

Vertical Shaft Impactor Helps New Mexico Producer Meet Superpave Specs

When it became clear to Richard Cook that Superpave would soon become a reality in New Mexico, he didn't bang his head on the wall, rail against the new regulations, or lament the fact that life is unfair. Instead, he simply rose to the challenge the same way he has since he took over Espanola Transit Mix from his father in 1950. He found a crusher that could produce aggregate to meet the new specifications, at the same time meeting production demands with low wear costs.

The state of New Mexico has been at the forefront of the Superpave revolution, requiring Superpave specifications on all jobs since mid-1997. The extreme temperature fluctuations and weather conditions that New Mexico roads face, as well as the amount of traffic on these roads, all contribute to the abuse they undergo each year. According to Cook, regulators in New Mexico decided to improve conditions, and they felt Superpave was the way to go.

"The state of New Mexico started imposing Superpave regulations in late 1997, with the majority of jobs calling for Superpave specifications since that time," says Cook. "We knew it was coming, so we started looking for a crusher that could produce material to meet the new



Associated Asphalt Materials' Espanola, NM, crushing plant spread showing the Pioneer 2500 Ultra-Spec VSI. Owner Richard Cook purchased the 2500 Ultra-Spec VSI in order to meet New Mexico's Superpave specifications.

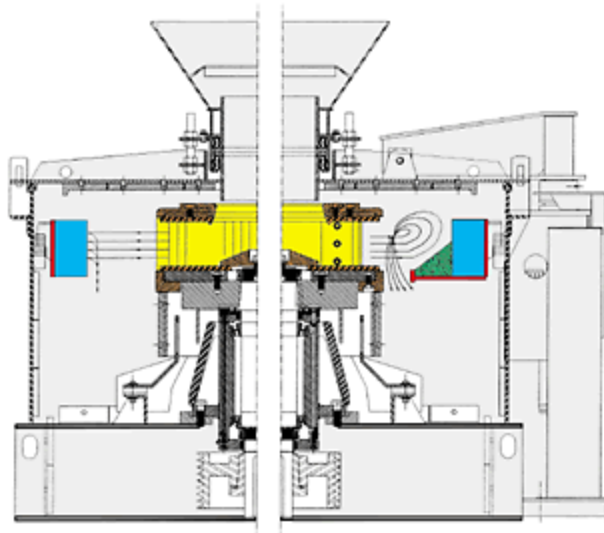
specifications. We decided an impactor would solve the problems we were having with our cones, which were producing too many elongated particles in small rock for (Superpave) asphalt mixes, and not giving us enough production."

Formerly the Espanola Mercantile Co., Espanola Transit Mix, is based in Espanola, N.M., about 85 miles north of Albuquerque and 25 miles north of Santa Fe. It is parent to several subsidiaries, including Espanola-based Associated Asphalt Materials and Industrial Asphalt of Santa Fe. Cook is his own end user, with companies that produce washed aggregate and aggregate for roadways, asphalt and the ready-mix industries - as well as the asphalt itself.

In the midst of Cook's search for the right impactor, Paul Miller, General Manager of Albuquerque-based Aggregate & Mining Supply, asked Cook if he could present a new impactor manufactured by Kolberg-Pioneer, Inc. (an Astec Company) based in Yankton, S.D. The Pioneer 2500 Ultra-Spec Vertical Shaft Impactor (VSI) was a new crusher designed specifically to produce aggregate that would meet Superpave specifications.

Building a Better Impactor

An improvement over traditional VSI designs, the Pioneer 2500 Ultra-Spec VSI is unique in that it utilizes fully autogenous (rock on rock) crushing with a hybrid rock shelf, resulting in 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.



Cross section of semi-autogenous and fully autogenous configurations.

The problem faced to date with traditional VSI rotors is high-wear concentrated at the exit end of the port. According to Kolberg-Pioneer Applications Engineer Tim Harms, "We examined 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 was a better rotor design with reduced costs for wear-parts replacement."

Instead of placing larger carbides within the rotor, Kolberg-Pioneer substituted a smaller carbide strip in a holding base. The strip is located where it will most effectively resist wear, but will not be exposed to the ricocheting rock that can cause premature cracking in larger, more expensive carbides.

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.

"To lower wear costs for the producer, we've put the higher-cost, high abrasion-resistant parts exactly where they are needed," Harms says.

The new hybrid rock shelf, equally important, is a combination of the traditional fully autogenous (rock on rock) and the semi-autogenous (rock on steel) crushing methods. In the 2500 Ultra-Spec VSI, when the rock exits the rotor, approximately two-thirds of it strikes 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 effect, material exiting the rotor strikes a protective layer of rock.

In conventional cascade feed 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. This does two things. Anvil life is extended due to the protected layer of rock. In addition, the rock, because it is supported by the anvil instead of being struck in mid-air, increases the crushing action in the chamber.

Conventional 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 traditional VSI's. Instead, the results have surpassed expectations. According to 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.

"We were convinced."

"Pioneer gave a good presentation, and really sold us on the crusher," notes Cook. "At the same time, we decided to rent for a period of time to make sure the impactor would do what they said it would.

"We were convinced almost immediately," he continues, "and when we knew it would give us the product and production we wanted, we went ahead and ordered one for purchase. We had a six-month rental to get us through the 1997 season, and the 1998 season started about the same time the new impactor was in place."

The original 2500 Ultra-Spec VSI model rented by Cook did not have the hybrid



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rock shelf, which is an optional feature, Cook explains.

"But we ordered the rock shelf on the model we purchased, and we think it has helped with the wear parts considerably," he says. Cook adds that Kolberg-Pioneer voluntarily made more modifications to the overall design of the wear parts in the crusher. These modifications were added to his impactor

several months ago at no additional cost to Cook and they have further improved the impactor's wear costs.

Cook feeds 1" aggregate to the 2500 Ultra-Spec VSI at 300 TPH using a 6 x 20 screen, and makes three products with the impactor: 1/8" to 3/8" crushed aggregate, 3/8" to 1/2" crushed aggregate and crushed fines. He can crush 2500 tons per day in a 10-hour shift. "Production numbers are good," he says. "We could not have

done this well with the cone setup we had at all."

Although Cook has used the 2500 VSI at only his Associated Asphalt Materials location based in Espanola, he plans to move the impactor to his other four crushing spreads in New Mexico as it is needed. "The crusher is fully self-contained with its own diesel motor and it sets up easily," he says. "It is variable speed and is adaptable to different RPMs. I can move the impactor up to 100 miles in one day - which is as far as I have to go to reach any of my crushing spreads - and be set up to crush by the next day.

"The 2500 VSI gives us the shape of aggregate we need to meet Superpave specifications," says Cook. "I know of two jobs we did last year that could not have possibly met specification if we hadn't had the Pioneer impact crusher."