



Andhra Pradesh State Road Transport Corporation  
Office of the Managing Director, Bus Bhavan, Hyderabad - 500 624.

No: OP5/462(1)/2014-MED

**CIRCULAR No. 08/2014 - MED, Dt.09.05.2014.**

Sub: **MAINTENANCE**- Micro Analysis of breakdowns for the Year 2013-14 - Prevention of breakdowns and achieving "ZERO" breakdown Rate - Certain instructions issued - Reg.

- Ref: 1). Circular No.25/2012-MED, Dt.19.12.2012  
2). Circular No.14/2011-MED, Dt.03.05.2011  
2). Circular No.11/2010-MED, Dt.30.04.2010  
3). Circular No. 9/2008-MED, Dt.06.06.2008  
4). Circular No: 09/2005-MED, Dt. 03.09.2005  
5). Circular No: 17/2004-MED, Dt. 02.11.2004  
6). Circular No: 16/2003-MED, Dt. 05.06.2003

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The maintenance policies of our corporation are so designed that no vehicle is stranded enroute due to mechanical breakdown of any kind. The objective of the Corporation envisages preventive maintenance to the vehicles in order to provide safe, punctual, reliable and efficient operations to the public. Hence, foreseeing the possible breakdowns and arresting them by rendering the required maintenance as per the stipulated maintenance schedules is the basic principle of our entire maintenance activity. Thus, the ultimate aim of our maintenance management is to provide "Break down free" service.

Prevention of Breakdowns is one area which if neglected, not only results in financial loss to the Corporation but also in loosing the patronage of the commuters. Therefore the stoppage of vehicle on road due to mechanical failures rendering the vehicle immobile or discontinuation of further journey is a most undesirable phenomenon.

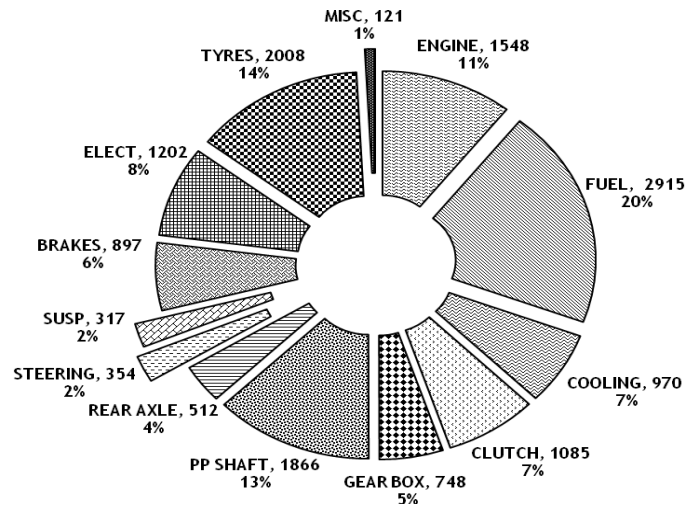
The **breakdown rate** at **Corporate level** during the year **2013-14** is **0.07** per 10,000 kms of operation against **Target of 0.06**. The Regions like WL, EG, NLR, OGL, MBNR, MDK, NLG, RR, ADB, KRMR, KMM, NZB & GNT have performed better with a breakdown rate of 0.02 to 0.07, whereas *the Regions of KRI, HCR, VSP, WG, ATP, KDP, KRNL, CTR, SCR & NEC* have registered the highest breakdown rate of 0.08 to 0.12.

Similarly the Ashok Leyland Regions **NLG, RR, NZB, WL, NLR & PRKSM** have achieved their communicated Break Down Rate target for the year 2013-14, whereas **East Godavari** is the only Tata Region which achieved the Target of 0.04 for the year 2013-14. All other Tata Regions have registered higher Breakdown Rate than the communicated targets.

It clearly shows that wherever the preventive maintenance systems are followed scrupulously and the failures are analyzed critically with a view to identify the causes of failure viz., material failures, system failures, human failures etc., those Regions/Units are maintaining the lowest breakdown rate. The other Regions/Units where these aspects are ignored are not faring well and are contributing to more breakdowns.

