



ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION

Mechanical Engineering Department, Office of the VC & MD,
Bus Bhavan, Mushirabad, Hyderabad - 500 624

Lr.No.OP4/462(1)/2015-MED,

CIRCULAR No: 06/2015-MED, Dt.28.03.2015

Sub: MAINTENANCE - Contingency measures to avoid engine overheating problems during the summer season - Certain instructions issued - Reg.

Ref: 1) Circular No: 10/2012-MED, Dt.03.04.2012

2) Circular No:13/2012-MED, Dt.12.04.2012

3) Circular No : 18/2007-MED, Dt.06/09/2007

Engines are designed to operate within a "normal" temperature range of about 90 to 100 degrees Celsius. A relatively constant operating temperature is essential for proper emissions control, good fuel economy and optimum performance. But problems may arise in the vehicles which cause the engine to run hotter than normal, resulting in engine overheating. If engine gets overheated, it may start to detonate, rattle and lose power. If detonation continues, it may damage the rings, pistons and/or rod bearings.

Overheating also causes piston scuffing. As the engine gets very hot, the pistons may expand to the point where there is no more room for expansion and they scrape against the cylinders, damaging the pistons and cylinders.

Exhaust valves may also stick or scuff in their guides. This can damage the valves, guides and lead to a loss of compression. Engine overheating can also cause cam shaft to seize and break.

Another consequence of engine overheating may be a blown head gasket. Thermal stress can distort the head and make it swell in areas that are hottest like those between exhaust valves in adjoining cylinders, and areas that have restricted coolant flow like the narrow area that separates the cylinders. This will eventually cause the head gasket to leak compression between adjacent cylinders, or leak coolant into the cylinders.

Engine overheating also affects the Radiator and its hoses causing to burst under the excess pressure. Steam that is generated inside the cooling system can also damage radiators with plastic end tanks.

The first indication of a vehicle overheating is either when the needle on the temperature gauge moves into the red zone or the "Temperature" malfunction indicator light glows on the dashboard. Under severe overheating conditions, the liquid in the radiator boils over, and steam comes out from under the hood. Strict instructions shall be issued to the Drivers to stop driving the vehicle at the first sign of overheating. The drivers shall turn the engine off, allow it cool down, try to find out the cause and inform the Maintenance incharge for arranging necessary relief.

Detailed guidelines were issued vide circulars cited on improving the engine life by taking proper care of cooling system. However, the following instructions are reiterated once again to avoid engine overheating complaints at depots.

1. Coolant Mixture:

The coolant mixture shall always be maintained in the correct ratio prescribed for various types of engines/Radiators. Vehicles shall not be operated with diluted coolant mixture under any circumstance.

The wrong type of coolant and/or mixing the incorrect concentration of coolant and distilled water can result in engine overheating

2. Cooling system leaks

Loss of coolant because of a coolant leak is the most common cause of engine overheating. Possible leak points include hoses, the radiator, Oil Cooler, water pump, thermostat housing, head gasket, Dummy plugs on Head & Engine block, automatic transmission oil cooler, cylinder head and block.

A careful visual inspection of entire cooling system shall be done to identify the coolant leakages duly fixing a recommended pressure cap to the Radiator.

3. Radiator Pressure Cap:

It is important to use only the recommended Pressure caps (7 PSI or 0.5 kg/cm²) for Radiators. Over-rated or under-rated Pressure caps may lead to engine overheating or cause damage to the Radiator. A weak cap (with too low a pressure rating) will lower the coolant's boiling point and can allow coolant to escape from the radiator.

4. Engine thermostat:

The hot water continues to circulate through engine and water pump instead of passing through the radiator if the bypass port of the water pump is not closed properly on attaining the operating temperature because of defective Thermostat. Therefore, the thermostat should be tested and replaced if found defective during every Sch-IV maintenance.

5. Leaky Head Gasket

Leaky Cylinder head gasket allows the coolant to seep into the engine's cylinders or crankcase. Symptoms include a loss of coolant with no visible external leaks, and white steam in the exhaust, especially after restarting the engine and after a while.

6. Defective Fan

Most engine overheating problems are caused by a faulty fan clutch in viscous type cooling fans. Defective fan clutches are a common and often overlooked cause of engine overheating. The shear characteristics of the clutch fluid gradually deteriorate over time, with an average loss in drive efficiency of about 200 rpm per year. Eventually slippage reaches the point where effective cooling is no longer possible and overheating occurs.

If the fan clutch shows signs of fluid leakage (oily streaks radiating outward from the hub of the clutch), spins freely with little or no resistance when the engine is off, or wobbles when the fan is pushed in or out, it needs to be replaced.

The fan must rotate fast enough to provide adequate cooling at idle and low speed of the engine.

7. Missing fan Shroud:

Missing fan shroud reduces the fan's cooling effectiveness by as much as 50% (depending on the fan's distance from the radiator) which may be enough to cause the engine to overheat especially in hot weather.

8. Water pump

Water Pump is the 'heart' of the cooling system, which is responsible for pressurizing and propelling engine coolant through the cooling system. Any malfunction of the water pump, including eroded impeller vanes, seepage or wobble in the pump shaft, can prevent adequate coolant flow and result in engine overheating

In some instances, a pump can cause engine to overheat if the impeller vanes are badly eroded due to corrosion or if the impeller has become loose from the shaft. The only way to know if this is the problem is to remove the water pump and check the impeller to see that it is tight on the shaft. The water pump housing and/or impeller may also be subject to cavitation erosion. The loss of blade area or an increase in clearance between the housing and impeller will reduce the flow of coolant and can lead to engine overheating.

