The Benefits of Bevel Gear Technology

ATA Gears collaborates with FLSmidth to successfully keep mining equipment running efficiently

Matthew Jaster, Senior Editor

The Danish company FLSmidth wants to be in constant dialogue with their customers in the mining and minerals industry to develop individual and pioneering solutions for better productivity as well as the responsible and efficient use of natural resources. As the drive is the heart of the crusher, the bevel gear is one of its most important components, making gear quality crucial to the design and manufacture of reliable crushers. This means that FLSmidth wants to use only the best and most reliable partners to supply those gears.

"ATA Gears has been working together with FLSmidth since the 1990's and we have developed new bevel gear designs for several crusher types over the years," said Pentti Hallila, sales manager at ATA Gears.

Hallila said ATA Gears supports its customer base on bevel gear design daily examining everything from efficiency and reliability to performance and assembly. "High power transmission efficiency without big energy losses is always desired, but the top priority is reliability."

Understandable, seeing that these bevel gears need to operate effectively—under a full load with an ideal tooth contact pattern—in harsh environments for an extended period.

ATA Gears has worked closely with FLSmidth on bevel gear design for mining operations for several years. (Courtesy ATA Gears)

History of Bevel Gears/ Gyratory Crusher

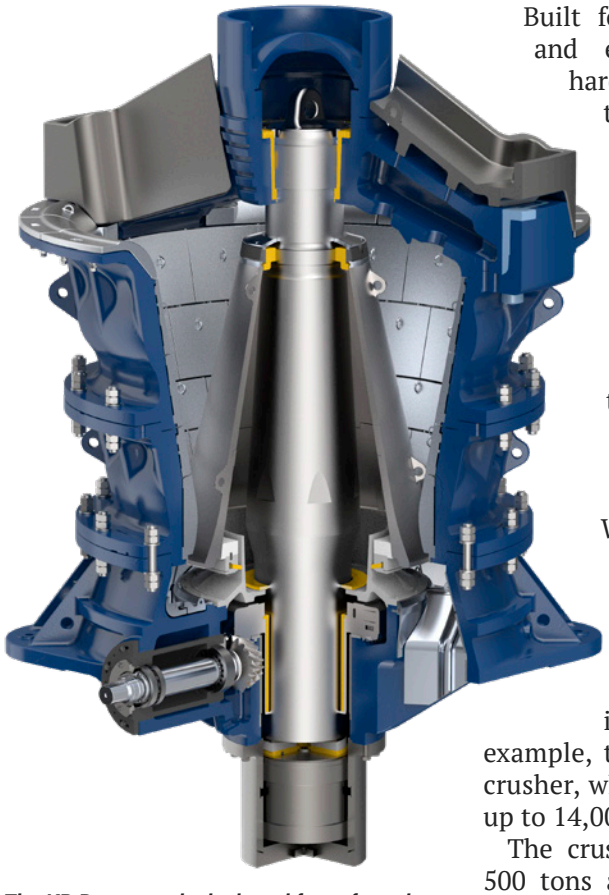
Compared to straight-toothed gears, the advantage of spiral bevel gears is smoother and more gradual tooth engagement. This not only reduces noise but also the impact stress on the teeth. Moreover, spiral bevel gears, unlike straight-toothed gears, don't break under heavy load or at high speed. The first ATA spiral bevel gear was manufactured in 1940. Since then, these specially designed, spiral-toothed gears have become renowned for their superior power transmission capability. Today, ATA spiral bevel gears and bevel gear systems are utilized in marine, industrial and heavy engineering applications that must have high-quality. ATA can produce gears from 50 mm to up to 3,000 mm in diameter—and the optimal unit solution for any requirement.

A gyratory crusher is a machine designed to reduce the size of Run of Mine (ROM) large rocks to smaller rocks, gravel, sand, or rock dust; this is essential for efficient transport of the ore via conveyors etc. (*savree.com*) Crushing is the first of many

stages that lead to separation of the ore from the waste (gangue) material. Waste material can be discarded or recycled allowing the ore rich stream to be further processed at the main plant.

Various types of crushers and mineral separators may be employed depending upon the throughput, hardness, and properties of the ore being processed. In all cases, the crushing stage is essentially achieved by transferring a mechanically amplified force (via mechanical advantage) to a material, to breakdown the bonds which hold the material together.

Gyratory crushers were invented by Charles Brown in 1877 and further developed by Gates in 1881 (they were commonly referred to as "Gate's crushers" in the early years). A primary crusher is designed to receive ROM rocks directly from the mines. Gyratory crushers typically crush to reduce the size of aggregate to a maximum of about one-tenth of its original size.



The KB Pro range is designed for safe and easy maintenance, high performance, and high throughput rates.

FLSmidth Crushers

FLSmidth's commitment to optimizing quality crushers dates to the Traylor and Fuller-Traylor gyratory crushers of the early 1900s. Since then, these crushers have continuously withstood the harshest demands of the world's mines and rock quarries. Through constant improvements in engineering, the company has earned a reputation as a proven and preferred crusher supplier throughout the mining industry.

FLSmidth's Gyratory Crusher Pro series has more than 80+ installations around the globe, operating successfully in all climate zones. This crusher series is designed for high performance and, at the same time, cost-effective operation with low servicing and maintenance costs. The Gyratory Crusher Pro offers customers high-performance crushing operations under toughest conditions from -40°C to 50°C—whether it is the heat of the Australian summer or the cold of the Norwegian winter.

Built for ultimate performance and easy maintenance, this hard rock crusher excels at the crushing of medium hard to hard rock and ore in semi-mobile and stationary processing plants in ore mines and in the natural rock industry. FLSmidth focuses on performance, reliability, and cost-effectiveness in these mining operations.

Upgrading Operations

Working with ATA Gears, FLSmidth has achieved remarkable operative success in the power transmission applications of the mining sector—producing, for example, the new 63-130 gyratory crusher, which has a throughput of up to 14,000 tons per hour.

The crusher itself weighs nearly 500 tons and the diameter of the bevel gears delivered by ATA is impressive, 2.4 m. The shape of the teeth, the meshing behavior and materials have been developed over the years together with ATA´s Gear Doctors in close and highly professional cooperation.

Through the continuous cooperative development over the years, the new bevel gear design allows the installation of higher motor power for the same size of crusher, resulting in higher throughput rates. This helps FLSmidth's customers achieve more efficient energy consumption without needing upgrades or new machines to achieve the same throughput. Moreover, the 63-160 gyratory crusher, which is among the world's biggest gyratory crushers—if not the biggest—offers major savings in maintenance time and costs.

Christian Wibbels, head of purchasing, expediting and inspection (Germany) at FLSmidth is very happy about the cooperation between his company and ATA Gears.

"Thanks to ATA's gear design, in service situations, the pinions can be assembled and disassembled without moving gear wheels axially. This feature has reduced assembly time of our gear drives by more than 50 percent. Also, downtime due to maintenance at mining sites has been significantly reduced," Wibbels said.

Tooth stress distribution, dynamic behavior, sliding speeds, flank temperatures and tooth backlash are all important considerations to optimizing crushers and other mining equipment. These demanding conditions require dependable and sustainable gears for record-breaking operating times and quality rates.

"In the future we will see larger power transmission capacity, increased gear size, higher accuracy, optimizations, high grade materials, reliability, and more stringent quality assurance," Hallila added.

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