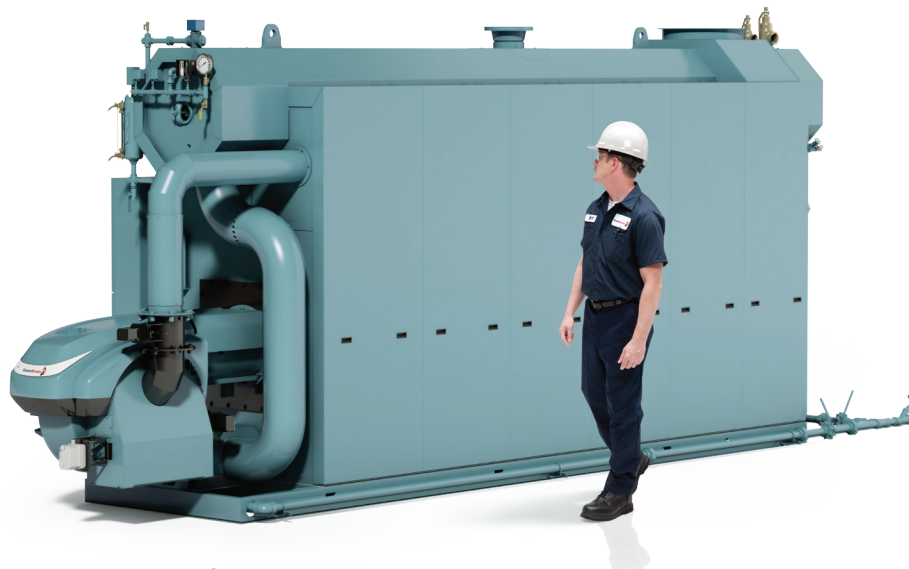




Cleaver-Brooks Large Flextube® Boiler is Engineered for High Efficiency and Low Emissions

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*Cleaver-Brooks Large FLX is a field-erect unit providing
flexibility for entryways and on-site assembly.*

When Cleaver-Brooks engineers commenced to design a large flexible watertube boiler, capable of 12.5 to 25 MMBTU, they wanted to engineer a product that would raise the bar for both efficiency and emissions in the category. Their goals were for the Large FLX boiler to obtain 81 percent efficiency on 125 psig steam and 85 percent efficiency on hydronic heating applications. In addition, they wanted the product to be able to achieve less than 9 ppm NO_x, when required.

The majority of flexible watertube boilers on the market today, and even some firetubes, peak at 80 percent efficiency. Cleaver-Brooks engineers knew they could increase the efficiency of their flextube product by increasing the heat transfer area and integrating key components.

Optimizing the Heat Transfer Area

Cleaver-Brooks engineers used mathematical modeling to study flow through the vessel on both the waterside and gas side. They discovered that they could increase the heat transfer area by designing the tubes so that the water travels through them diametrically, as opposed to the traditional way, which is from the bottom drum to the upper drum.

In addition, the engineers evaluated tube size and determined that for the larger boiler sizes (16.5 to 25 MMBTU), a larger diameter tube provided better flow and heat transfer. As a result, the engineers utilized two-inch tubes, as opposed to the conventional one-and-a-half-inch tubes, to further enhance performance in these models.

Improved Internal Technology

The engineers used computer modeling and conducted on-the-unit tests to ensure that the burner part of the package worked in unison with the rest of the equipment. They selected an EV series, package-type burner and tailored it for the Large FLX.

Once the engineers accepted that the burner was fully integrated and tested, Cleaver-Brooks consulted with a design firm to make it aesthetically pleasing. The design firm recommended smoothing out the lines and melding the burner into the package to make it more visually appealing.

Every Large FLX unit includes a linkageless control system as a standard feature, which optimizes combustion and increases repeatability, efficiency and safety compared to a linkage-driven mechanical drive. With any linkage system, there is always some hysteresis or “drift” as a result of play in each connection point of a linkage arrangement, which compromises efficiency over time.

The linkageless combustion-control unit on the Large FLX can display positioning data for several individually controlled channels, such as fuel, air, flue-gas recirculation, and atomizing air. It monitors the relative positioning of these channels, enabling the system to achieve near stoichiometric combustion throughout a boiler’s fuel-input range while maintaining exact temperature or target pressure values.



The Hawk control monitors burner performance to maximize turndown and efficiency.

