



सत्यमेवजयते

GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS

**Technical Audit of Wheel Pressing Procedure for  
Electric Locomotives at Electric Loco Shed Kanpur,  
Electric Loco workshop Bhusawal & Kancharapara**

Report No.: RDSO/2023/EL/TAR/0031 Rev. '0'

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## Technical Audit of Wheel Pressing Procedure for Electric Locomotives

ED/(EE)/Safety/ Railway Board vide letter No. 2023/Safety (Implt)/12/2 dated 06.04.2023 advised RDSO to conduct process audit of wheel assembly lines at BSL/Central Railway and KPA/ Eastern Railway.

Accordingly, RDSO officials visited ELS/CNB (on 01.04.2023), ELW/BSL (on 17-18.04.2023) and ELW/KPA (on 20-21.04.2023) to conduct process audit of wheel assembly line and following observations were made:

### (A) Wheel shop at Electric Loco Shed, Kanpur:

1. There are two wheels pressing machines at shed and both are in working condition.



Wheel Press Machine (Manual)  
DoC: 1987  
Make: Indian Sugar General Engg.  
Corporation Ltd.  
Without graph plotting feature

CNC Wheel Press Machine  
DoC: 25.05.2013  
Make: M/s Electropneumatic &  
Hydraulics (India) Pvt. Ltd. Pune

2. Facility of recording of pressure graph is not available in manual machine, but this machine is being used for only press out of wheel.
3. CNC Machine is not under AMC since last 3-4 years, **So calibration of machine is also not done. Analog pressure gauge attached in machine is showing that calibration is due since 2018.**
4. Before assembly interference between wheel seat and wheel bore is being measured. On checking of record it is found that interference is being kept within limit.
5. **Surface roughness is not being measured** at the time of wheel pressing. One ready axle for wheel pressing checked visually found groove line. **On checking found surface roughness out of limit (Ra 5.47  $\mu\text{m}$  against limit of Ra 3.2  $\mu\text{m}$ ).**
6. **Presence of taper on wheel seat is being checked but very vaguely and also it is not being recorded anywhere.**

7. No calibration record found for inside and outside micrometer on shop floor. It is told that record being maintained by tool room. As per calibration certificate collected from tool room, calibration is due since Feb' 2023.
8. **UST of wheels is not being before wheel pressing.**
9. **Kluber make OKS 200 MoS2 Assembly paste is being used, which is not as specify the TC-132 or MP.IB.VL-01.02.09 (Rev 01).**
10. Some wheels were not properly stacked. On checking some new wheels dent mark were found on them.



**Improper Stacking of wheels**



**Dent mark on wheels**

11. It was told that M/s DSP is sending wheels in loose in truck which may cause damage to wheels. Whereas imported wheels from M/s TZ Taizhong Hong Kong International Lmt.-Hong Kong are received properly stacked and tied in stand as shown below.



**Loose wheels received from M/S DSP**



**Properly Stacked and tied in stand wheels**



## **(B) Wheel shop at Electric Loco Workshop, Bhusawal:**

1. There are 02 wheels pressing machine at ELW/BSL



**New CNC Wheel Press Machine**  
DoC: 24.12.20  
Make: M/s Electropneumatic &  
Hydraulics (India) Pvt. Ltd. Pune



**Old CNC Wheel Press Machine**  
DoC: 27.04.2002  
Make: M/s Electropneumatic &  
Hydraulics (India) Pvt. Ltd. Pune

2. Old Machine is being used only for pressing out of wheel as pressure graph is not saved due to some fault in Machine. Workshop is in touch with manufacturer for maintenance of the above fault.
3. As per wheel set out-turn data collected from workshop around 158 wheel sets are assembled per month.
4. Handling and storage of wheel found satisfactory.



