

ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION

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Office of the VC&MD,
Musheerabad,
Hyderabad, Dt.20-12-05

Circular No : 16/2005-MED

Sub : MAINTENANCE - Leakage of Air in the Brake system - Certain instructions issued for taking corrective action - Reg.

In the present context of unprecedented hike in oil prices, it is our primary objective to explore various measures for conservation of fuel to the best possible extent. Even though, the present systems which we have been implementing to reduce the fuel consumption are yielding substantial results, there is scope for further improvement.

Leakage of air in the air brake system is one of the contributing factors for excess fuel consumption. Practical studies reveal that operating an engine for 3 to 5 minutes at high idle r.p.m., for the purpose of building air, consumes 300 ml of diesel per vehicle in a day. This can be avoided if the air filling and brake actuating systems are maintained properly.

Leakage of air not only contributes to excess fuel consumption but also leads to ineffective braking, leading to brake failure and also lowers the life of Air Compressor. Therefore, maintaining a leak proof system in the Air brake vehicles is an important task.

There is every need to educate the maintenance staff on how to identify the leakage of air, rectify the defects and maintain the system leak proof. Here are some of the common points where the leakage of air occurs in Air brake system.

- 1) **Leakage at Air Compressor** : The leakage of air occurs mainly from AC Head gasket, Delivery unions & pipe joints. The leakage in the area between Air compressor & Unloader valve can be identified only when the engine is running. Therefore, leakage shall be checked when the engine is under operation.
- 2) **Leakage of Air after unloader valve**: Leakage occurs near the pipe joints, air filters, sensing tank & service reservoir drain valves, pipe lines upto to DB valve ports 11 & 12, Air pressure gauge pipes & connectors, DB valve unconnected ports and DB valve electrical switch connectors. The leakage in this area can be identified when the engine is in off condition and the air is filled upto cutout pressure. For easy identification of leakages, soap water shall be applied on the suspected areas.
- 3) **Leakage of Air from Dual Brake Valve** :
 - a) Continuous leakage from exhaust port :

- I. Continuous leakage of Air from the DB valve exhaust port is an indication of malfunctioning of valves inside the DB valve.
 - II. Sometimes, the leakage of air from the exhaust port occurs due to internal leakage of air in the Rear spring actuators (hand brakes in released condition). If the leakage ceases after applying the Hand brakes, it can be confirmed that the leakage is due to defective Spring Actuators. It can also be confirmed by disconnecting the port No.11 of Spring brake actuators one after one.
- b) Leakage from DB valve exhaust port when the Brakes are applied : Leakage shall be checked by applying the foot brake. If the leakage occurs from exhaust port keeping the brake pedal in applied condition then it is due to internal leakage of DB valve.
- 4) Leakage in lines between outlet Ports (21 & 22) of DB Valve and Brake chambers : Leakage occurs at the unions of DB valve ports, pipes & connectors, Rubber hoses, Brake chamber diaphragm (in case of puncture) and Brake chamber diaphragm clamping area. This leakage can be identified by keeping the brakes in applied condition.
 - 5) Leakage between the port No.23 of SP Valve and Hand brake valve and between port No.24 of SP valve - auxiliary systems like Air horn, wiper, Air suspension system etc., : Leakage can be identified only when the system pressure reaches above 6.2 kg/cm^2
 - 6) Leakage between Hand brake valve & Spring brake actuators : This leakage can be identified when the hand brakes are in released condition. To identify the leakages soap water shall be applied on all pipes and connectors.
 - 7) Leakage of air from the auxiliary items like Air horn, Wiper and Air suspension system : Check for visible leakage from the Air horn switches, wiper switch, wiper motor, Air suspension leveling switch, pipes & pipe connectors.

The following trouble shooting guide helps the Mechanics and Supervisors to avoid leakage of air and minimize the air building time.

Encl : Annexure

The air building time for a normal vehicle shall be 3 to 3.25 minutes only. Exceeding 3.5 minutes indicates fault with the system.

Unloader valve cut-out/ cut-in pressure setting is very important to avoid excess fuel consumption as the compressor consumes 3 BHP power of the engine for building air, where as the compressor consumes only 1.5 to 2.0 HP power at the time of cut-out. Prolonged loading of compressor to build higher cut out pressures may lead to breakage of Camshaft, reduces the life of Air compressor, life of the rubber parts (due to high temperatures and high moisture content) and leads to more leakages. Always maintain the following cut-out & cut-in pressures as recommended by the manufacturers.

For TATA vehicles, the cut-out pressure is 7.25 kg/cm^2 and cut-in pressure is 6.45 kg/cm^2 .

For Ashok Leyland vehicles, the cut-out pressure is 8.25 kg/cm² and cut-in pressure is 7.45 kg/cm².

Always maintain the suction side of the Air compressor leak proof. Entry of dust into the compressor leads to premature wear in compressor bore & piston rings due to which the air building time will increase abnormally besides causing oil carry-over by air. Oil in the air reduces the life of the rubber parts leading to leakage of air. Ineffective braking etc. The dust in the suction side of the air compressor also results in malfunctioning of Valves in the AC head.

Regular draining of condensate from the air tanks improves the life of the brake units and rubber parts. The condensate forms rust in the air tanks and pipe lines which gets trapped in the sealing areas of the brake valves and cause air leakage. Therefore, regular draining of condensate from the sensing tank and service reservoirs is very much needed. (Draining of condensate is not required for the vehicles fitted with Air Dryers)

Ensure that the Air Dryer is working properly and do not allow the system to run with purge tank in disconnected condition.

Replace the Air Dryer Desiccant which comes along with the repair kit No. MSP 3/75 at every 1.50 lakh kms or once in 2 years whichever is earlier. Never allow the Dryer to run with saturated Desiccant as this will lead to higher condensate in the compressed air and also cause back pressure in the Air compressor resulting in air leakage/ gasket failure.

