

White Paper:

Gaining Efficiencies with a Boiler OR Burner Replacement



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Overview

A boiler and burner combination is an essential part for any building, residential high rise, institution or healthcare facility. It provides us heated air, an essential part to an area with cold winters, to a warm shower. It is also an operational challenge: increases in energy consumption, cost for purchasing energy and maintenance as well as the time it takes to monitor.

We'll discuss the following:

- Boiler – how it is evaluated and when or if it should be replaced
- Burner – how has technology changed and what are the benefits
- Energy Savings – purchasing energy is costly, how can a boiler and/or burner help save
- Money – justifying a boiler and/or burner is as easy as ROI

Raising the Efficiency of the Boiler

Your boiler is not immune to the issues that develop over time, whether it's a 200 – 300H.P. boiler in a high rise building or a 1000H.P. + boiler in a manufacturing facility or hospital, they all age in a similar fashion. There are a couple of factors that can age a boiler faster.... lack of maintenance and poor water quality.

It's not too difficult to understand that if there is a lack of attention given to anything, it will continue to deteriorate. Water quality is a major factor in the decline of a boiler. Depending on where you are located, some town's main water supply may come from a local well and will have a higher concentration of iron. In other areas, the water may have higher concentrations of hardness. Both of these conditions can have an effect on the boiler's life span.

What if the boiler was well maintained?

Bringing in an expert that can complete an assessment on the boiler is the best first step. There are some very good experts in the field and if you need a recommendation, contact me directly. The purpose for the visit is to determine the condition of the entire vessel.

A visual inspection to evaluate the boiler will begin. Are there any other conditions apparent that could affect the operation of the boiler? IE lime buildup on the waterside or any soot present on the fireside?

The next step would be to test the thickness of the water walls, steam and mud drums, boiler tubes, and the vessel shell itself (Non-Destructive Testing), to determine the amount of erosion over a period of time. Has it been fast or slow?

Original boiler specifications will provide a base line of how the vessel started on its first day of operation.... to today. Non-destructive testing and wall measuring thickness dimensions will be obtained. These calculations will give you a better understanding of the amount of time remaining on the boiler.

If the vessel is 30, 40, or even 60 years old, it doesn't necessarily mean you're in need of a new boiler. There are many boilers in the marketplace today that are 50 years old and in great shape. The key: maintenance and water quality. There's no way around it.

If the Boiler is Fine...What's Next?

Let's say that the result of your "Useful Life Study" proves that the boiler has many years of productive service ahead. The next area to evaluate would be the fuel burner. (The boiler and the burner should be treated separately, even though they are attached and reliant on each other.)

A Burner Evaluation Survey

In order to best evaluate the burner's efficiency, American Combustion Service performs an Energy Savings Analysis. Below is the information required for this analysis.

Input Summary

Boiler Make:	<input type="text"/>	Boiler Horsepower:	<input type="text"/>	
Boiler Type:	<input type="text"/>	Low Pressure Steam:	<input type="text"/>	
Hot Water:	<input type="text"/>	High Pressure Stream:	<input type="text"/>	
Boiler Model #:	<input type="text"/>	Serial #:	<input type="text"/>	
Steam Operating Pressure:	<input type="text"/>	OR	Water Operating Temp:	<input type="text"/>
Burner Make:	<input type="text"/>	Burner Model #:	<input type="text"/>	
Serial #:	<input type="text"/>			
Max Firing Rate:	<input type="text"/>	Min Firing Rate:	<input type="text"/>	
Fuel Type:	<input type="text"/>			

Boiler Run Time: Hours Per Day:

Days Per Year:

Annual Fuel Cost Per Year:

Fuel Price: Per Therm:

Per Gallon of Oil:

Electricity Cost: Per kwh:

Number of Cycles/hr:

	Low Fire	Medium Fire	High Fire
Estimated % Run Time:	<input type="text"/>	<input type="text"/>	<input type="text"/>
% O2:	<input type="text"/>	<input type="text"/>	<input type="text"/>

It takes time to collect all the information, but the investment is certainly worth the effort. The Energy Savings Analysis gathers the running characteristics of the boiler and performs a robust combustion evaluation. Once you have all of the necessary information, American Combustion Service, Inc. takes the information and inputs it into a specially designed computer program to calculate the energy savings that could be attained by upgrading the burner. The results can be quite astonishing.

In most situations, there are efficiencies to be gained. Hospitals and industrial companies uncover the fastest payback due to the constant use of the boiler and burner.

In a high rise building, the boiler may be in use during the summer season to heat domestic hot water. Utilizing a modern high efficiency, high turn down burner will effectively manage the fuel consumption. Contributing factors include the advanced control intelligence built into the burner and its efficient high turndown capability during minimum firing rates, when your boiler and burner are running with the smaller loads during summer season.