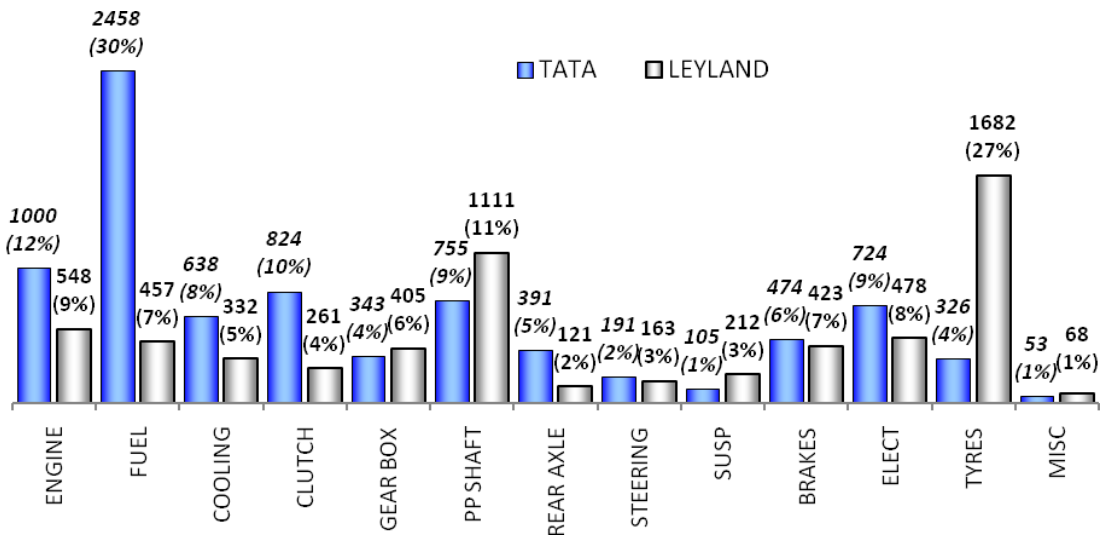
Through the circular No.9/2008-MED, detailed instructions were already issued for implementation at various levels to achieve **Zero breakdowns**.

Further, the Mechanical Engineering Department/Head Office has analyzed the **14,543** breakdowns occurred during the year 2013-14. The System-wise and micro level analysis is discussed hereunder for the benefit of Managers and the Supervisors to go for similar exercise at Depot/Region level for further planning and execution to achieve **“Zero breakdowns”**:



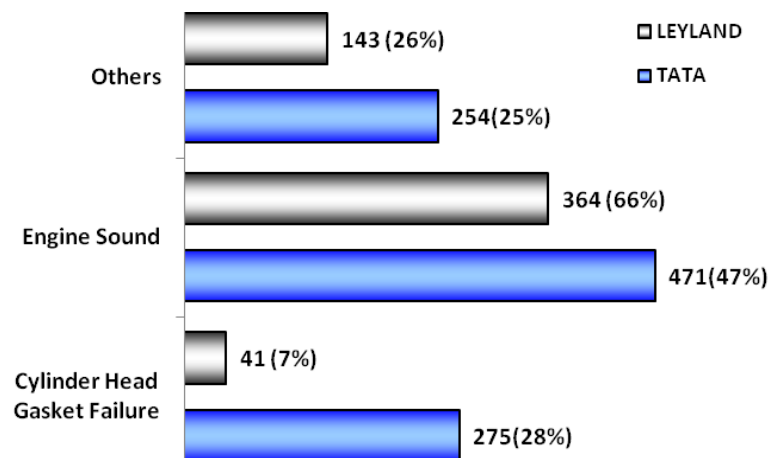
System-wise Breakup of total Breakdowns for the year 2013-14

The area-wise breakdown analysis i.e, Tata area Vs Leyland area during the year 2013-14 is as follows.



It could be inferred from the critical analysis of breakdowns occurred during the year 2013-14 that the failures on account of very few systems are contributing to the high rate of breakdowns in both Tata and Leyland areas. The following **micro level analysis** of breakdowns in each system helps in identifying the common deficiencies and scope for paying extra attention to the areas where the rate of failures is on high side.

- 1) **ENGINE SYSTEM:** Out of 1,548 failures occurred in Engine system during 2013-14, Tata area contributed to 1,000 failures and Leyland area to 548 failures. Failures on account of Engine sound are observed to be more in both Tata & Leyland areas.



The study on engine breakdowns reveals that majority of engine failures can be well anticipated much ahead of its occurrence by keenly observing the peculiar sound the engines emanate owing to defects like worn out Main/Con-rod bearings, worn out gudgeon pin bushes, defective tappets/rockers/valves/camshaft, defective timing gears, mis-firing of injectors, etc. If these defects are properly identified and attended in time, majority of the engine breakdowns can be avoided besides preventing irreparable damage to the expensive parts like Engine block, Crankshaft, cam shaft, connecting rods etc.,

Engine Lubrication system & Cooling systems are the most vital systems of an engine which require greater attention to prevent engine failures at depots. Engine oil pressure gauge and Coolant temperature gauge are the two important instruments of an engine which help in knowing the condition of the engine very accurately. But, the working condition of these two instruments is mostly neglected at majority of the Depots. There is need to ensure proper working condition of all instruments in the dashboard and create awareness among the Drivers and maintenance staff on the importance of reading these instruments.

