

Application/Case Study

HVAC-2

one of a series of applications for Fulton products



Subject:

Fulton Pulse Combustion Boilers Reduce Fuel Bills Approximately 50% at Truax Field

If you see an F16 fighter soaring over the peaceful farm land of central Wisconsin, chances are it's based at the Truax Field Air National Guard facility in the state capitol of Madison. Adjacent to the Dane County Regional airport, the base has a long history of meeting the military, humanitarian and civic needs of the state.

Serving first as an Army Air Corps base in 1943, Truax Field became home to the Air National Guard at its formation in 1948.

It continued as an active duty Air Force base through 1968, when it was turned over entirely to the Air National Guard. Today's Truax Field has 25 buildings on 155 acres, and houses the 115th Fighter Wing, including F16 flying forces, maintenance people and

equipment. The recently remodeled buildings share a clean, contemporary architectural style reminiscent of a modern college campus. The base operates year round, with hours ranging from 6:00 a.m. to 5:00 p.m., plus Unit Training Assembly one weekend per month.

Federal government mandates reduction in energy usage

Involved in an ongoing project to remodel and upgrade existing buildings, Facility Manager, SMS Charles Ross, and Production Controller, TSG Hoyt Halverson, turned to pulse combustion boiler technology for their hot water heating needs. A congressional mandate from the National Energy Policy for Federal Facilities in part prompted their decision. Halverson explains.

"As part of the Federal Government, we have goals to reduce total energy use per square foot on a yearly basis by 20% by the year 2000, and by 30% by 2005.



When I say total energy use, I mean electrical and gas. So, increasing the efficiency of the heating plant is not just driven by cost savings, but also by this requirement."

But why pulse technology? With a burner that takes air from the boiler room, an outside air damper must be opened to let air in when the boiler is operating. This becomes a problem when cold winter air invades the boiler room, making it necessary to heat that area as well. With a sealed combustion system, associated with a pulse combustion boiler, it is not necessary to bring the air needed for the flame to survive through a heated space. Instead, it comes in through considerably smaller PVC intakes, travels into the combustion chamber and exits out as exhaust in a similarly small stack. The temperature in the boiler room can stay constant, eliminating the danger of frozen pipes and other problems related to the cold. Halverson added, "Another direct advantage of this in certain of our applications is that, because of the Fultons, we have gotten rid of three large masonry smoke stacks which are inefficient because they maintain a draft. We also got rid of them before they would have needed significant masonry repairs."

The first pulse boiler installed cut fuel bill in half

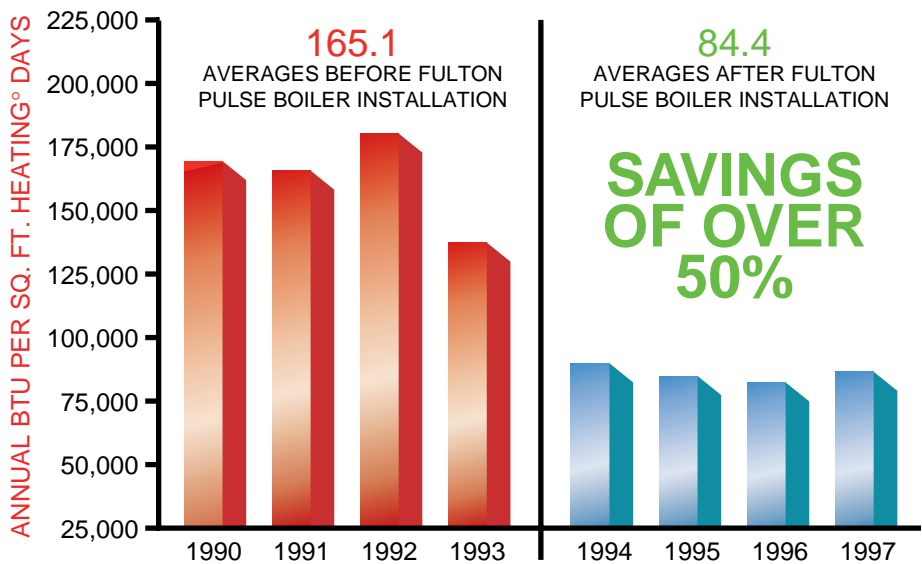
The first of twenty-one Fulton pulse combustion boilers now in use on the base was installed in building 1000, a vehicle maintenance facility. Building 1000 was remodeled in FY-92. The remodeling project included supplying the building with outside makeup air, insulating the building, and adding infrared gas tub heaters to the vehicle maintenance bays. The remodeling project resulted in

a 12% reduction in gas usage in FY-93 over the average usage prior to the remodeling year. In summer of 1993 the PHW750, a 750,000 BTU unit, replaced a low pressure steam system that had been in use for many years. The results were impressive. Building 1000's average natural gas consumption was cut by 49% over the average prior to remodeling and by 42% over the consumption of FY-93 post remodeling. Ross explained, "We don't look at savings from a dollar & cents perspective like a lot of outside corporations do, because in our opinion it's not a true indicator. Heating seasons place considerably different loads on systems - the cost of natural gas fluctuating has significant impact - so that's why we use total BTUs used that year, divided by the square

footage of the building, and then take that result divided by the actual heating degree days. This gives us a number that we can compare year to year. That's how we track consumption."

To further assess real savings, the Truax team looked not only at the BTUs per Square Foot per Heating Degree Day, but also the year-end figures. "Doing this," according to Halverson, "takes care of monthly variations due to building use, wind [which is not reflected in degree days], and other variables. Looking at the year-end figure helps us a lot." Based on those assessments, the initial performance of the Fulton boiler in one building alone was enough to prove the value of the pulse boiler concept for the entire base.

