Boiler preparations best practice

Pre-cleaning and passivation of new boilers

Overview

New boilers and new parts must be cleaned and passivated to prevent flash rusting and to minimize iron contamination of the steam cycle.

Metal surfaces in new boilers are normally contaminated with oils, greases, temporary protective coatings and mill scale from the manufacturing process. If left in place, these materials can be detrimental to the boiler's operation.

All water entering the boiler must be oxygen free, treated with alkaline buffering agents and corrosion inhibitors. Introducing corrosive water for hydrotesting and initial operation instigates ongoing damage.

Benefit and value

Extend useful life of new equipment and replacement parts. Improper commissioning causes and promotes corrosion and subsequent fouling of boiler heat transfer surfaces.

Best practice summary

- Coordinate with customer to follow either the manufacturer's procedure or the customer's procedure
- Investigate PPE needs
- Prepare unit for cleaning
- Drain and dispose of cleaning solution according to local regulations
- Maintain protection with proper wet or dry layup procedures

Process and procedures: Precleaning and passivating a new boiler

The following alkaline precleaning procedure has been designed to remove contaminants before routine operation is commenced. If the boiler manufacturer or the customer have specific precleaning instructions, employ that method. The following general recommendations are available for events where the customer is looking for input on best practices and should not be taken as a stand-alone procedure.

- Remove treated water used for hydrostatic testing
- Replace the regular level gauge glass with a temporary glass to be discarded after precleaning
- Fill the boiler to approximately 1/4 gauge glass level using high quality deoxygenated water
- Add treatment chemicals which have been blended and thoroughly dissolved according to the following recipe (consult MSDS for handling precautions)
- Fill the boiler with compliant water to its normal operating level
- In a new boiler, fire the unit at a low rate according to the manufacturer's recommendations to dry out refractory material
- Raise the boiler pressure to a level sufficient to maintain positive circulation. Pressure is usually limited to ≤ 50% of the design value during this period
- Blow down the boiler to lower the water level to 1/2 of the gage glass level at least 4 to 6 times during the procedure. Blowdown should be divided equally between the continuous blowdown line and all manual blowdown locations

Component	Quantity / 100 gallon boiler-holding capacity
High quality water	30 gallons
Soda ash	4 lbs
Sodium Nitrate ($NaNO_3$)	1 lbs
Trisodium Phosphate ($Na_3PO_4 . 12 H_2O$) AKA TSP dodecahydrate	4 lbs
Baker Hughes BPC 67289 surfactant	0.5 pints

- At the end of each blowdown cycle, add compliant feedwater to raise the level to the normal operating level. Chemical solution should be injected to maintain the original treatment concentration
- The procedure usually lasts between 24 and 96 hours, but may be extended if required to dry the refractory
- At the conclusion of the procedure, allow the boiler to cool slowly. Drain the alkaline solution to an appropriate disposal area. Flush the unit with high-quality boiler feed water until the conductivity is ≤ 80 µmhos higher than that of the rinse water and PO4 is ≤ 10 ppm
- Inspect internal surfaces to ensure that cleaning was complete
- Reinstall the original gage glass

Limitations

This procedure is not intended to remove hardness and/or iron deposits that accumulated during boiler operation. Specific chemical cleaning should be employed to remove post-operational deposits.

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