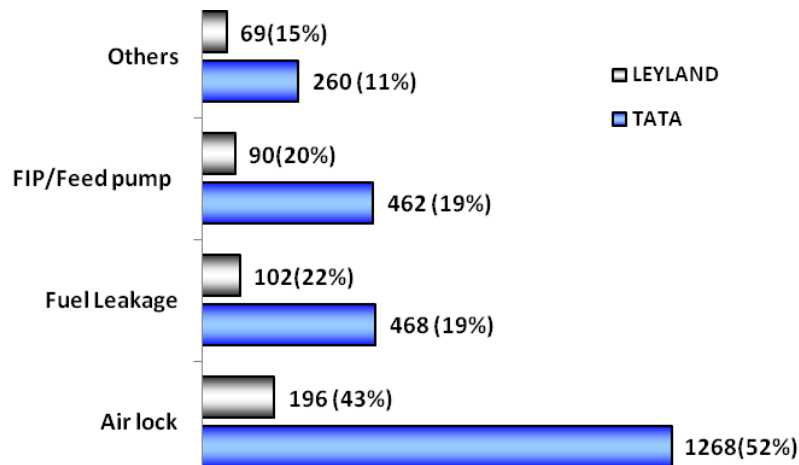
Detailed guidelines have already been issued on the measures to be taken on engine care and maintenance vide circulars

- 13/2012-MED dt.12.04.2012
- 10/2012-MED dt.03.04.2012
- 34/2011-MED dt.16.09.2011
- 16/2011-MED dt.13.05.2011
- 15/2010-MED dt.24.06.2010
- 13/2009-MED dt.27.06.2009
- 23/2008-MED, Dt. 29.09.2008
- 18/2007-MED, Dt.06.09.2007
- 3/2000-MED, Dated 29.2.2000
- 64/1992 MED., Dt. 22.12.1992
- 40/92-MED., Dt. 04.08.1992
- 54/1992 MED., Dt. 05.11.1992
- 35/91-MED., Dt. 28.09.1991

- 54/91-MED., Dt. 09.12.1991

The instructions issued through the above circulars need to be implemented with true spirit to avoid engine breakdowns.

- 2) **FUEL SYSTEM:** As many as 2,915 Breakdowns were occurred in Fuel system which contributes to about 20% of total breakdowns recorded during the year 2013-14 at corporate level. This is the highest among all the systems. Particularly, the number of Fuel breakdowns is on high side in Tata area which is a matter of concern.



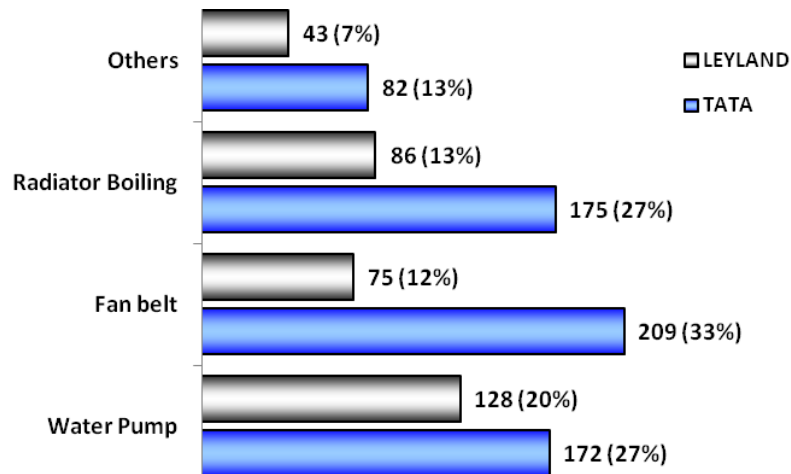
The common failures that occurred both in Tata & Leyland areas are Air lock troubles, and majority of these failures are totally avoidable. The important aspects like proper clamping of all fuel pipe lines, cleaning of Fuel Tank/ Strainers/ Baby filters at the recommended intervals with HSD oil only, draining of water from Fuel Water Separator (FWS), timely replacement of fuel filters, Checking the function of feed pump and periodical replacement of feed pump valves etc., play greater role in avoiding the Air Lock Trouble to the maximum extent.

The guidelines issued through the following circulars need to be implemented scrupulously to prevent breakdowns on account of fuel system failures

- 11/2009-MED, Date: 26-06-2009,
- 16/2007-MED, Dt 23-07-2007,
- Lr.No.OP3/463(7)/06-MED, 26.02.2007,
- 15/2006-MED, Dt.24-11-2006,
- 19/92-MED., Dt. 08-05-1992,
- 18/92-MED., Dt. 8-05-1992,
- 54/1992 MED., Dt. 05-11-1992

- 3) **COOLING SYSTEM:** '970' cooling systems failures were registered during 2013-14 contributing to 7% of total failures. Though the number of breakdowns on account

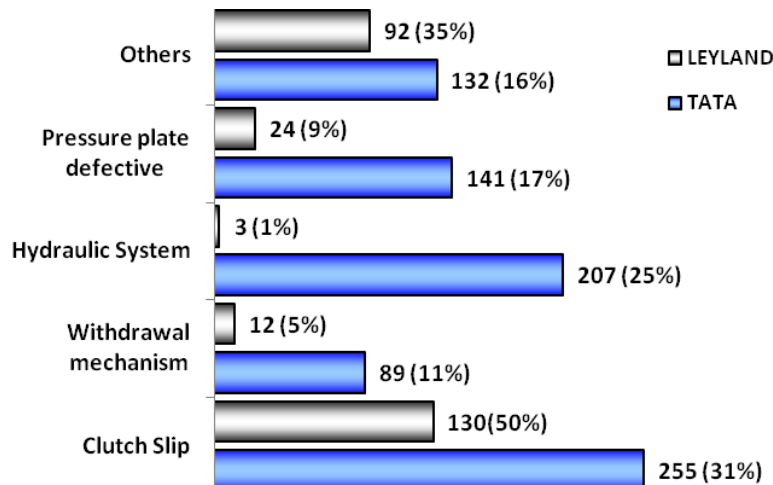
of cooling system is relatively low, but these failures could cause extensive damage to the engine and its components if not prevented.



