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Date 28.05.2019

No. EL/3.2.182

Chief Electrical Engineer,

- Central Railway, Mumbai CST-400 001.
- Northern Railway, Baroda House, New Delhi-110 001.
- North Central Railway, Hastings Road, Allahabad- 211001
- Eastern Railway, Fairlie Place, Kolkata -700 001.
- East Central Railway, Hazipur-844101.
- East Coast Railway, Chandrashekharpur, Bhubaneshwar-751016.
- Southern Railway, Park Town, Chennai-600 003.
- South Central Railway, Secunderabad-500 371.
- South Eastern Railway, Garden Reach, Kolkata -700 043.
- South East Central Railway, Bilaspur-495004
- Western Railway, Churchgate, Mumbai-400 020.
- West Central Railway, Jabalpur-482001.
- North Eastern Railway, Gorakhpur – 273 001
- North Frontier Railway, Malegaon Guwahati – 781 011
- North Western Railway, Jaipur – 302 006.
- South Western Railway, Hubli – 580 023
- Chittaranjan Locomotive Works, Chittaranjan-713 331 (WB).
- Diesel Locomotive Works, Varanasi – 221 004

Sub.: Minutes of Meeting on adoption of Traction motor labyrinths of TM type 6FRA6068 as per original dimensions given by ABB to eliminate problem of gear case oil ingress

Ref.: RDSO's letter of even number dated 05.04.2019 & 29.04.2019.

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The minutes of meeting **on adoption of Traction motors labyrinths of TM type 6FRA6068 as per original dimensions given by ABB to eliminate problem of gear case oil ingress** held at RDSO on 02.05.2019 had been issued and may be downloaded from RDSO website using following path: http://www.rdso.indianrailways.gov.in→ Directorates → Electric Loco → Reliability meetings →TM/MSU/Bearing →EL/3.2.182 dated 28.05.2019.

This is for your kind information please.

28.5.19

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

Copy to:
Secretary (Elect.), Railway Board, Rail Bhawan, New Delhi- 110 001
(Kind attention: **Sri A. K. GoswamiDEE/RS/RB):** For kind information please.

28.5.19

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

Encl: As above

Meeting on adoption of Traction motor labyrinths of TM type 6FRA6068 as per original dimensions given by ABB to eliminate problem of gear case oil ingress into TM held at RDSO on 02.05.2019

Present : As per enclosed list.

1. In the past, during 2008-09, large numbers of bearing seizure cases in 6FRA6068 TM were reported. These was attributed to the fact that radial clearance between rotating and non-rotating ribs of labyrinths were in range of 0.25 mm to 0.435 mm and any non concentricity of 0.2 mm to 0.3 mm between labyrinths/End frame/Stator may cause rubbing of labyrinths which may finally result in bearing seizure. CLW had increased the clearance between fixed and moving parts of matching labyrinths by 0.5 mm in diameter and 0.2 mm axially.

2. It is observed that initially in 2008-09, there were issues related to quality of machining and measurements carried out and prescribed dimensions/tolerances and concentricity of components could not be ensured, which was resulting into bearing seizures. To reduce the problem of bearing seizures, CLW had increased the clearances, which solved the problem of bearing seizures but due to increase in clearance between labyrinths, problem of ingress of gear case oil in DE side bearing and stator had started.

3. Original design of labyrinths was with SGCI material, however, due to non-availability of casting and machining facilities for SGCI casting, CLW started to use labyrinths with General Structural Steel of Grade Fe 410 WB as per CLW Specification 4TMS.096.055 from July 1997. CLW switched over to original design material on 20.11.2007 from General Structural Steel as per IS: 2062 to SGCI as per IS:1865.

4. RDSO had also issued modification sheet number RDSO/2016/EL/MS/0439 (Rev.'0') dated 23.11.2016 for Modification in drawing of Outer Bearing Cap (DE) to drain out ingressed gear case oil from TM type 6FRA6068. However, even after implementation of modification, the problem of oil ingress continued.

