BOILER MAINTENANCE AND OPERATIONS

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The necessity of obtaining maximum operating efficiencies in boiler rooms today is a prime concern of industry. We must conserve our fuel and reduce energy costs in order that we can survive in the marketplace.

The availability of fuels, their comparative costs and the guidelines set up as environmental standards means that many people in plant engineering and boiler room operations are going to have to take on a new, positive approach to equipment selection and its performance factor.

In most boiler rooms the greatest continuous cost is for fuel. Many times in the past, undue emphasis was placed on initial capital cost of the boiler room equipment, with little or no investigation into the performance factor commonly known as the fuel-to-steam efficiency.

A good boiler operation and maintenance program should be clearly defined in an operating policy and procedures log book. The availability of this information keeps the senior operator, as well as the new employee, fully informed.

The routine sections of the log book should contain instructions and forms pertaining to daily, weekly, monthly and yearly procedures. Elaborate reports for the sake of creating work should not be confused with "basic-fundamental reporting." Insist on factual reports and that they be turned in promptly to the person in charge.

The satisfactory operation of a boiler depends on regular routine service to the equipment. In order to perform such

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maintenance some basic tools are needed; for example, electrical multi-meters, air test gauges, a flue gas analyzer, water treatment test kits, hand tools, etc.

Most manufacturers' operating manuals cover general conditions that could be encountered in the boiler or auxiliary equipment operation. The problem is to get the operator to read and to comprehend these conditions and to convince management that the need for maintenance is of prime concern. A skilled, professional boiler operator should be knowledgeable in several broad categories:

1. The complete steam, condensate return, make-up and treatment cycle. If, for example, the system is hot water, the circulation pattern, temperature differentials and over-pressure requirements should be thoroughly understood.
2. A knowledge of, and the capability to care for, all electrical items comprising the boiler control system.
3. An understanding of the combustion control programming device, as well as a knowledge of the principles of flame supervision and the maintenance requirements of these components.
4. The fuel oil pumping system, strainers, vacuum readings, oil preheating equipment, fuel oil metering controller, pressure and temperature ranges are all items the boiler operator must be completely knowledgeable about.
5. If gas is used, the characteristics of gas firing, its control and regulation must be well known.
6. A well-rounded knowledge of troubleshooting procedures is needed. Do not dismantle the boiler if you don't know why you're doing it.
7. A knowledge of the principles of combustion and the ability to maintain the burner at peak efficiency is essential. The use of a flue gas analyzer should be part of daily routine. A 5% loss of fuel-to-steam efficiency will increase annual fuel costs approximately 6.5% while a 10% loss would result in a 14.3% addition to the fuel bill.

The following categories of boiler operation offer the greatest savings potential:

1. Fuel burning. A system of control by regular flue gas and stack temperature analysis must be established.
2. Boiler cleanliness. The fireside and waterside heat transfer surfaces must be kept as clean as possible. A stack gas thermometer will alert the operator to any change in heat transfer capability due to dirty fireside or scale build-up on waterside surfaces. It is also an instrument that will indicate minimum and maximum limits of operation.
3. Operate on pressures consistent with the job requirements. Overpressure only results in higher transmission losses. Day-night pressure controls on a high-pressure boiler can result in great fuel savings and reduced heat loss.
4. Review actual overnight and weekend requirements, as enormous savings potential can be found here. By closing the steam header valve and allowing the boiler to operate at its normal pressure, this will usually eliminate any metal stresses, refractory failures and loss of water treatment balance that are usually encountered in allowing a boiler to cool down during these periods. Under pressurized conditions, the boiler is always hot and ready to be put on-the-line.
5. Where some minimal steam demand exists overnight and weekends, consider the economics of installing a small strategically located steam generator for these periods.
6. Check boiler and steam distribution system insulation factors. Uncovered steam lines are a major source of heat loss in many plants.
7. Save the hot, treated water in your boiler system by minimizing leakage and blow-down procedures. Excessive blow-down can result in high make-up water requirements, with additional water treatment needs as well as high BTU loss down the drain.
8. Visits by State and insurance inspectors should be of great benefit to you. They are professionals and, if asked, can offer many suggestions to improve operating efficiencies.
9. Visits by outside service personnel should always be based on a written report-request. A written record of events leading up to a problem will help insure that all related areas will be investigated.
10. To repeat, maintain a daily log book treating all entries with a professional attitude.
11. A proven spare parts inventory gives you backup component protection. Untested spare parts may be damaged or defective.
12. The true cost of poor maintenance and efficiency affects total plant operation in many ways. Poor housekeeping practices in the boiler room will probably mean that other maintenance services are also inadequate. High fuel consumption, high stack temperatures, high refractory repair costs, and high maintenance costs are all interrelated.

When the proper time for maintenance to be done has been reached, do it, because putting it off will invariably only result in its never being done; and once the rhythm of maintenance has been interrupted, an inevitable breakdown in employee morale follows with the final result that the whole plant comes crashing down in time.

This phenomenon is most commonly found in plants that never program any or enough time for proper maintenance, but somehow have unlimited time and money available for breakdowns. They readily subscribe to service contracts on electric typewriters and copying machines but refuse to budget any money for boiler maintenance, according to this report by Mr. Lind, presented at the 12th Annual Energy Conservation and Economics Symposium, Nov. 17, 1977.