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View From The Penthouse

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Boiler Lay Up

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Many boilers spend a significant time in lay up, awaiting further use. If oxygen is not excluded from the waterside, the tubes can suffer localized pitting and corrosion, especially underneath deposits. Waterside stress-assisted corrosion may also occur where attachments on the cold side induce stresses that may break the protective magnetite layer.

Short-term lay ups are typically wet, that is the boiler is left filled with water so that it can be brought back on line more quickly. Long-term lay ups may be either wet or dry. Dry lay ups involve draining and drying the inside of the boiler to prevent corrosion.

General Preparation

Prior to the shutdown, blowdown rate should gradually be increased via continuous and bottom blowdown. Chemical feed rate may need to be increased to offset the additional chemical loss through higher blowdown rate. The solids level must be reduced to prevent potential precipitation. As water cools while shutting down the boiler, solubility of most solids decreases, and they precipitate. During operation, solids are dispersed both chemically and mechanically (by natural circulation of water). As circulation slows down during shutdown, excessive solids can settle on the waterside surfaces, and dry to become adherent deposits. If the boiler is drained while hot, the continued evaporation of water will cause excess solids to concentrate on the waterside surfaces, and possibly bake onto hot surfaces. These would increase the chance of localized corrosion or overheating during operation.

Preparation of the boiler for lay up starts with a very thorough cleaning. Corrosion may occur underneath waterside deposits where corrosive salts concentrate and the pH might decrease. On the fireside, slag, ash and dust from sulfur-burning fuels can contain sulfuric acid. Blowing with air, water-washing and scraping may be required to remove build-ups. This should be followed by rinsing with alkaline water (for example, sodium carbonate washing soda) to neutralize any residual acid in the deposit. Refractory and insulation need to be dried well. Periodic inspection is required to monitor the fireside condition.

Wet Lay Up

Successful lay up will start with development of sound procedure. The unit should be filled with deaerated, demineralized water, with a volatile oxygen scavenger such as hydrazine and sufficient ammonia to maintain the pH at the high end to ensure against any acidic conditions. Polymer level must also be maintained at the high end to keep minerals from becoming insoluble at the lower temperature. Work closely with the water treatment vendor to optimize a treatment strategy. The boiler must be filled to the top to force out as much air as possible, otherwise trapped air will consume the oxygen scavenger in the water. Excessive trapped oxygen may consume the entire available oxygen scavenger, causing the boiler to corrode. After the unit is filled, a nitrogen cover should be initiated at 5-10 psig to prevent air ingress. Remember safety precautions to prevent personnel ingress to this oxygen-free space.

If the unit is to be maintained in wet lay up when ambient temperatures reach the freezing point, then the unit must be heated to prevent freezing damage to the boiler parts.

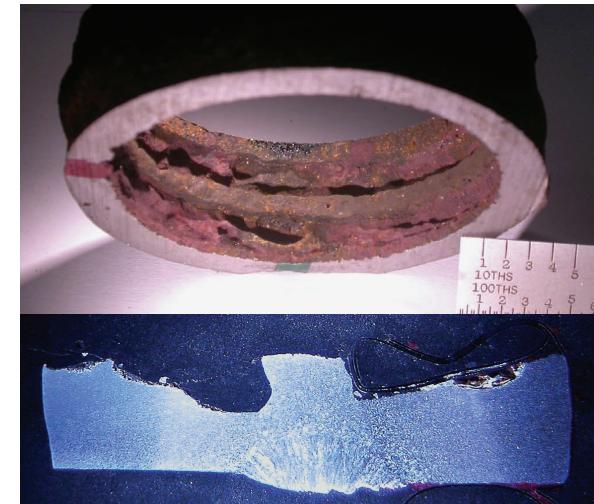
Chemical levels will need to be monitored regularly and make-up added as needed. The water should be circulated by heating or pumping to keep chemicals mixed.

Dry Lay Up

For dry lay up, the unit must be thoroughly cleaned both internally and externally, drained, dried, then closed and sealed to exclude air and moisture. A hydrotest at or near operating pressure is recommended to ensure that any leaks may be found and repaired. As part of this procedure, any leaking isolation valves must be repaired. Then following hydrotest, pressure testing with air can be performed. The unit would then be filled, a gas fire used to dry the inside of the furnace and warm the unit. Chemical feed lines would be flushed clean. The boiler is then slowly drained while maintaining a positive nitrogen pressure.

Vapor phase corrosion inhibitors may be added to the unit to protect the waterside. On the fireside surfaces, a protective coating may be applied. Dessicant may be placed in

the drums to remove residual water vapor. The dessicant may need periodic replacement. Follow up with regular inspection of the unit to ensure corrosion is not occurring.



Corrosion is often worst at welds

Mothballing

If a very lengthy lay up is involved, then the unit may be mothballed, or put into storage. Many of the same procedures for dry lay up would be employed. Chemical cleaning before mothballing may be desirable to prevent under-deposit corrosion, and the cleaning needs to be followed by passivation. Equipment such as electrical stations, cabling, instrument lines, and all the other auxiliary systems need protection against corrosion in the case of a lengthy lay up. Additional precautions may need to be taken to guard against corrosion of the exterior of the equipment where condensation may occur. Depending on the length of the expected lay up, some equipment may be not worth protecting, and may be allowed to corrode. Again, periodic inspection is advised.

Start-Up

On start-up, it is important to fill with deaerated, demineralized water to prevent corrosion or waterside stress assisted corrosion during heat-up of the unit. It is at this time the risk is high for stress assisted corrosion on the waterside at attachments.

Topic Ideas ? Please email inquiries@davidnfrech.com