Elaborate instructions have been issued vide circular No. **18/2007-MED**, Dt.06/09/2007 on the importance of Cooling system and the measures to be taken at depots for its effective maintenance.

With regard to the latest vehicles fitted with Intercoolers, much attention is required to ensure cleanliness of fins on both Radiator and Intercooler, so that the air passes freely & adequately through the Radiator for effective heat dissipation from the coolant. The temperature gauges, transducers, thermostats shall always be kept in proper working condition. All types of Radiator hoses, Jubilee Clips/clamps, Radiator caps, Thermostats etc., shall be adequately stocked at depots for timely replacement. There shall not be any compromise with Water pump greasing (for Tata vehicles) during Sch-II, III/IV maintenance which otherwise may lead to premature failure of water pumps.

- 4) **CLUTCH SYSTEM:** As many as 1,085 Clutch related failures were registered during the year 2013-14 contributing to 7% of total breakdowns, which is the fifth highest of the system breakdowns.



Clutch riding by the Drivers is one of the main causes for such a high rate of clutch related breakdowns in both Tata & Leyland areas. This is more prevalent in Tata area owing to hydraulic clutch actuation fitted on these vehicles. Proper

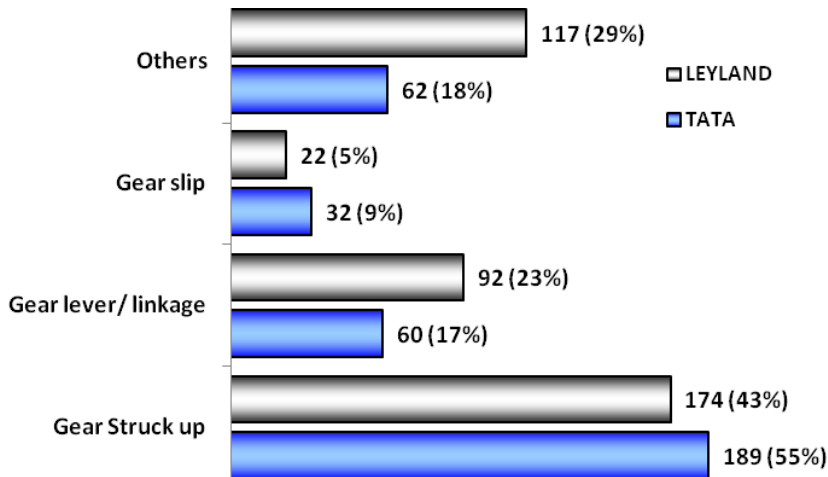
counseling and education of drivers on clutch abuse can help in reduction of clutch related failures to a great extent.

The mismatching of different models of Clutch discs/Pressure plates in case of Tata fleet will also result in more clutch slip failures besides usage of RC clutch linings for clutch discs. The proper usage of Jig for adjusting Push/Pull type clutch Pressure plate fingers along with clutch disc in Tata/ by 'H' gauge in Leyland will eliminate the clutch slip problems.

With regard to the maintenance of clutch system, the guidelines issued vide the following Circulars shall be followed scrupulously to avoid breakdowns on account of clutch system.

- 15/2002-MED, DT. 18-10-2002,
- 02/2000-MED, Dated 24.01.2000,
- 27/99-MED, DT. 06.09.1999.,
- 19/2009-MED, Dated: 20-08-2009,
- 19/2002-MED, DT. 17-12-2002,
- 54/1992 MED., Dt. 05-11-1992
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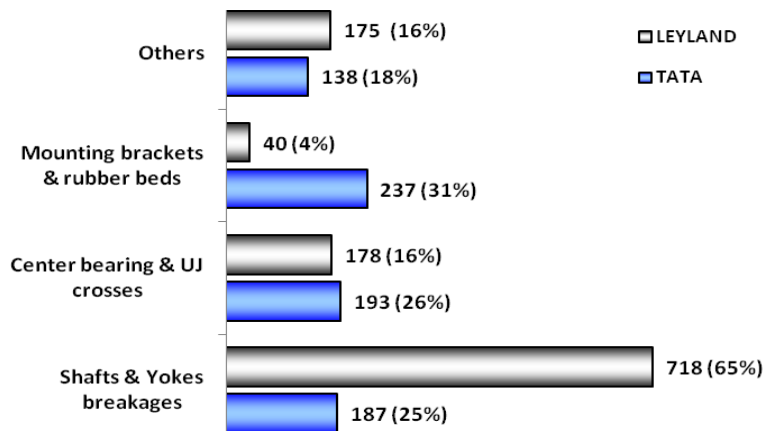
5) **GEAR BOX:** '748' Gear system failures account for about 5% of total breakdowns occurred during 2013-14. The percentage of Gear system failures is slightly higher Leyland areas.