**Lifting of wheel**

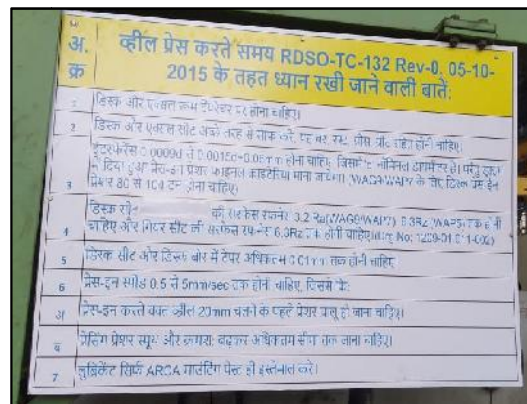


**Storage of wheel**

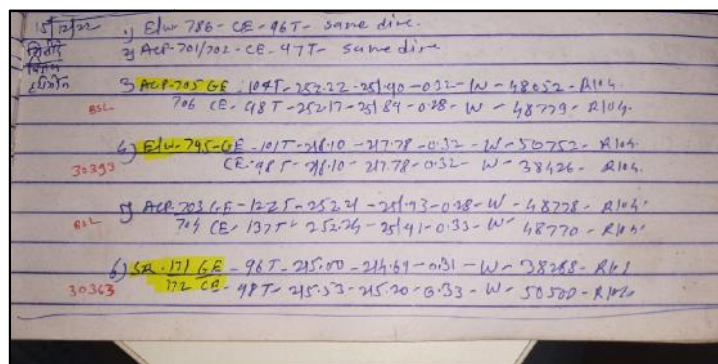


**Arrangement for holding of axle before assembly**

5. Work instruction for wheel pressing is available.



6. A register for recording the data is available at shop floor, which is showing records of wheel pressing in since April'2023. Old record of wheel pressing is asked, but same is not available for scrutiny. However on asking repeatedly some photos of old record were received and as per this record surface roughness & taper of wheel seat and wheel bore were not being measured before assembly of wheel set.



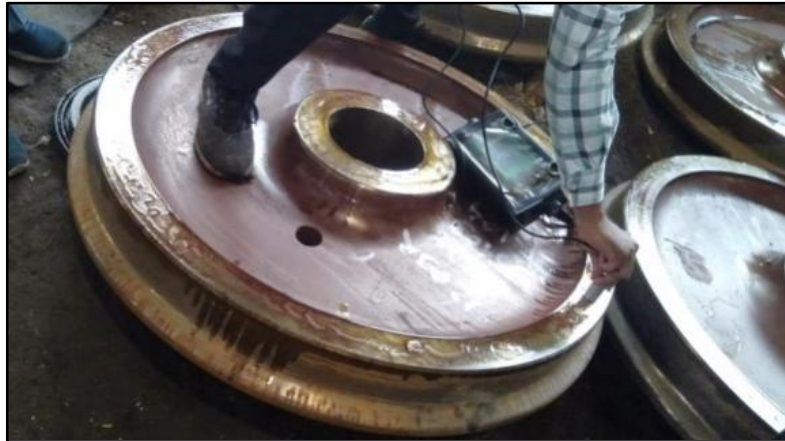
Old wheel pressing record

7. As per the new register measurement of surface roughness of wheel seat & taper and ovality of wheel seat and wheel bore is being done and being recorded since April'2023.



Surface roughness checking

8. **Workshop is allowing taper below 0.02mm. However as per ABB manual specified limit of taper is 0.01mm.**
9. Before assembly interference between wheel seat and wheel bore is being measured. On checking of record it is found that interference is being kept within limit (0.25 to 0.33 mm).
10. Pressuring in graph for wheels is maintained.
11. **Surface roughness of wheel bore is not measured by workshop at the time of wheel pressing due to non-availability of instrument. Workshop official told that procurement of the instrument is under process.**
12. Arcanol of M/s Schaeffler/Germany (which is as per TC 132) is being applied by workshop as mounting paste by brush after cleaning of wheel seat and bore during wheel pressing.
13. Oil groove and side area of bore is honed by staff by using honing stone if burrs observed.
14. **Process of wheel gauge adjustment work is also discussed with workshop officials. It is informed that in case of higher wheel gauge, wheel gauge adjustment is done by pressing out of gear end side wheel upto half length of wheel seat and pressing in it again to achieve wheel gauge with in limit and record of any measurements are kept by workshop. While in case of lower wheel gauge, workshop measuring wheel gauge at 4 places at equal distance and if it is found less than some material from inner face of wheel rim is being cut by surface lathe machine.**
15. No of rejection of wheel pressing-in for 01.04.22 to 11.04.23 is 48 wheel set.
16. Before pressing in UST of wheel is being done.



**UST of Wheel rim and hub**

17. Calibration of Instrument (i.e. inside micrometer, outside micrometer, surface roughness tester, road gauge and CNC machine) used by workshop for wheel pressing activities were examined and found satisfactory.



