AIR COMPRESSOR (ALCO)

TYPES:

According to manufacturers:

1. ELGI Make
2. KPC (KIRLOSKAR PNEUMATIC COMPANY)

According to number of cylinders:

1. 6 CD 4UC
2. 6CD 3UC
3. 3CD
4. 2CD

According to Cooling arrangement used:

1. Air Cooled
2. Water cooled

Function of Compressor –

It is two-stage compressor with two LPs and one HP cylinder. After suction of air through a wire mesh filter, 1st stage of compression is done in LP cylinders. The air is then delivered to discharge manifold at a pressure of 35-40 PSI.

The pressure differential between the available pressure (i.e. atmospheric pressure) and pressure inside the LP cylinders (when the piston moves from TDC to BDC – i.e. suction stroke) open the inlet valve and air from atmosphere through intake filter is drawn into the LP cylinders during suction stroke. In the next stroke of the piston, the air is compressed and forced out through the discharge valve while the inlet valve remains closed. Each LP cylinder head is having two inlet and two discharge valves.

The compressed air, discharged by LP discharge valve at a pressure of 35-40 PSI, is then passed through an intercooler to increase volumetric efficiency. The intercooler is an air to air cooler where compressed air is passed through the element tubes and is cooled by atmospheric air blown on the outside fins by a fan fitted on the compressor crankshaft. An intercooler safety valve set at 60 PSI is provided after the intercooler as a protection against high pressure developed in the intercooler due to defects of valves.

Air then enters HP cylinder and is compressed to a pressure of 135-140 PSI. After cooling through after-cooler, and a set of coiled tubes below the loco superstructure, the air is sent to the air reservoir. The defined air pressure set in the MAR is 8-10 Kg/cm^2. The MAR

safety valve is set at 10.5 Kg/cm^2 or 150 PSI. The air first enters in the MAR 1. This air may be contaminated with moisture, dust or lube oil. Thus to remove the pollutants, while air is going to MAR 2 from MAR 1, air passes through air dryer. In air dryer a certain descicant particle is present which will absorb the pollutant and pass fresh air to MAR 2.