BUILDING 1000



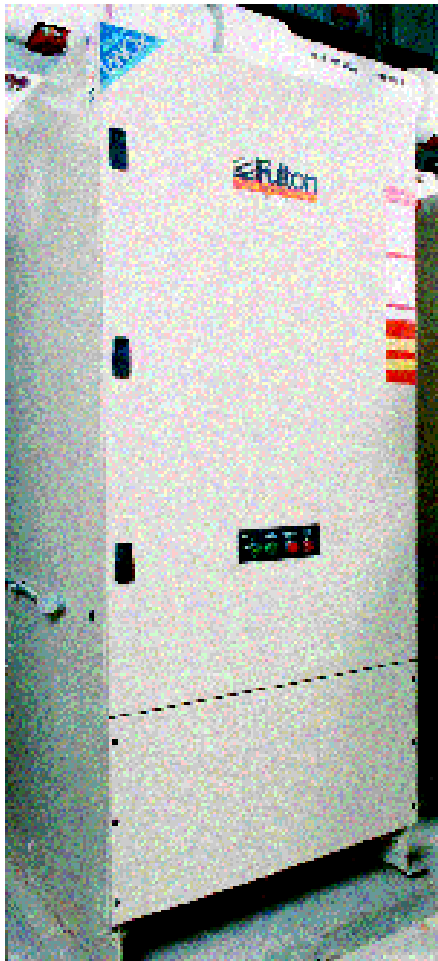
Building 1,000's average natural gas consumption was cut by 49% over the average with Fulton's PHW 750 pulse boiler.



Twenty more Fulton pulse boilers installed since 1993

In the years following that first installation, another 20 Fulton pulse boilers were installed in nine more buildings in the complex, replacing existing Atmospheric and Power Burner units. Administrative offices, a clinic and a dining area primarily used during Guard Drill weekends are housed in Building 500, where two PHW1000 boilers replaced six Atmospheric natural draft boilers. Base Supply in Building 510 is a combination of about 1/4 office suites with the remainder used as warehouse space with very high ceilings. Here, six smaller PHW500 Fulton boilers also replaced six considerably larger and less efficient atmospheric units. "What we found interesting with these buildings" according to Ross "was that in the first year we

Base Supply (building 510) replaced atmospheric boilers with six Fulton PHW500 pulse boiler units.



also saw a 20% drop in the BTUs/SqFt/HDD which was also lower than any of the preceding 10 years." Much of the installation work was done by in-house staff, with Madison consulting engineers Mead and Hunt providing heat load analysis, contracting by All-Mechanical of Milton, and Wenniger Mechanical Contractors of New Berlin Wisconsin. Allan Schmidt, with Heat & Power Products of Madison, Fulton's Authorized Representative, worked closely with the Truax team as more Fulton units were added.

With pulse boilers, the colder the return water is, the more efficient the boiler will be

Said Schmidt, "Installation is made easier because you don't need a fire-rated enclosure, you don't need a mixing valve, you don't need a primary/secondary pump system, and the colder the return water is, the more efficient the boiler will be. A conventional boiler can be "shocked"

by bringing in water that is too cold." The return water temperature factor was cited as one of the key advantages of the Truax installations. Halverson added, "We don't have to worry about return water temperature. In fact, we program for the lowest return water temperature we can, to heat the building. What we've done in most of our buildings is to actually control on return water temperature. On a 40 degree day outside, we may be running a return water temperature of 110 degrees. [By comparison] a lot of boilers say you must maintain a 140 degree return water temperature."

Multiple units eliminate complete down time—boiler parts interchangeable

Costs benefits in training, maintenance and parts were also realized as a result of the simpler pulse combustion system. Replacement parts are readily available through Heat and Power Products, but due to the recent installations, parts availability has not been an issue. According to Ross,

Three F16 fighters stand ready on the ramp at the Truax Field Air National Guard facility in Madison, Wisconsin. In The background, Maintenance Hanger (building 400), heated by three PHW750 Fulton boilers.





Intake and exhaust stacks on the exterior wall serve two Fulton PHW1000 boilers

"The parts, other than the orifice, are the same in the PHW500 as they are in the PHW1000, so we don't have to stock as many emergency parts. If we want to keep one controller box and one blower fan, the two most likely things to go down, and a couple of spark plugs, we don't have to stock one for every style, type and size of boiler." Halverson added, "In an emergency, if we don't have the part, we can go to a building with multiple boilers, and cannibalize. You can't over-estimate, in an emergency condition such as a long holiday weekend with a minus-twenty degree



An array of three Fulton PHW750 units replaced much larger boilers with power burners in Maintenance Hanger building 400.

outside temperature, how great an advantage that is. The three sizes of boilers we primarily use, all use the same parts. It's just a huge advantage." When asked about preventive maintenance, his answer was similarly positive. "We're looking at basically once a year spending an hour on preventive maintenance per unit, and every third year spending two hours. In that longer maintenance period, doing things like changing the ignition spark plug, and the membrane material in the flapper valve." Training new people to operate the boiler controls was accomplished

during a one-day class with a Fulton factory representative. Relentless Wisconsin winters, coupled with the daily demands of an Air National Guard unit, present a formidable challenge to any heating plant. Realize a 22-23% energy savings across the board while drastically cutting parts inventory and maintenance costs, and the sky's the limit. F16s use after-burners to get the job done in the air, but back at the base, pulse technology by Fulton will be keeping the home fires burning efficiently into the next century.

Contractors and Authorized Fulton Representative Involved in the Project

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