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Sub : Optimisation of Performance of Vertical Dynamic Brake Resistance(DBR)

The high capacity vertical DBR provided in WAG-5/WAG-7 class of locomotives has rated power dissipation capacity of 2430 KW. The RF elements connected in 2S-2P combination are rated for 900 Amps.

However , earlier RDSO vide Technical Circular No. 10 had limited maximum braking current to 700 Amps. mainly to maintain braking effort at lower speeds (below 45 kmph) within adhesion limit of 22T. This, in turn, has restricted its capacity to 60% of its rating also at higher speeds. With fixed power dissipation of DBR , the braking effort produced increases with decrease in speed and with full 900A current , braking effort remains within adhesion limit upto 45 Kmph in WAG-7 locos. For lower speeds the current has to be reduced to 700A to limit braking effort within adhesive limit.

With an objective of making optimum use of DBR capabilities and make it more effective in controlling train, **following improvement measures are suggested:-**

1.0 QF Relay Setting

1.1 QF relay coil is connected across shunt (1000 Amps./ 285 mv) with 10 sq.mm cable having different lengths for non-modular and modular design of WAG-5 / WAG7 locos. Based on the trials, taking into consideration the ambient temperature inside the loco, zero error in the TM ammeter, ± 5% tolerance (repeat accuracy) on specified pick-up value of QF relay (without latch) and milli volt drop in the lengths of cables used, the current setting of **QF relay has been revised to 4.4 Amps. for modular and 4.8 Amps. for non-modular design** (corresponding to 850 Amps. braking current). **This supersedes Technical Circular No.10 regarding setting of QF relay.**

1.2 QE Relay Setting : Ensure that the **relay is set to pick-up at 4.5 Amps.**

2.0 QVRF Relay - Working

2.1 LSDBR Indication

LSDBR should extinguish as soon as QVRF relay is picked-up. This relay normally picks-up at MVRF speed correponding to 75-85 Volts supply to MVRF, achieved with 150-175 Amps. braking current and corresponding to 3rd notch at 30 kmph (lowest range of DBR operation).

As such, **Drivers should be instructed that on application of DBR, if LSDBR does not extinguish upto 3rd notch, don't move to next notch and wait for 10 sec. at this notch.** As soon as it extinghishes, the Driver can take further notches. **In case LSDBR still does not extinguish, discontinue application of DBR** and record the same in the log book treating a case of MVRF not in working order.

2.2 QVRF Relay Setting

Set the relay to pick-up between **-12 (+0, -2) mmWC**.

2.3 Flexible Pipe Connection from Suction Nipple to QVRF Relay

2.3.1 The vertical DBR of various makes have been provided with QVRF relay of three manufacturers viz;

i) M/s. Dwyer Instrument, USA
ii) M/s. Electro- Mation, GmbH
iii) M/s. Switzer Ltd., Chennai
iv)

The relays of above manufacturers are of differential type but it also works accurately with either of the two i.e. pressure or suction. The identification of connection ports for different makes are as under :-

Make	Identification	
	Pressure	Suction
M/s. Dwyer, USA *	Hi	Lo
M/s. Electro- Mation, GmbH	+	-
M/s. Switzer, Chennai	Not available	Lo

*In this make, the markings have been stamped on the circumference of both the ports which is not easily visible and there could be mistake. In case of incorrect connection, QVRF will never pick-up even though MVRF may be working properly.

2.3.2 Location of Suction Nipple on DBR duct below the Blower Blades

For reliable operation of QVRF relay, the **location of the suction nipple should be 25 ± 5 mm below the bottom sweep of the impeller blades.** Check each and every make of high capacity DBR and if the fitment location of nipple found to be incorrect, remove it, seal the existing hole and refit the nipple at recommended distance of 25.0 ±5 mm

2.3.3 To avoid the non-functioning of QVRF relay and obtain reliable performance, following points are recommended for compliance during shed maintenance :-

(i) During schedule inspection, remove QVRF relay from DBR. Observe carefully the marking on the sensing port as indicated above. Write with oil paint (any bright colour) the marking 'Hi' and 'Lo' at a suitable place near the port for all makes of relays. The marking should be clear and readable.

(ii) Set the relay to pick-up between –12 (+0, -2) mmWC.

(iii) Clean the suction nipple beneath the blower blades throughly. Connect low pressure port at QVRF to the suction nipple. **Don't block the high pressure port and let it be exposed open to atmospheric pressure.**

(iv) Disconnect the MVRF terminal from the terminals of top grid on front panel. Connect indication lamp across the contacts of QVRF. Connect external DC source (available in the sheds of suitable rating) to MVRF. Run the blower by gradually increasing the DC voltage till the QVRF picks up and indication lamp glows. Record the MVRF voltage and current at which relay QVRF picks up. The relay should pick up well within 85 V DC, if it is properly set to pick up between -12 (+0, -2) mmWC.

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for Director General(Elec)