Pq: Keep in mind that all heaters are unique and dangerous.

Resolve to trim that excess air

Five excess air heater good practices can lead the way to peak performance

Process heating, in the form of fired heaters and boilers, accounts for 65% to 90% of a plant's energy demand. For those without state-of-the-art controls, these energy hogs represent one of the easiest areas to reduce energy use. Whether digital, analog or field controls, process heaters require constant attention to run at peak efficiency.

There are many ways to improve performance, like better insulation, better convection-section heat recovery, removing process tube scale, improving radiant absorption and better furnace designs. However, excess air is the number one controllable reason for poor energy performance. So, to start the New Year with an energy resolution, try implementing five key excess air heater good practices. I've selected these practices because, in most cases, they can be implemented without taking the heater off-line. Committing to at least one item is a good start to reducing that monthly energy bill. Using all five will help approach top performance.

1. You can't manage what you don't measure! There are two basic instruments that a process heater needs to be safely adjusted to minimum excess air. They are an oxygen sensor in the box and a box draft meter. But to actually measure your stack loss, install a flue gas analyzer and a temperature sensor in the stack (after any exchange equipment). A box oxygen sensor is your control point for determining heater air requirements. But a stack flue-gas analyzer is needed to report stack loss. Both are important for a successful energy program. Also oxygen sensors will only measure the oxygen in the area surrounding the sample point. Multiple point sampling is always preferred.

2. Start a training (or retraining) program on heater adjustments. All operators need to be able to properly adjust furnaces. The process is fairly straightforward but doesn't get the highest plant priority. In all my years working in process plants, I can count on one hand how many times I've seen operators voluntarily adjusting a furnace outside of start-up. Furnaces should be adjusted once a shift and right after upsets or when the process or weather drastically change. There are so many furnace types that discussing how to adjust them in this column isn't possible, but a good training program will have proper procedures in place for each.

3. Keep your burners, registers and dampers in good operating order. A few years ago, I installed automatic air-register controls on a heater because the oxygen levels were extremely high. Even though the operators wrote in their log books for years that they adjusted the manual registers each shift, I found that 90% of the old registers couldn't move or were damaged and never repaired. The most effective practice that I've seen is one where a dedicated maintenance person inspected and maintained the moving parts (yes, they are supposed to move) of the plant's furnaces.

4. Once (preferably twice) a year, bring in a furnace specialist to check your heaters. Most plants cannot afford to maintain a full-time furnace expert. But it makes sense to have a third party regularly check your heater performance. First, it tells your operating people that the heaters are being watched and performance counts. Second, it

allows your operators to consult an expert. This expert also can do training while at your site. Some heater vendors perform this service and there are independent consultants or DOE consultants who also are available. A consultant who can model your furnace is preferred.

5. Consider CO control or a fully functional CO analyzer. I mentioned the sampling problem with oxygen but there're more basic problems. Air that leaks in from openings in the furnace (peepholes, areas surrounding pipes, improperly sealed manholes) can't be distinguished from excess air that comes through the register. Carbon Monoxide (CO) can only be created at the burner. Maintaining your CO level between 100 ppm and 400 ppm, depending on environmental requirements, can help in running the lowest possible oxygen level. I have seen heaters run 0.5% to 2% excess oxygen with proper CO analyzers. They're also a great safety device.

Before following any advice, be aware that all heaters are unique and dangerous. Create a Management of Change document to avoid creating an unsafe situation or violating regulatory or insurance requirements. When dealing with controls or burners, it's always a good idea to consult the manufacturer before proceeding.

Gary Faagau, energy columnist
gfaagau@icubedenergy.com