

WET LAY UP OF BOILER

INSIDE THIS ISSUE:

WATERSIDE CORROSION DURING LAYUP	1
WATERSIDE DEPOSIT DURING LAYUP	2
WET LAYUP	2
WET LAYUPS: LESS THAN 30 DAYS	2
SHORT-TERM WET LAYUP	3
TESTING OF BOILER WATER UNDER LAY-UP POSITION	4
GUIDELINE FOR PROPER	4
CONCLUSION	4

The Water-side surfaces of steam boilers are vulnerable to corrosion when air contacts moist metal surfaces during out of service periods. Therefore, in order to prevent corrosion, the boiler water-side surfaces must be protected by

- Keeping the surfaces completely dry, or
- Excluding air from the boiler by filling it with properly treated water.

The best program for preventing scale and corrosion during the operation of the boilers can be wasted by improper shut down, improper lay-up, and improper maintenance on the boilers during downtime. Continued maintenance of the entire boiler systems, even during downtime, is essential in protecting the boilers against corrosion and deposit too.

When boilers are removed from service, they can be laid up either WET or DRY. The choice depends on how



long a boiler would be laid up. Here we are discussing Wet Layup, for short run and more, ideal practice of Wet Layup, recommended water chemistry to be maintain

Layup and guidelines to start up of Boiler after shutdown.

WATERSIDE CORROSION DURING LAYUP

There are two types of corrosion are usually observed in idle boilers: acid attack and oxygen pitting.

Both high- and low-pressure systems may be badly affected by a low pH-acid attack from acid contaminant sources.

These acid sources could include condensate system contaminants, a demineralizer system anion exchanger, and leaking feed

water and boiler non-return valves.

By far, the most frequent regular corrosion in idle boilers is oxygen pitting. If oxygen is present in the water, oxygen pitting can occur on boiler steel. The rate of corrosion is depends on the concentration of oxygen and temperature of the water.

WATERSIDE DEPOSIT DURING LAYUP

During operation, the solids are dispersed both chemically and mechanically (by natural circulation of water). However, when the boiler is shut-down, circulation stops. As such, any excess solids will settle onto the waterside surfaces and become adherent deposits. Boiler water cools down during shutdown, decreasing the solubility

of most solids, and increasing the potential for precipitation. If a boiler is drained while hot, the continued evaporation of water will cause the excess solids to concentrate and precipitate on the waterside surfaces, and possibly bake on the hot surfaces too.

To prevent these problems, the solids level

must be reduced by increasing blowdowns prior to shutdown. The blowdown rate should be gradually increased, both via continuous and bottom blow down. Chemical feed rate may have to be increased to offset the chemical loss through higher blow down rate. Lastly, boilers should never be taken down hot.

Excessive trapped air may consume all of the available oxygen scavenger, causing the boiler to corrode

WET LAYUP

Wet lay-up entails keeping a boiler filled with treated water. It allows the boiler to be returned to service within a short notice. Under this method, the boiler water chemistry must be prepared before shutting down.

As water cools down, it will absorb more oxygen, increasing potential for pitting corrosion. To prevent this problem, the oxygen scavenger level must be increased up to the high end of the operating range.

The boiler water pH must be maintained at the high end of operating practice. The scale inhibitor level must also be maintained at the high end of the operating range. The additional dispersion properties of the inhibitor will assist in preventing the minerals from becoming insoluble at the lower temperature.

The boiler must be filled to the top with the above treated water to force out as much air as possible. Otherwise, trapped air will gradually consume

the oxygen scavenger in the water. Excessive trapped air may consume all of the available oxygen scavenger, causing the boiler to corrode.

It is important that the chemicals are well distributed in the boiler water, by firing up the boilers lightly to provide some circulation of the chemicals. It is also important that analytical tests on the boiler water be conducted regularly to ensure the maintenance of the proper chemistry.

WET LAYUPS: LESS THAN 30 DAYS

Recommended guidelines for wet layups of less than 30 days are sulphite

(Sodium Sulphite) : 200 to 400 ppm; Hydroxide alkalinity: 600 to 800

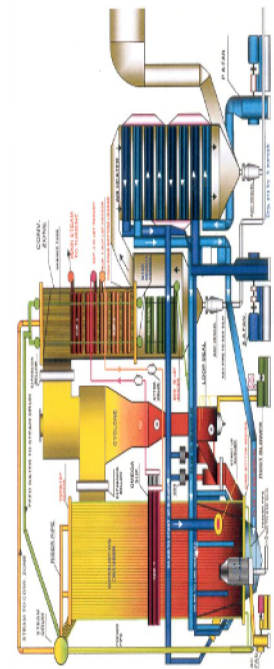
ppm (by pH booster) ; and scale inhibitor (Poly phosphate , polymer based

program is to maintain a boiler pH of 11 and an oxygen-free environment. Also, this chemistry cannot be used for layup of superheaters. Demineralized water and all volatile chemistry (Cyclohexyl Amine, Morpholine, Polyamine etc.) must be used. To achieve the proper wet layup chemical levels in the boiler, begin increasing chemical dosages to the boiler at least one week prior to shutdown. High alkalinity levels can cause foaming and carryover

during on-line operations on some boilers. To minimize the potential for foaming, hence adjust alkalinity just prior to shutdown is recommended.

