ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION

Office of the VC & MD,
MSRD:HYDERABAD-20.

No. PRDl/675(2)/99-MED **Dated : 29.02.2000.**

CIRCULAR No. 3/2000-MED, Dated 29.2.2000

SUB: ENGINE - Breakage of Engine Blocks and Crankshafts - Steps to be taken to avoid breakages - Reg.

REF: 1) Circular *No.* 19/90-MED, dtd: 30.7.90
2) Circular No. 54/91-MED, dtd: 9.12.91
3) Circular No. 7/92-MED, dtd: 29.1.92
4) Circular No. 13/92-MED, dtd: 20.4.92
5) Circular No. 28/92-MED, dtd: 22.1.92
6) Circular No. 40/92-MED, dtd: 4.8.92
7) Circular No. 13/93-MED, dtd: 12.4.93
8) Circular No. 39/93-MED, dtd: 21.9.93
9) Circular No. 40/94-MED, dtd: 7.12.94
10) Circular No. 17/95-MED, dtd: 14.8.95

1.0 Through the circulars cited above, detailed instructions were issued on maintenance of engines to improve the performance of HSD oil & Lub oil as well as unit life. Maintenance schedules for EOC, Coolant changes etc., were also specified. By stepping up CO production of different types of engines viz., 370, Hino, 692, 697 etc., at workshops, supply of engines has improved. Most of the workshops have been maintaining ZERO outstanding of float engines to depots and are in a position to supply CO engines on counter exchange basis.

2.0 It is distressing to note that in the current financial year upto Dec.'99, Engine blocks 229, and Crankshafts 186 were broken mostly due to maintenance lapses at depots. Cause-wise breakages are summarized below. CAUSE-WISE BREAKAGES:

SI. No.		Block breakages		C/shaft breakages	
		QTY	%	QTY	%
1)	Oil starvation	23	10	20	11
2)	Sludge formation	46	20	132	71
3)	Con. rod bolt hitting	29	13	-	-
4)	Lack of Coolant/ inadequate coolant/improper coolant concentration	112	49	-	-
5)	Improper torque of Con. rod bolts.	10	4	-	-
6)	Hydraulic lock	9	4	-	-
7)	Blow holes & others	-	-	34	18

From the above, it was observed that formation of sludge, delayed EOCs, topping up of burnt lub oil, oil starvation etc., are mostly responsible for crankshaft breakages. Few crankshafts have broken due to blow holes, improper fillet radius and other miscellaneous reasons.

Formation of rust on water channels of engine block due to improper coolant and water mixture, sludge formation, improper torque given to connecting rod bolts etc., are the reasons for breakage of engine blocks and development of cracks between adjacent cylinder bores.

3.0 Workshop-wise and type-wise(engine) breakages of crank shafts(CB) and engine blocks(BB) are given below.

WORKSHOP-WISE BREAKAGES:

WORKSHOP	370/6.65/692/HINO/697				TOTAL	
	BB	CB	BB	CB	BB	CB
UPL	11	22	10	10	31	32
KRMR	39	5	---	22	39	27
NLR	4	---	18	---	22	---
AL AREA	54	27	28	32	82	59
VJA	13	12	50	18	63	30
VZM	1	---	23	6	24	6
CDP	11	20	39	63	50	83

TPT	**2**	**2**	**8**	**6**	**10**	**8**
TATA AREA	**27**	**34**	**120**	**93**	**147**	**127**
GRAND TOTAL					**229**	**186**

It is noted form above that in AL area breakage of "engine blocks of 370" and "crankshafts of Hino" are on high side in KRMR Zone. On the other hand, breakage of crankshafts of 370 are on high side in HYD Zone and breakage of HINO blocks are on high side in NLR Zone.

