

REPAIRING

5.1 Common parts which are prone to failure, Their reasons of failure & Remedial measures

→ Every part of every equipment has a particular life. After completion of its life, generally it fails down.

→ Parts which are prone to frequent failure :-

- (i) Gears
- (ii) Seals, Packing & Gaskets
- (iii) Bearings
- (iv) Keys
- (v) Chains
- (vi) Clutches
- (vii) M/c spindles

5.1.1Gears

A gear may be defined as a toothed element which is used for transmitting rotary motion from one shaft to another.

→ Reasons of failure :-

- (i) If the meshing of two gears is not proper.
- (ii) If the gear ratio is not proper.
- (iii) If the teeth of gears worn out.
- (iv) If the error is present in the pitch.
- (v) Due to absence of lubrication.

→ Remedial Measures :-

- (i) Use proper lubricants for lubrication.
- (ii) Clean the surface of gears.
- (iii) Select the proper materials for gears.
- (iv) Avoid overloading.
- (v) Check the alignment of the shaft.

5.1.2 Seal, Packing & Gaskets

Seal is used to stop leakages of fluids. Packing & gaskets are also used for the same purpose.

→ Causes of failure :-

- (i) Due to wear of seals.
- (ii) Due to age of seals, packing or gaskets.
- (iii) Due to over-heating.
- (iv) If the fitting of gaskets is not proper.
- (v) Due to lack of lubrication.

→ Remedial measures :-

- (i) Avoid overheating & overload.
- (ii) Material should be of high quality.
- (iii) Fit the seals / gaskets properly.
- (iv) Provide lubrication properly.

5.1.3. Bearings

Rotating shafts are supported on bearings. The long shaft is supported at suitable intervals by bearings.

→ Causes of failure :-

- (i) Dirt causes rupture & removal of lining while rubbing.
- (ii) Due to long running time, the bearing fail due to fatigue.
- (iii) Due to hot spot phenomenon. Due to insufficient oil flow.
- (iv) Due to fretting (load concentration)
- (v) Due to overheating.

→ Remedial measures :-

- (i) Clean the inner surface of bearing.
- (ii) Grinding & polishing the journal surfaces.
- (iii) Provide proper lubrication.
- (iv) Desired level of oil film thickness.

5.1.4. Keys

Keys are temporary fasteners & are used to hold pulleys, wheels, gears, crank arms & flanges of coupling etc.

→ Causes of failure

- (i) Due to overload.
- (ii) Due to improper fitting of Key in Keyways & Key seat.
- (iii) Due to improper material of Key.
- (iv) If the procedure of fitting of Key is not proper.
- (v) If the size of Key chosen is not proper.

→ Remedial measures

- (i) Choose the right size of Keys.
- (ii) Before using Key, smooth down the outer surfaces of Keys.

- (iii) Select the right type of Key acc. to use.
- (iv) Use proper method for fitting or disassemble the Key.
- (v) Avoid overloading.

5.1.5 Chains

In order to avoid this slipping phenomenon, chain drives are used. Chain drives provide a positive transmission & slip is not present as in case of belt & rope drives.

→ Causes of failure

- (i) If speed is more than 15 m/sec.
- (ii) If there is lack of lubrication.
- (iii) If the links after chain are loose.
- (iv) If the chain is too much tight.
- (v) If the distance b/w sprockets and bearing is large.

→ Remedial measures

- (i) Speed should not be increased more than 15 m/s.
- (ii) Proper lubrication of chain
- (iii) Replace the worn out sprocket.
- (iv) ~~Replace~~ New chains should not be installed over a worn out sprocket.
- (v) Loose the chain, if it is too much tight.

5.1.6 Clutches

Clutch is a mechanical device used to connect or disconnect the driven shaft from the driving shaft at the will of the operator while power is transmitted from driving to driven shaft.

