Wet and Dry Boiler Storage Procedures

Technical Bulletin 1-002
Boiler Systems

Boiler Storage
An improperly stored boiler is very susceptible to oxygen pitting. In fact, more cases of severe corrosion and subsequent metal failure occur in idle boilers than in operating ones. To reduce this potential for corrosion, it is important that the proper boiler storage methods be used.

Wet Storage
Wet storage is preferred where a boiler is to be placed on stand-by status for short periods and/or may be needed for service on short notice. To prevent possible boiler damage, there must be no danger of freezing. Effective corrosion control in wet stored boilers is directly dependent on maintaining adequate levels of alkalinity and sulfite in the boiler water and not allowing any intrusions of oxygenated makeup, feedwater, steam, or condensate. **A minimum of 100 ppm of Sulfite and 400 ppm of P-Alkalinity should be maintained in a wet stored or stand-by boiler.**

Wet Storage Procedure
1. If the boiler is to be wet stored more than one month, it should be drained, washed out, and inspected before placing in storage.
2. If the boiler has been drained and washed out, add sufficient treatment chemicals directly to the top manhole while refilling to achieve the desired treatment levels (sulfite 100-200 ppm, p alkalinity min 400ppm). To ensure the storage chemicals are well-mixed and to expel any excess oxygen, the boiler should be fired temporarily. **Your Chem-Aqua Representative will provide the proper start up dosages.**
3. If the boiler was not drained prior to placing in storage, add additional chemicals to raise treatment levels into the desired range shortly before taking off line. Be sure to add enough chemicals to achieve the required levels after the boiler has been flooded.
4. Allow the boiler to cool to less than 200°F, then flood with feedwater to the top of the drum. If the “quick fill” is used to flood the boiler with cold makeup, be especially careful that the sulfite level does not drop below minimum. Make sure all connections are closed so the steam line or superheaters are not flooded.
5. Install an external pump and piping to connect the bottom blowdown to the surface blowdown so the boiler water can be circulated on a weekly basis. If the boiler water is not circulated weekly, stratification may cause some tubes to be inadequately protected from corrosion. Test the boiler water weekly to ensure the minimum Sulfite and P-Alkalinity levels are being maintained throughout the boiler.
6. If the treatment levels drop below the minimums, additional treatment chemicals should be added and the boiler water circulating by means of the external pump mentioned above or by lowering the water level and steaming the boiler for a short time. If the water level was lowered to steam the boiler, it should be completely flooded as outlined above before placing back in storage.
7. When the boiler is returned to service, increased blowdown may be necessary to reduce the alkalinity and sulfite levels to their normal ranges.

Dry Storage
Dry Storage is preferred when a boiler is to be out of service for extended periods of time (90 plus days) or where freezing temperatures are a concern.

Dry Storage Procedure
1. Drain, wash out, and inspect the boiler.
2. The cleaned boiler should be thoroughly dried, using warm air to dry internal surfaces. Precautions must be taken to prevent the entry of moisture in any form. All valves to and from the boiler should be examined to see that they do not leak. If necessary, disconnect water and steam lines during stand-by status, and block off the openings.
3. A non-corrosive moisture absorbent (desiccant) should then be placed on plastic or wooden trays and inserted in the boiler drums or shell. The trays should be placed so air can circulate underneath.

4. The most widely used desiccants are quicklime (not the same as hydrated or agricultural lime) and silica gel. Silica gel is generally preferred since it is a more efficient moisture absorbent and can be reused. It is also safer to handle and easier to use than quicklime.

5. The recommended amounts of desiccant to use per 30 cubic feet (225 gallons) of boiler volume are: two pounds of quicklime or five pounds of silica gel.

6. Replace the manholes and completely seal the boiler. **Prominently tag the boiler to indicate it must not be operated until the moisture absorbing chemicals are removed and the boiler refilled.**

7. Every two months, open the boiler and inspect the moisture absorbing chemicals. Replace the quicklime as needed or regenerate the silica gel and return it to the trays in the boiler. Reseal the boiler completely. Note that some desiccants can give off noxious fumes. **Be sure the boiler is thoroughly ventilated prior to entering.**

8. There are Humidity Indicating Cards available that are convenient for dry stored boilers. The cards are available in a variety of humidity ranges and from several manufacturers. Cards are sensitive and should be used along with the desiccant.

9. The Humidity Indicating Cards should be hung with a string (there are pre-punched holes) inside the boiler so they do not touch the metal interior or the desiccant trays, i.e. free-hanging.

10. The cards have a blue indicating dye while dry. As they absorb moisture, they will turn pink. Discard desiccant and change cards when a pink spot is observed on the card.

11. Before returning the boiler to service, remove all desiccant trays and any loose desiccant. If the Humidity Indicator Cards were used, they too must be removed. Add start up dosage of treatment chemicals when refilling.

**Alternative Dry Storage Methods**

**Nitrogen Blanket**

Another dry storage method recommended for boilers that are going to be out of service for extended periods (90 plus days) consists of completely sealing the drained and dry boiler and maintaining a positive pressure (three to five psig) of nitrogen. When inspecting the boiler or returning it to service, first disconnect the nitrogen supply, then vent in a safe manner external to the building and away from air intakes. **Thoroughly purge the boiler with dry air prior to entering the boiler - nitrogen will not support life.**

**Cortec® Lizard™**

This product is a vapor phase corrosion inhibitor. To use the Cortec Lizard, simply place the package inside the cooled, drained boiler and slit the package open. It will vaporize inside the boiler and coat the tubes. The bag is water-soluble so it does not need to be removed. The dosage for Cortec Lizards is one package per thousand gallons volume. **Cortec Lizards are recommended for use in fire tube boilers and smaller water tube boilers only.**

**Storage of Auxiliary Equipment**

**Contact Chem-Aqua Engineering for site-specific guidelines for storing economizers, superheaters, and other auxiliary equipment.**