angular position. Now balance the rotor as described under para 5.8.1

vi) If coupling is balanced separately then 180^0 indexing to be done from coupling flange by removing four fixing screws of coupling flange with reference to adopter flange (rotor shaft not be indexed with adopter bore etc.) Other procedures shall be adopted as mentioned above.

6. PERIODICITY OF IMPLEMENTATION :

After any repair to rotor of motor and impellers of blowers.

7. AGENCY OF IMPLEMENTATION :

All Electric Loco Sheds and Shops

8. REFERENCE :

Item 1.0 of XIX MSG (EL) held at Madras in December 1991

9. DISTRIBUTION :

As per enclosed list.

(P.K. Jain)
for Director General /Elect.