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सत्यमेव जयते

भारत सरकार – रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ – 226011
Government of India - Ministry of Railways
Research, Designs & Standards Organization,
Lucknow - 226011

No. EL/11.5.5/5

Date: 28.08.2014

Chief Electrical Engineers,

- Central Railway, HQs Office, 2nd floor, Parcel Office Bldg., Mumbai-400 001
- East Central Railway, Hajipur (Bihar)-844 101
- Eastern Railway, Fairlie Place, Kolkata – 700 001
- East Coast Railway, Railway Complex, Bhuvneshwar – 751 023
- Northern Railway, Baroda House, New Delhi-110 001
- North Central Railway, Allahabad – 211 001
- South East Central Railway, Bilaspur-495 004
- South Central Railway, HQs Office, Rail Nilayam, Secunderabad-500 071
- South Eastern Railway, Garden Reach, Kolkata- 700 043
- Southern Railway, Park Town, Chennai – 600 003
- West Central Railway, HQs Office, Opp. Indira Market, Jabalpur-482 001
- Western Railway, Churchgate, Mumbai – 4000 020

Modification sheet No. RDSO/2014/EL/MS/0436 (Rev.0), Dated 11.07.2014

1.0 Title:

Modification to address failures of DC link capacitors of 3x100 kVA, GTO based auxiliary converter.

2.0 Object:

2.1 DC link capacitors of 6000 micro Farad, 350 volts have been provided in GTO based auxiliary converters of three phase electric locomotives on IR. There are 12 capacitors provided which are connected in 2S & 6P combination in each auxiliary converter.

2.2 There have been number of cases of bursting of DC link capacitors provided in auxiliary converter of BTIL make during the year 2008-09. Vide this office letter of even no. dtd. 23.12.2009, it was decided to implement certain modifications in M/s BTIL make auxiliary converter.

2.3 SCR has recently reported the same type of failure in DC link capacitor of M/s BHEL and M/s CGL make auxiliary converters also and stated that they have started modification in DC link capacitor as per RDSO letter dtd. 23.12.2009.

2.4 As per investigation, the reasons of failure of DC link capacitors are following:

(i) High loading of capacitor nears the load connections;

(ii) Restricted cooling of capacitor due to support frame;

(iii) Not changing of rubber gaskets during the schedule, as prescribed, resulting in rubbing of top support frame with capacitors and damaging of outer insulating sheath of capacitor; and

(iv) Less tightening torque at capacitor's terminals.

2.5 Keeping in view the above and to improve reliability, the modifications shall be implemented in auxiliary converter of M/s BHEL and M/s CGL & in existing locomotives by Zonal Railways.

3.0 Modification details:

Following modifications shall be carried out:

3.1 Provision of multiple links instead of single link to ensure better load sharing:

Existing Design: In most cases, it has been observed that failure is initiated from the load side as shown in Fig1. This is attributed to higher loading of capacitors near the load connections. The reason for this load imbalance is that the two parallel banks of capacitors are linked to each other via just a single link as shown in Fig2.