Once the boiler is shut down, it is difficult to achieve proper mixing of chemicals unless the boiler is placed on-line to increase circulation. Initially, maintain 400-ppm sulfite because air intrusion causes sulfite levels to drop. To prevent oxygen pitting, do not let

sulfite levels drop below 200 ppm. Our treatment program of **ALTRET 1302** prevents corrosion while wet layup. It is catalysed Sulphite base treatment and scavenges oxygen from water, if oxygen does not persist in water, corrosion does not take place. Moreover the recommended chemicals maintain desire alkalinity slightly alkaline, which also provides protection to metal. Generally slightly alkaline condition of water is ideal preservation of equipment.



***For Boiler Start Up
Every effort need
to be made to
ensure the boiler
water quality is
returned to
recommended
guidelines as soon
as possible***

SHORT-TERM WET LAYUP

Wet layup, regardless of length of time, needs to maintain the same chemical parameters to minimize the waterside corrosion. Plants that have several boilers sometimes choose to cycle all their boilers on a regular basis. This routine sometimes causes short two to three day run times. The number of startups and shutdowns influences boiler life. The heating and cooling of the boilers due

to short run times increases mechanical stress on the boiler. Ultimately, frequent expansion and contraction along various joints and welds can lead to leaks.

These guidelines do not refer to boilers kept in hot standby. However, plants that have several boilers may choose to keep them in a hot standby mode at normal operating chemistry lev-

els. Boilers operating under these conditions are very susceptible to significant corrosion. It is important to evaluate how many boilers need to be kept in hot standby vs. Using proper layup procedures. When possible minimize short run times. Instead consider the following wet layup options:



**ALTRET INDUSTRIES
PVT LTD**

12/2881, Altret house,
Saiyedpura Main Road,
Surat-395003
Ph. 0261-2451807-808-809

E-mail: info@altret.com
www.altret.com

**Energy &
Environment Saver**

*We Match With Your
Specification*



Compiled By:
Zakirahmed Atashbajiwala
Vice President-Tech. & Mkt
Altret Industries Pvt Ltd
info@altret.com

References

1. Holloway, R.T., et al. 1994. "Consensus on operating practices for the control of feed water and boiler water chemistry in modern industrial boilers." American Society of Mechanical Engineers.
2. Boiler Operator's Handbook- By Kenneth E. Heselton
3. A Primer on Protecting Idle Boilers By Howard Benisvy, Member ASHRAE
4. ALTRET -handbook for water treatment
5. Troubleshooting & Monitoring for boiler -Altret presentation By Zakir

TESTING OF BOILER WATER UNDER LAY UP POSITION

Water sampling and testing should be performed at least once per week. Since the water is stagnant, it is difficult to obtain accurate samples. Test from several locations. If the chemistry falls below any of the recommended levels, add more chemicals. Inspect the boiler prior to bringing back on-line.

GUIDELINE FOR PROPER STARTUP OF IDLE BOILERS

Proper startup of boilers is critical to minimize scale and corrosion, and to ensure good steam quality. It is not unusual for iron levels to be slightly elevated from layup. Every effort needs to be made to ensure the boiler water quality is returned to recommended guidelines as soon as possible. Prior to returning an idle boiler to operation, a full inspection should be performed to evaluate and record the condition of the waterside and fireside.

The following procedure for startup is recommended:

1. Boiler inspection and record condition are strongly recommended.

2. If boiler is in dry layup, remove all desiccants and humidity cards.

3. Open and clear all valves of the waterside area of boiler.

4. Open all dampers to the fireside. Remove any desiccants/humidity cards.

5. Fill boiler with high quality feed water per recommended or specified guidelines. Ensure availability of treated MB/DM/ Soft water in well quantity prior to boiler start-up.

6. Increase surface blow down to reduce chemistry to normal operating ranges (if boiler was not drained and inspected prior to startup).

7. Increase frequency of bottom blow down for

first week of operation to remove suspended solids: maintain short 3 to 5 second blow downs.

8. Monitor chemistry and adjust to get in range. (To maintain desire water chemistry parameter ensure proper dosage of pH booster, Phosphate conditioning and Oxygen Scavenger)

9. Monitor iron levels in feed water and boiler to ensure they are within recommended guidelines.

10. Ensure the corrosion inhibitors and other water treatment chemicals dosage with respect to keep in mind not availability of condensate and deaerator operation)

CONCLUSION

Wet layup method can be used for normally water-filled or wetted components such as feed water heaters, condensate/feed water piping, deaerators, and boilers. The main disadvantage of the wet layup method, particularly for long-term conditions, is that it requires staff time to ensure that chemical conditionings are appropriately maintained. As much as practical, this article provides guidance for protecting idle boilers. Evaluating the mechanical limitations of your boiler is important to selecting the best layup approach for your industry.