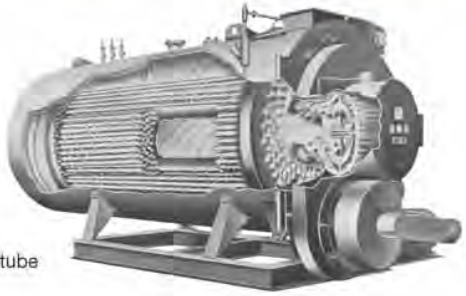
TECH TIP #2

BOILER TYPE AFFECTS SCALING & EFFICIENCY

RITE boilers

Firetube, Watertube, or Cast Iron? Copper Fin, Bent Tube or Straight Tube?

Steam Locomotive



Firetube

Bent Tube

Cast Iron

Copper Fin Tube

These are some of the decisions faced when choosing a boiler. Making an intelligent choice starts with asking the right questions: What are the basic design differences? What is the boiler's efficiency when new and more importantly – can this efficiency be maintained? Which boiler will have the lowest operating cost and the longest service life and why?

Did you know that some current designs go back well over a hundred years? Today's firetube boilers, for example, are descendants of the old steam powered locomotive boilers that once crisscrossed America. As the industrial and commercial boiler markets grew in the early part of the 20th Century, one notable improvement over the firetube boiler was the bent tube boiler. Because bent tubes could flex, they could withstand the "shock" of cold feedwater better than firetubes. But cold feedwater created another problem for both these types of boilers: oxygen corrosion. This helped popularize cast iron boilers which had better resistance to oxygen corrosion than steel. However, cast iron's low tensile strength also limited its use primarily to low pressure commercial and residential applications.

Today many of the challenges and assumptions that earlier boiler manufacturers faced no longer exist. Steam traps, de-aerators, and water treatment have largely eliminated cold feedwater problems. The old "minimum square feet of heating surface" rule has shrunk from 10 square feet per boiler horsepower in 1900 to around 5 square feet by 1960. And steam boilers themselves have been largely replaced by water heating boilers for comfort heat and other low temperature process applications. But one very big problem for all boilers still remains: ***SCALE***.

Also called "lime", "mud", or "sludge", it occurs when dissolved solids in water settle out in a boiler. Making matters worse, these solids tend to drop out of suspension and plate onto the hottest heat transfer surfaces, forming a cement–like barrier of insulation that leads to overheated metal surfaces and ultimately metal fatigue. It's the familiar process that ends the life of most residential hot water heaters.

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TECH TIP #2 (Cont.)

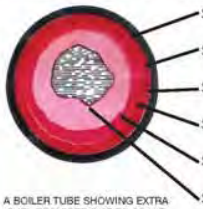
BOILER TYPE AFFECTS SCALING & EFFICIENCY

ENERGY LOSS DUE TO SCALE DEPOSITS

Scale Thickness in Inches	Fuel Loss % of Total Use		
	Scale type		
	"Normal"	High Iron	Iron Plus Silica
1/64	1.0	1.5	3.5
1/32	2.0	3.1	7.0
3/64	3.0	4.7	—
1/16	3.9	6.2	—

Source: National Institute of Standards and Technology

ADDITIONAL FUEL REQUIRED DUE TO SCALE



A BOILER TUBE SHOWING EXTRA FUEL REQUIRED DUE TO SCALE OF VARIOUS THICKNESSES.

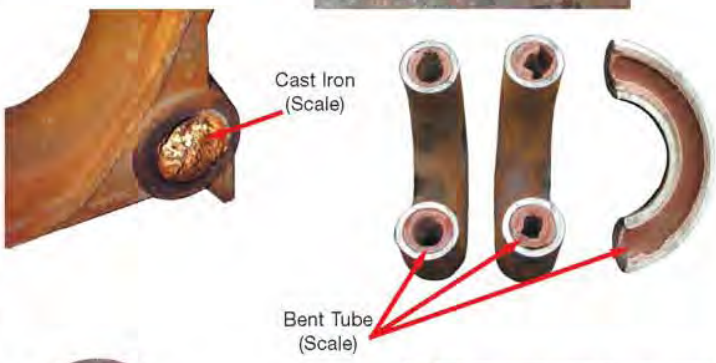
Scale 1/50 in. thick approximately 5% additional fuel required
Scale 1/25 in. thick approximately 10% additional fuel required
Scale 1/16 in. thick approximately 15% additional fuel required
Scale 1/8 in. thick approximately 30% additional fuel required
Scale 1/4 in. thick approximately 66% additional fuel required
Scale 1/2 in. thick approximately 150% additional fuel required

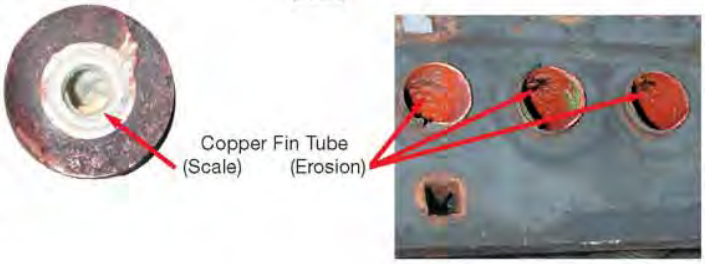
Source: Cooper Tools

As the charts show, this widely recognized problem has a devastating effect on boiler efficiency and operating costs. No matter how impressive a new boiler's start-up efficiency is, scale can quickly knock it down—driving up fuel costs until major boiler repairs or replacement are unavoidable. So, how easy is it to keep some common boiler designs clean and operating at peak efficiency year after year? Let's take a look:

You'll find it's virtually impossible for a person to get inside a firetube boiler to clean out scale. Cast iron boilers offer no access. The "U" bends in bent tube boilers not only create natural traps for scale to collect, but compound this problem by keeping scale hidden from view as well. And copper fintube boiler manufacturers require an exact flow rate of 7 feet per second if you want to insure their tubes from scaling *or eroding*. "Well", you ask, "Did anybody design a heavy-duty boiler with fast and effective waterside access?"

Shortly after World War II, a new type of boiler appeared on the market. With a heat exchanger consisting of two headers with removable endplates and a connecting bank of inclined "see-through" tubes, this boiler was designed to remove scale with ease. The Horizontal Inclined Watertube Boiler, as it came to be called, proved to have many other advantages as well.





Rite Engineering began manufacturing this type of boiler in 1952. Fifty years and over 25,000 boilers later, Rite is more committed than ever to engineering and packaging *performance you can trust and efficiency you can maintain.*

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