FurnaceMANAGER Safety and Analysis System

Industry needs an early warning alarm system that continuously monitors the furnace to reduce operational risks and reduce failures.

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Introduction

For years the operation of fired heaters has been monitored by experienced engineers and operators that have manually looked through doors on the side of the furnace to determine the proper operation of the burners within. Based on what they are able to see with the naked eye and their level of experience, they would adjust various parameters to make the furnace operate safer and more efficient.

Figure 1. Typical Sensor Unit

As the global economy causes competition to intensify, most businesses are forced to downsize, outsource, and stretch resources even more than ever before. Consequently, just trimming the budget becomes not just a matter of profitability, but a matter of survival.

Safety and risk management add significantly to operating costs, and all methods to reduce these costs are welcomed by a successful safety director. Therefore the idea of a system that can monitor a furnace 24 hours a day/ 365 days a year, and maintain records of all fluctuations or changes in operation or safety concerns, provides a capability previously unavailable.

Reduce Risk

A successful day is defined as one in which all goals for that day have been met or exceeded and everyone leaves in as good a condition as when they arrived. One way to reduce risk is to limit or eliminate personnel exposure to dangerous areas. It has been our goals at Increase Performance, to not only develop tools and procedures that make working around fire boxes safer, but also increase efficiency and thereby reduce operating costs.

Removing the operator from potentially harmful areas has been one of the main motivating factors in creating a processing tool called FurnaceMANAGER. Up to this point, current flame monitoring technology has been limited to the use of flame rods or ultraviolet

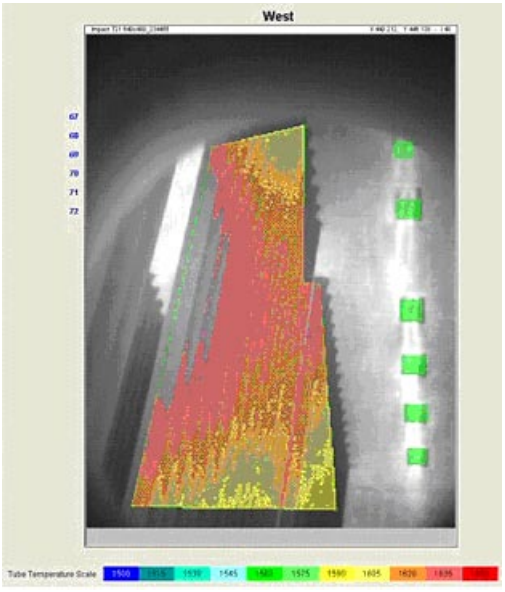

Figure 2. Radiant Flux Smart Color Overlay

flame scanners that would only provide a single light source detection system. This intelligent remote monitoring system allows the operator to remain in the safety of the control room while being notified of potential problems in the firebox.

Uneven Heating

Another major problem that can occur inside the furnace is uneven heating over the process tubes due to improperly adjusted burners or clogged process tubes. When these problems occur, it can lead to expensive tube ruptures and the possibility of human injury or death.

The FurnaceMANAGER system provides a method of detecting even a minor tube leak, far sooner in time before a full rupture develops, allowing the operators to monitor the leak in the control room, safely allowing the unit to continue operating until it can be shut down for repair.

It addresses this problem by continuously monitoring the radiant flux waves emitted from all of the burners in the furnace. When improper air gas mixture is supplied to a burner, the flame could drift next to processing tubes causing uneven heating condition. When this occurs, the system will quickly detect the relative temperature differences between adjacent tubes and graphically show the variance.

Historian

To make the work environment safe for everyone, you need well trained and informed personnel. The historian feature collects and stores images and data received from the remote sensors for later retrieval and analysis. The data and progressive modeling of the images can then be used to demonstrate and train plant personnel about conditions or procedures that could potentially be harmful.