→ Causes of failure

- (i) Due to excessive wear of plates.
- (ii) If cam surfaces are worn out.
- (iii) Improper lubrication.
- (iv) Improper use of discs.
- (v) Not proper disengagement of driver & driven shaft.

→ Remedial measures

- (i) Clean the disks & friction lining properly.
- (ii) Replace the worn out plates.
- (iii) Check the condition of lubrication film.
- (iv) Check the condition of spring & pressure plates.
- (v) Washing the clutch with Kerosene.

5.1.7Machine Spindle

It is used to mount chuck, centre, face plate, dog carriers, etc. The accuracy of m/c spindle like machine guides greatly influences the jobs being machined on the machine.

→ Causes of failure

- (i) Due to tightness of bearings
- (ii) Due to improper alignment.
- (iii) Due to rusty material.
- (iv) Due to absence of lubrication.
- (v) If the spindle is thin or long.

→ Remedial measures

- (i) Proper lubrication.
- (ii) Replace the worn bearing.
- (iii) Replace the seal.
- (iv) Clean the surface of bearing & spindle.
- (v) Proper coating to avoid corrosion.

5.2Parts which require frequent repair & maintenance5.2.1Belts

Belts are used for transmitting power from one shaft to another shaft. Belts run over the pulleys. Belts are used where the distance b/w the shafts is large.

→ Causes of belt drive failure

- (i) If groove surfaces are worn-out in case of V-belt.
- (ii) If belts are worn-out.
- (iii) If speed is too much high.
- (iv) If joints of belts are not proper.
- (v) If surface of belts is not clean.
- (vi) Improper lubrication of belts.

~~→ Repair & Maintenance~~

→ Repair & Maintenance

- (i) Replace worn out belts.
- (ii) Check the drive for alignment.
- (iii) Keep the belt grooves clean and in good condition.
- (iv) New & old belts should not run together.
- (v) Extra load should be avoided.
- (vi) Never use idler on the top side of a Vee-belt.

5.2.2

Couplings

Long line shaft is composed of a no. of small shaft pieces, put together end-to-end joined by coupling & supported by bearings. Couplings are also used to connect the shafts of

two machines so that the power can be supplied directly from one m/c shaft to the other m/c shaft.

→ Causes of Coupling Failure

- (i) Due to defective materials used during construction.
- (ii) Improper tolerance.
- (iii) Improper selection of coupling.
- (iv) Improper alignment of shafts.
- (v) Improper lubrication.

→ Repair & Maintenance of Coupling

- (i) Provide proper lubrication film.
- (ii) Proper selection of coupling.
- (iii) Should Not be any excessive looseness b/w the coupling hub & shaft.
- (iv) Speed of rotating shafts should not be too high.
- (v) Check proper alignment before using coupling.

5.2.3 Threaded Fasteners (Nuts, Bolts, Studs)

These are those temporary fasteners, which hold the parts together through the medium of a screw thread. These are used in pairs for their action. A nut & a bolt or stud comprises a screwed pair.

→ Causes of Failure

- (i) Improper sizes of nuts & bolts.
- (ii) Due to rust.
- (iii) Due to over-tightness.
- (iv) Due to high vibrations of machines / equipment.
- (v) Improper lubrication.
- (vi) Due to different types of threads used for nuts & bolts.

→ Repair & Maintenance

- (i) Provide proper lubrication film.
- (ii) Clean the surfaces of the nuts & bolts.
- (iii) Check the threads of nuts & bolts before winding.
- (iv) Use nuts & bolts with proper tightening.
- (v) Do proper coating over the surfaces to avoid corrosion.

5.3 Repairs & Maintenance of Heat Engines

An engine which is used to convert heat energy of fuel into mechanical work is termed as Heat engine.

1. Inspection - (I) :-

- (a) Check the working of the engine.
- (b) Check the leakage in the cylinder head.

- (c) Check the condition of fuel used.
- (d) Check the working of valves.
- (e) Check the lubrication oil, engine oil.

