



Multifamily Facility Management Services

BOILER REPLACEMENT

Description:

The decision to replace a boiler usually involves a long-term financial commitment. Many replacement options are no more efficient than the existing boiler; some options may even be less efficient. Even if the selected boiler is known to be more efficient, the payback for boiler replacement is normally longer than a typical building owner's payback criteria. Consequently, when deciding whether to replace the boiler, the owner should consider energy savings along with any other benefits of boiler replacement (such as upgrading the building, eliminating nuisance maintenance, the availability of good financing or utility rebates). Of course, if the existing boiler no longer operates, is no longer safe, or can no longer adequately heat the building, it needs to be replaced regardless of energy savings potential or other benefits.

The options for new commercial boilers are numerous and constantly changing, and unlike the residential boiler market, the minimum performance of commercial boilers (input ratings of over 300,000 Btu/h) is expressed in terms of steady state combustion efficiency, not seasonal efficiency. (Residential boilers use annual fuel utilization efficiency or AFUE, which is comparable to seasonal efficiency.) Furthermore, there is no standard method of testing for larger boilers so that one company's 80% steady state efficiency rating may not equal that of a second company. As a result, when comparing replacement options, it is better to look for certain features which are likely to result in higher seasonal efficiencies, than to rely *solely* on steady state efficiency claims from manufacturers.

One of the main features to look for is the type of burner or method of combustion:

- atmospheric burners,
- power burners, and
- advanced specialized burners.

Boilers with atmospheric burners are generally the least efficient replacement option, but can be made slightly more efficient by the installation of a vent damper. Power burner boilers are more efficient because the design allows precise control over the air/fuel mixture, minimizing excess air and resulting in more consistent combustion efficiency. In addition, louvers on the power burner close during the off-cycle to prevent air from drafting through the boiler, providing benefits similar to a vent damper. The most common type of power burner has a basic on-off operation, in which fuel is fixed at a certain input. Two other power burner types are also available which appear to operate more efficiently: the low-high and the modulating. In these

burner types, input is varied to meet demand. Ideally these designs should also modulate combustion air. While data is limited, potential savings for the fully modulating burner over simple on-off operation may be as high as 9%.

Boilers with advanced specialized burners are at least as efficient as power burners and can be more efficient. Most of these designs minimize excess air as well as provide improved heat absorption through specially designed heat exchangers. This category includes equipment that utilizes some of the features found in the most efficient residential boilers like induced draft, fan assisted combustion, and condensing or near-condensing technologies.

Overall system design should be considered in conjunction with the decision about which type of boiler to purchase. For example, a condensing boiler is the most efficient equipment option currently available. However, system design conditions will affect how often a condensing boiler will actually operate in true condensing mode. Therefore, it is important to make certain that the replacement system is designed to take full advantage of the condensing feature. Otherwise, the extra money spent to purchase a condensing boiler over a near-condensing option will not be worthwhile.

Another design consideration might be whether to install a single large boiler or several sequentially-fired, smaller boilers. Such a modular system has several advantages, including the availability of backup and the physical ease of installation and maintenance. In addition, the individual boilers in such a design can be operated or turned off as needed to meet building load, resulting in lower standby and off-cycle losses and higher overall system efficiency than a single large boiler. Increased seasonal efficiency from this type of design over a single boiler may be in the 5 to 15% range. If a modular system is specified, boilers should only be installed with primary-secondary pumping, a plumbing arrangement that eliminates the flow of hot water through any boilers that are not in use.

One design consideration which should always be addressed is how the new system will be controlled. In some cases, existing controls can be re-used; in others, completely new controls need to be specified. Any new control should be selected to maximize energy savings with the new system. For example, in the case of a hot water system, some type of outdoor reset and cutout is recommended. A steam system requires a control that allows a long enough boiler cycle to adequately distribute steam throughout the building during each on-cycle. Specific recommendations should be discussed with qualified personnel.

How to Implement:

It is useful to plan ahead for boiler replacement in order to avoid making decisions hurriedly and without adequate information. In addition, the larger-sized commercial equipment with the more efficient features may need to be ordered. As a result, options should be discussed in advance with various contractors and/or possibly engineering or consulting services should be utilized to determine the best system design.

Once the options have been reviewed and a replacement system decided upon, it is useful to have an actual written specification from which contractors can be asked to bid. That way each contractor will be bidding on the same type of equipment and system, and bids can be more fairly compared and assessed. It is recommended that two, and preferably three, bids be obtained

before selecting the contractor who will actually complete the work. The replacement boiler must be installed by a qualified, licensed heating contractor.