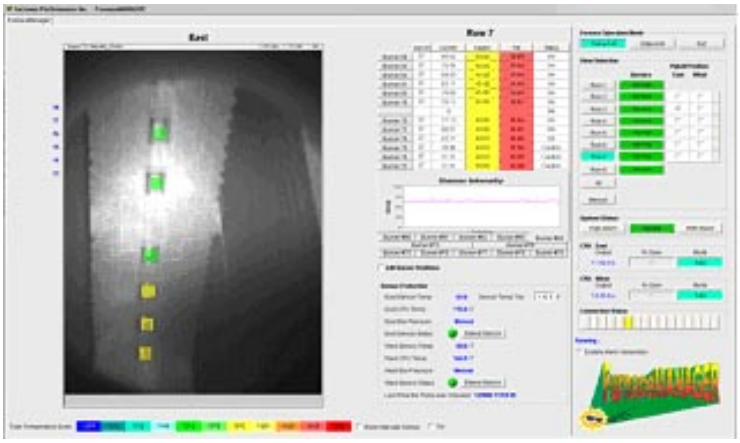

Figure 3. Monitored Burner Graphics

Burner Monitoring

All burner operations in the furnace are monitored and reported on a continuous basis, with the system alerting and or warning the operator anytime a burner has drifted outside its preselected parameters. This provides the means for a furnace to be operated in a safe and cost effective way. The monitoring system allows the burners to be tuned to the design excess air providing an even heat distribution throughout the radiant box, without jeopardizing safety of the operation, yet assuring correct air flow and combustion throughout. Data received from

each burner is graphically displayed to show trends that have occurred over a period of time. Operators can use this information to verify or detect changes in air or fuel being supplied to the burners.

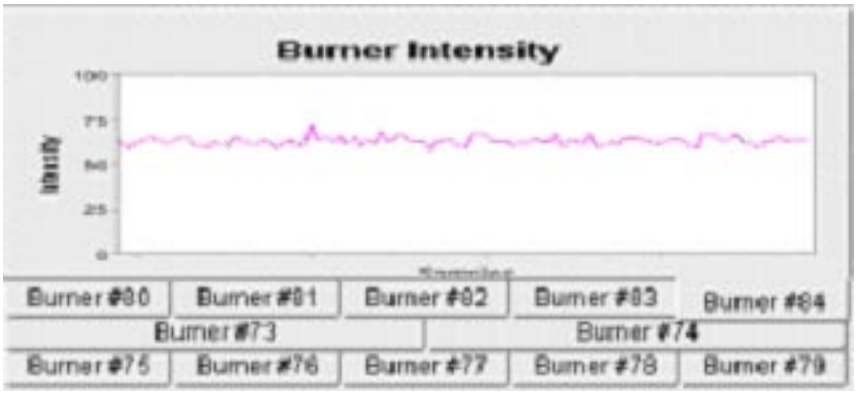

Figure 4. Graphed Burner Data

Remote Monitoring

During the start up phase of the furnace, preselected burners are lit in a predefined order allowing for even and controlled temperature regulation of the heater cabin. It is during this phase that a number of problems such as an extinguished burner or impinging flame will most commonly appear.

In the case of an extinguished flame, the unburned fuel can collect in pockets of the furnace until some portion of that fuel mass comes in contact with an ignition source that causes it to ignite, resulting in an explosive reaction inside the furnace. Clearly this is an undesired situation that could not only present a dangerous condition to personnel, but one that could severely damage the furnace.

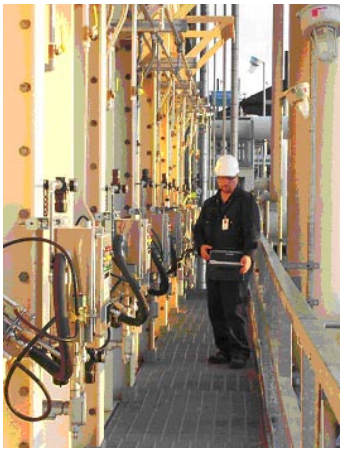

Figure 5. Remote Monitoring using Wireless Laptop

One more feature supplied by the FurnaceMANAGER system allows for remote viewing of each burner in the furnace from a wireless Class 1 division II laptop. This not only allows for the control room to continuously monitor and receive notifications of burner problems, but also gives the operator responsible for starting the burners a real-time view of the burner they are adjusting. This allows for an immediate confirmation of the operators steps and allows them to take corrective action during a potentially dangerous period.

Offsite Monitoring

As mentioned earlier, a way of making the plant safer is to avoid exposure to dangerous areas and supplying experienced personnel with information they need to make accurate and decisive decisions. Because FurnaceMANAGER is an Ethernet based system, it can be accessed over the internet or the company's internal network. This allows a safety director to monitor

the status of several plants from corporate headquarters or for a plant manager to be automatically emailed or paged when some predefined alarm has occurred.

Conclusion

FurnaceMANAGER is a tool that improves safety by monitoring conditions occurring inside a furnace and notifying personnel to take corrective action when necessary.