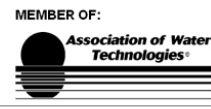


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BOILER LAY UP PROCEDURES

INTRODUCTION:

Many a boiler water treatment program is followed faithfully through out the winter months when building heat or process steam is required. Then when the boiler is not in use, the program is often forgotten. The boiler is either left full of water or it is drained, flushed and left open for a boiler inspection. It is during this period that much of the corrosion and rusting of internal boiler surfaces occurs. It is no wonder that many steam boilers encounter tube leaks and rusty water at start up in the fall or upon the resumption of an intermittent process load.

For corrosion to occur in a boiler only two materials need be present. They are oxygen and water. Additional corrosion may occur from acidic carbon dioxide attack. These causes of corrosion are usually addressed in a well-planned boiler water treatment program.

When a boiler is left "offline" for a long period of time, it cools down, and the water remaining in the boiler is able to absorb oxygen and carbon dioxide gasses. The oxygen depletes the remaining sulfite residual while the carbon dioxide reduces the boiler alkalinity. Left in this state most boiler water would absorb carbon dioxide until the boiler water pH was slightly acidic (pH 6.6 to 6.8).

Draining the boiler does not prevent this problem since some moisture always remains in the boiler. Depending upon the condition of valves, and the location

of the boiler room, moisture levels in the boiler may rise and fall during periods of downtime. These smaller areas of moisture will actually reach oxygen saturation and acidic pH much faster than will a boiler full of water.

HOW TO PREVENT DOWNTIME CORROSION:

The way to prevent the downtime corrosion of boilers is to use a lay up procedure. There are two types of lay up procedures used. They are the dry and the wet lay up procedures.

Dry lay up procedures come in two basic varieties. Both require the draining of the boiler. One method uses dry nitrogen gas to replace the air and water in the boiler. This method has the advantage of removing the water as well as both the oxygen and carbon dioxide gasses. It is excellent for long term storage and will withstand freezing temperatures in unattended and unheated buildings. The major disadvantage is that extreme caution must be used prior to inspecting a boiler, which has been preserved in this manner. The nitrogen, which has filled the boiler, must be purged out with fresh air prior to inspection. There have

been a number of instances where failure to do this has resulted in severe brain damage to those who entered a boiler that contained very low oxygen levels.

The other method of dry lay up uses desiccant trays, which are placed in the boiler. These trays contain a chemical,

which absorbs the water from the air in the empty boiler. The desiccant often contains a color indicator that shows when the desiccant has reached its useful life and should be replaced. This method removes only the water from the boiler. It leaves no moisture or condensation in which oxygen or carbon dioxide may dissolve. Thus these gasses can not cause corrosion. This method is excellent for long term storage and will also withstand freezing temperatures in unattended and unheated buildings. There are two disadvantages with this method. The desiccant needs periodic inspection to insure that it is still good. That process requires the opening of the boiler, which of course lets in more moisture. It is usually best to simply plan on desiccant replacement. The other disadvantage is that the desiccant needs to be removed and the boiler internals cleaned of any remaining desiccant prior to returning the boiler to service. Since the original writing of this paper, Vapor Phase Corrosion Inhibitors (VCI) such as the [Boiler Lizard](#) and [VCI Lay Up Powder](#) have become a third method of dry lay up.

Using the wet lay up procedure; the boiler is not drained. It is advisable, however, to double or even triple the bottom blowdown schedule in the weeks prior to shut down so sludge and scale can be more effectively removed prior to lay up. The wet lay up procedure requires the addition of chemical to the water to prevent oxygen corrosion and low pH attack of the boiler surfaces. This chemical needs to be added to the boiler in a high enough concentration to protect the boiler for the duration of it's down time. After the addition of the lay up chemical, the boiler needs to be overfilled

up to the steam header shut off valve. That valve is then closed to prevent contact with any air in the steam line. This method is commonly used for short term storage of boilers. It has the advantage that small samples of water can be taken for sampling without effecting the boiler's level of protection. To insure that the chemical level is sufficient to protect the boiler from corrosion a sample should be drawn once per month and tested. To restore the boiler to normal operation requires only that the boiler water be dropped to the normal operating level, and that the normal treatment program be resumed. Washing, draining, or flushing is not required. The disadvantage is that the boiler should NOT be in an unheated building where freezing can occur.

PRODUCT RECOMMENDATION:

The liquid water treatment product we recommend as a lay up is [LYP-7033](#). It is recommended to be used at the dosage of 4 gallons per 1000 gallons of boiler water capacity. A test kit is available to insure that the correct dose has been achieved. Refer to [boiler capacity charts](#) for the amount of chemical you need.

This product is available in the following sizes:

- 5 gallon, 48 pounds per pail
- 15 gallon, 145 pounds per drum
- 30 gallon, 289 pound per drum
- 55 gallon, 530 pounds per drum

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