

# PRESERVATION OF BOILERS



- The boiler life is more while in service than when it is idle.
- There are boilers, which are operated for 8-9 months in a year. There are boilers, which act as standby.

- While in service, waterside parameters are being monitored by most of the boiler users. When the boiler is running, the gas side surfaces are dry, except at the low temperature zones where flue gas condensation is experienced.
- However, the boiler when idle, both gas side and water side are to be taken care of to prevent corrosion.

# WATER-SIDE CORROSION

- Water, left inside the boiler without properly treating for oxygen removal, leads to corrosion.
- The attacks on metals take place due to improper pH level too.
- The corrosion results in isolated pits or craters where in the parent material thickness is reduced.
- This leads to generation of loose oxides, which again lead to further deposit related failures.
- Tube failures can occur at craters where thickness is less.



# GAS-SIDE CORROSION

- More corrosion can take place on the gas-side of an idle boiler than when the boiler is in operation.
- Gas side corrosion results from attack on the metal of the boiler by sulphur compounds. These accumulate in soot deposits, which can contain up to 30% sulphuric acid, which is hygroscopic, i.e. absorbs moisture from the atmosphere.
- The soot becomes wet, and allows the acid formation and leads to attack on boiler steel. Corrosion under ash deposits do take place depending of the sulphur and the fuel moisture.

# PRESERVATION METHODS

One of the following methods is used for preservation of boilers.

- Dry preservation
- Wet preservation under hydraulic pressure
- Wet preservation with nitrogen capping

Obviously the gas side has to be put in to dry preservation only. Water-side can be put in to preservation under any of the three methods.



# GAS SIDE PRESERVATION OF WATER TUBE / FLUE TUBE BOILERS

When boilers are laid- off it is important that the gas-side is thoroughly cleaned and all soot / ash deposits are removed. This is much more easily done with the boiler hot. The soot is then much drier and more readily removed.

water washing can be practiced, where boiler is provided with water washing arrangement / suitable for water washing.



# GAS SIDE PRESERVATION OF WATER TUBE / FLUE TUBE BOILERS

For Oil fired boilers,

Having cleaned the boiler it is advisable to dust all the heating surfaces with hydrated magnesia to neutralize any acid that is remaining. This can be done by blowing the powder through the flues by means of small vacuum cleaner arranged to blow.



Where boilers are connected to separate chimneys it is best to leave the gas side fully ventilated, i.e. open up the burner, or remove it, and leave the exit damper, if any, fully open.

Where boiler outlets are connected to common chimney this cannot be done otherwise flue gases may discharge back into the boiler house through the idle boiler. In this cases the exit damper must be shut and the dusting with magnesia carried out all the more thoroughly.

Flue tube boilers are easily amenable for gas side cleaning. This can be done by opening the II pass / III pass doors.



In the case of water tube boilers, the manholes provided for Superheater, Economiser, Airheater, MDC, ESP sections are to be opened to clean the ash / soot deposits thoroughly. Due to varying climatic conditions, and due to insulation, the inside of the boiler is never warmer. However it can be made warmer, by adding high watts lamps. Room heaters or hot air generators can also be used as source of hot air supply.

In addition, silica gel or slaked lime –  $\text{Ca}(\text{OH})_2$  can be kept inside the boiler in trays. At periodical intervals the silica gel / Slaked lime must be inspected and replaced.



# WATER SIDE PRESERVATION OF SHELL TYPE BOILERS

- **HEADERING WITH OPERATING BOILERS.**

It may be practical to leave the boiler under steam supply from other boiler. In such a case, the water quality must be monitored for residual sulphite level and pH. The pH must be maintained at 10 and at least 150 ppm of sodium sulphite should be maintained. For this purpose the boiler must have separate chemical dosing arrangement.

- **WET PRESERVATION UNDER HYDRAULIC PRESSURE**

In this case, the boiler is always kept under hydraulic pressure of 5-kg/cm<sup>2</sup> pressure. Water quality must be monitored for residual sulphite level and pH. The pH must be maintained at 10 and at least 150 ppm of sodium sulphite should be maintained. This method can be adopted for an idle period of upto three months.

## □ DRY PRESERVATION

Drain and dry boiler with hot air, place a small electric heater in the bottom of the boiler & leave man doors open to allow good ventilation. High wattage lamps may also serve the purpose. The dry preservation method will be the best and easiest method for the shell type boiler.

# WATER SIDE PRESERVATION OF WATER TUBE BOILERS

## 1. DRY PRESERVATION

The dry preservation method is effective provided the boiler is completely drainable. If Superheater / Economiser sections are completely drainable then this method can be practicable.

- The headers should have removable hand-hole plates wherein silica gel or hydrated lime can be kept inside for absorbing moisture.

- Heaters can be placed inside the headers. The warm climate will ensure the metal surfaces are dry. Similarly the drum / drums should be kept dry by means of room heaters.
- Volatile corrosion inhibitors can also be used to contain corrosion in idle boilers.