2. Small Repair - (S) :

- (a) Dismantle some minor units of the engine.
- (b) Clean all the dismantled parts.
- (c) Prepare the list of defects.
- (d) Tighten all the loose nuts & bolts.
- (e) Repair or replace the worn-out parts.

3. Medium Repair - (M) :

- (a) Disassemble all the major units of engine.
- (b) Wash the each parts of dismantled unit.
- (c) Repair or replace the piston.
- (d) Replace the piston rings.
- (e) Replace the engine oil.

4. Complete Overhaul - (C) :

- (a) Dismantle all the parts of the engine.
- (b) Clean & wash all the parts of the engine.
- (c) Replace all the worn-out parts.
- (d) Check the condition of lubrication oil & replace it if necessary.
- (e) Replace the connecting rod if necessary.
- (f) Replace or repair crank pin & replace the piston rings.
- (g) Assemble all the parts.
- (h) Check the performance of engine.

5.4 Repair & Maintenance of Compressors

An air compressor is a machine which compresses the air & raises its pressure. The air compressor sucks air from the atmosphere, compresses it & delivers the compressed air to a storage vessel.

1. Inspection - (I) :-

- (a) Inspect the working of compressor visually.
- (b) Check the oil level available in crank case.
- (c) Check the noise & heating of the compressor parts.
- (d) Check the inlet & outlet pressure.
- (e) Check the alignment of crankshaft.
- (f) Clean the oil filter.

2. Small Repair - (S) :-

- (a) Dismantle few selected parts of the compressors.
- (b) Check the condition of fasteners & replace them if necessary.
- (c) Clean the parts properly.
- (d) Clean the passages properly.
- (e) Repair the inner surfaces of cylinder.
- (f) Repair or replace the crankpin.

3. Medium Repair - (M) :-

- (a) Dismantle more parts of compressor.
- (b) Replace the piston rings.
- (c) Replace the inlet valve & outlet valve.
- (d) Replace the lubrication oil.
- (e) Replace the worn-out bearings.
- (f) Replace the crankshaft if necessary.

4. Complete Overhaul - (C) :-

- (a) Disassemble all the parts of compressor.
- (b) Replace the lubricating oil.
- (c) Replace the fasteners.
- (d) Replace the oil filter.
- (e) Replace the valve & valve seats.
- (f) Run the compressor & note the noise, vibration & heating.
- (g) Check the pressure developed.

5.5 Repair & Maintenance of Boilers

A steam boiler is usually a closed vessel made of steel. Its function is to transfer the heat produced by the combustion of fuel to water, and ultimately to generate steam.

1. Inspection - (I) :-

- (a) First check the boiler visually.
- (b) Check the pressure gauges.
- (c) Check the working of water level indicator.
- (d) Check the working of feed pump.
- (e) Inspect the tubes & shell properly.
- (f) Prepare the list of defects.

2. Small Repair - (S) :-

- (a) Dismantle 2 to 3 units of boiler.
- (b) Clean all the parts of units.

- (c) Replace the old nuts & bolts.
- (d) Check the leakage in pipes.
- (e) Wash & clean all the tubes.
- (f) Clean all the mountings & accessories.
- (g) Prepare the list of defects.

3. Medium Repair - (M) :-

- (a) Dismantle all the major units of boiler.
- (b) Clean properly all the parts.
- (c) Tighten all the loose fasteners.
- (d) Replace / repair the sensitive mountings.
- (e) Replace all the damaged tubes.
- (f) Paint all the unmachined surfaces.

4. Complete Overhaul - (C) :-

- (a) Dismantle all the parts of the boiler.
- (b) ~~Wash~~ Wash all the parts thoroughly.
- (c) Replace all the damaged tubes.

- (d) Repair/Replace all the mountings & accessories.
- (e) Change the oil.
- (f) Check & repair the pumps.
- (g) Check the fuel quality.
- (h) Check the working of boiler acc. to norms.

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