

Accurate Testing

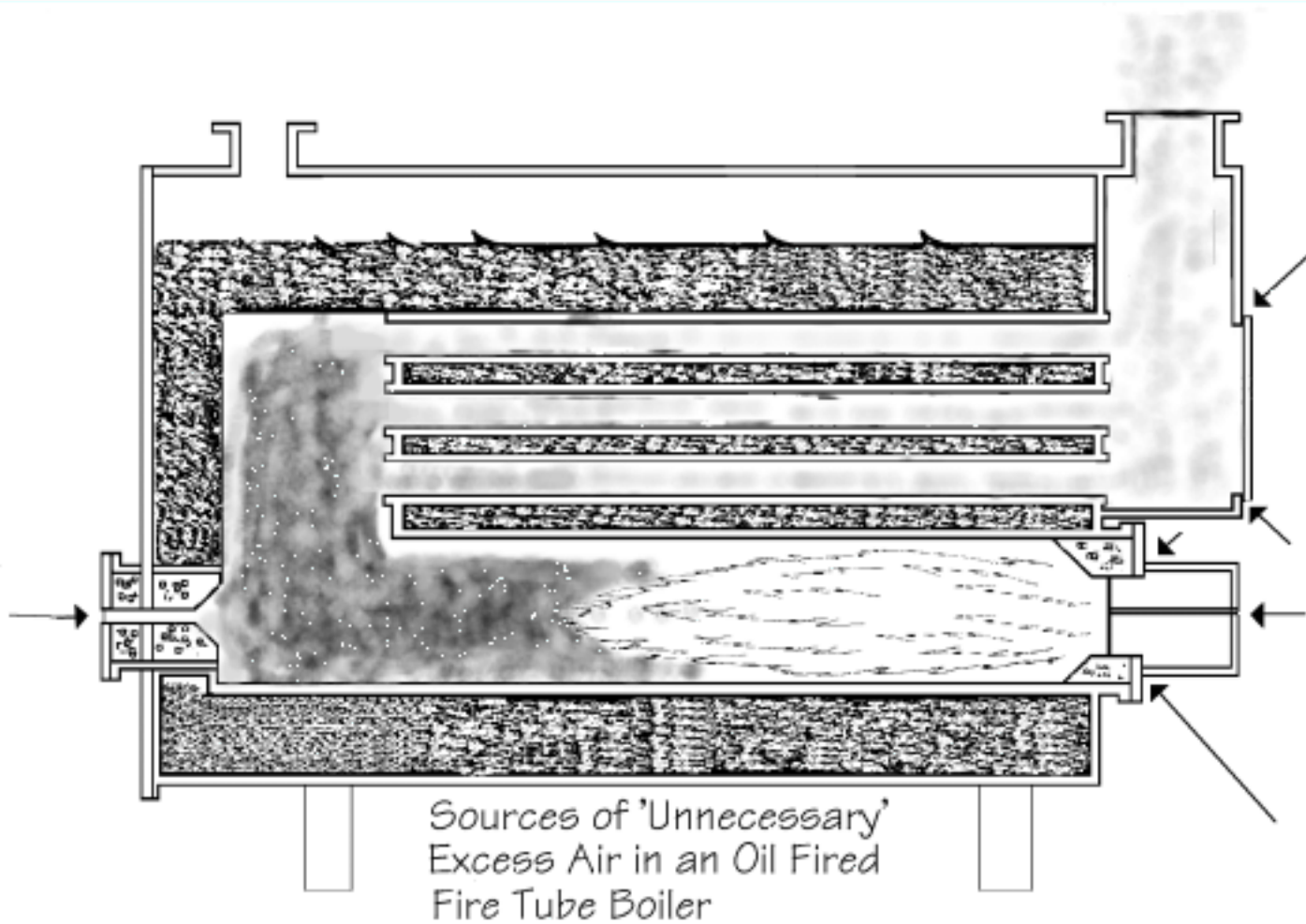
Excess air from any source (except that which is provided through the combustion air intake for complete combustion) needs to be eliminated to maximize efficiency. Just as excess combustion air reduces efficiency, air leaking in through boiler cleanout and access doors reduces the flame/flue gas temperature and increases the volume and velocity of flue gases required in order to be vented properly.

More importantly, before a reliable tune up can be performed, these sources of 'unnecessary air' need to be eliminated, as combustion tests are taken downstream from the burner. This air leakage will effect the combustion test readings which are being used to determine proper fuel and air adjustments.

For example, if the burner combustion air intake is providing the proper amount of combustion air to produce clean, efficient combustion, air being drawn in through access doors, cleanout ports, etc., will increase O₂ readings on the combustion analyzer and likely result in readings that suggest the burner is operating with too much excess air. Attempts to 'fine tune' the burner by closing the combustion air intake damper or increasing fuel pressure will likely result in starving the flame for air.

Check any access doors for leakage with a smoke source to identify leakage. During service, replace any deteriorated gaskets and if necessary use high temperature silicone chalk to insure an airtight seal.

One method to determine the amount of "unnecessary" excess air from leakage in a boiler or forced air unit is to take an overfire O₂ reading and compare with the stack O₂ reading. A higher stack O₂ reading indicates unwanted air leakage into the combustion chamber, flue passages or boiler sections. These areas must be sealed to attain accurate test results.



Miscellaneous Notes

Proper Venting

A negative pressure switch on sidewall vented or fan assist heating equipment, only proves a certain level of negative pressure in the vent. It does not necessarily prove flue gas flow. A restriction of the combustion air supply will not necessarily cause the pressure switch to lock out. Meanwhile, inadequate combustion air may be responsible for CO production and possibly soot - both of which will increase fuel consumption and safety concerns.

Newer systems use a number of pressure switches to sense pressure drop across the heat exchanger to address this issue.

Combustion Air

While it is required to size combustion air intakes in accordance with local codes, continuous readout combustion test instruments can verify that the combustion air intakes are operating as designed. By

simply opening a door or window to the outside (of the boiler/furnace room) and noting changes in any of the readings, sufficient combustion air intake can be verified.

Make Up Air

By the same token, observing combustion test readings while an exhaust system, air handler or clothes dryer, for example, are operated may provide information regarding the need for additional air intake to offset the indoor air removed by these type systems.

Thermal Shock

Heat stress (thermal shock) compounds the stress of the materials. Thermal shock is one of the most common causes of boiler accidents.

As a rule of thumb, return water should never be more than 60° cooler than supply water. Generally, boiler manufacturers recommend a 20° to 40° difference and that the burner be run at low fire or cycled for a programmed period of time before the burner brings the system to full operating capacity.

Keep this in mind when combustion testing during periods of time when the boiler hasn't been running regularly or during the summer when a chiller is in operation and there is any way for chilled water to return to the boiler.

Finally, remember other safety concerns identifiable during the course of your exposure to a particular installation are critical as well. Domestic hot water heating systems are a good example. Draft and combustion tests will help verify safe and efficient combustion. However, measuring the temperature of the water will determine the potential for scalding building occupants and is just as important.

Lowering tank temperatures have direct influences on the amount of corrosion and scale produced as well. Every 20° increase in water temperature doubles the corrosive effects of the water and increases lime scale deposits by as much as four times. This simultaneously reduces both operating efficiency and service life.

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