NTSB D030
D041

Removal from Service and Lay-up Procedures for Boilers

BY D. ANTHONY CARTER, PH . D. CHEMICALS INCORPORATED

INTRODUCTION

There are instances when boilers are removed from service and are stored for varying periods of time before being placed back in service. It is important during these periods to carefully plan the procedure for removing the boiler from service, storage of it and start-up. If the procedure is not handled correctly, it can result in excessive stress on the tubes due to rapid expansion and contraction, and baking of boiler sludges on the heat transfer surfaces.

DISCUSSION

The following steps should be taken to slowly bring low to intermediate pressure boilers (up to 900 psig) off-line.

1. Two to seven days prior to the scheduled shutdown, the blowndown rate for the operation should be increased. The bottom blowdown **should be doubled by increasing the** frequency. The continuous blowdown should be increased to reduce the cycles by 50%.

2. The hydroxide alkalinity and dispersant dosage should be increased during this period to increase the fluidity of any sludge in the boiler.

3. When the boiler is taken off-line and still under pressure, bleed heavily from the continuous and bottom bleed, making up with hot deaerated feedwater.

4. This process should be continued with bottom "blow" every one to two hours while the temperature of the boiler is slowly reduced. The boiler should be cooled over a period of two to five hours depending on pressure (five hours at 900 psig and three hours at 150 psig is a good guide).

5. The fire side of the boiler should be slowly cooled using the draft fan to prevent damage to the brickwork and refractory material.

6. At very low pressure (<10psig), careffilly open the steam vent valve. When there is no steam coming from valve, open the drain valve to slowly drain the entire boiler.

After draining the boiler, the manhole covers should be removed from access and inspected. After a quick initial inspection, the boiler should be water washed while still wet to remove any loose sludge deposits to prevent them from baking on the tubes. In watertube boilers, wash out the steam drum first. In firetube boilers, start at the top and work down.

The boiler can now be thoroughly inspected. After completing the inspection, it is necessary to appropriately store the boiler if it is not scheduled to immediately start up. The wet method is typically utilized for short-term lay~up (up to six months), whereas the dry method is recommended for longer periods of lay-up.

In bringing down the boiler, moisture laden air enters the boiler and moist surfaces are extremely susceptible to oxygen corrosion under these conditions. In order to prevent this from occurring, we have to either eliminate the oxygen or the moisture.

In wet storage of boilers, the boiler is refilled with softened, deaerated water and treated with an oxygen scavenger, hydroxide alkalinity and a dispersant. Typical products would be:

I)Catalyzed sodium sulfite to achieve a residual of 250-1,000 ppm as S03.

II)Sodium hydroxide to achieve a hydroxide alkalinity of 1,000-2,000 ppm as CaC03-

III)A dispersant formulation at two to three times the normal recommended dosage.

In high pressure boilers, dernineralized water is used with hydrazine or a hydrazine replacement

such as diethylhydroxylamine, hydroquirione carbohydrazide, etc. (as the oxygen scavenger). It is important not to flood the steam lines or superheaters.

The boilers should be fired up at a low firing rate to bring the boiler up to boiling temperature (100'C) in order to thoroughly mix the chemicals in the boiler. The boiler is then cooled and filled to the top of the drum. A tank filled with the treated water should be place above the steam vent of the boiler and connected to the top vent so that if water is lost from the boiler, it will fill up from the tank. The tank should be checked periodically and filled if needed.

It is a good practice to fire at low load approximately once a month in order to circulate the water. It should not be heated to its steaming temperature.

The dry method of storage involves drying the boiler out with warm air to aid the removal of moisture from the boiler. With the manholes open, the boiler is lightly fired to complete the drying process. Alternately, a small auxiliary space heater can be used to provide the necessary heat.

Once the boiler is as dry as possible, silica gel or other water absorbing material should be distributed on trays throughout the boiler. The boiler openings are then closed. The boiler should be inspected every two to three months and the water absorbing material replaced if necessary.

Drainable superheaters should be stored dry. It is very important that the superheaters be completely dry during storage.

Non-drainable superheaters can be stored wet. It is necessary to use demineralized water to completely fill the superheater section of the boiler and to treat with hydrazine or a hydrazine substitute at 50-150 ppm residual. A pH of 8.5 should be maintained in the storage water. A neutralizing amine such as morpholine can be used for pH adjustment.

When the boiler is brought back into service, it

should be fired up slowly according manufacturer recommendations.

CONCLUSION

A well-planned program is necessary to take a boiler out of service and to store out of service for a period of time. Correctly implemented wet and dry lay-up procedures will ensure that no damage occurs to the boiler during these periods. If incorrectly stored, severe corrosion will occur and create future operational problems.