

VSI Purchase Broadens Specification Crushing Capabilities for North Dakota Contractor

Parallel Configuration with Cone Increases Production

When Berthold, N.D.-based Gratech Co. Ltd. decided to go beyond crushing aggregate for gravel roads and road base in late 1998, the company's goal was to eventually produce specification material for Superpave projects. The tri-state market Gratech serves -- North Dakota, South Dakota and eastern Montana -- was moving toward Superpave requirements, having already adopted QC/QA requirements for Class Q materials in South Dakota. At the time, the jaw and cone crushers Gratech owned could not produce the necessary crushed fines to meet material specs -- in fact, the company was overproducing rock with its cone in an effort to get the needed crushed fines -- and production numbers were low. Gratech General Manager for Aggregates Max Schriock told Gratech's owner and president, Harley Neshem, what he specifically needed was a VSI crusher.

Schriock says he and Neshem were both aware at that time that the purchase of a VSI crusher would be another step for Gratech Co. in broadening its capabilities for the roadbuilding industry. The company's origins were in earthmoving -- primarily highway work. Any aggregate work Gratech handled related to these early jobs was purely subcontracted. "About 5 years ago, it became apparent to Harley that the company would have a better handle on the entire job if they contracted the aggregate work themselves," explains Schriock. "So they bought a jaw/roll crusher, and then three years ago added a cone crusher to improve the production of gravel for roads. That's when I joined Gratech."



Gratech chose to run the Pioneer 2500 Ultra-Spec VSI in parallel configuration with a cone, which has allowed them to crush spec material at high production rates.

Schriock says during his 35-year history in heavy construction, part of which he spent supplying material for hot mix asphalt plants through his own aggregate company, he had become familiar with VSI crushers. As Gratech moved toward producing materials for hot mix asphalt, he began to collect VSI literature.

"Very few contractors in our area were buying VSI crushers at the time," says Schriock. "They're hesitant to use a VSI because the crusher has a reputation for being very high maintenance. It scares them off and they look at other crusher types."

When Neshem gave a mandate in Winter 1999 that the aggregate division of Gratech must raise production rates and eliminate its fines production problems, Schriock, armed with his stack of VSI literature, began to research the solution.

"I started to talk to dealer salesmen in the spring of 1999, and I realized RDO Equipment Co.'s aggregate specialist Robin Lee (in Minot, ND) really knew a LOT about aggregate production," Schriock says. "RDO represents the Pioneer line, and Robin was trying to sell me on its 2500 Ultra-Spec VSI. As we talked, I discovered the way the Pioneer VSI is built inside is similar to the Spokane VSI, which I was most familiar with. But I was really impressed with the innovations Pioneer has brought to the internal workings of their VSI."

Better rotor design

The Pioneer 2500 Ultra-Spec VSI is a unique improvement over traditional VSI designs because it combines the traditional fully autogenous (rock on rock) crushing with semi-autogenous (rock on steel) crushing through a "hybrid" rock shelf. The result of this innovative rock shelf design is a reverse cascade material flow -- the rock is forced upward. In addition, a redesign of the traditional VSI rotor carbide insert size and location has increased production and reduced wear costs.



Gratech first screens material and then runs it through a twin jaw. After screening it a second time, material goes to both the VSI and a cone.

With the hybrid rock shelf, when the rock exits the rotor in the 2500 Ultra-Spec VSI, approximately two-thirds of it strikes other rock, while the remaining one-third strikes the anvil. As rock exits the rotor at high velocity, a portion is driven upward, past the slope of material retained on the shelf, and positions itself in front of the anvil, effectively providing a wear face. Because of this, material exiting the rotor strikes a protective layer of rock.

In conventional VSI designs, rock strikes rock in mid-air with minimal resistance. In the 2500 Ultra-spec VSI design, the rock being struck is backed by a steel anvil, which provides two benefits: Anvil life is extended due to the protective layer of rock; and, the rock itself -- because it is supported by the anvil instead of being struck in mid-air -- increases the crushing action in the chamber.