Replace the worn out piston rings of the Air compressor immediately when the oil carry over by the air is observed. The oil in the air is a threat to the rubber parts in the valves and diaphragms in Brake chambers resulting in abrupt failures.

All the filters in the air pipe lines shall be cleaned during every sch.IV to prevent trapping of dust particles in the sealing areas of DB valve, SP valve, GHC valve etc which cause leakage of air. The filter kits (MSP 25/8 or MSP 25/26) shall be replaced once in a year.

Proper adjustment of brakes has to be ensured. Excess gap between the liners and drum consumes more air on each brake application. Always maintain the recommended gap of 0.25

to 0.40 mm between the Drum & liners. Always ensure that the drop in Air pressure shall not exceed 0.5 kg/cm² on each application of brakes.

Always ensure proper clamping of pipes to avoid fouling of pipes with other chassis parts due to vibrations which may lead to failure of pipes.

Ensure that accessories like Air Wiper, Horn and Air Suspension systems are leak proof-The nylon pipes used for connecting these systems shall be arranged in such way that they are not fouled with other parts.

The Depot Managers and Maintenance Incharges are advised to follow the above guide lines strictly and ensure that all the vehicles are maintained without any air leakages. The Dy.CMEs are advised to pay special attention to the leakage of air during their inspection of Depots.

The Regional Managers are advised to work out the Depot-wise requirement of Air Dryer Repair kits and furnish their requirements to the respective zonal stores for procurement and supply.



EXECUTIVE DIRECTOR (ENGG)

Problem: Air is not building up in both the gauges

1.10	Air Compressor	AC head gasket failure. (Failure can be identified by the sound & leakage at parting surface of Compressor & AC head)	Check for any block in pipe lines, hose and ULVTI filter. Remove blockade, clean filter and refit. Replace AC head with new gasket.
		AC head Suction/ Delivery Valve Failure (Failure can be identified by checking the suction & delivery by disconnecting the pipe lines)	Replace AC head valves or Replace AC Head assy
1.11	Hose, pipes & fittings	Heavy leak in circuit between compressor delivery and system protection valve inlet. (Leakage between the Compressor delivery and Unloader valve can be found only when the engine is running)	Check lines & all joints Rectify & replace hose assy if damaged. (Use soap water to identify the external leakages)
1.12	Unloader valve with TI (ULVTI)	Heavy leak through top cover & ex-spout.	Overhaul assembly.
1.13	Sensing reservoir	Heavy leak through weld joints or drain valve.	Rectify weld joint. Replace defective drain valve.
1.14	Air Filter	Heavy leak through cover.	Overhaul assembly.
1.15	System protection valve	Heavy external leak from the valve assembly.	Overhaul assembly.

1.20 PROBLEM: Delay in building up system pressure

1.21	Compressor	Defect in cylinder head Suction / Delivery valve	Overhaul cylinder head or replace with CO head.
		Damaged piston/ rings	Carry out major overhaul or Replace Compressor Assy.
1.22	Hose, pipes & fittings	Leak in circuit between compressor delivery and system protection valve inlet.	Check lines & all joints. Rectify/replace hose assy if damaged.
1.23	Unloader valve with T1	Leak through top cover & exhaust spout.	Overhaul assembly
1.24	Sensing reservoir	Leak through weld joints or drain valve	Rectify weld joint. Replace defective drain valve.
1.25	System protection valve	External leak from the valve assembly.	Overhaul assembly.

2.0 PROBLEM: Air is building up in one gauge only

2.1	System protective valve	Leak through element 21 or 22. Valve not functioning	Overhaul assembly.
2.2	Dual brake valve Relay valve - if fitted	Leak through exhaust or unused ports not plugged.	Overhaul assembly. Plug unused ports left open.
2.3	Service Reservoir connected to particular gauge	Leak through Drain valve/ reservoir weld joints	Replace drain valve. Rectify weld joint
2.3	Air gauge	Defective air gauge	Replace defective air gauge.

3.0 PROBLEM: Air is not building up more than 6.0 bar while running OR down to 4.5 bar when vehicle is parked

3.1	Grad. hand brake valve Relay valve - if fitted.	Leak through exhaust.	Overhaul assembly.
3.2	System protection valve (SPV)	Leak through SPV element 23 or 24.	Overhaul assy.
3.3	Spring brake actuators (SBA)	Leak through L - tube indicates main seal / ram defect Leak through SBA service port (with pipelines disconnected and Hand brake released condition) indicates O ring/ram stem defect.	Identify the defective assy and overhaul
3.4	Hose, pipes & fittings	Leak in 23 and 24 circuit lines.	Check pipe lines & all joints. Rectify/replace hose assy if damaged
3.5	Ex. brake valve / Lever control valve Foot Control Valve (if engine brake system is fitted)	Leakage through air exhaust or Foot Control Valve.	Overhaul assy.
3.6	Other aux. assemblies.	Leakage through aux assys, such as air horn, air suspension etc.	Identify defective assemblies and overhaul.

4.0 PROBLEM: Pressure drops down to Zero when vehicle is parked

4.1	Dual brake valve	Leak through exhaust.	Overhaul assy.
4.2	Hose, pipes & fittings	Leakage from SPV delivery line circuits with internal in System Protection Valve assembly.	Identify and rectify the leaky joints. Replace hose assy. If damaged. Check SPV for internal leak and overhaul assy., if defective. (If no internal leak, check delivery line circuits of 21 & 22 only.)
4.3	System protection valve (SPV)	External leak from the SPV assembly.	Overhaul assy.
4.4	Service reservoirs	Leakage through weld joints and drain valve.	Rectify weld joint. Replace defective drain valve.

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