LIPTEN™
A Quarterly report from the "Hands On" EPC Energy Solutions Company
advantage
4th Quarter, 2011

Watertube vs. Flextube Boilers: The following is a summary representing **TYPICAL** differences in waterube vs flextube boilers. (The comparisons can vary depending on manufacturers):

Attribute	Traditional Water Tube	Traditional Flextube
Tube bends	Typically won't exceed 60°	May have several 90° bends [1]
Tube Size	Larger	Smaller
Drum Connection	Welded	Compression fittings
Footprint	Larger	Smaller
Load Responsiveness	Slower steaming rate	Quicker steaming rate [2]
Durability	Useful life typically 30-50 years	Useful life typically 20-40 years
Initial Costs	Higher cost	Lower cost
Operating Costs	Better or Worse depending on load	Better or worse depending on load
Reliability	Same or Better	Same or Worse

1. Higher angle bends may create weak spots on the outside of the bend.
2. Quicker steaming rate can make the boiler more responsive to load swings. It can also potentially mean more thermal stress.

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Lipten Company is an Engineering, Procurement and Construction (EPC) firm that specializes in Central Energy Plant (CEP) General Contracting. Lipten also has a controls group that provides traditional and custom control solutions.

We provide steam generation, power generation, chilled water systems, compressed air systems, water treatment systems, controls and related Energy Center equipment and services. Our level of support can vary from an advisory role to complete turn-key facility construction. Services include:

HISTORIC QUOTES

"Getting information off the Internet is like taking a drink from a fire hydrant."
-Mitchell Kapor

"Find a job you like and you add five days to every week."
-H. Jackson Brown, Jr.

"When your work speaks for itself, don't interrupt."
-Henry J. Kaiser

"If you don't design your own life plan, chances are you'll fall into someone else's plan. And guess what they have planned for you? Not much."
-Jim Rohn

Steamin' Hot NEWS

Lipten Recommended Website: U.S. Department of Energy Steam Tips; Quick and to the point, two-page tip sheets for engineers, technicians, equipment operators, and others for technical advice to improve steam systems. www1.eere.energy.gov/industry/bestpractices/tip_sheets_steam.html

How Do You Calculate Boiler Efficiency?

John Ingraham
Proposal Manager

A useful equation to determine boiler thermal efficiency based on the measurement of steam, feedwater and fuel flow is given below. ("h" is heating value, also known as enthalpy.)

$$\text{Boiler Efficiency} = \frac{(\text{Steam Flow} \times h_{Steam}) - (\text{Feedwater flow} \times h_{fw})}{(\text{Fuel Flow}) \times (h_{Fuel})}$$

Example application of the equation:

- Steam flow is measured at 100,000 lbs hr at 100 psig
- Feedwater flow is measured at 103,000 lbs hr at 227°F (flow includes additional 3% for blowdown)
- Natural gas fuel flow is measured at 115,000 ft^3 per hour
- From steam tables, the enthalpy of steam (h_{steam}) is 1,189.60 BTU/lb
- From steam tables, the enthalpy of feedwater (h_{fw}) is 193.76 BTU/lb
- From a natural gas analysis the heating value of the fuel is known to be 1,000 BTU/ft^3

Boiler efficiency using the fuel-steam boiler efficiency equation is:

$$\frac{(100{,}000 \times 1{,}189.60) - (103{,}000 \times 193.76)}{(115{,}000) \times (1000)} = 86.09\%$$

Boiler efficiency can be measured and stated in many different ways. Some measures of efficiency state "theoretical" maximums of heat transfer and may not take into account radiant and other losses. An efficiency analysis that relates actual useful thermal energy (steam or hot water) to actual fuel input is a practical method for understanding fuel use and the related fuel costs.

Efficiency is just one of many important attributes that Lipten engineers consider when evaluating steam systems. Efficiency, boiler size, facility load characteristics, maintainability, equipment longevity, turndown requirements, back-up requirements, responsiveness, fuel type(s), control requirements, water quality and emission requirements are all part of the evaluation.

Spotlight On . . .
Randy Flanagan, Sr. Mechanical Engineer

Randy Flanagan,
Sr. Mechanical Engineer

Randy is a Senior Mechanical Engineer with vast experience in power plant operation and overhaul projects. Randy has been the project leader for many projects at electrical generation facilities up to 782 MW. Randy has in-depth expertise in steam boiler and turbine systems. Randy's major project accomplishments include:

- Construction of a 31 MW Wood Biomass System: Lead Engineer for Efficiency and Power Output
- CHP System: Lead Engineer for a new CHP system— Natural gas fired turbine, waste flue gas Heat Recovery Steam Generator and Steam Turbine
- 782 MW Coal Fired Units: Lead Engineer for Turbine/Generator Overhauls, HazMat coordinator, Plant Performance Evaluation Team, Capital Projects Team – Service Water, Boiler Components, Fly Ash Handling and Fuel Handling
- 170 MW Oil Fired Unit: Site Quality and "Code" Welding Program Lead Engineer, Predictive Maintenance Program Leader, Water Treatment Plant Supervisor, Capital Project Team Leader, system wide boiler inspection