WORLD COAL®

JUNE 2013 - VOLUME 22 NUMBER 06

DON'T WASTE TIME & MONEY COLLECTING DUST. CLEAN YOUR AIR.

martin-eng.com

martin®

COVER STORY

TIME FOR AN UPGRADE

Daniel Marshall, Martin Engineering, US, and David Wetrosky, OPPD, US, explain how a Nebraska power plant has upgraded its coal handling system.

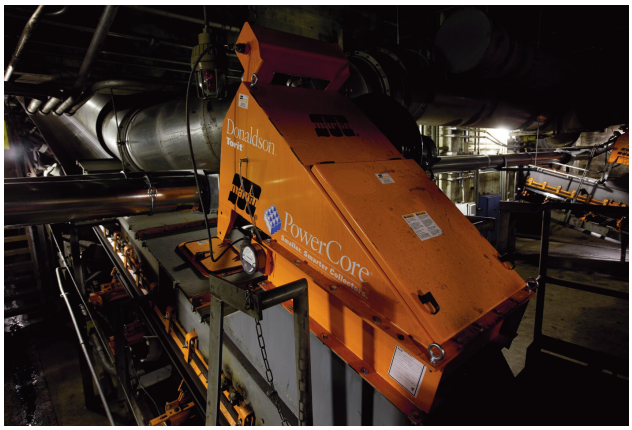
The Omaha Public Power District (OPPD) is one of the largest publicly owned electric utilities in the US, serving more than 350,000 customers in 13 southeast Nebraska counties. Employing 2300 people, the district operates over 15,500 miles of electric transmission and distribution lines. Organised as a political subdivision of the State of Nebraska in 1946, today OPPD has a generating capacity of over 3200 MWe, almost half of which is generated from coal.

As part of OPPD's commitment to best practices for environmental stewardship, the North Omaha power plant, a 646 MWe coal-fired power plant located on the Missouri River north of the city, was converted to burn cleaner, lower-sulfur coal from the Powder River Basin (PRB). Constructed over 50 years ago, the five-unit plant was initially designed to burn Midwestern, high-sulfur coal. In switching to the cleaner fuel, the plant faced some challenges during the conversion process. This included the development of specific dust mitigation techniques required when handling the new material.

While containing less sulfur – and thereby reducing SOx emissions – PRB coal contains higher moisture levels, generates less heat and burns less efficiently than the type of coal it replaced. In fact, although overall emissions have been reduced, the plant now requires more throughput to ensure the same generating capacity. This increases the wear and strain on the coal handling system, as well as the chances for bottlenecks, blockages and fugitive material.

Omaha Public Power District (OPPD) is one of the largest publicly owned electric utilities in the US., located north of the city along the Missouri River.

Transfer point upgrades aimed at combustible dust mediation were needed to improve the overall safety of the plant.



Martin® Air Cleaner at the Omaha Public Power District plant in Omaha, NE.

PRB coal also breaks down easily into flammable dust particles that can remain airborne for long periods. If left untreated, the dust can contribute to potential health hazards or explosion risks. Due to the inherent properties of PRB coal, it is prone to spontaneous combustion despite close control of temperature and an absence of spark or flame.

The five-year plan

In order to optimise the material handling system for the characteristics of PRB coal and address its unique safety hazards, OPPD embarked on an ambitious five-year plan to upgrade the facility's coal handling system.

According to Kirk Estee, material handling supervisor at OPPD, the "plant puts an extremely high dollar value on safety. We have 105 employees here and our recordable injury rate is extremely low. We expect our employees to work safely, and it is our job to ensure each of them has a healthy and safe working environment."

There were 14 conventional conveyor belts between the reclaim system and the bunkers at this power plant, each of them aging and producing spillage and dust. These 14 conveyors were split between three locations: the unloading/reclaim building, the crusher building and the bunker floor. The dust in the unload/reclaim building and the crusher building was being handled by two 150 hp. central dust collectors, while the bunker building was handled by a 125 hp. central dust collector.

While the plant was not capable of upgrading all conveyors at once, plant officials wanted to create a safer working environment. They knew that eliminating dust and spillage would reduce wasted material and maintenance time, while helping to prolong equipment life.

Action taken

To understand the problems and limitations of its existing coal handling systems and prioritise efforts, the plant worked with a Martin Engineering consultant to conduct a safety and materials handling audit. Of particular concern was fugitive material and coal dust control.

The consultant assessed the plant's fuel-handling system, walking the conveyors, inspecting the chutes and other coal handling components to review performance and check for fugitive material and other indicators. This audit revealed some opportunities to upgrade the system that would improve plant safety, while addressing coal dust issues.