You can find the Energy Saving Analysis form at: <http://acsigroup.com/Installation.aspx>

Controls Contribute to the Efficiency and Energy Savings

If you do nothing else, replacing the controls can increase efficiency by 1% – 2%. However, it's not the ideal solution to only replace the controls. It's just worth noting that the "right" controls on a fuel burner are an important factor in energy savings.

Newer control systems are "linkageless".

These "linkageless" control systems manage key components of the burner. Instead of operating fuel valves and air dampers off of a jackshaft with swivel joints and rods, the "linkageless" control manages a direct drive servo motor on a fuel valve and on the air dampers that work in unison. These systems allow you to program the opening and closing of the valves and dampers to avoid any 'slop' or hysteresis - that is characteristic with linkage type/jackshaft burners.



(Hysteresis, in relation to the air dampers mean.....they are not closing the exact same way as they opened).

By putting an individual servo motor on the fuel and on the air dampers, the hysteresis can be eliminated and precise accurate control over the fuel/air ratio is gained.

Overall, by replacing the burner and controls together, ACSI has been able to help companies save between 5% - 9% on their energy consumption.

Efficiencies in the Chimney

Additional efficiencies can be gained by installing an economizer on the boiler's stack. An economizer is a heat exchanger that preheats the feedwater going into the boiler, which, in turn reduces your stack temperature. By reducing the stack temperature by approximately 100 degrees a 3% energy savings can be realized.

Controlling Draft

An item that is often overlooked is the draft control system.

Maintaining constant draft in the combustion chamber of the boiler is crucial to any boiler/burner operation.

Draft control can be achieved with a simple Barometric Damper on smaller installations. Larger installations, especially with tall chimneys may require an automatic full sequencing controller.

Improvements in Burner Technology

Companies that have burners that are more than 15 years old, can safely assume improvements in burner technology has been introduced since their own installation.

Advancements in both the United States and abroad, finding better ways to burn fuel efficiently and conserve as much as possible has been attained.

The latest enhancements come from all over the world. Most other countries spend more on energy than in the US due to higher fuel prices. This certainly encourages the other countries to uncover new ways of saving energy and becoming more efficient.

It's sad to say that because of the high cost of energy in Europe, the Europeans seem to be ahead of us here in the United States with their technology.

Efficient Low End Firing Rate of the Burner

In order to maintain a stable flame, almost all fuel burners require more "excess air" as the firing rate of the burner goes to low fire position. (More excess air = reduces efficiency).

A fuel burner that can run lower oxygen levels throughout it's entire firing range is what you are looking for. The technology is here...now! ACSI has proven results with many clients!

Linkageless Burners

As mentioned earlier, another newer technology is linkageless controls. A linkageless burner can reduce fuel consumption. Additional control functions such as temperature control and cold start are managed from a single unit. A linkageless system has the potential to increase the combustion efficiency, resulting in additional energy savings.

VFD and Oxygen Trim Systems

In conjunction with linkageless controls, the added benefits of automatic Oxygen Trim control will pay for itself over time. The "trim system" will allow the burner to be set up at minimum excess air – maintaining the "minimum" safe operating parameters of the burner throughout it's firing rate.

Adding the VFD (Variable Frequency Drive) to the burner's combustion air blower, enhances the Oxygen Trim System, while reducing electrical energy costs.

Fuel Change Over

If you have experienced at any time, changing over to another fuel source, it can take up valuable time. Some facility managers have reported that it takes sometimes 30 minutes up to 4 hours depending on the type of stand by fuel. Technology exists today that will reduce the long procedure down to a couple of seconds. It can be as easy as a flip of a switch.

Maintenance is “Key” for Maintaining Efficiency

Burners today are complex to maintain. It is highly recommended that the burners get inspected and serviced at minimum, once per year, in order to ensure maximum energy efficiency and operation. For environments that allow exposure to excessive dust and dirt, 2 or 3 times per year may be in order. This service normally requires partial disassembly of the burner, in order to clean and inspect the internal components properly. Don't settle for less!

A fully documented Combustion Report should also be completed during every burner “tune up” service. This Combustion Report is also a useful tool – to quickly identify a potential problem – when parameters are not how they were originally left.

To ensure maximum energy and cost savings, call upon ACSI to find the right burner for your application. Our clients have saved significant amounts of money following our recommendations. Not only were the results cost effective, but was also a step toward “Going Green”!

Our expertise has been trusted for over 24 years.

Francis (Frank) M. Lacny
President
American Combustion Service, Inc.