### (C) Wheel shop at Electric Loco Workshop, Kancharapara:

1. There are 02 wheels pressing machine at ELW/KPA.



**New CNC Wheel Press Machine**  
DoC:24.08.20  
Make: M/s Electropneumatic &  
Hydraulics (India) Pvt. Ltd. Pune



**Old CNC Wheel Press Machine**  
DoC: 14.09.2013  
Make: M/s Electropneumatic &  
Hydraulics (India) Pvt. Ltd. Pune

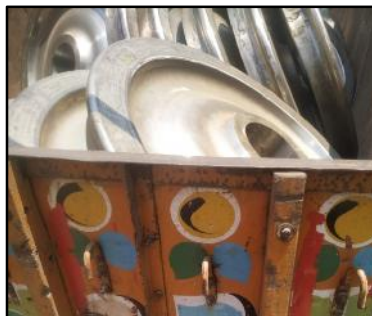
2. WAP7/WAG9 Wheel set out-turn data of workshop for the period of 2020-21 to 2022-23 is as under:

Year	Out Turn in set
2020-21	280
2021-22	452
2022-23	679

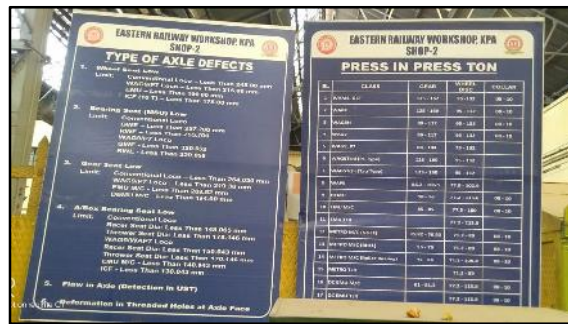
3. Handling and storage of wheel found satisfactory.



4. On discussion it was told that Wheel disc from DSP are coming in loose in truck, which may cause dent mark on wheel.



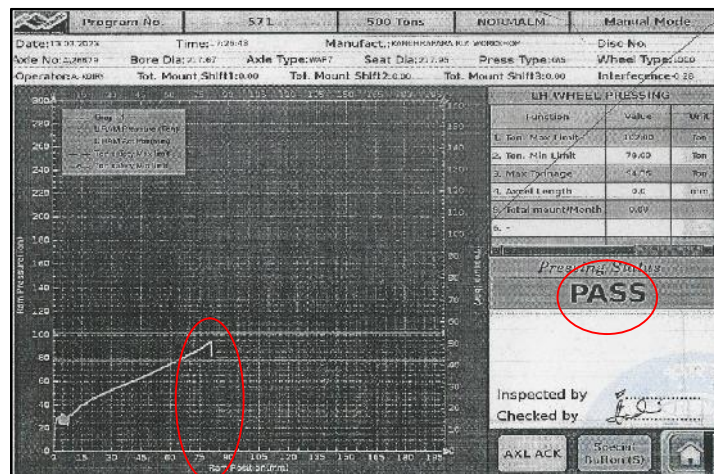
- 5. Important parameter related to wheel pressing is displayed at shop floor.



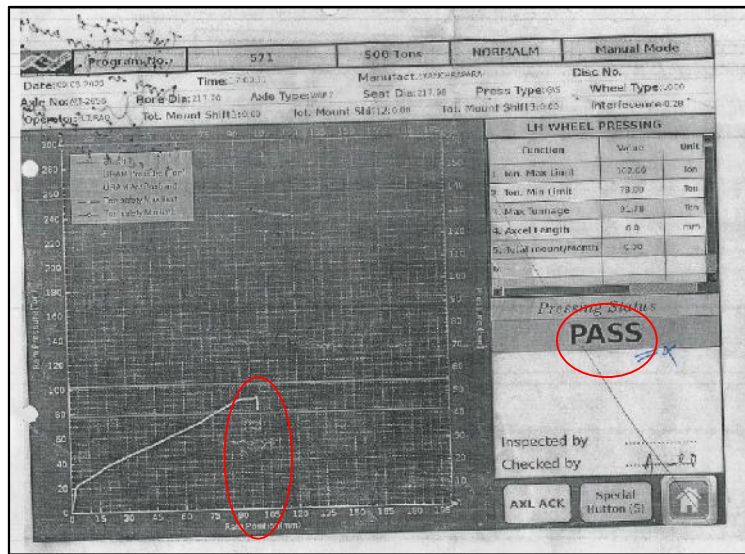
- 6. In old machine if pressing-in is stopped in between for any reason (such as for final adjustment of wheel gauge or for achieving gap between MSU tube and hub of wheel) and started again, a separate graph is being generated for second stroke rather than in continuation of earlier graph as shown. Workshop should approach OEM for rectification of the same.



