

Steps to Select the Proper Industrial Watertube Boiler

When a process application requires higher pressures, large quantities of steam or the possibility of additional heat through integrally mounted superheaters, an industrial watertube (IWT) boiler is the best solution. IWT boilers are noted for their fast steaming capability. Steam is generated quickly due to the boiler's relatively low water content. This allows it to respond rapidly to changing load demands. To select the proper IWT boiler for an application, consider these six basic evaluation steps.

- Industrial watertube boilers are best for applications that require higher pressures or larger quantities of steam
- A D-type watertube boiler is ideal for nearly any steam need and is the most common IWT boiler style
- Determining the total system load requires an understanding of steam- and process-load needs

1. Steam- and process-load needs. Determining the total system load requires an understanding of the type of load in the system, measured in either BTUs or pounds of steam (at a specific pressure and temperature). There are three types of loads: heating, process and power. A heating load typically is low-pressure steam or hot water used to maintain building heat. A process load usually is a high-pressure steam load and pertains to manufacturing operations, where heat from steam or hot water is used in the process. A process load is further defined as either continuous or batch. In a continuous load, the demand is fairly constant, such as in a heating load. The batch load is characterized by short-term demands. The batch load is a key issue when selecting equipment, because a batch-type process load can have a very large instantaneous demand that can be several times larger than the normal draw on the boiler. Many facilities have a combination of both heating and process loads. The third type of steam load is for producing power. High-pressure steam is superheated and used to spin a turbine to produce electricity. In many cases, the steam exits the turbine at a lower pressure for use in a heating or process load.

2. Footprint and site issues. In the boiler room, plan for extra space around the boiler to walk and conduct boiler maintenance such as casing repair, tube replacement, burner adjustments and removal of sootblower lances, if applicable. Ceiling height is important as well as it needs to accommodate boiler piping, valving, a possible economizer, etc. Overhead restrictions such as ducting or extraneous system piping should be checked and the floor-loading requirement confirmed.

If the boiler is a replacement, the best way is to access the boiler room, after the old boiler has been removed, is to use the same openings. Once inside the building, determine if there are any interferences in the way of rigging the new boiler in place.

3. Specification considerations. Often, improving efficiency, reducing emissions and minimizing maintenance are common goals. To reduce maintenance costs, have adequate inspection openings to the pressure vessel and furnace to better detect potential problems early. These openings can also be very helpful in limiting the labor cost when service is required because access to the troubled area is so easily attained.

There are several boiler types to choose from, including the D-type, O-type and A-type. A D-type watertube boiler is ideal for nearly any steam need and is by far the most common boiler type. These are available up to 500,000 lb/hr of saturated or superheated steam flow. An O-style boiler has a symmetrical shape with a central center of gravity, making it ideal as a portable or rental unit. With capacities available up to 250,000 lb/hr, and it's also the ideal choice when width is tight. The vertical gas outlet allows the economizer and stack to be located directly above the boiler, instead of off to the side like a D-style, reducing footprint in the boiler room.

Lastly, the A-type watertube is different from the other two types in that it has two mud drums instead of one. This allows for a much larger furnace, and therefore, higher steam capacity, pressure and superheat. In most cases, an A-type will require less fan horsepower consumption than a comparable D-type, but be advised that an A-type demands a premium over the more common D-type. If the capital expenditure budget is a key issue, keep this in mind. But do not overlook the benefit of years of reduced operating costs.

4. Emissions requirements. There are a number of pollutants that must be managed, particularly nitrogen oxides (NOx) and carbon monoxide (CO) when burning natural gas. If ultra-low NOx is required (<9 ppm), consider a system that includes a low NOx burner with flue gas recirculation (FGR) as well as selective catalytic reduction (SCR) if you are looking for NOx reduction to the near-zero level. With FGR reducing NOx to 30 ppm or less, the SCR system will perform a 90% reduction for single-digit NOx levels. Note that SCR involves a reactant (ammonia) working in conjunction with the catalyst bed, and there are some safety and permitting issues to be aware of depending if anhydrous or aqueous ammonia is used. There are pros and cons with either solution. Also, for emissions reduction, look at the furnace in which the burner is firing to make sure its heat release is low enough so as not to overly propagate thermal NOx.

5. Shipping. Large IWT boilers can be shipped by truck, rail or barge. They are generally shipped as packages, minimizing the amount of field labor to get the system operational. Shipping of these units can be quite costly and involve state and local authorities. Be sure to contract with a reputable heavy hauler who is familiar with the nuances of heavy, wide-load hauls, including: DOT restrictions, weight and height restrictions, utility obstructions, permitting and escorts. These are key issues that can significantly impact the timing on the job as well as its overall cost. Once the boiler is off-loaded, the owner of the boiler takes responsibility for it. A reputable OEM can help answer questions about delivery and offloading.

6. Economics. Some IWT boiler manufacturers offer standard boilers with a fixed set of options for a lower price. If a standard offering meets the primary needs, such as higher efficiency/reduced fuel cost, lower emissions (30 ppm NOx) and lower maintenance requirements, this may be a good solution. At a later time, upgrades and ancillary equipment can be added.

To learn more, watch the [Six Steps for Proper Industrial Watertube Boiler Selection](#) webinar or visit cleaverbrooks.com.