

# COMPACT Boiler



This Clayton compact steam generator at Westway Feed Products operates at high efficiency and can come on line in minutes to meet varying plant steam requirements. Photo courtesy Clayton Industries.

creasing as a strategy to reduce fuel consumption. Better pressure control is also being achieved with fully modulating controls in lieu of the older style step-fired controls. Clayton's built-in economizer design offers a convenient solution over the additional piping and support requirements required by conventional designs."

Wales explains that older large boiler systems are frequently being replaced with multiple compact boilers. He points out, "Typically there is an efficiency penalty when a boiler operates at less than its full rated output. Since control is normally based on system pressure, the schemes are relatively simple. There are some minor differences in feedwater requirements, but these can be handled easily."

## Major Fuel Savings Immediately

Wales gives as an example of the benefits of modern compact boilers an installation of a Clayton compact steam generator at Westway Feed Products in Stockton, California. According to Jeff Steger, national product manager for Westway, the new unit operates at 85.5% efficiency and delivers a 50% fuel saving over the previous system.

Steger says, "The most efficient gas usage is not using any at all," explaining that the previous boilers had to be kept operating on low-fire. The new boiler runs one-third to one-fourth the amount of time as the old system. The compact new unit requires only five to ten minutes to start up compared with one to two hours with the previous system. Steger indicates that start-up takes less than a minute if the steam generator is still warm from earlier in the day. He points out that another advantage is a rapid response to changing load conditions.

## Vertical Designs

Many of the newer compact designs use a vertical configuration. This allows a smaller footprint, and allows designers to place the burner and controls in locations that are more easily accessible for inspection or service. According to Chad Fletcher at Hurst Boiler, there is growing trend for using these boilers in multiple unit installations for systems needing steam in pressures up to 300 psi. Hurst's Model 4VT is a tubeless vertical unit with a cyclone firing arrangement. Fletcher notes, "This unit leaves our plant with all the needed equipment skid mounted, so it is a simple installation at the job site. Only a few connections are needed to city water, power, city sewer for blowdown, and the necessary steam lines."

According to Fletcher, one reason for the ability to build more compact boilers is better heat exchange design. "The smaller units you see today work in the range of 2.5 to 3.5 square foot of heat exchange per boiler horsepower." He notes that this compares with 5.0 square feet or more for older systems. Yet there is no loss

**A COMBINATION OF COMPUTER-ASSISTED DESIGNS,** advanced metallurgy and digital controls in a new line of compact packaged steam boilers offers today's plant engineer a wide range of steam supply options. New compact boilers can significantly improve plant energy efficiency and will fit into smaller spaces than ever before. Just as importantly, they can reduce fuel and maintenance expenditures. All are designed with attention to minimizing emissions and fitting into existing steam plant systems.

## Taking the Modular Approach

Advances in boiler design and control are being offered in units with footprints much smaller than two decades ago. They are generally completely assembled at the factory, including electrical and control components, and are often even test-fired. Factory assembly dramatically reduces installation expense, and simplifies startup. Package boilers are skid mounted and many can even be moved into place on a conventional freight elevator. Where they replace older units in a crowded boiler room, they free up floor space, allowing additional future boiler capacity in the room.

Compact boilers are available in firetube, watertube and tubeless vertical designs. Steam system planners can specify multiple high-efficiency compact boilers rather than a single unit. Because the efficiency of these smaller units has improved, it is now practical to take this modular approach without a sacrifice in system efficiency. According to Brian McKernan, a marketing representative of Miura Boiler, his firm offers a multiple unit (MI) controller. "This is specifically designed for multiple units in a central steam plant. It turns boilers on or off to match load patterns for the highest possible in-service efficiencies."

## Trends Favor Compact Units

Andy Wales, Western Regional Sales Manager for Clayton Industries in City of Industry, California, says the newer compact units offer not only smaller footprints, but also easier installation, better pressure control, and higher levels of automation. Wales, a boiler industry veteran, notes, "The use of economizers seems to be in-

# Technology

## Opening Doors With a Smaller Footprint

in efficiency, and in fact, an improvement. Hurst claims efficiencies as high as 81% on standard systems, and up to 90% with the use of economizers. Fletcher says, "You get the same heat transfer as with a 5.0 square foot boiler, but you do it with less material." In addition to the Model 4VT, Hurst offers several models of tubeless vertical and firetube boilers that have been designed with a small footprint and are ideal in modular boiler arrangements.

### Supplementing Existing Plant

Often an industrial or institutional steam plant has widely varying steam requirements depending on the season of the year or variations in the industrial process. For applications like this, a compact boiler or steam generator can be added to the system to meet the steam load requirement during low-use periods or during plant startup and can also add capacity at peak use hours. McKernan from Miura Boiler explains another strategy. "The existing boilers can also be base-loaded, which will improve their efficiency and reliability by reducing the thermal shock of load swings, and the compact fast-response units will ramp up very quickly if steam pressure starts to drop. In Miura's case, for instance, a cold boiler will produce full steam in just five minutes."

Another example of such a system is the compact steam generator offered by Vapor Power International. This coil-type steam generator is widely used in industrial process applications where there is a need for steam at pressure above 400 psig. This type unit is very attractive to supplement an existing steam plant because of its ability to produce steam very quickly. Because it can go from cold standby status to full steam output in five minutes, very little fuel is wasted in the startup process. Coil-type steam generators can provide high pressure steam with turndown ratios starting at 8:1 with some going as high as 13:1. Like many other new boiler designs,

these coil-type steam generators are modular in design, can be skid mounted and have a small footprint.

### Meeting Payback Requirements

Wales from Clayton Industries points out that although there can be substantial fuel savings by replacing older equipment, normally there needs to be some other financial factor such as a major repair cost, or an increase or decrease in plant loads to meet the short payback requirement of most companies today. He adds, "Waste heat recovery projects usually have shorter paybacks because you are replacing high fuel costs with "free heat."

He suggests that owners considering boiler replacement should look at operating costs and efficiency in relationship to total operating costs. "Nobody buys a steam boiler for an industrial process to just let it sit idle. The annual fuel cost to run a unit can easily be three to five times the total installed cost of the unit." Brian McKernan from Miura Boiler points out that new compact boilers such as Miura's LX Series can also bring "green" benefits. These boilers are designed to eliminate 75% of the NO<sub>x</sub> levels of boiler designs of just a few years ago.

### Choosing a Compact Boiler System

With a wide range of choices in new compact boilers – firetube, watertube and tubeless – and with precise new control technology and reduced emissions, now may be the right time to consider sliding a compact boiler into your batting order. As Andy Wales says, "Smaller multiple units with rapid startup times and linear efficiency profiles can save fuel while also providing better operating flexibility." McKernan from Miura Boiler emphasizes, "Thorough research and comparison of product specifications is essential to making the right decision in choosing a compact boiler system." **GT**



Miura Compact Steam Generators, Model LX 200, offer ultra-low NO<sub>x</sub> emissions and high efficiency in a compact package. Photo courtesy Miura.



This boiler at a grain-processing plant illustrates several advantages of today's compact boilers: Small footprint, high efficiency, easy access to controls and to boiler components for service. Photo courtesy Clayton Industries.

## MORE info

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