5. Schedule of Technical Requirements (STR) number RDSO/2007/EL/STR/0021 Rev. '1' dated 31.7.2007, prescribes CNC machining centers for machining and Coordinate Measuring Machines (CMM) for measurements of assembly components of three phase electric loco traction motors.

6. As CLW had already switched back to original SGCI material and machining of assembly components is now carried out on CNC machining centers and measurements are carried out on Coordinate Measuring Machines (CMM), it is felt that, if clearances of labyrinths are restored to their original dimensions prescribed by ABB, problem of non-concentricity should not arise now and it will also solve the problem of ingress of gear case oil in traction motor which had started when clearances had been increased.

7. To overcome the problem of ingress of gearcase oil in TM, CLW was advised vide letter number EL/3.2.182 dated 21.11.2017, to procure & provide 5 loco set quantity of assembly components in kit form manufactured as per original ABB dimensions and monitor the performance.

8. CLW had procured 10 Loco set quantity (60 sets of assembly components) from M/s KMRI, Howrah vide letter no. CLW/TM/18059/Part-1 dated 22.01.2018.

9. In order to expedite the trial with original ABB dimensions, it was decided vide letter no. EL/3.2.182 dated 08.02.2018 that, ELS/GMO shall collect 5 Loco sets (30 TM sets) of assembly components of TM type 6FRA6068 with original ABB dimension from CLW and provide them in kit form in 30 TMs in five WAG9 locomotives during overhauling.

10. Based on satisfactory performance of five WAG9 received from ELS/GMO, and to expedite the trial of labyrinths with original ABB dimensions, South Eastern Railway and Northern Railway were advised to collect 5 Loco sets (30 TM Sets) of assembly components of 6FRA-6068 TM with original ABB dimensions from CLW and provided them in kit form in five WAP7 locomotives during overhauling.

11. CLW vide letterNo. CLW/TM/17280 dated 27.08.2018, had provided the fitment details of 29 Traction motors with associated components as per original ABB dimensions in 14 different locomotives as detailed below:

Name of Shed/Rly.	Loco No.	TM Number	Date of Dispatch
LDH/NR	32122	8803,8791,8823,8863,9086	16/08/18
	32151	8772,8777,8784,8797,8790,8831	31/07/18
	32168	8757,8867	29/06/18
	32147	8752	13/07/18
	31635	8759	11/07/18
HWH/ER	30567	8359	27/06/18
CNB/NCR	32174	8780,8804,8832,8824,8845,8844	31/07/18
	32171	8816	24/07/18
BNDM/SER	32167	8769	18/05/18
TATA/SER	32140	8770	31/05/18
TKD/WCR	32169	8755	09/07/18
	32157	8776	16/07/18
KZJ/SCR	32128	8728	10/05/18
AQ/CR	39003	8854	31/08/18

12. ELS/GMO/ECR vide letter no. ELS/401/GMO/3-Ph/TM dated 12.02.2019 had submitted the performance of 5 Loco set. Modified labyrinths were provided in May 2018. In one of the Loco No. 32086, Axle No. 5 was found locked on line on 23.08.2018 due to self failure of bearing seizure. Performance of other TMs is reported normal and no oil ingress is reported.

13. Performance of above Traction motors were asked vide RDSO's letters numbers EL/3.2.182 dated 12.03.2019, EL/3.2.182/SER dated 12.03.2019 & EL/3.2.182/NR dated 12.03.2019

14. Northern Railway vide letter no. 230-Elect/TRS/92/2/5 dated 25.03.2019 had informed the performance of 15 TMs (fitted in five WAG9 Locos by CLW) in ELS/LDH. Out of 15 TMs, oil ingress reported in only one TM fitted in Loco No. 32122. CLW is requested to investigate oil ingress reported in one TM by ELS/LDH.

