

**PROTECTING
OUT-OF-SERVICE
STEAM BOILERS**

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by

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INTRODUCTION

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:

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

LAY-UP PROCEDURES

It is preferable that a boiler be drained, flushed, inspected, and possibly chemically cleaned prior to lay-up. Once this initial activity is completed, the two basic methods of laying up boilers consist of a dry lay-up and a wet lay-up. When storing a boiler dry, trays of moisture absorbing chemicals are distributed in the boiler drum and the boiler is sealed. The wet storage method involves forcing air out of the boiler by completely filling it with water that has been specially treated.

The choice between the dry and wet lay-up methods depends on how long the boiler is expected to be out of service. The dry lay-up method is preferable for long outages (i.e., for 3 months or more), whereas the wet lay-up method has the advantage of permitting the boiler to be returned to service on reasonably short notice.

DRY LAY-UP

The following steps should be taken when using the dry lay-up method of boiler protection:

1. Maintain the operating control parameter concentrations within their respective control limits until boiler shutdown;
2. After the boiler has cooled somewhat but is still hot, drain the unit completely;
3. Thoroughly flush loose deposits from the water-side surfaces, and if necessary, remove adherent deposits with a chemical cleaning procedure;
4. Thoroughly dry the water-side surfaces using a forced air heater;
5. Place a desiccant such as calcium oxide (i.e., dehydrated lime), silica gel, or activated alumina in trays and distribute them in the steam drum, and if possible in the mud drum as well for water tube boilers, and on top of the tubes for fire tube boilers. The usual amount of desiccant required is 20 lbs. of calcium oxide, 100 lbs. of silica gel, or 150 lbs. of activated alumina per 1000 ft² of boiler heating surface;
6. Seal the boiler completely, blanking off all openings through which steam from another boiler (i.e., do not rely on the steam stop valve) or air may enter;
7. After approximately two months of lay-up, open the boiler, inspect the moisture absorbing chemical, replace it when necessary (i.e., calcium oxide forms a crust, silica gel gets gummy & activated alumina gets mushy when saturated), and re-seal the boiler.

WET LAY-UP

The following steps should be taken when using the wet lay-up method of boiler protection:

1. Maintain the operating control parameter concentrations within their respective control limits until boiler shutdown;
2. After the boiler has cooled somewhat but is still hot, drain the unit completely;
3. Thoroughly flush loose deposits from the water-side surfaces, and if necessary, remove adherent deposits with a chemical cleaning procedure;
4. Fill the boiler completely to the stop valve with softened, and if possible deaerated, water that is treated with catalyzed sodium sulphite and caustic soda such that a minimum sulphite concentration of 200 mg/l SO_3 and a minimum OH alkalinity concentration of 200 mg/l CaCO_3 are maintained in the boiler water;
5. Recirculate the boiler water once per week using a circulating pump (note: continuous circulation is not recommended because of possible air in-leakage at the pump);
6. After recirculation, perform sulphite & OH alkalinity tests on a boiler water sample, and add chemicals as required in order to maintain the concentrations of these control parameters within their control limits of 200 mg/l SO_3 minimum sulphite concentration and 200 mg/l CaCO_3 minimum OH alkalinity concentration.