The wrong practice of shifting gears without applying the clutch by the Drivers, low oil level in the Gear Box due to leakages (neglecting breathers cleaning), delayed oil changes, negligence in timely rectification of defects in gear shift linkages, loose mounting of Gear lever bed on Cylinder head (in Tata) are some of the contributing factors for Gear system breakdowns. The wrong practice of overhauling Gear Boxes at Depot level by cannibalizing the units is also a contributing factor for enroute breakdown of Gear boxes.

6) **PROPELLER SHAFTS:** This is one area which needs greater attention, as almost all the PP shaft failures are totally avoidable. Breakdowns on account of PP shaft

failures constitute to about 13% of total breakdowns during 2013-14 and which is the third highest system of failure after tyres.

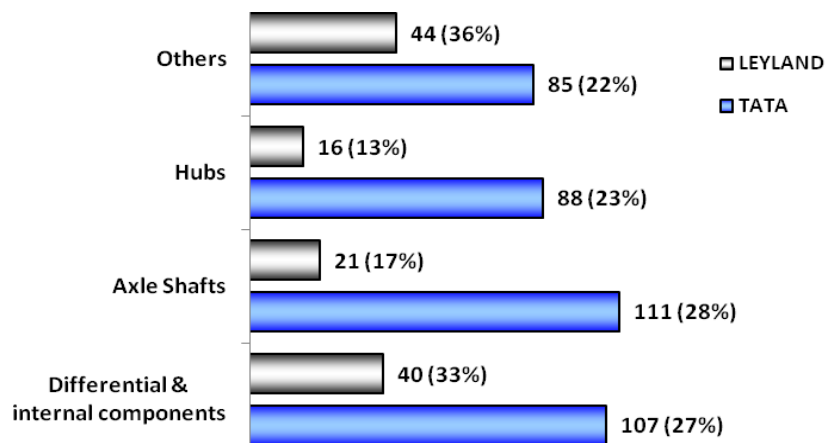


About 65% of P.P. Shaft breakdowns in Leyland area are due to Yoke/shaft breakages, while 31% of the failures are on account of CJ Bracket/ Rubber bed failures in Tata area. Hard & rash engagement gears without applying the clutch, heavily worn out splines lead to breakage of yokes and PP shafts. Lack of lubrication is one of the most important causes of UJ Cross, CJ Bearing, slip joint, sliding yoke failures. Mis-alignment, 'out of round'/unbalanced shafts lead to vibrations and failure of CJ Rubber beds and Brackets.

The guidelines issued on proper maintenance of Propeller shaft through the following Circulars shall be followed to prevent failure of PP shafts.

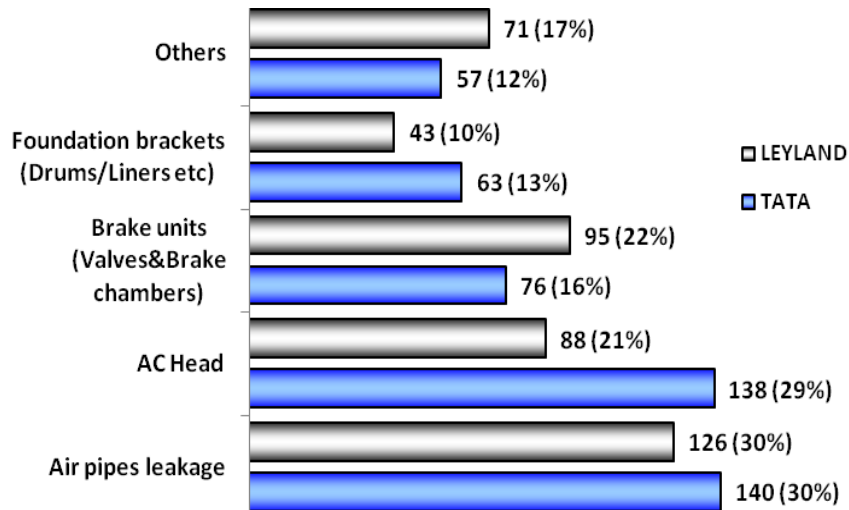
- 15/2006-MED, Dt.24-11-2006 &17/2000-MED, Dated 24.05.2000
- 02/2004 - MED DT.08.01.04
- 54/1992 MED., Dt. 05-11-1992
- 52/91-MED., Dt. 9 12 1991
- 6/99-MED, DT. 19.02.99
- 28/91-MED., Dt. 14 8 1991

7) **REAR AXLE:** Failures occurring in Rear Axle can be mainly attributed to lack of lubrication, not adjusting Crown wheel-pinion backlash and not adjusting the thrust pads during Sch-IV maintenance.



