CONSPEC® CASE STUDY

Xcel Energy's Harrington Station

When Savage Energy Services began fuel-handling operations in two power plants in Texas, engineers there began to investigate methods to enhance the safe handling of Powder River Basin (PRB) coal. Liberation of carbon monoxide (CO) can indicate the presence of oxidizing coal before a fire begins. Correcting the problem during this incipient phase greatly mitigates the possibility of having a fire.

The cooperative effort to incorporate a CO monitoring system into the power plants began at the fuel-handling systems owned and operated by Savage at Xcel Energy's Harrington Station in Amarillo, Texas, and at Xcel's Tolk station in Muleshoe, Texas. Part of this effort included engineering an overall system design plan.

The system, developed by Conspec Controls, consists of CO sensors, a cable to provide a communications highway, and a central computer station to interpret the data.

FACILITIES

The coal-handling facility at Harrington utilizes an elevated rail and bottom dump coal cars to create a live pile above the underground reclaim tunnel. Large earth-moving equipment is used to maintain and move the live pile for storage and retrieval.

When bunkers feeding the furnaces need replenishment, the live pile is dropped into the reclaim tunnel, moved through a series of conveyor belts, a crusher, and transfers on its way to the top of the storage level tripper deck.

It is common to see burning coal being dropped out of rail cars as a train is being unloaded.

INSTALLATION

Carbon monoxide monitors were initially installed within the reclaim tunnel, crusher building, belt galleries, and tripper deck. Additional units were added to bag houses and bunker locations.

The monitors are tied to a central computer in the main office building, where alarming, trending, and historical storage takes place.

The ventilation fan in the reclaim tunnel was subsequently updated to have a variable speed controller. Operators determined they could save money by running the fan only when needed and increase the speed to a level intended to keep all CO monitor readings held in check during the coal transfer process. While coal was not being moved, the fan was turned off or kept to a very low speed. Whenever the CO concentration rose above a predetermined level, the fan speed was increased.

By adjusting the ventilation fan speed and watching the resulting CO concentrations, operators at the plant realized that more than just the CO level was required to determine whether an active combustion process was occurring. If air movement was also taken into account, a relative measure of CO volume production could be used as the performance measure for alarming.

The Harrington plant incorporates dust collection systems to minimize buildup near belt transfer points. Bag houses, connected to the transfer points by metal ducts, draw air from the transfer points like a large vacuum system. CO monitors were installed in the outlet side of the bag house airflow. In at least one instance, an impending fire was detected in one of the ducts leading to the bag house. Operators noticed an increase in CO concentration at one of the bag house locations. Inspection of the bag house showed no sign of hot zones. The monitor appeared to be intact and working correctly, so inspection of the incoming ductwork began. A hot zone was detected in one of the hoods above a transfer point, and the potential fire was prevented from going any further.

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CONSPEC® CASE STUDY

Xcel Energy's Harrington Station, continued

Following the system installation, a CO monitor located above a storage bunker began showing higher than normal readings. This particular bunker had not been in use for several days, and was thought to be safe due to being empty. Upon further inspection, a hot zone at the bottom of the bunker, near the pulverizer was found and contained. Monitoring of bunker CO levels subsequently was intensified.

In general, the use of Conspec Control's CO monitoring and control system within this coal-handling facility has proved effective at providing an early warning of potential dangers. In particular, hot zones in locations where coal or coal dust accumulate have been detected, allowing operators to take corrective action before the danger becomes obvious.

FINDINGS

Immediately upon installing the CO monitors, it became apparent that readings approaching 100 ppm or more would be seen in the reclaim tunnel whenever coal was being actively transferred. As soon as the coal passed to the next section of belt and left the reclaim tunnel, all readings along the remainder of the system remained below 4 ppm. Thus, it appeared that CO was being created or liberated within the depths of the live pile and followed the path of coal into the reclaim tunnel. Once the CO reached the tunnel, it was nearly all drawn off by the ventilation fan.

The reclaim tunnel is nearly a confined space. Without the ventilation fan, very little air movement would be possible. In contrast, the belt galleries, crusher building, and tripper decks above the bunkers are very open to air movement. The "open" nature of these areas makes it hard to determine whether CO is being created in any appreciable quantity.

Alarm levels for the reclaim tunnel CO monitors were made variable to take into account the levels during coal transfer versus normal idle conditions. Prior to beginning coal transport, operators selected high alarm levels on the central computer and kept them until the bunkers were filled. Once complete, lower alarm levels were reestablished.

Managing the risk of fires at this site has been enhanced greatly by use of Conspec CO detectors at key locations and also by appropriate alarming methods that include dynamic operating conditions.

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