In a conventional VSI crusher configuration, anvils crushing abrasive hard rock material typically last about 80 hours. Kolberg-Pioneer initially anticipated their exposed anvil surface also would last 80 hours -- ultimately resulting in 160 to 240 hours of service because the rock was impacting the steel only one-third as much as in a traditional VSI. Instead, the results have surpassed expectations. According to Kolberg-Pioneer Applications Engineer Tim Harms, in applications at producers' abrasive deposits across the country, the 2500 Ultra-Spec VSI ran for more than 1,500 hours with no appreciable wear to the anvils.

A major problem also faced to date with conventional VSI rotors is high wear concentrated at the exit end of the port. "After examining the high number of parts in other machines and the wear patterns of those parts, we determined that by optimizing the size and design of the wear parts in select locations, the result would be a better rotor design with reduced costs for wear-parts replacement," Harms says.

Kolberg-Pioneer's solution was to substitute a smaller carbide strip in a holding base, rather than placing larger carbides within the rotor. The carbide strip in the Pioneer 2500 Ultra-Spec VSI is located where it will most effectively resist wear, but will not be exposed to the effect of ricocheting rock, which can cause premature cracking in larger, more expensive carbides. "To lower wear costs for the producer, we've

put the higher-cost, high abrasion-resistant parts exactly where they are needed," Harms adds.

Exceeding Expectations

Schriock presented his findings to Neshem, and because RDO had a Pioneer Ultra Spec 2500 VSI in its rental fleet, Gratech opted to try the VSI on a rental basis to see if the crusher solved their problems.

After taking delivery of the crusher in June 1999, Gratech's first project for the VSI crusher was to produce 3/8" maximum surface treatment aggregate chips. "This first project was a real learning experience for us, not knowing what to expect in equipment wear and production. We learned right away that we needed to add a magnet ahead of the VSI," Schriock says. "After that project, we used it to produce road base gravel. It was a coarse aggregate base gravel that we needed to produce quickly, and the VSI was available at the time, even though we knew this was an application it had not been designed for."

According to Schriock, the VSI performed well in making coarse gravel, crushing the material better than any expected production.

"For our third project, we needed to produce a surface treatment aggregate, and we ran the VSI parallel to the cone," Schriock continues. "This was a Bureau of Indian Affairs job, and we had tight specifications to meet. We were pleased that we had absolutely no problem making this material at high production rates."

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By end of summer 1999, Gratech was regularly using the VSI in parallel configuration with its cone, making spec product for the Montana DOT. "We had to produce highly fractured material, with a high amount of crushed fines," Schriock notes. "We ran the Pioneer VSI hard, yet it had no problem producing the material. It seemed to just idle along. The addition of the VSI has made it easy for us to get spec material when we run it side by side with the cone. They compliment each other, and we have increased production beyond our expectations with this configuration."

Schriock reports production rates of 130 TPH when the cone is running alone, and in excess of 250 TPH when the VSI is run parallel to the cone. According to Kolberg-Pioneer's Harms, a parallel configuration with a VSI and a cone is becoming more and more the norm for making spec material at high production rates. "In Gratech's case, the material is screened first and then run through a twin jaw," Harms says. "From there it goes to a three-deck screen with 1-1/2", 3/4" and 3/16" screen cloth. Gratech uses the fines as a product, the

3/16" by 3/4" inch material is a product, the 3/4" by 1-1/2" material goes to the VSI and the 1-1/2"-plus material goes to the cone. In a closed circuit, material from both the cone and VSI crushers then go back to the three-deck screen, where it is sized as asphalt products, or returned to the crushers. This configuration allows them to crush spec material at high production rates."

"After running it throughout the summer, we've learned how to fine tune the VSI and it's doing very well for us," Schriock says. "We're controlling our wear costs, which was a concern, given the reputation traditional VSIs have, as I mentioned before. For example, we have changed minimal, if any, iron on the Pioneer VSI in the last five jobs -- and we've been running it to some extremes. We're really pleased with the way this VSI has allowed us to expand our operation. We've eliminated our problems with fines production. We've raised our production rates beyond expectations. And we're bringing in more work because we're now able to offer custom crushing to our customers."