The worn out Half axles shall be replaced during Sch-III/IV maintenance to prevent enroute breakdowns. The splined portion of Wheel Hubs in Tata and studs/ stud bores in Ashok Leyland shall be checked thoroughly during Sch-III/IV maintenance.

- 8) **BRAKE SYSTEM:** Breakdown of vehicles with failure of Brake system shall be treated as very serious in view of its importance connected to the safety of the vehicle. It is a matter of concern that as high as 6% of Breakdowns were occurred due to Brake system failures in the year 2013-14.



Air leakages and AC Head failures constitute major share in Brake System failure in both Tata & Ashok Leland Area.

Elaborate instructions were issued vide circular no. 16/2005-MED, 20-12-05 on the steps to be taken at depots to avoid air leakages.

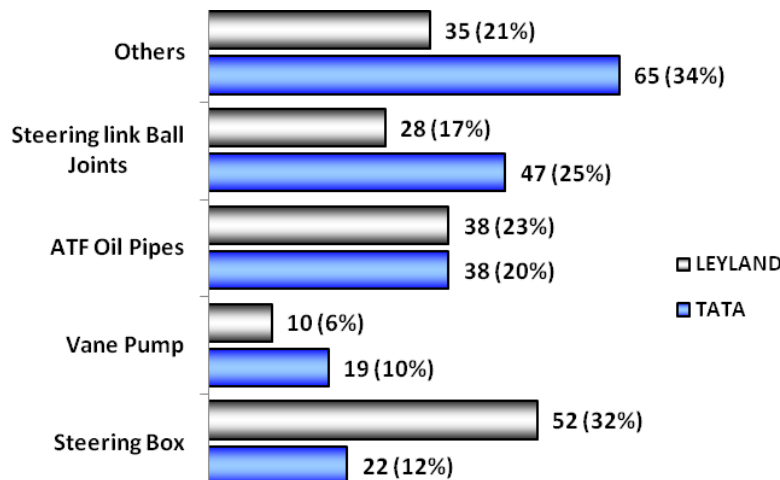
The following are some of the important circulars issued on maintenance of Brake System at depots.

- 21/2009-MED, Dt 11.09.2009 on ensuring proper connections between DB Valve & Relay valve
- 10/2009-MED, Date: 11.06.2009 on latest model Ashok Leyland Brake linings
- 29/2009-MED, Dt 24.12.2009 on features & maintenance of brake system in Tata SLF vehicles
- 27/2009-MED, Dt 17.11.2009 on features & maintenance of brake system in Ashok Leyland SLF vehicles
- 17 / 2008 - MED Dt.16.07.2008 on features and maintenance of Automatic slack adjuster
- 20/ 2007-MED, Dt.11-10-2007 on features & maintenance of DDU, Relay valve, Polyamide pipes.
- 29/2003-MED, Dt.11.08.2003, Cir No.20/97-MED.Dt.20.09.97 & Cir No.14/96-MED. Dt:7.6.96 on Brake maintenance during FC attention
- 23/2003-MED, Dt.07.07.2003 on maintenance of Hand brake system
- 17 / 2003 - MED, Dated 5.06.2003 on method of tapping of air for horn, wiper
- 14/2000-MED, Dated 3.5.2000 on features of modified brake drums Ashok Leyland



- 16/97-MED. Dt.03.07.97 on the features of Automotive Axles in Ashok Leyland
- 15/96-MED Dt:7.6.96 guidelines on Brake Drum-Liner matching
- 8/96-MED, Dt.22.3.96 on maintenance of Tata Foundation brake system
- 9/96-MED. Dt.22.3.96. on maintenance of Leyland foundation brake
- 5/95-MED., Dt 15.3.95 on usage of proper brake lining rivets
- 59/91-MED., Dt.28-12-1991. 42/1993 MED., Dt. 12 10 1993. on Tata full air brake maintenance
- 7/1993 MED., Dt. 20 02 1993. on Leyland brake maintenance

9) **STEERING SYSTEM:** Steering system is also another vital safety system of the vehicle in which breakdowns should never take place. '354' breakdowns in Steering system in this year can be treated as too high in view of its importance in terms of vehicle safety.



