



High-Tech Dust Control

A New York producer designs a new crushing and screening plant with computers that help dust-suppression measures.



By Rodney E. Garrett

When you think of dust control methods, you don't usually think high-tech. But a dust-control system recently installed at a Buffalo Crushed Stone quarry is remotely controlled by computer — the same computer that also controls processing functions of the new crushing/screening plant where the dust-control system is installed.

Buffalo Crushed Stone Inc. owns and operates

three limestone crushing/screening plants, a slag crushing/screening facility, two sand-and-gravel plants and eight asphalt paving plants.

It was a major financial commitment for the company to replace a time-worn secondary rock-crushing/screening segment at its Williamsville, N.Y., quarry. This is especially so because the new plant was designed with special computer software in mind for controlling the plant.

The new secondary crushing/screening plant is operated one eight-hour shift, five days a week. Production from the existing primary crusher plant is 1,000-st/hr. With severe winter weather the rule in this area of the United States, the

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quarry is shut down about three months during the winter season. To compensate for the yearly shutdown, various products are stockpiled to meet off-season product demands. Aggregates production for the nine operating months is approximately one-million short tons.

It is an old quarry, dating back to the turn of the century. The primary plant is of mid-1970s vintage. However, parts of the secondary plant just replaced were in service for 64 years.

Brooks Systems, Lehigh Valley, Pa., was the designer of the new secondary plant, which was installed in 1996. A team of Buffalo Crushed Stone people, headed by James F. Pfohl, assisted not only in the plant's design but selected all the components such as crushers, screens and conveyors. The same team also selected the computer software used for operating the plant.

Pfohl is the vice president of operations for the company and is both knowledgeable about quarry equipment and its installation. Thus, he was the logical choice to be construction manager for installing the plant. The work was performed both by Buffalo Crushed Stone employees and subcontractors. This included the installation of the components, the concrete work required for foundations, the

mechanicals such as water lines and the installation of the electrical services, PCL circuits and motor hook ups.

Pfohl had plenty of expert assistance from others in the company including the plant superintendent, Tom Rashford, and electricians Bill Marshall and Tom Neuman.

Diverse products

The plant was designed for producing diverse aggregate products. At this time, there are 15 products being made for roadbed applications, aggregates for concrete mixes and aggregates for asphalt paving and Superpave products.

The fugitive dust generated from the quarry processing activities creates a general nuisance to the quarry and its environs. Buffalo Crushed Stone was determined to suppress any fugitive dust because a safe and healthy working environment is a priority for the company. With that in mind, the company concluded that effective dust control was necessary to eliminate any possible health threat.

After careful consideration, a Dust-Buster dust-control system from Martin Marietta Magnesite Specialties was installed on the crushing/screening plant.

The major components making up the new plant are as follows:

1. Six triple-deck Seco screens (three 6-ft. x 20-ft.; one 8-ft. x 20-ft.; two 8-ft. x 24-ft.). All screens are outfitted with TEMA Isenmann urethane media. Urethane screens were selected over wire cloth despite their much higher initial cost. Reasons for selecting urethane screens include their superior longevity and replacement ease, because only worn or damaged sections need be replaced, not the whole screen area. Also, these screens do not blind as often as wire cloth screens.

2. Five crushers (one 7-ft. Nordberg standard cone; two Nordberg 5½-ft. shorthead cones; two Barmac Duropactors (These are vertical-shaft impactors.)

3. One mile of conveyors. (This includes pre-existing conveyors that tie the primary crusher to the secondary plant.)

4. Rockwell Software and necessary PLC (programmable logic controllers). The PLCs employ the hardware architecture of a computer and a relay ladder diagram language. The computer oversees the functions of the rock-processing equipment as they relate to one another.

Some functions of the computer include:

- Controlling the plant lighting.
- Controlling the quantity of rock fed to the crushers by variably regulating the crusher feedbelts' speed.

Foam-injection dust control

The dust-control system installed at Buffalo Crushed Stone's Williamsville, N.Y., plant is designated 49-1024. It features five independent units where each includes a variable-capacity Pulsafeeder chemical pump operated by a Baldor Inverter Drive. There are Valcon water-proportioning orifice valves, water and air solenoid valves, flow meters and a remote 4-20mA current calibrator.