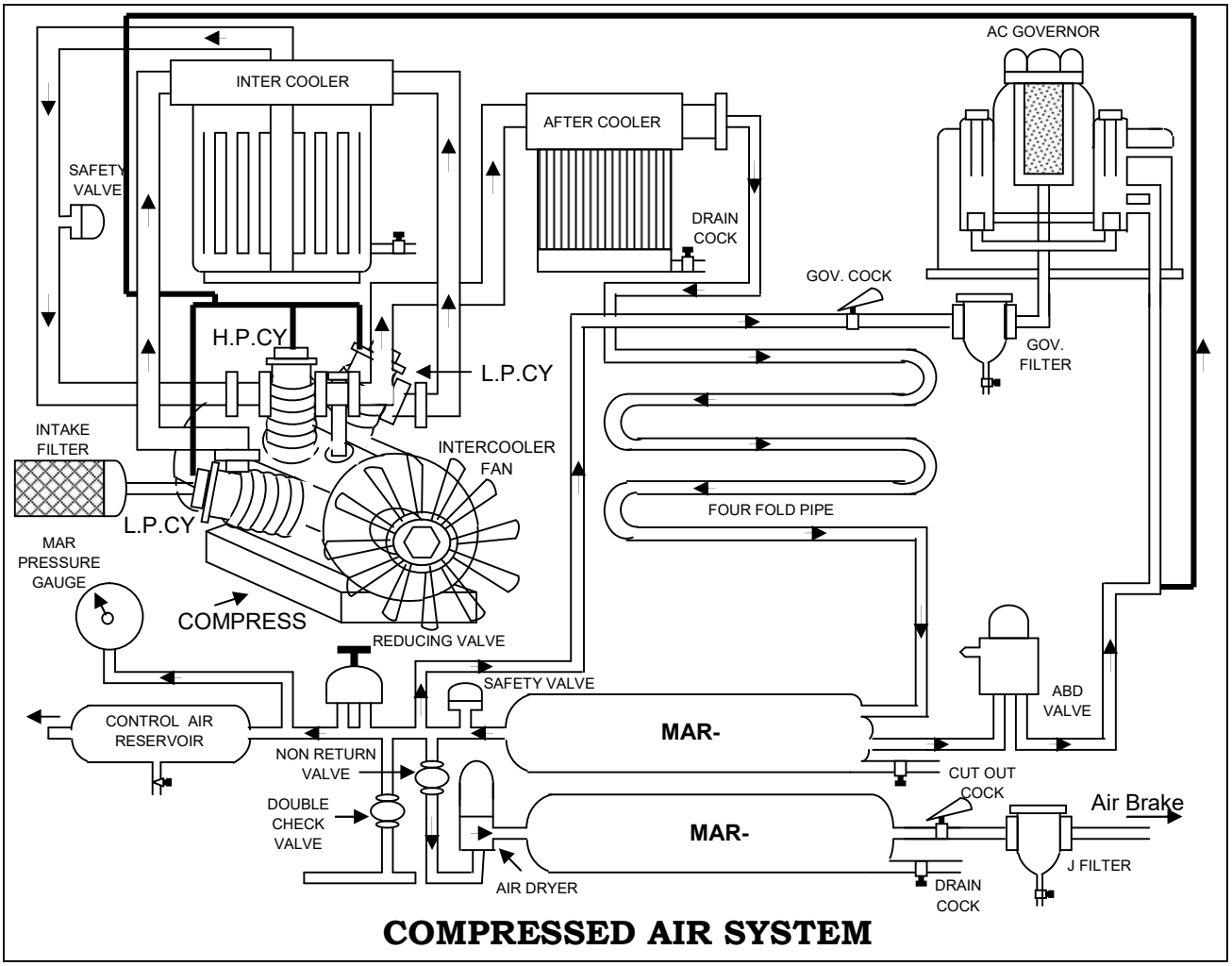
To avoid the compressor running hot due to overloading and also to avoid the wastage of engine horsepower, arrangements are provided to unload the compressor when a particular pressure is reached. The compressor cylinders are not required to compress the air beyond 10 Kg/cm^2, so it stops loading once MR pressure reaches this limit. The MR pressure naturally falls due to normal consumption and leakages. When it reaches 8 Kg/cm^2, it resumes loading. The process of loading and unloading is achieved through unloading plunger and NS-16 air Governor/Electro-pneumatic governor (EP Governor).

Lubrication –

It is having a separate lubricating system independent of lube oil system of the engine. SAE-40 is filled in 21 Ltrs capacity sump. The sump oil is sucked through a strainer filter screen by a gear type pump under hung from the crankshaft journal & driven through sprocket and chain. The oil is circulated to the journal bearings at a pressure between 45 PSI to 60 PSI. It also lubricates the small end bush of the connecting rods and the cylinder liners. A connection is taken from the pump housing to the stem valve, lift of which indicates adequacy of oil pressure. A relief valve is also provided to release oil pressure in case the pressure in the system is beyond its usual limit.

Specification –

- Make : KPC/ELGI etc.
- Type : KCW 523/623/LG3CDB
- H.P. absorbed : 50/52/60 KW at 1000 RPM.
- Weight : 850 Kgs.
- Free air delivery at 10 Kg/cm2.
- At Idle (400 RPM) : 2266 Ltrs/Minute.
  (KCW 523/623/LG3CDB)
- At 1000 RPM : 5000 Ltrs/Minute (KCW 523)
  5665 Ltrs/Minute. (KCW 623/LG3CDB)



COMPRESSED AIR SYSTEM

OVERHAULING OF AIR COMPRESSOR (ALCO)

1. Unloading from loco

Remove expressor unit from the locomotive for M24 and out of course or if required, remove the following items.

(i) Inlet, discharge and MR pipe joint and pipes.

(ii) Flexible coupling joint in case of MG, fast coupling in case of BG, HP/LA cylinder manifold and inter cooler assembly.

2. Disassembly

Strip the following from the expressor unit.

1. Manifold of cylinder head.

2. Valves
3. Cylinder heads
4. Cylinder liners
5. Remove the connecting rod assemblies.
6. Lube oil pump assembly.

3. Cleaning:

Clean the components duly de – carbonizing and de- greasing using HSD oil, jet of water and finally blow with compressed air.