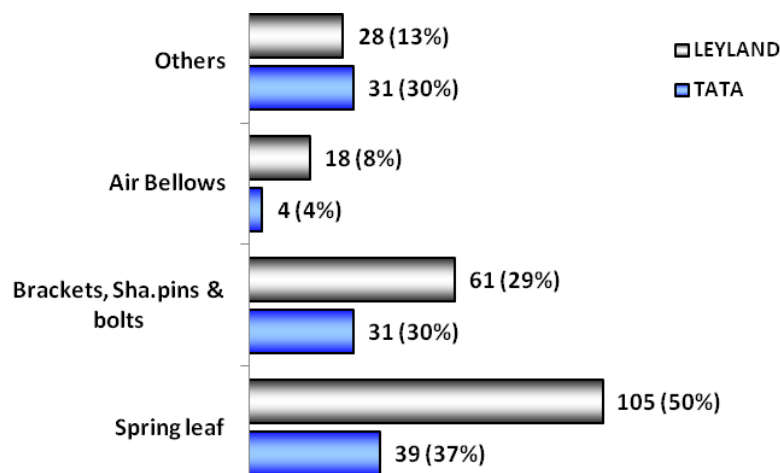
The failures occurring in power steering Gears and Vane pumps are mainly due to oil starvation because of leakages, use of wrong grade of oil, delayed filter/oil changes, air, water/dust entry into the system. Detailed guidelines have been issued vide Circular No.11/2006-MED, dt.11.10.2006 on maintenance & troubleshooting of Power steering systems of both Tata & Leyland. Provision of proper clamps and avoiding the rubbing of Oil Pipes to the chassis will also eliminating the ATF Oil Pipe failures.

The common deficiency observed in Power Steering vehicles is under-lubrication of kingpins which is leading to severe distortion of bores in I-beams and bore cracks. Lubrication of all ball joints during scheduled maintenance is very important in prevention of breakdowns. Tampering of Wheel lock bolts is also one of the contributing factors for Steering system failures. The following are some of the important circulars issued on effective maintenance of Steering system & Front Axles.

- 15/2006-MED, Dt.24-11-2006 on features & maintenance of FA 90 Front Axles in Ashok Leyland BS-II vehicles
- 13/2005-MED, Dt.07.11.2005 on proper fitment of steering arm bolts
- 18/99-MED, DT. 01.05.99, Cir No. 37/90-MED., Dt. 22-12-1990 & Cir No.30/91-MED., Dt. 31-8-1991 on maintenance of Tata steering system maintenance

- 14/96-MED. Dt:7.6.96 on replacement of ball joints during FC attention.
- 15/97-MED. Dt.03.6.97 on proper procedure for setting wheel alignment
- 31/91-MED., Dt. 7.9.1991 on Ashok Leyland steering system maintenance
- 3/86, dt.4.06.1986 & Cir No.21/89-MED. Dated 8.12.1989 on maintenance of Front Axles
- 13/88-MED Dated 30.5.1988 on fitment of wheel lock bolts.

10) **SUSPENSION SYSTEM:** Though the number of failures occurred in Suspension system are relatively less compared to the other systems, there is ample scope for maintaining “zero” breakdowns in Suspension system by strengthening spring maintenance and by taking certain precautions in Air suspension system of the vehicles.

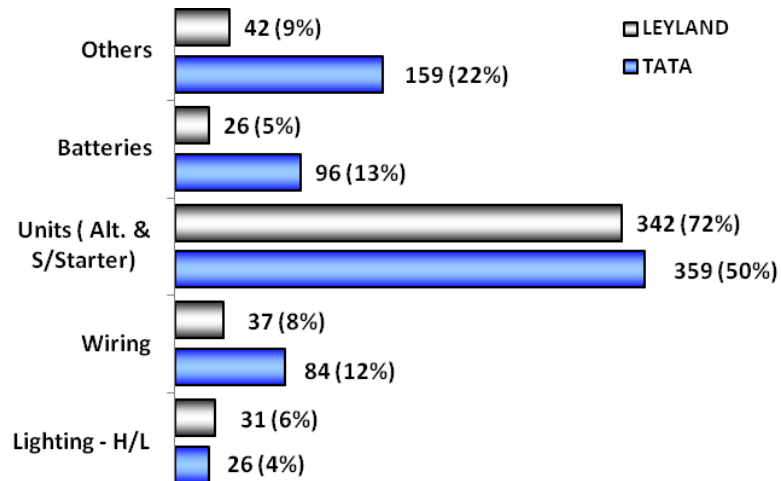


The circulars Nos.17/99-MED, DT. 06.05.99, 11/94-MED, Dt. 24.03.1994 & 21/92-MED. Dt. 16-05-1992 cover all the features of spring maintenance and steps to be taken to avoid spring failures. The Circular Nos.04/2000-MED Dated 03.03.2000 & 17/97-MED.DT. 17.7.97 were issued on proper fitment of Spring Brackets.

The salient features of Air suspension system & its maintenance are covered in details in the circular Nos. 02/2007-MED, Dt.23.01.2007, Cir No.6/2004-MED, Dt.08.04.2004 & Cir No.7/2004-MED, Dt.08.04.2004.

In order to ensure that Air Suspension system is completely free from defects on all vehicles of the Corporation, it is decided to conduct “Air Suspension Care Fortnight” throughout the Corporation from 1<sup>st</sup> May to 15<sup>th</sup> May’2014 vide Lr.No.OP4/462(1)/2014-MED. During this campaign it is advised to carry out through inspection of all Air Suspension fitted vehicles as per checklist and identify the defects. An action plan shall be prepared to get the defects of all vehicles rectified by the end of the Fort night and proper alignment to be done for Front & Rear Axle using Computerized Wheel Alignment machine available locally.