Essentially, as the milliamp signal from the PLC increases, the pumping capacity increases, thus delivering more foam to the aggregates. The object is to apply 0.5 gal/st of the chemical (CDS-8040)/water solution in its foam state at the application points.

This Dust-Buster dust-control system can control airborne dust at all

dust-generated points of a crushing and screening plant as effectively or more effectively than traditional water-spray systems, yet it requires



much less water. The system can control airborne dust using only 10 to 20 percent of the water-quantity required using a typical medium pressure water-spray system.

Low-water application rates means no screen clogging (blinding), and less rock fines adhering to and wearing out the plant's moving parts. As important, the liquid foaming agent produces a foam that is environmentally safe.



The operation's computer system oversees the functions of the rock-processing equipment.

■ Recording continuously updated totals of processed materials at each crusher.

Each crusher is continuously monitored for its function and performance. The software was supplied by Aggressor Controls, Mt. Hope, Ontario, Canada.

DUST-BUSTER®

As already mentioned, effective fugitive dust control is very important to the company. Buffalo Crushed Stone wants to ensure a healthy work environment for its employees and clean air for the neighborhood.

From the start of the new plant's installation, the company tried various water-spray and water-fogging systems. They also considered installing a bag house but this was quickly dismissed. Pfohl says a bag house is cost-prohibitive in a cold/damp area such as Buffalo because it means very high maintenance costs. For example, the bags must be changed often because the dampness causes them to clog.

"We wanted a dust-control system that would be effective," Pfohl says. "To that end, we experimented with different systems. Water and fog systems were monitored very carefully for fugitive dust by our own certified inspectors, who recorded all the data. The results were a disappointment," Pfohl says.

There are 74 transfer points that were monitored. By taking aerial photos of the plant in operation, each transfer point was evaluated for airborne dust. Of the 74 transfer points, 11 points of fugitive dust could not be satisfactorily controlled using the various dust control systems. To solve the problem, Pfohl invited Lin Midyett, technical field rep for Martin Marietta Magnesia Specialties Inc. to evaluate the dust-control problem.

"I had read an article in *Pit & Quarry* about a quarry operation that was successfully using the Dust-Buster system," Pfohl says. "So I called Martin Marietta."

The initial installation was typical for a Dust-Buster sys-

tem. Essentially, it meant the volume of Martin Marietta's CDS-8040 foam dust suppressant/water mix that was applied to the rock being processed was manually controlled. This worked fine, but it required much of an employee's time to constantly regulate the rate of spray at various transfer points, depending on the aggregates production rate. Manually regulating the spray rate meant, at times, too little or too

much suppressant was applied because of fluctuating crushing rates.

For the sake of reducing labor costs and improving the efficiency of the rate applied, it was decided to interface the Dust-Buster system to the plant's computer-control system.

Designing the system

The Martin Marietta engineering team designed the system so it could interface with the computer for a fully automated dust-control system. While Martin Marietta did design a computer-controlled automated dust-control system for a coal-processing plant, it is the first such system designed specifically for the aggregates industry.

As already mentioned, the computer control system regulates the quantity of rock being fed by belts to the various crushers. The feeder belts have variable speed motors that are controlled by the computer.

This has enabled the crushers to be choke fed for improved cubical products. Cubical-shaped aggregates are important for meeting Superpave specifications. If the crusher is not choke fed, the rock crushes into slivers, thus not meeting the Superpave specifications.

The Dust-Buster dust-control has proven very effective for this new plant. It is controlling dust much better than the other systems tried. In addition, the idea of automating the system has paid off, according to Pfohl. For one, it has eliminated the labor constantly required to regulate the foam's application rates to correspond to the various crushers' fluctuating productivity.

Secondly, the rate of foam applied instantly changes in proportion to the changing crushing rates at each crusher, thus controlling the dust effectively for the least cost. Pfohl says, the operating cost, including the CDS-8040 chemical, ranges from 3 cents to 3½ cents/st.

The dust-control system was the right choice for the company. It is controlling airborne dust to the satisfaction of both the company and the regulatory agencies. ☐