- 7. During audit pressing-in of 5 wheels was checked and in 2 cases operator stopped pressing-in after the travel of around 105 to 135 mm against total required travel of 180 mm, on wheel seat when pressure reached around maximum limit, operator saved the graph in this halfway condition itself to make it a acceptable pressing. However on insistance by RDSO official it was asked to plot the complete graph upto the desires location and pressur was found out of limit. In this regard some old graphs were also cheked and found that it is a general practice that in some cases it pressure is reached at maximum limit at any distance of wheel seat graph is save at that position only and pressure taken for movement of remaining distance is not recorded in graph.







Old graphs from record

8. **Surface roughness & taper is not being measured before assembly.**
9. Interference was being checked before assembly and being maintained within limit.
10. Mixture of white lead with linseed oil is being used as mounting paste, which is as per TC-132 Rev. 0.
11. Maximum Wheel pressing-in pressure in graph shown in machine and maximum tonnage recorded in table on the machine display were not matching.
12. Oil groove on bore is honed by staff by using grinder if burrs observed.
13. **UST of wheels is not being before wheel pressing.**
14. Calibration of Instrument (i.e. inside micrometer, outside micrometer, road gauge and CNC machine) used for wheel pressing activities was examined and found satisfactory.

#### **(D) Recommendations:-**

1. It should be ensured that RDSO Technical Circular No. RDSO/2015/EL/TC/0132 (Rev-0) dated- 01.10.2015 issued vide RDSO letter no. EL/3.2.108 dated 5.10.15 regarding procedure for pressing-in wheels on axles in electric locomotives is followed by all wheel shops.
2. 100% Ultrasound testing must be carried out by a fully trained person on wheels and axles before wheel pressing. The results should be recorded and preserved for future reference.
3. Ensure proper handling of wheels to avoid any dent mark on wheels.
4. The axle shall be fully machined and finished as per the relevant drawing. If any taper exists (within limit), the small diameter must be at outside end (reversed taper not allowed).
5. All the critical parameters i.e. taper, surface finish, interference and pressing in pressure are to be measured with calibrated instruments and their values must be maintained within prescribed limits as below:

Surface roughness	Wheel seat	Ra 3.2 $\mu\text{m}$
	Wheel bore	Ra 1.6 to 3.2 $\mu\text{m}$
Taper	Wheel seat	0.01 mm
Interference	0.251 to 0.33 mm	
Pressing-in pressure	79.4 to 104.6 Tonnage	

6. The wheel must be pressed in single stroke.
7. The wheel pressing machine shall be equipped with a correctly calibrated pressure indicating gauge and automatic recorder producing a plot of pressing-in force as a function of wheel displacement relative to the axle wheel seat throughout the pressing operation. This plot shall be large enough to permit a precise determination of pressing-in force at any position on the curve.
8. The complete records for wheels pressed for gauge adjustments should also be maintained, same as for initial wheel pressing.
9. The manufacturers' serial number should be properly noted down before machining of hub face. After machining the same serial no should be punched again on the hub to ensure traceability of the wheel discs. This will permit proper investigation in wheel disc failures particularly those in which problems are noticed in a particular source/batch/heat.
10. At ELS/CNB it was found that new imported wheel from M/s M/s TZ Taizhong Hong Kong International Lmt.-Hong Kong were received in proper stacked and tied in stand to avoid damage. M/s DSP may be asked to send the wheels in same manner.



**(E) References:-**

1. RDSO Instruction Bulletin No. MP.IB.VL-01.02.09 (Rev 01)
2. RDSO Technical Circular no. RDSO/2015/EL/TC/0132
3. M&C Investigation Report no. 17/16 issued vide letter no M&C/MIT/I&T/6 dated 2.6.16
4. MP Investigation Report no. MP.INV.51 (Rev.00)