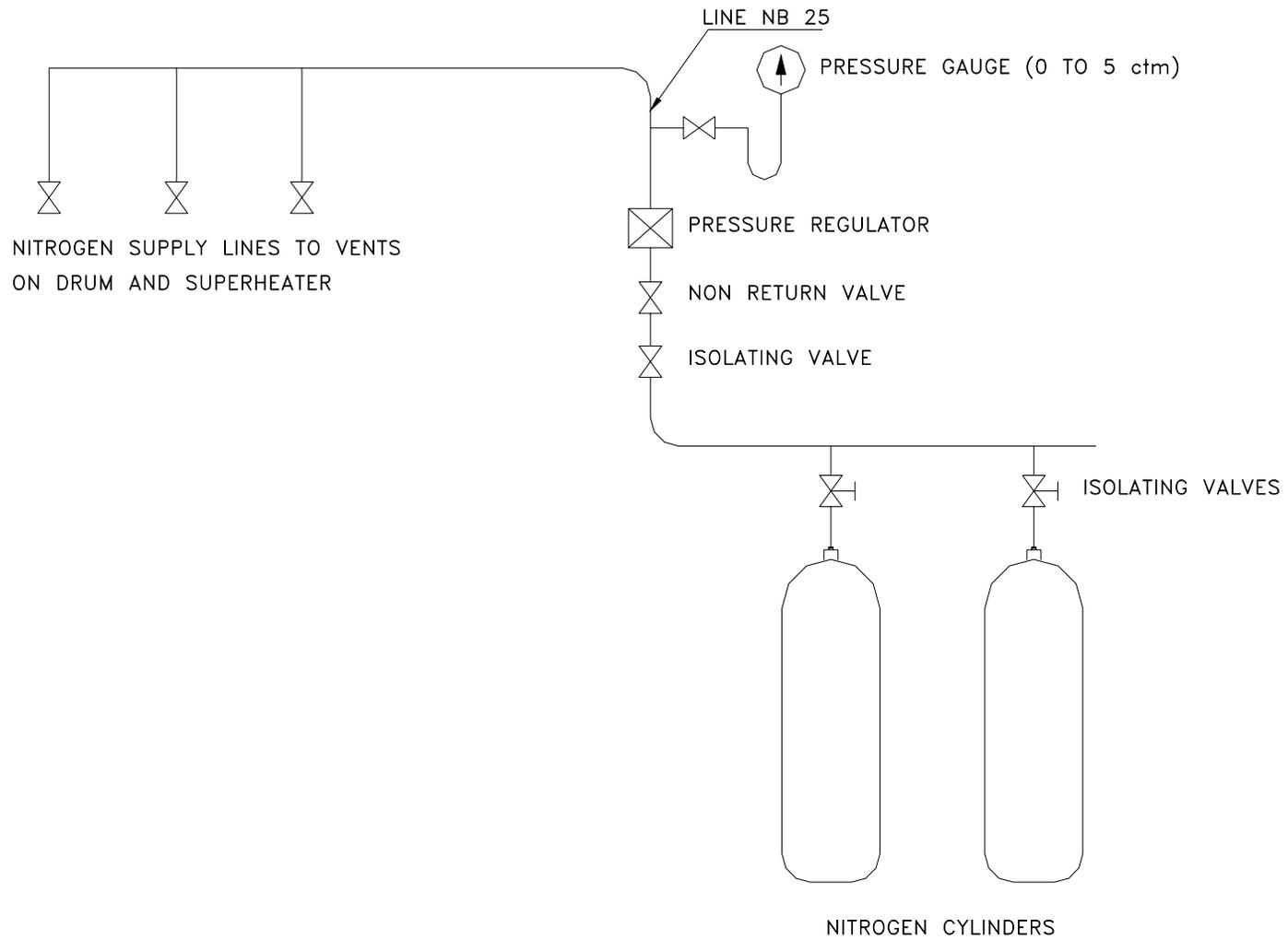
If the boiler has non-drainable superheater sections, getting rid of water will be difficult. Hence this method can not be adopted for such boilers.

## 2. WET PRESERVATION

In this method the boiler should be filled with DM water with a pH of 10 and hydrazine dosed to 200 ppm. It is a fact that the steel corrodes at the least rate, when pH of 10. The boiler filling must be proper. It is necessary to back fill the boiler from Superheater section and ensure the water overflows from Superheater to the steam drum. The water should be filled from the lowest point to ensure the air is properly released from the boiler. After this, any one of the following should be implemented.



- Maintain 5 kg/cm<sup>2</sup>g pressure in the boiler by means of a hand pump. Every day the pressure should be monitored.
- Instead of pressurizing, the space above the water surface can be sealed by Nitrogen gas, which is inert. This is known as Nitrogen blanketing. The recommended scheme is shown below. The nitrogen is maintained at pressure of 0.35 kg/cm<sup>2</sup> g to avoid air ingress. In this case the Superheater section will not be filled with water.



SCHEME FOR NITROGEN BLANKETING

Periodical testing of water has to be done to ensure the water pH is maintained at 10 and the hydrazine levels are maintained at 200 ppm. A pump arranged for recirculation will be necessary for higher capacity boilers, where the water hold up volume is more.



# CONCLUSION

Preservation leads to following benefits

- While restarting the boiler, the carryover possibility is eliminated since no suspended corroded particles will be present in boiler water.
- Phosphate hide out will not be experienced.
- Under deposit corrosion is eliminated. Pin hole failures will be avoided.



End