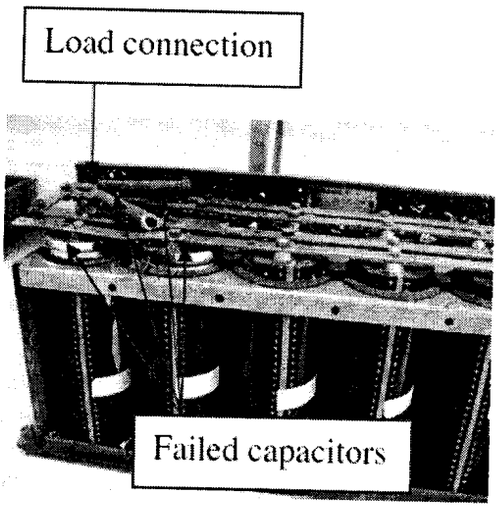

Fig.1

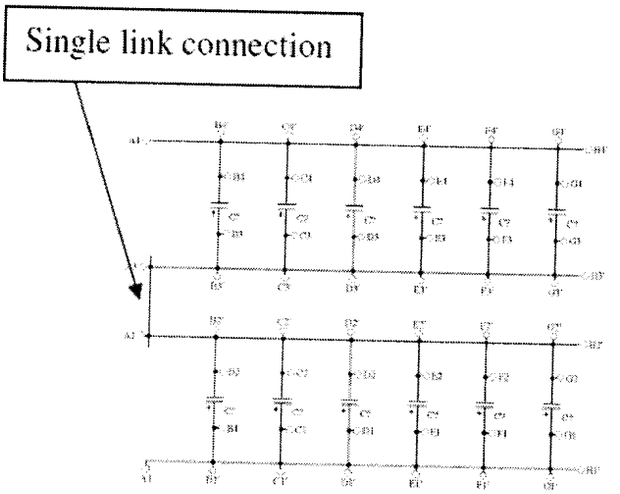

Fig.2

Modified Design: As shown in Fig. 1 & 2, two parallel banks of capacitors shall be linked with a number of links individually instead of a single link in order to achieve better load sharing. Further, the load connections shall be connected to the center of the capacitor banks shown in fig.3 & 4 as A1 and A2.

Material: Cu-ETP with nickel plating of 10 micron.

Thickness: 3mm.

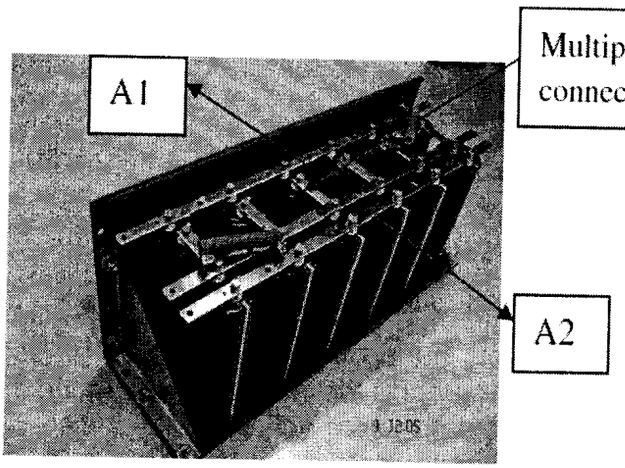

Fig.3

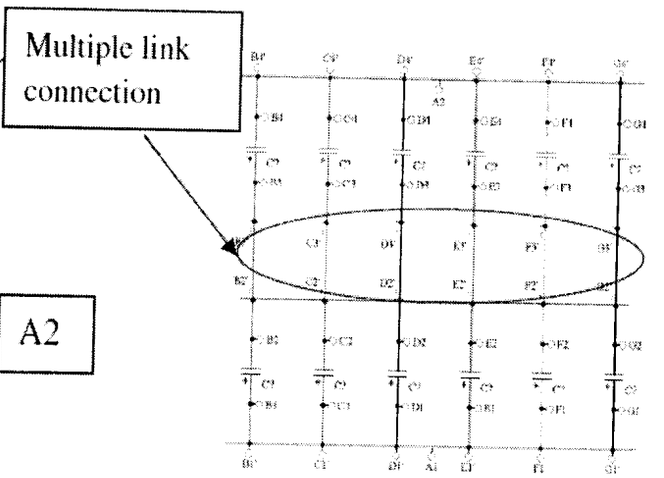

Fig.4

3.2 **Removal of top frame arrangement for better air circulation and to avoid damage of outer sheath of capacitors due to worn out rubber gasket;**

Existing Design: As seen in Fig.5, the presence of the support frame around capacitor bank restricts the air flow between the capacitors and therefore capacitors are more prone to get heated up.