4. Inspection all the components for cracking, damages and scoring pitting marks etc.

5. Zyglo test pistons, connecting rod & connecting rod bolts.

6. Dimension Details of Crank Shaft:

Sl.No	Size of Crank Shaft	Crank Pin Range	Pump Journal Range	Bearing Journal Range	Disposal
1.	Standard	3.624" – 3.625"	4.500" – 4.985"	3.544" – 3.5435"	Renew as applicable

7. Cleaning:

Clean the expressor housing with HSD oil and blow through compressed air.

8. Inspection of pump components.
9. Inlet discharge valve and Un-loader valve assembly overhaul.
10. Inter cooler assembly.
11. Assembly of expressor unit. Check the crank case Vacuum.

Sl.No	Parameter to check	Instrument Used	Permissible range
1.	Crank case Vacuum	Vacuum gauge	45 – 60 cms

12. Assembly the fast coupling for BG along with cooling fan.
13. Load the expressor into the loco.

Alignment of Expressor:

a. Align the expressor by using a dial gauge placed on the expressor crank shaft with extension shaft of the engine. Check the run out of the expressor with the help of a dial gauge.

b. If run out exceeds 0.006” then add / remove the shims accordingly to maintain the run out within the limit.
c. Tighten the foundation bolts and provide dowels pins.
d. Connect both side coupling and fill with cardium compound.
e. Connect exhauster inlet and discharge pipes.
f. Connect compressor delivery pipe to the cooling coils.
g. Top up servo press 150 oil to high marks.

AIR DRYER

Air dryer:

Air dryer is a complete air cleaning and drying unit provided between MR-1 and MR-2 of a diesel locomotive. It also helps the automatic drain and check valve by purging of dryer system. Purging is the removal of collected moisture from the desiccant beeds. The compressed air is being dried by absorbing the water vapour from the air passing through that tower. It supplies dry and clean air to the locomotive brake system.

Objective:

The primary purpose of the dryer of the dryer is to provide dry, oil free and clean compressed air to the locomotive brake system.

Construction:

The current design consists of a boro scilicate coalescing filter known as pre coalescar and twin regenerated desiccant towers that operates simultaneously these two towers are connected to pre coalescer to remove oil and water aerosols pre coalescer and dryer towers are connected by a common inlet and outlet manifold with solenoid assembly. All the electrical controls which programme the sequence of operation are located in housing attached to the outlet manifold.

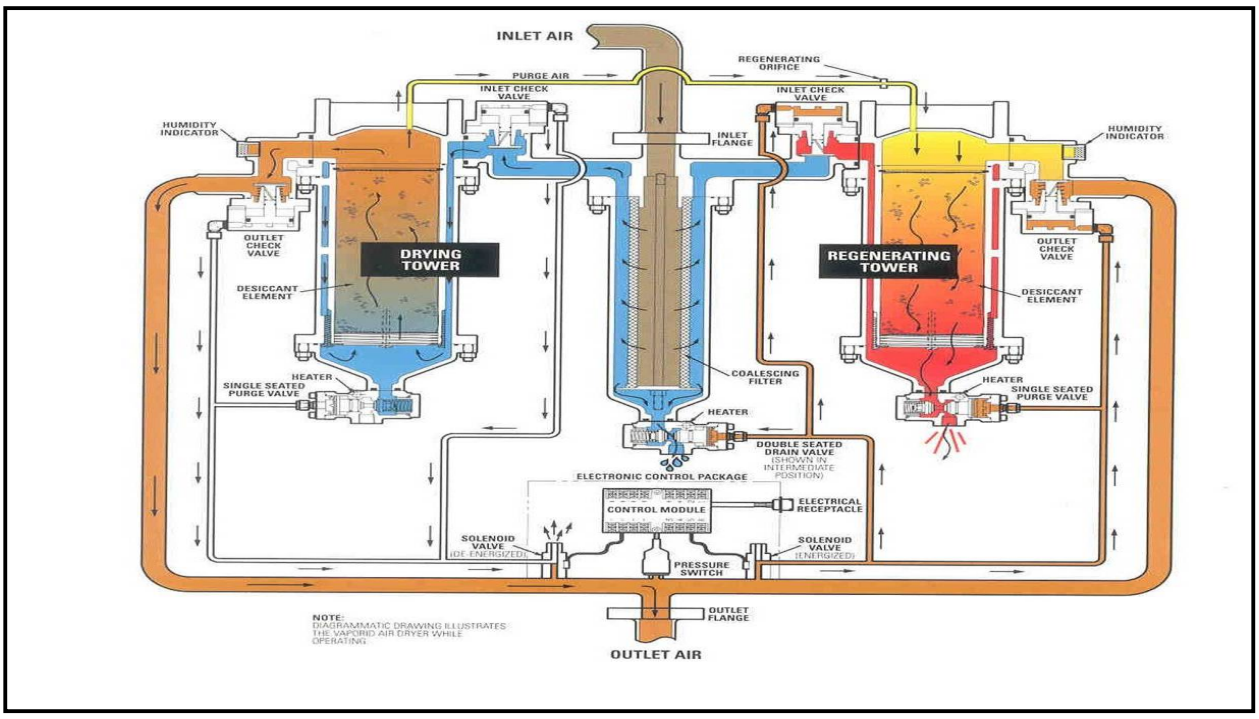
The first component is a multi layered pre coalescing element two other layers are constructed by small microscopic fibres which are random in size to enhance the collection of oil and water aerosols. The unit is mounted with aluminium housing having pneumatically operated double seated drain valve attached to the sump.

