Hays Cleveland
Division of UniControl Inc.

WHY IS DRAFT CONTROL RECOMMENDED?

The question has been raised as to the need or desirability for the application of automatic draft control to boilers fired by pressure type burners-specifically pressure-type packaged steam generators of both fire tube and water tube types.

A pressure-type burner is equipped with a blower capable of delivering all the necessary air for combustion to the burner against the positive combustion chamber pressure.

A packaged boiler, fire tube or water tube, designed for pressurized firing, in theory requires no assistance from a chimney for the combustion process. A short stack or chimney is needed only for exhausting the products of combustion to meet any existing regulations.

This should not be confused with power burners requiring a zero or negative pressure in the combustion chamber for best performance.

There is resistance to the flow of gases through the boiler passes. This can be indicated readily by comparing pressure readings in the combustion chamber and at the boiler outlet. Without a stack, the pressure at the boiler outlet is theoretically atmospheric or zero gage. The difference between this reading and the combustion chamber reading is the amount of pressure drop through the boiler and a measure of the resistance to flow when a system is set up correctly.

For example, if no stack is used and the difference is 0.2" then the positive pressure in the combustion chamber is created by the resistance through the boiler to the flow of gases. It is pressure against which the burner/blower must deliver air. This back- pressure varies with the burner-firing rate.

Because the burner/blower combination is designed to operate against this boiler backpressure, any variance will adversely affect performance and efficiency. The volume delivered by a fan or blower varies considerably with the pressure against which it is discharging. It follows that the pressure at the boiler exit should not be permitted to vary if we are to maintain the conditions of design. Actually, the fuel-air ratio cannot be maintained efficiently if the backpressure is allowed to vary.

A chimney causes a varying negative pressure at the boiler exit depending on stack temperature, wind velocity, and other climatic factors. Multiple boilers or other types of combustion sources firing into a common breaching can also affect outlet-breaching pressures. This can be checked by periodic draft readings at the base of the chimney.

Negative pressure (draft) at the boiler exit reacts through the boiler passes to the combustion chamber, diminishing or completely overcoming the normal positive pressure desired for correct fuel-air ratio.

At times negative pressure may exist in the combustion chamber. The burner fan delivery is thus affected by the uncontrolled stack draft, which upsets the fuel-air ratio. This condition is most prevalent at low and intermediate firing rates.

The following burner operating difficulties can result from uncontrolled draft:

- Poor combustion efficiency.
- Pilot fails to light.
- Unstable pilot – tendency to drift from scanner and cause nuisance shutdowns.
- Main flame fails to light.
- Pilot deflected from main fuel injection, delaying light-off and resulting in starting puff or possible explosion.
- Lack of flame retention – causing momentary loss of flame-sensing signal and “flame failure” shut-down.
- Abnormal flame pulsation’s setting up harmonic vibrations that create an unbearable noise nuisance and can cause damage to boiler and breaching.
- Soot accumulations due to varying fuel-air ratio.
- Excess draft causing fan volume delivery to increase and excess air creates an envelope around flame, chilling ends and causing heavy sooting.
- Poor boiler heat transfer.

Obviously, pressure at the boiler exit should be closely maintained at atmospheric pressure, regardless of connection to a high stack. The factors, which cause variations, can be eliminated with automatic draft controls. Many large boiler manufacturers fully agree and recommend draft controls as a further service to their customers.

High-rise building design, which provides a naturally high stack influence, amplifies the need for accurate draft controls.

Stack heights as low as 25 or 30 feet can create draft problems, particularly on small boilers. Under certain conditions, even boilers with a stub stack can be more efficient with draft control.

On **multiple packaged boiler installations**, the boiler outlet pressure varies with the firing rate. Because of this, draft controllers are recommended to maintain zero or near zero pressure. Also, when the heat demand is satisfied **Hays Cleveland Draft Controls** close the outlet damper of each boiler, if it is fired by gas/oil, to retain the residual heat for greater economy.

The **National Academy of Sciences**, in its Technical Report No. 51 states, “Separate automatic draft regulation should be provided on all boilers having forced draft fans in which the furnace is designed for negative or zero pressure operation. Such regulation should be provided on any other boiler where one stack serves two or more boilers and/or when the use of a regulator would significantly reduce air flow, and consequently boiler heat loss, during shutdown periods.”

All **Hays Cleveland Draft Controllers** control either positive or negative pressure with an adjustable range from 0 to –2.0”w.c. (negative) or 0 to +2.0”w.c. (positive). Remember: the aim of Draft Control is to “control it”, not “kill it” as old-fashioned barometric damper systems do. Incorrect draft control can result in higher fuel usage and what amounts to a sizable “chunk of change” being wasted straight up the chimney. We put the most sophisticated fuel/air controls on the front end of the boiler: so why do we persist in ignoring the back end as though it doesn’t matter? It *does* matter, and even more now with rising fuel costs. Think about it while you drink your coffee, and it becomes a “no-brainer”—unless of course, you have "money to burn”!