Boiler Efficiency

One gallon of No. 2 fuel has a heating value of about 140,000 BTU. Chemical combination with oxygen yields about 200 lb. of steam starting from water at 60 F. The combustion process itself is nearly 100% efficient. There is no good reason why it should not remain so with adequate monitoring, maintenance, and control. Ideally, no fuel, no oxygen, and no heat should leave the furnace with the combustion products. Essence of combustion control is to analyze combustion gases to check for oxygen and combustible gases, and to monitor stack temperature. Too much oxygen means reduced efficiency. Excess O_2 may indicate leaks in the system. Combustibles in the stack may indicate that mixture is too rich, burner or combustion chamber is wrong design for fuel used or for load, or something is quenching the flame.

Stack analysis requires great accuracy for economic reasons. A fraction of a percent difference in an analysis can mount to a considerable sum in wasted fuel. To assure complete combustion, the practice is to feed excess air above that required chemically. For gas, the level is about 10% excess air, for fuel oil, around 20%. First step is to measure oxygen level flue gases and current flue temperature. The exce air is reduced until some limiting factor is reach (smoke, combustibles in flue gases, flame instabilit Then amount of excess raised to give a margin f error under steady conditions. After correcting exc air, stack temperature will be lower for the san steam production. For example, if a 4% excess air c be reduced to 2% excess, one can save 1% on fuel. A F drop in flue gas temperature from 600 F will sa another ½%. It now pays to equip boilers wi capacities as low as 25,000 lbs. of steam per hour wi up-to-date controls that relate fuel input, air inpu changes in fuel BTU, ambient air temperature a relative humidity. A boiler with the capacity giv above, at 60% efficiency, will burn 210 gallons of f oil per hour. At 40¢ per gallon, $84 per hour, $600,0 per year, a 5% improvement is worth striving for

Anon. 1975. On the improvement of combusti through the use of installed and portable instrume to detect flame and analyze exhaust gases. *Instr. Control Systems.* 48(1):35-38.

Your Editor,

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