In TELCO area, block breakages are on high side in Vijayawada and Cuddapah Zones. Crank shaft breakages are found to be high in CDP Zone. VZM Zone seems to be doing well by preventing crank shaft breakages;

On further scrutiny of data it is noted that in each Zone, "about 10 depots are contributing for more than 80% of crank shaft and block breakages". From this, it is clear that breakage of blocks and crank shafts are controllable. By proper maintenance at the said depots, 80% of breakages may be avoided/ minimised.

4.0 The following maintenance lapses are contributing for breakage of engine blocks and crank shafts of both NEW and CO engines.

4.1 EOC DELAYS:

Engine oil changes are delayed by more than 2000 kms at many depots. In some cases, delays have gone beyond 5000 kms. Due to the abnormal delay of engine oil change, quality of oil was found deteriorated and caused formation of sludge. Lubricant ceases to perform its functions after deterioration of quality and therefore intricate parts of engine viz., Crankshaft, thin walled bearings, tappets, camshafts etc., are subjected to rapid wear and pitting. Sludge formed engine oil will not freely pass through the small holes meant for passage of engine oil in engine block and Cylinder head and consequently there may be oil starvation leading to failure of engine.

4.2 NEGLIGENCE OF COOLING SYSTEM:

Specified concentration of coolant is a mixture of water and coolant are not maintained at prescribed ratios i.e., 1:1 for 697/Cummins, 1:4 for Hino and Servo cut oil in water at 1:200 ratio for 370/ 6.65/692 engines. Pressurized caps are maintained in Radiators to prevent loss of coolant due to evaporation. With pressurized radiator cap, the evaporation temperature of coolant increases by about 5°C and consequently loss of coolant by evaporation will be less. For failure to maintain pressurized cap coolant gets evaporated and quantities lost are replenished by drivers with hard water. On account of such incorrect maintenance practices of cooling system rust/scale formation takes place on water channels /jackets of engine block. Heat dissipation from engine block to water is affected adversely as rust/scales prevents transfer of heat and the engines get over heated in operation. Overheating of engine leads to seizure of rings in piston grooves and scoring of cylinder liners, rapid wear of Piston rings and scoring on cylinder liners, in turn, lead to engine blowing and may lead to drop of fuel and lub oil performance and may lower the engine life.

4.3 DELAYED TOP OVERHAULS:

New/RC engines are operated by depots for more than a month "even after observing blowing defect" duly topping up lubricant every day. Lub oil gets burnt in blowing engines and blow by will be aggravated. Engine oil quality deteriorates fast in blowing engines due to mixing of partially burnt gases and water vapor and sludge formation takes place.

Due to formation of sludge, circulation of engine oil gets reduced as oil passages are partially blocked. Hence, critical/costly components of engine are subjected to oil starvation leads to rapid wear. Heavy blowing coupled with sludge formation, oil starvation, drop in oil pressure etc., lead to rapid wear on crankshaft, bearings seizure and finally breakage of crankshafts.

5.0 Approximate cost of engine block is Rs.60,000/- and crank shaft is Rs.30,000/-. Cost of 229 engine blocks breakages, and 186 Crankshafts breakages during 9 months i.e., from April'99 to Dec.'99 works out to about Rs. 193.20 lakhs. Further, in all such block/crankshaft breakage cases, extensive damages are caused to other costly components of engine assembly such as bearings, Pistons, liners etc. This, inturn, increases the average cost of overhaul of engine. Further, fuel and lub oil performance of such engines will be less and consequently the operational costs will increase.

5.1 As per the instructions given through Circular No. 17/82-MED, dtd:24.7.82 and Cir. No. 10/85, dtd: 28.3.85, Depot Managers have to bring block and crank shaft breakage cases immediately to the notice of Dy.CME of the region and such engines shall be sent to Work Shops along with a covering letter giving reasons for breakage and action taken by the Depot Manager.