The second component is pneumatically controlled inlet check valve located within the inlet manifold for each of the identically designed dryer tower. Each dryer tower consists of finned aluminium housing containing a desiccant canister. The canister includes a pneumatic compactor to hold the desiccant tightly with in the canister to minimise the attrition on dusting of the desiccant and a mesh filter that is attached to the bottom of the desiccant canister along with the pneumatically operated single seated purge.

The third component is a spring loaded outlet check valve mounted in the outlet manifold of the dryer towers adjacent to the humidity indicators.

Functions:

Air from MR-1 flows into the air dryer inlet manifold down to the cell of the pre coalescing element and exits through the pre coalescing element where oil and water aerosols are collected. Air then flows up around the outside of the element and through the interning manifold



to both of the dryer towers contaminants such as oil and water aerosols are collected in the element, migrate to the sump, these contaminants are then discharged to the atmosphere through a double seated pneumatically operated drain valve attached to the bottom of the pre coalescing sump. This valve is activated momentarily each time of the dryer cycles. Filtered air leaving the pre coalescing element passes through the manifold with pneumatically operated inlet check valve and enters the top of the air dryer tower.

Drying and purging cycle:

There is an arrangement of drying and purging cycle which is governed by timer circuit. One tower drying by collecting moisture from air, while the other purging the collected moisture from the desiccant beads. It continues for one minute. After one minute timer circuit changes the position, the tower that was drying begins to purge and the tower that was purging begins to dry air.

Timer circuit:

The timer circuit is electronically timed to operate the tower, when air pressure reaches 100psi, the pressure switches closes. The timing circuit energises the solenoid on one tower, which provides pneumatic signals, close the inlet check valve and at the same time opens the purge valve at the bottom of the housing, simultaneously the spring loaded outlet check valve is closed and stops the flow of air to the tower. A small amount of dry filtered air from the top of the drying tower flows through an internal orifice and to the desiccant beeds removing collected moisture at the same time the opposite tower collects moisture from compressed air, which passing through the desiccant beeds. After one minute the electronic timer reverses the

operation of the tower. The purging tower now becomes the drying tower. The solenoid is de energised which causes the inlet and outlet check valves to open and the purge valve to close permitting full air flow through the desiccant beeds hat absorb water vapour. Simultaneously the solenoid circuit on the opposite tower is energised.

Checking the proper function of the air dryer system:

Blue indicator- indicating dryer has been performing correctly

Lavender indicator- dryer is suspect

White indicator – possible damaged dryer check for water in final filters

Yellow/brown indicator- damaged dryer.