9. Slipping Belt

The belt tension and belts condition shall be checked and attended. A loose belt that slips may prevent the water pump from circulating coolant fast enough and/or the fan from turning fast for proper cooling.

10. Radiator Hoses

Pinched hose or collapsed bottom radiator hose blocks the flow of coolant when the engine is running and lead to cause engine overheating. The condition of all radiator hoses shall be checked thoroughly and replaced. Additional care shall be taken for cooling hoses of Air compressor which are more prone for damage/leakage.

11. De-Aeration system:

There is danger of engine getting overheated if the air pockets or vapors in the cooling system are not vented out through de-aeration pipes/ hoses. The blocked de-aeration holes on the cylinder head shall be cleaned thoroughly

12. Plugged or Dirty Radiator

Dirt, dead bugs and debris can block air flow through the radiator and reduce its ability to dissipate heat. Internal corrosion and an accumulation of deposits can also block the flow of coolant. The radiator should be removed for cleaning or replaced during the Sch-IV maintenance. Back flushing the cooling system and/or using chemical cleaners can remove rust and hard water scale to some extent.

The space between the Intercooler and Radiator shall always be kept clean. A low pressure air/water jets may be used to clean the fins.

13. Blocked Coolant Passageways

Rust, dirt and sediment can block or greatly impede the flow of coolant through the passages in the engine block and cylinder head. This hampers the system's ability to control engine temperature, which may result in higher operating temperatures and engine overheating. A thorough flushing is required to remove debris in the passages.

It is recommended to remove the Engine oil cooler, check the condition, clean thoroughly and refit the cooler during Sch-IV maintenance.

14. Excessive exhaust backpressure

Clogged Muffler or Catalytic converter or Exhaust brake butterfly valve will restrict the flow of exhaust and cause heat to build up inside the engine. Other causes include a crushed exhaust pipe. Check the exhaust system thoroughly and rectify the defects and ensure free flow of exhaust gases.

15. Dragging brakes

Grabbing brake or not released Parking brake may cause the engine to overload resulting in overheating. Proper setting of brakes and quick retraction shall be ensured.

16. Over-racing of the engine

The clutch slippage may lead to over-racing of engine and thereby building excess heat. Proper clutch setting shall be ensured to avoid clutch slippage.

17. Injection timing:

Faulty injection timing may cause the engine to overheat. Incorrect timing when coupled with other problems may bring the engine temperature to a critical point. The injection timing shall be checked and adjusted if necessary. The malfunctioning or not properly connected KSB unit keeps the injection timing in advance for few degrees continuously thus overheating the engine. It is also necessary to ensure proper connections between MPC unit and Intake manifold for optimum combustion under varying conditions.

18. Engine Valve Clearance:

Incorrect valve timing is also one of the reasons for engine overheating. The valve clearance as prescribed the vehicle manufacturer shall always be maintained.

19. Engine oil level:

Low engine oil tends to overheat the engine because the oil removes from 50 to 60 percent of the "waste heat" in the engine (in addition to doing its other job of lubrication). The correct engine oil level shall always be maintained.

20. Front Grills:

Free passage of air through the Front Grills shall be ensured. Banners, Posters or any other sign boards shall not be kept in front of the Engine grills which may block the air flow through radiator.

All the field managers shall take the above measures to avoid engine overheating problems during the summer season duly educating the drivers to stop the vehicles in the event of extreme overheating condition to avoid serious engine failures. A checklist for inspection is prepared and enclosed herewith. All Dy.CMEs are advised to ensure that the special drive on Cooling system on all vehicles as a summer contingency activity and submit compliance by 15-04-2015.



EXECUTIVE DIRECTOR (ENGG)

Encl: As above.

To
All Depot Managers.

Copy to: VC&MD for favour of information.

Copy to: JMD, Director (Vig. & security), ED(A&P), FA, CAO & ED(HRD & Medical) for infmn.

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

Copy to: All Regional Managers for necessary action.

Copy to: All HODs for information.

Copy to: All Dy.CMEs for necessary action.

Copy to: All WMs & COSs for information.

Copy to: All Principals, ZSTCs & TA/Hakimpet for information

Copy to: All Maintenance incharges of the Depots for n.action.

Copy to: Manual Section/Head Office for filing

Copy to: RAO, AG Audit, Bus Bhavan for information

CHECKLIST FOR ENGINE COOLING SYSTEM

Vehicle No:

Type:

Insp. Date:

S.No	ITEM	OBSERVATIONS	ACTION TAKEN
1	Coolant Mixture concentration		
2	Coolant leakages		
3	Radiator Pressure Cap		
4	Radiator Neck top		
5	Thermostat		
6	Cylinder Head Gasket		
7	Cooling Fan		
8	Fan Shroud		
9	Water Pump		
10	Fan Belts		
11	Radiator Hoses		
12	Air Compressor cooling hoses		
13	De-aeration holes		
14	De-aeration hoses		
15	Radiator Fins		
16	Radiator fill capacity		
17	Intercooler Fins		
18	Coolant flow in Engine Block		
19	Exhaust Back pressure		
20	Brakes condition		
21	Clutch Slippage		
22	Injector Timing		
23	KSB connection		
24	MPC connection		
25	Valve Clearance		
26	Engine oil level		
27	Vehicle Front Grills		