Energy Efficient Solutions For Greenhouse Gas Reductions

Process heating and comfort heating require energy. Typically, that energy comes in the form of natural gas which is burned to make steam, hot water or hot air. If it's possible to generate the same steam, hot water or hot air with less fuel…. 1. Fewer Greenhouse gases are emitted to the atmosphere and 2. Costs for generating steam, hot water or hot air are reduced.

Did you know that up to 20% of the energy in the fuel you buy is lost out of the stack in the form of hot exhaust and water vapor? There are ways to capture and use that lost energy to reduce your total fuel consumption, in turn reducing greenhouse gas emissions and reducing fuel bills.
Win – Win!!!!

By now everyone has heard the benefits of *Condensing Boilers*. "Replace your boiler with a condensing boiler and reap the benefits and clean the air!" This may be true for residential and small commercial applications where "cold" city water is taken in and heated. The "cold" water is a "heat sink" that pulls energy out of the flue gas and reduces the flue gas temperature.

Where larger applications use the energy for steam or hot water, they typically bring hot condensate or warm water back to be heated again in a continuous energy cycle. Without a cold heat sink, the flue gas cannot be reduced in temperature and can never give up "low grade" energy.

Why is this important? Exhaust gas at a lower temperature is lower in energy. By transferring that energy to a "working fluid" (steam, hot water, or hot air) more energy is used from the fuel and is not wasted. But more important than the temperature of the flue gas is the water vapor in the flue gas!

When burning natural gas, the fuel combined with oxygen in the air results in water. Burning 1 lb of methane (Natural Gas) results in about 2.2 lb of water in the flue gas. This water is instantly vaporized with the heat of combustion leaving the boiler, furnace, heater, oven, engine or turbine as water vapor. The energy used to vaporize the water is called latent heat or latent energy. This is the portion of energy in the fuel that is being lost when exhaust gases are not cooled to condense the water vapor out of the gas. The principle of a "condensing boiler" is to cool the exhaust gas to the point that the water vapor condenses, giving up the energy it took to vaporize the water. By dropping the exhaust gas temperature below its Dew Point you can condense out water vapor which gives up **<u>much</u>** more energy than reducing the temperature alone.

There's a way to do this without replacing your boiler and it can be done for any heat source including boilers, turbines, engines, ovens, dryers or incinerators!

A condensing economizer can be added to an existing "system" that includes a single or multiple heat sources. The hot flue gas is cooled in a condensing economizer using a "cold" liquid like make up water, process water, domestic hot water or glycol. The cold water would otherwise have to be heated using fuel or electricity, but can now be heated with waste exhaust gas. You get hot water for free and you emit less green house gas including water vapor which it turns out, is also a green house gas! If you pay for water for a process, you could also use the condensed and extract water vapor from the flue gas to reduce your water bill after some minor cleaning. Another **win-win!!**

Another way to reduce the amount of fuel burned is by having a good look at steam traps in a steam transmission or heating system. Many existing steam traps, a device that extracts liquid condensate while keeping live steam in the piping, are mechanical devices that require attention and maintenance. Unfortunately, in many cases, attention to other more pressing maintenance needs comes before attention to steam traps! Left to cycle open and closed continuously, steam traps fail and allow live steam to pass with the condensate. This results in wasted steam and more energy used than would otherwise be needed for the process or heating.

Steam traps come in many different types and designs for different applications, but any mechanical trap has the disadvantage of moving parts that will eventually wear and fail and then have to be replaced. Orifice type traps though, have no moving parts and utilize thermodynamic principles to create a seal allowing more dense liquid condensate to pass through while stopping live steam from escaping. Till now, orifice type traps have been offered for constant pressure applications but haven't been appropriate for most steam applications that fluctuate from high to low pressure. By adding a special venturi section after the orifice, along with some other features to aid in installation and routine maintenance, the orifice trap or Hydrodynamic trap now has great advantages over mechanical traps.

In Its design, a hydrodynamic trap will not allow live steam to leak out of the system. By continuously relieving condensate, there are no pulsations imparted into the steam lines reducing the potential for water hammer and possible damage to steam and condensate piping. There are no moving parts to wear and a properly sized hydrodynamic trap can last the life of the plant. Hydrodynamic steam traps can also be insulated reducing heat and energy losses in steam transmission lines.

As much as 15-20% of fuel costs can be saved by using advanced hydrodynamic steam traps that will not allow live steam to be lost and wasted in a system. This means additional greenhouse gas emission reductions by reducing the amount of fuel needed for the same process needs.

Rather than costly complete boiler replacements or addition of gas scrubbing equipment like selective catalytic reduction systems to remove greenhouse gases including NOx and CO from exhaust, why not start with an efficiency improvement that reduces fuel costs, reduces emissions and saves energy for the same process output.

Many utility and natural gas supply companies are offering incentives to implement fuel saving equipment and systems. A condensing economizer and updated steam traps certainly fall into that category and utility incentives can bring a project payback down to 12-18 months and in some cases, less!

Please allow me to show you more about the Condex Condensing Waste Heat Recovery system and the complete line of Fenix Hydrodynamic traps. I would be happy to review your process and if appropriate, estimate the savings by utilizing waste heat recovery and reducing lost steam with improved trap equipment.

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