15. Northern Railway vide letter no. 230-Elect/TRS/92/2/5 dated 02.04.2019 had informed that ELS/GZB has put 29 numbers TMs into service in WAP7 and found no ingress of oil so far. (30218 – 4.1.19, 30207 – 4.2.19, 30214 – 26.2.19, 30399 – 28.2.19, 30403 – 5.3.19) One remaining motor cannot be assembled due to crack in labyrinth. CLW is requested to investigate the cause of crack in new labyrinth reported by ELS/GZB.

16. West Central Railway vide letter no. WCR/L/05/2225 dated 15.03.2019 had informed that 2 TMs into service in two WAG-9 Locomotives and noticed no problem of oil ingress since commissioning.

17. ELS/HWH vide letter no. ELS/HWH/Tech.1/P7/18-99 dated 16.03.2019 had informed that TM No. 8359 is working normal.

18. ELS/AQ vide letter no. ELS/AQ/T-53A dated 08.04.2019 informed that TM is working satisfactory & no ingress of oil noticed till date in motor no. 8854.

19. South Central Railway vide letter no. E.221/TM-3-phase/Vol.V dated 08.04.2019 had informed that problem of gear case oil ingress into TM is not noticed so far in TM No. 8728/TM-3, Loco No. 32128 since 10.05.2018.

20. ELS/TATA/SER vide letter no. RS/TATA/T/Per/584 dated 08.04.2019 had informed that they had fitted 12 sets of labyrinths (12 TMs) in Locos No. 37011 & 37061 (WAP-7) and working normal till date.

21. Summary of the Traction motors equipped with original ABB dimensions of assembly components and performance received from sheds is given below :

Sheds/ Railway	TMs Nominated for trial	TMs in service	Loco Type	Ingress of oil reported by Railways/Sheds	Remarks
LDH/NR	15 TMs	15 TMs	WAG-9	1 TM	Nil
GZB/NR	30 TMs	29 TMs	WAP-7	No ingress of oil so far	One cracked labyrinth in set.
GMO/ECR	30 TMs	29 TMs	WAG-9	No ingress of oil so far	Self failure of Bearing in 1 TM
HWH/ER	1 TM	1 TM	WAP-7	No ingress of oil so far	NIL
KZJ/SCR	1 TM	1 TM	WAG-9	No ingress of oil so far	NIL
TKD/WCR	2 TM	2 TM	WAG-9	No ingress of oil so far	NIL
AQ/CR	1 TM	1 TM	WAG-9	No ingress of oil so far	NIL
TATA/SER	30 TM	18 TM	WAP-7	Working normal till date	NIL
CNB/NCR	7 TMs	7 TMs	WAG-9	Working normal till date	NIL
BNDM/SER	1 TM	1 TM	WAG-9	Performance not received	Nil
TATA/SER	1 TM	1 TM	WAG-9	Working normal till date	NIL
Total	**119**	**105**			

22. From the above table it is observed that, performance feedback received, 48 TMs are working satisfactory in WAP7 Locomotives, and 57 TMs are working satisfactory in WAG9 locomotives as on date.