11) **ELECTRICAL SYSTEM:** Failures related to Electrical system constitute to about 8% of total breakdowns. The most common breakdowns are on account of Self Starter/ Alternator failures followed by wiring short circuit and Battery related failures. The no. of failures of Batteries is on high side in Tata area compared to Leyland Area due to the long off road of vehicles in bandhs. The higher no of failures in electrical unit failures shows neglected maintenance during Sch III/IV activity where these units are inspected & overhauled thoroughly.



A special focus on Electrical Maintenance was taken up by the observance of “**Electrical Care Fortnight**” vide Circular No.15/2013-MED from 16.08.2013 to 31.08.2013. During the Fortnight 100% physical census of vehicles at Depots was taken on all electrical systems of vehicle and the identified defects are rectified in a phased manner. At Zonal Work Shops census was conducted on floor stocks of all electrical units and their availability was reviewed by respective WMs. Similarly the premature failures, target mileages & quality aspects of all electrical units were also analyzed by the respective WMs besides conducting of Training/Seminars on electrical maintenance system for Depot Electricians & selected Supervisors.

Though the wiring system failures seem to be on low side but the negligence in maintaining the wiring system will lead to short circuit & fire accidents. Hence the usage of rated/recommended fuses, electrical cables/wires, eliminating the loose/rubbing wiring and proper routing of electrical cables/wiring will eliminate the wiring failures. The following are the important circulars issued on proper maintenance of vehicle Electrical system.

- 16/2007-MED, Dt 23-07-2007 on wiring harness maintenance of Tata BS-II vehicles
- 14/83-MED Dated 1-7-1983 on maintenance Electrical systems
- 26/1993 MED., Dt. 18 06 1993 on preventive maintenance of Tata Electrical system and Cir No.1/1993 MED., Dt. 29-01 1993 on preventive maintenance of Ashok Leyland Electrical system
- 35/98-MED,DT. 18.12.98, Cir No.14/97-MED. DT.03.06.97 , Cir No.10/86-MED Dated 15-5-1986 and Cir No.5/86-MED, Dt.5.4.1986 on maintenance of Self Starters
- 7/2005-MED, DT: 8.7.05 on usage of de-mineralized water for batteries

12) **TYRE FAILURES:** Breakdowns on account of tyre failures is one area where more efforts are needed for reduction. As many as 2,008 breakdowns were occurred due to tyre failures in the year 2013-14 which constitute to 14%. There is wrong notion among the majority of maintenance staff that tyre failures are un-avoidable. But on analyzing the tyre failures based on the tube injury pattern, it has been proved that majority of the tyre failures are avoidable. The following are the some of the avoidable reasons for tyre punctures.

- The injuries on the tube surface on the area where it makes contact with the flap indicate the punctures occurring due to pinching of folded/ cracked flaps.
- The punctures developed in the tube folds indicate improper positioning of tube inside the tyre, use of elongated tube (not following make-wise selection), not adhering to the system of inflating and deflating the tube at the time of tyre assembly
- Punctures owing to hard spots on tube surface indicating presence of foreign particles, lumps of chalk powder due to negligence in ensuring the cleanliness of tyre inner periphery at the time of assembly.
- Failure of once applied patches on tubes due to poor quality of patch application viz., non-usage of water tub for puncture identification, improper marking of injury, wrong selection of patches, not cleaning the surface properly, not buffing the punctured area, not applying the make-wise solution, using expired solution, not giving sufficient time for curing etc.,.
- Using old and defective valve pins and non fitment of dust caps
- Non-removal of trapped stones and pebbles from the tread grooves which otherwise may penetrate deep into the tyre carcass causing punctures.
- Over inflation resulting in concussions
- Under inflation leading to patch failures

It is therefore required to make a thorough analysis of punctures at all depots to identify the reasons for tyre failures and take necessary remedial measures to avoid recurrence of such failures.

All the Depot Managers are therefore advised to implement the preventive maintenance systems strictly as stipulated in the circulars mentioned above and strive for achieving “ZERO BREAKDOWNS” in the coming months.

  
VICE CHAIRMAN & MANAGING DIRECTOR

To

All Depot Managers,

Copy to: Director (V&S), ED (E&IT), ED (O&MIS), ED (A &P), ED (T&C) & Secy to Corporation, FA and CAO for information

Copy to: All Executive Directors (Zones) for necessary action

Copy to: All RMs for necessary action.

Copy to: CME (O), CE (IE&COM), CPM, CM (HRD), CCOS & CA for information

Copy to: Director, TA/HPT for information

Copy to: Dy.CME(C&B), Dy.CME (IEU), Dy.CME (P), & CSTO for information.

Copy to: All Dy.CMEs of Regions for necessary action.

Copy to: All WMs, COSs & Dy.CAOs of all Zones for information & necessary action

Copy to: All Principals of ZSTCs for information

Copy to: All Maintenance Incharges for necessary action.

Copy to: Manual Section/Head Office for filing