The Large FLX control also incorporates parallel positioning, which helps maintain the unit so efficiency is not lost. Burners that are controlled by a single jackshaft and corresponding linkages attached to the fuel drive and air damper fix the air-to-fuel ratio over the firing range. Over time, linkages wear down, causing the air-to-fuel ratio to become erratic as the burner modulates from low to high fire. Parallel positioning uses dedicated actuators for the fuel and air valves so lower excess air levels can be set due to consistent repeatability. With parallel positioning, it is possible to tweak the unit to lessen the excess air in the air-to-fuel ratio. Lowering the excess air decreases the heat loss up the stack.

An oxygen trim system or draft controls also can be added to the Large FLX in conjunction with linkageless controls to further increase combustion efficiency.

In addition, engineers integrated an industry-leading water level control system into the Large FLX steam unit. The Level Master monitors and displays boiler water level for enhanced performance. This control monitors for normal water movement and prompts when a water column blowdown is needed. It also detects if the float has not moved and shuts the boiler’s burner off, when necessary.

Setting a New Bar for Performance

The engineers achieved their goals. The Large FLX gets up to steam quickly and can obtain 81 percent efficiency on steam applications and 85 percent efficiency on hydronic applications. It also can achieve less than 9 ppm NO_x with Cleaver-Brooks NT series burner technology.

On the proprietary NT series, the Large FLX boiler is UL listed. Cleaver Brooks is the only manufacturer to offer a UL listed, boiler-burner package in the Large FLX size range for 9 ppm NO_x for natural gas and No.2 oil as a back-up. Often, low emissions burners on a boiler are not UL listed because the boiler and burner parts are manufactured by different companies. Cleaver-Brooks manufactures and integrates all of the components for the Large FLX, including the burner.

The turndown on larger FLX units without controlled emissions is 10:1 with gas and 7:1 with oil. For controlled emissions (e.g., less than 30 ppm NO_x), the turndown is 7:1 with gas due to the addition of FGR; however, the range remains the same for oil.

Another feature distinct to the burner on the Large FLX is the air atomization on the larger units as opposed to mechanical oil atomization on the smaller ones. There is a small increase in operational efficiency when operating on oil. With a higher turndown on oil, the standby fuel becomes a little more advantageous to operate.

On steam applications, in the upper drum, engineers put a series of baffles to ensure the steam leaving the nozzle is not towing water with it. As a result, Cleaver-Brooks can guarantee 99.5 percent dry steam for low and high pressure operation, which is important for process applications as well as for heating. When wet steam is carried into the system, it impacts the steam piping. The result is energy loss and banging that can jar pipes and contribute to energy loss. If this situation occurs, a boiler is burning more energy than it is producing for heat transfer.

In hydronics, thermal stress capability is a concern. The design of the Large FLX minimizes the thermal stresses in a boiler. In some boilers, when there is a rapid swing in temperature, the boiler can suffer damage from thermal stress. Flexible boilers, and in particular, the larger flex models, are designed to absorb that stress.



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Easy Installation and Maintenance

Cleaver-Brooks Large FLX is a field-erect unit, which means the package can be shipped in pieces and assembled on site, unlike units made by some other manufacturers

Maintenance on the Large FLX is simple for several reasons. First, the boiler has waterside handholes as opposed to small plugs used on similar products by other manufacturers. The handholes allow a boiler technician to more easily view the inside of the upper and lower drums and readily identify a problem. Access to the furnace is easy through the manway, located in the rear wall of the boiler, providing full viewing of the furnace and furnace wall tubes.

Also, the Large FLX burner incorporates a hinge attachment, so it can swing open. This enables a technician to inspect the burner interior without having to remove the burner, and it provides easy access for maintenance. In addition, because the Large FLX operates with a linkageless control, it is easier to set up, troubleshoot, and service.

Lastly, the Large FLX boiler has non-welded tube attachments. The tube ends in the upper and lower drums have a special fitting that is tapered and can be driven in with a special hydraulic tool or hammer. Once the tube is driven in to a certain depth, it locks into place. To remove a tube during a tube replacement, a tube puller is used. Since the tubes are not welded, a code welder is not required, which reduces routine maintenance costs for a customer.

Ideal for a Number of Industries

Cleaver-Brooks Large FLX boiler is a large capacity steam and hot water boiler, well-suited to a number of industries, including food processing, pharmaceuticals, hospitals and universities. The hydronic heating application, which provides quick heat up and rapid load tracking, is ideal for colleges and universities, medical and pharmaceutical facilities, airports, laundry facilities, and office complexes.

Cleaver-Brooks is a leading provider of boiler room products and systems and is committed to providing efficient solutions to help its customers and the industry reduce energy usage, cost, and environmental impact. It has a dedicated alliance of representatives available for consultation, sales, maintenance and aftermarket support.

To locate a representative, visit cleaverbrooks.com or call (800) 250-5883.