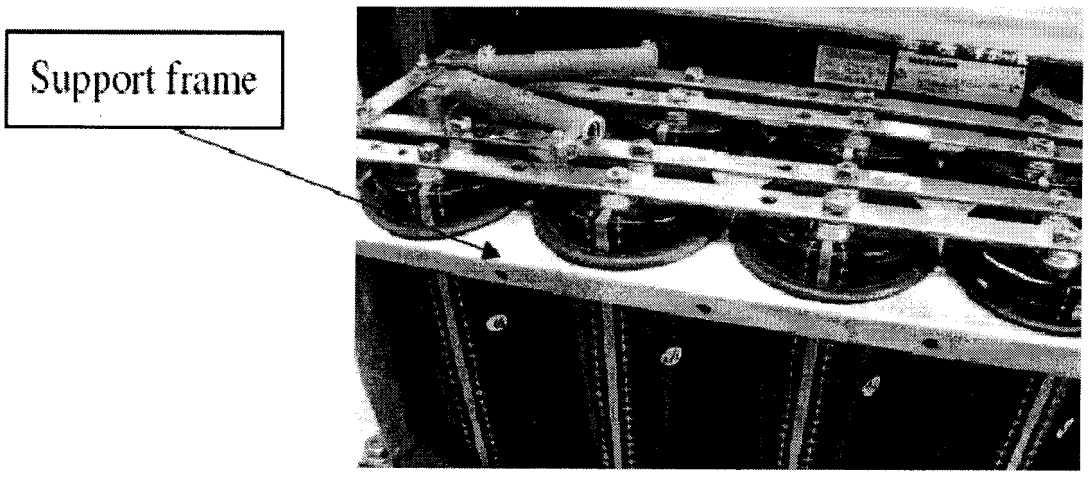

Fig.5

Modified Design: Frame arrangement shall be removed as shown in Fig.6 which allows better air circulation between the capacitors.

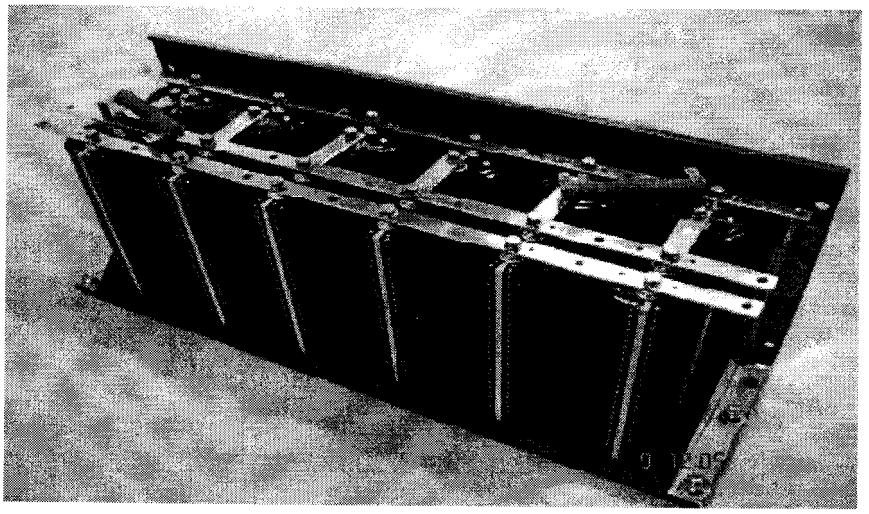

Fig.6

3.3 Tightening torque of capacitor terminals shall be increased from 3.5 Nm to 6.0 Nm; and

3.4 **Provision of side mechanical support to improve stability**

Support clamps of material SS304 of 1.5 mm thickness are required to be added at both the sides of capacitor bank in order to provide mechanical stability as shown in fig. 8 & 9.