23. Loco wise service period is given below:

SN	Loco No.	Loco Type	Shed/Rly.	Nos of TM fitted	D.O.C	Approx period	Remarks
1	32086	WAG 9	GMO/ECR	6	02/05/18	12 months	1 TM brg. Seiz.
2	32037	WAG 9	GMO/ECR	6	04/05/18	12 months	
3	32074	WAG 9	GMO/ECR	6	12/05/18	12 months	
4	32065	WAG 9	GMO/ECR	6	16/05/18	11.5 months	
5	32079	WAG 9	GMO/ECR	6	19/05/18	11.5 months	
6	32122	WAG 9	LDH/NR	5	04/10/18	6 months	1 ingress case
7	32155	WAG 9	LDH/NR	6	30/09/18	6 months	
8	32168	WAG 9	LDH/NR	2	05/08/18	8 months	
9	32147	WAG 9	LDH/NR	1	19/08/18	7.5 months	
10	31635	WAG 9	LDH/NR	1	21/08/18	7.5 months	
11	32174	WAG 9	CNB/NCR	6	20/08/18	7.5 months	
12	32171	WAG 9	CNB/NCR	1	20/08/18	---	
13	32167	WAG 9	BNDM/SER	1	--	---	Perf. Not recd.
14	32169	WAH 9	TKD/WCR	1	28/07/18	9 months	
15	32157	WAG 9	TKD/WCR	1	31/07/18	9 moth	
16	32128	WAG 9	KZJ/SCR	1	10/05/18	1moths	
17	3214	WAG 9	TATA/SER	1	11/06/18	11 months	
18	39003	WAG 9	AQ/CR	1	03/12/18	5 months	
19	30567	WAP 7	HWH/ER	1	23/08/18	7.5 months	
20	30218	WAP 7	GZB/NR	6	04/01/19	4 months	
21	30207	WAP 7	GZB/NR	6	04/02/19	3 months	
22	30214	WAP 7	GZB/NR	6	26/02/19	2 months	
23	30399	WAP 7	GZB/NR	6	28/02/19	2 months	
24	30403	WAP 7	GZB/NR	5	05/03/19	2 months	1 TM not assembled
25	37011	WAP 7	TATA/SER	6	13/10/18	6 months	
26	37061	WAP 7	TATA/SER	6	23/01/19	3.5 months	
27	30534	WAP7	TATA/SER	6	21/04/19	1 month	

24. All the sheds except ELS/HWH had informed that the modification of reverting back to original ABB dimensions is successful and problem of oil ingress had stopped with this modification. The sheds had suggested implementing this modification to solve the problem of oil ingress.

25. ELS/HWH had informed that after implementation of MS-439, problem of gear case oil ingress had stopped and informed that no further modification is required on this issue. However, other sheds had informed that even after implementation of MS-439, problem of gear case oil ingress had not stopped and requested RDSO to revert back to original ABB dimensions of labyrinths. Other sheds were also advised to visit and study the practices adopted by ELS/HWH.

26. CLW informed that implementation of MS-439 is not required in labyrinths with original dimensions as prescribed by ABB.

27. During the meeting, it is decided that production units (CLW/DLW/DMW) and traction motor manufacturers (BHEL/CGL/Saini etc.) shall revert back to labyrinths with original dimensions as prescribed by ABB. CLW shall modify the drawings suitably and issue the modified drawings to all concerned. Loco sheds will also provide labyrinths with original dimensions as prescribed by ABB, gradually during overhaul of traction motors or when traction motor needs to be removed due to any failure/oil ingress.

28. RDSO advised that strict quality control is required when labyrinths with original dimensions are provided. Machining should only be carried out on CNC machining centers and measurements should be carried out on Coordinate Measuring Machines (CMM). CLW is also advised to increase the quality control and quality check measures suitably. CLW and other traction motor manufacturers shall also carry out in-house inspection of assembly components on CMM on random basis.

29. During the meeting, ELS/LGD informed that they are providing prescribed quantity of grease in TM type 6FRA6068 in all schedules and greasing till outlet in second IA.

30. ELS/AQ had given a presentation during the meeting. Information given during presentation and discussed were as under:

(a) About 60 locomotives with original ABB dimension labyrinths in shed but no problem of gear case oil ingress in these locomotives.

(b) Changing the remark of most preferred dimension in table B3/C3 of MS-415 for DE bearing housing from 319.950 mm to 319.970 mm. The permissible range is 319.950 mm to 319.99 mm. With 319.950 mm as preferred dimension, interference with racer is from 10 to 50 micron. Higher interference is not desirable in end shield. With 319.970 mm as preferred dimension, interference with racer will be from -10 (clearance) to 30 micron. Other sheds also agreed for this. RDSO will issue suitable amendment of MS-415 separately. Sheds shall ensure that clearance is not there while assembly.