5.2 Works Manager has to organise joint inspection of such extensively damaged engines and educate the DMs, MFs and concerned staff of the depots. The WM shall send monthly consolidated report of the premature failure and extensively damaged units to respective RMs and DyCMEs. These details shall be discussed in PRC meetings to bring awareness among all DyCMEs and in turn at all the depots of the zone. Based on the report of WM, DM has to initiate suitable disciplinary action on the persons responsible for breakage of block/crank shaft. If any depot is not responding positively, in spite of giving assistance and guidance, WM shall take suitable action on such depot through ED(Zone) and RMs.

6.0 In order to improve the performance of engines and to avoid breakage of crankshafts and engine blocks, the following instructions are issued for strict implementation.

6.1 (a) Carry out EOC on CO as well as NEW engines at 1.000 kms of initial operation duly replacing engine oil filter.

(b) Change engine oil and filters "at regular intervals at prescribed kilometerage" i.e, at 16,000 kms for 370/6.65 engine, 15,000 kms for Hino engine and 18,000 kms for 692/697 Tata Cummins engines)

(c) Check engine oil levels daily after allowing sufficient time for the oil in circulation to settle down in sump and maintain oil level between max & min. marks of the dip stick by topping up required quantity of fresh engine oil.

(d) Avoid leakage of engine oil from sump packing, tappet cover, AC oil seal etc.

6.2 (a) Maintain proper ratios of Golden cruisher/ Tejon/Servo cut oil with water in coolant mixtures for different types of engines as detailed at para 4.2

above.

(b) Avoid leakage of coolant through hose pipes, radiator, water pump etc.

(c) Ensure availability of pressurized cap on radiator and maintain correct fan belt tension.

(d) Ensure availability of Thermostat in cooling system which helps to maintain temp, of coolant at optimum level and thereby enhance life of engine and control premature blowing of engine.

(e) Ensure flushing of radiators and replacement of coolant at the intervals reiterated below :

Type of engine	Coolant flushing and change
692	at every Sch-IV maintenance
697	at every 3.20 lakh kms of operation or 2 Years which ever is earlier for the engines fitted with expansion volume radiator and coolant mixture of 1:1 i.e., 50% of water & 50% Golden cruisher
Cummins	at every 3.20 lakh kms of operation or 2 years which ever is earlier
370/6.65	at every Sch-IV maintenance
Hino	at every 75,000 kms of operation

6.3 (a) Carry out top overhauls on engines immediately after observing Blowing defect to prevent faster wear of Cylinder liner and Piston rings. Further, the quality of engine oil deteriorate fast as the blowing increases.

(b) Avoid delays in carrying out top overhaul, as it does not help to improve lub KMPL. On the other hand, breakage of blocks and crankshafts are likely to take place.

(c) Select engines for top overhaul based on the criteria of loss of power due to drop in compression pressure in Cylinder to less than 20 kg/cm2 for 692/697, 21 kg/cm2 for 370/6.65 and 33 kg/cm2 for HINO, excessive consumption of lub oil rather than getting guided by the kms done by the engine.

7.0 CONCLUSION:

Depot Managers shall identify the engines requiring TOs once in a fortnight and ensure that top overhauls are carried out immediately after observing blowing/ blowby defects. Top overhaul shall be done as a preventive measure to improve lub KMPL, fuel performance and to avoid damages to costly components of engine. Follow the guidelines/procedure given in Circular cited at reference(6) to select engines and to carry out Top overhaul.

Dy.CMEs of the regions shall review the Lub KMPL, trends of Lub KMPL of each vehicle during their inspections and shall review/monitor top overhauls. He shall co-ordinate with WM/COS for supply Cylinder heads/Piston rings to depots to facilitate carrying out of top overhauls as per the TO schedule.

DMs and Dy.CMEs shall ensure proper maintenance of cooling system as explained at para No.6.2 above. If breakage of any engine block or crankshaft occurs, reasons for such damages shall be studied in detail by the DM/DyCME and the persons responsible for breakages shall be taken up suitably. Cost of damage of engine block/crankshaft may also be recovered from the concerned.

Sd/-
(P.ARJUNA)

EXECUTIVE DIRECTOR(Engg)