Material: SS304

Thickness: 1.5 mm

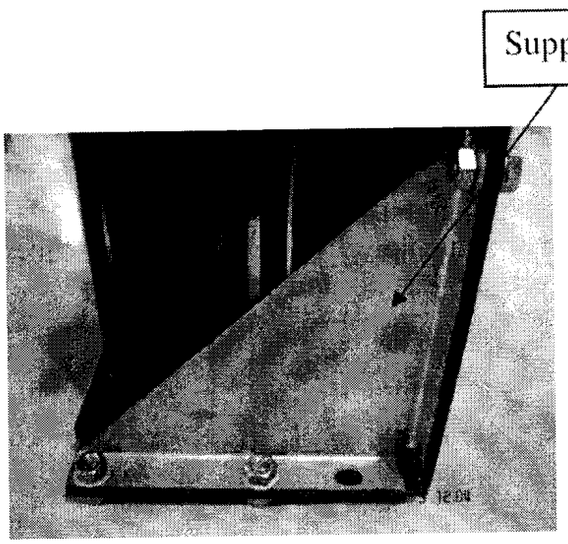

Fig.8

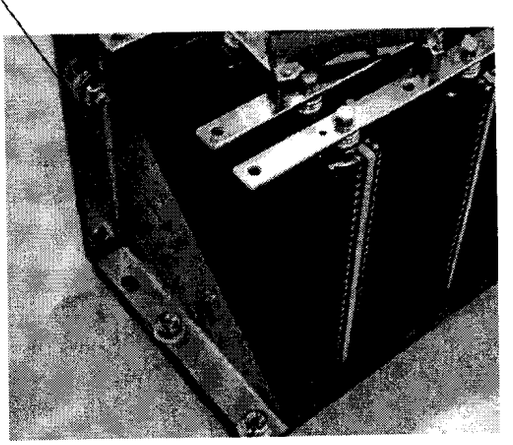

Fig.9

4.0 Application to class of locomotives:

WAP-5, WAP-7, WAG-9, WAG-9H.

5.0 Material Required:

As stated in Para-3.1 and 3.4 above.

6.0 Material Rendered Surplus:

Nil.

7.0 Reference:

Nil

8.0 Modification Drawing:

Nil

9.0 Periodicity of Implementation

MOH, IOH and POH

10.0 Agency of Implementation:

(i) M/s BHEL and M/s CGL in new supplies and Electric Loco Sheds holding WAP-5, WAP-7, WAG-9 & WAG-9H locomotives in BHEL & CGL make auxiliary converter.

(ii) M/s BTIL has already implemented this modification vide this office letter of even no. dated 23.12.2009.

(iii) M/s BHEL & M/s CGL have been advised for this modification in new supply vide this office letter of even no. dtd. 28.01.2014.

(A.K. Goswami)
for Director General/Elect.

Encl: Nil.

Copy to:-

1. Secretary (Electric Traction), Railway Board, Rail Bhavan, New Delhi -110 001 : For kind information please.
2. CEE (L&S), Chittaranjan Locomotive Works, Chittaranjan – 713 331
3. CWM, ELW, Central Railway, Bhusawal – 425 201

4. CWM, ELW, Eastern Railway, Kancharapara, 24 Paragana (N) – 743145 (WB)
5. CWM, Loco, Carriage & Wagon Works, Western Railway, Dahod – 389 160
6. **Sr. DEE (TRS), Electric Loco Sheds,**
   - Central Railway, Ajni, Nagpur-440 008
   - Central Railway, Kalyan – 421 304 (Maharashtra)
   - East Central Railway, Gomoh-828 401
   - Eastern Railway, Howrah – 711 106
   - Northern Railway, Ghaziabad-201 001
   - North Central Railway, Fazalganj, Kanpur – 208 003
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   - Southern Railway, Royapuram, Chennai – 600 013
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   - Western Railway, Vadodara – 390 002

(A.K. Goswami)
for Director General/Elect.

Encl: Nil