The programme started with the first installation beginning in October 2009 and was completed over four phases, finishing in 2012. Specific projects included upgrades to coal transfer points on 12 belts throughout the plant. Martin Engineering supplied components to contain material and improve serviceability.

Overall, the biggest physical change has been the rebuilding of those transfer points. "We once had significant dust and spillage," Estee continued. "But now that all the transfer points have been refurbished, it is a night and day difference."

Extensive work was done to rebuild the stilling zones of the transfer points, replacing the aged steel construction with new, more robust components. Belt support cradles were installed under the drop chutes to protect the belt by absorbing impact and stabilising the belt line to prevent spillage.

Upgrades to the sealing system were also incorporated, with the installation of new impact cradles to further stabilise the load and belt path, as well as a dual-sealing system to contain fugitive material. The system incorporates a primary seal clamped to the steel skirtboard to keep lumps on the belt. A secondary or "outrigger" strip captures fines and dust particles. The secondary seal lies gently on the belt and self-adjusts to maintain consistent strip-to-belt pressure, despite high-speed material movement.

New wear liners were mounted to protect the mild steel chute walls from abrasion, as well as protecting the seal from direct contact with the conveyed material. The programme also included a slight redesign and modification of some of the plant's loading chutes. The simple chute rework improved the material centre loading, correcting a major contributor to spillage issues.

To further reduce the escape of fugitive dust, the plant specified

Martin Engineering upgraded four transfer points and twelve belts throughout the plant.

Insertable air cleaners were added to seven load zones to further reduce the escape of fugitive material.

Martin® insertable air cleaners for six of the plant's load zones to ensure that each transfer point was operating under negative air pressure. Insertable air cleaners can eliminate many of the problems seen with central baghouse collection systems, including long runs of ducting, large enclosures, maintenance difficulties and high power consumption.

Unlike central collectors, the negative pressure delivers airflow into, rather than out of, the transfer points. Because dust travels with air, control of the air resulted in control of the dust. These air cleaners allowed the plant to deactivate two of the older, larger dust collectors in the unload/reclaim building and the crusher building, which were powered by 250 hp. of energy collectively. The central collectors were replaced with seven integrated units, consuming a grand total of 32 hp.

Rather than carry dust-laden air to a central collector, insertable systems filter the air inside the transfer point where they can easily return material to the conveying system. An integrated fan pulls dust-laden air through the filter elements. The air passes through the filter, trapping the particles on the filter element. A reverse jet of compressed air regularly cleans each filter element. This momentary reversal of the airflow dislodges the dust cake back into the main material body.

The new air cleaners have also improved safety at the power plant. "Now that we can use the smaller equipment, we shut down two of the older, central, dust collectors, a design that has a history of explosion hazards," said Estee.

The new insertable air cleaners are only one part in a larger dust mitigation strategy that includes dust containment and other fundamental practices that Martin advocates.

Additionally, Martin installed a Dust Fighter™ foam system to better manage fugitive dust. The foam system mixes and applies consistent dust suppression foam to the load to control airborne particles, while minimising the addition of moisture to the material. The foam system consists of a cylinder with inlets for the air lines and the chemical/water mixture and also outlets that accommodate up to eight nozzles. Duckbill nozzles are set in a cam-mechanism that allows the nozzle to be removed from the chute for maintenance without requiring any tools. The system architecture can be easily automated by including electrical ball valves in the water line at the inlet of the pump module and at the air inlet of the foaming chamber.

Continued inspection

To help ensure that all the components are working properly, Martin representatives visit the plant monthly, walking along the belt lines and inspecting transfer points. Technicians replace wear items, adjust the belt cleaners and confirm correct tension to maintain system performance. The company also maintains a parts inventory onsite to minimise downtime, keeping new seals, belt cleaners and other wear items close at hand. "When the Martin personnel come through every month, they're looking at their own equipment, which they installed. Because they are so familiar with our system, they're able to quickly and efficiently diagnose problems as they arise, often spotting potential issues before they become problems," said Estee.

"Throughout our ongoing relationship, Martin has been consistently responsive, giving us competitive pricing, standing behind their products and ensuring that they operate reliably," added Estee. "They come in, install the components and return not only to ensure that the system is working properly, but they take it upon themselves to look for issues. Because we don't have the time to study all the inherent challenges posed by dust control, Martin makes sure that everything is working as promised," he concluded.

Conclusion

The material handling upgrades at the OPPD North Omaha power plant have been so successful that the Powder River Basin (PRB) Coal Users' Group recently announced the facility has been named as recipient of the prestigious Small Plant of the Year Award. The PRB Coal Users' Group recognises a power plant each year for innovation and implementation of "best practices." The plant will be featured in *POWER* magazine. WC