(c) Changing the NDE end shield diameter in table C4 of MS-415 from existing 214.948 - 214.96 mm to 214.948 – 214.970 with most preferred dimension as 214.96 mm. Other sheds also agreed for this. RDSO will issue suitable amendment of MS-415 separately.

(d) DE and NDE end shields rib side diameter was also increased by CLW by 1mm. Due to this increase in rib side diameter of end shields, grease is getting thrown on DE & NDE windings irrespective of the problem of oil ingress.

End Shield	CLW Drg. No.	Existing Diameter	OEM's Diameter
DE	1TWD.096.005	255.5 mm	254.5 mm
NDE	0TWD.096.003	181.0 mm	180.0 mm

CLW is requested to examine the suggestion of ELS/AQ and give its comments to RDSO within one month.

(e) CLW had not yet implemented the following modifications

i. To shift Stator Junction Box away from NDE side to avoid damages to leather bellow. CLW is requested to confirm the implementation of this modification.

ii. MS-437 regarding shielding of Temperature sensor cables. CLW is requested to confirm the implementation of MS-437.

(f) M/s. KMRI/HWH is putting it's identification mark of DE End Shield on Air inlet net. It needs to be provided on End Shield. CLW is requested to examine the issue and take necessary action on this issue.

(g) In CLW Drg. No. 1209-01-118-002 Alt-2 'Holder Plate for TM suspension', dimensions do not have any tolerance limit specified. All the dimension are shown without any tolerance limit. Drawing needs to be modified to indicate applicable tolerances. CLW is requested to examine the issue and take necessary action on this issue.

(h) Type of threads as per drawings in press off bores in Pinion shafts of 3 Phase TM 6 FRA 6068 are as below:

Sr. No.	Types of Pinion	Drawing No.	Type of threads
1	15 Teeth	1 TWD.096.107 & SKDP-3436	R ¼" BSP
2	21 Teeth	ABB's Drg. & SKDP-3847	G ¼" BSP
3	20 Teeth	SKDP-3473	R ¼" BSP

Actual threading done by manufacturer is given below

Make	15 Teeth	21 Teeth	20 Teeth
GGAG	Taper	Parallel	Taper
KPC	Parallel	Parallel	Parallel

M/s. GGAG supplies Pinions as per approved drawings, whereas M/s. KPC supplies with parallel threads in all types. Adaptors of Pinion extraction machine have parallel threads which gets damaged in taper threaded pinions and also gets leak at higher pressure. ELS/AQ requests for parallel threads in all types.

CLW is requested to examine the issue and take necessary action on this issue.

28.5.19

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

Annexure - I

List of Participants

SN	Name of Delegate	Designation	Railway/Shed
1.	Shri O.P. Kesari	PEDSE	RDSO
2.	Shri P.K. Saraswat	Director/TM	RDSO
3.	Shri Anurag Agarwal	Dy.CEE/TMD	CLW
4.	Shri A. Koteswara Rao	DEE	ELS/LGD/SCR
5.	Shri Mushtaq Hussain	ADEE	ELS/CNB/NCR
6.	Shri Arun Kumar Rana	ADEE	ELS/HWH/ER
7.	Shri Bibekanand Singh	SSE	ELS/GMO/ECR
8.	Shri G. Ajay Brahamachary	SSE	ELS/LGD/SCR
9.	Shri M.R. Ghooi	SSE	ELS/AQ/CR
10	Shri D.I. Singh	SSE	ELW/BSL/CR
11.	Shri S.P. Verma	SSE	ELS/TKD/WCR
12.	Shri Mahendra Pratap	SSE	ELS/CNB/NCR
13.	Shri G.C. Ghosh	SSE/D&D	CLW
14.	Shri Dig Vijay Singh	SSE	ELS/TATA
15.	Shri Mohd. Azeem	SSE	RDSO
16.	Shri Mahendra Kumar	Tech-II	ELW/BSL/CR
17.	Shri Abhay Kumar Tiwari	Tech	ELS/GMO/ECR