

DuPont™ Kevlar® Conveyor Belt Carcass Offers Mining Giants Better Throughput and Less Maintenance

A conveyor belt tough enough to stop a bullet?

Codelco (Corporación Nacional del Cobre de Chile) is the world's number one copper mining company, with a 2013 copper output of around 1.6 million tonnes. To stay on top, Codelco's Andina Division managers are always looking to improve their systems. They knew DuPont™ Kevlar® fiber was used for ballistic protection in body and car armor, so when they heard it was also used to reinforce mining belts, they were intrigued. How well would the super-tough material stand up to copper ore's razor-sharp edges in the glacial climate of their Andina, Chile operation? For miners, frequent conveyor belt replacement is a fact of life, so any potential means of lengthening belt lifespan, decreasing maintenance costs and downtime, and/or sustaining increased throughput is worth exploring.

Lighter weight than nylon/polyester or steel, with excellent performance.

Kevlar® fiber offers a number of advantages over nylon/polyester (EP) cord or steel, particularly for this mine. For one thing, copper is one of the sharpest ores, and even single-ply Kevlar® fiber resists cutting far better than 5-ply polyester/nylon, increasing the lifespan of the belt while decreasing its weight and thickness. In addition to requiring less maintenance, lightweight belts made with Kevlar® can run faster without straining the system, thereby increasing throughput and reducing energy consumption.

Greater flexibility and better resistance to the elements.

At 3000-4200m elevation, this Andes mine experiences extreme cold, which can make a rubber belt cover harden, adding shock and distress to the carcass. With no glass transition temperature, flexible Kevlar® fiber does not become hard and brittle as polyester/nylon or steel fibers do, and therefore can last longer despite the low temperatures. The flexibility of Kevlar® also allows a conveyor belt to form a greater trough angle, further increasing transport capacity by helping prevent materials from sliding off, even at higher speeds.

Low maintenance for lower costs and decreased downtime.

Despite their flexibility, belts made of Kevlar® fiber exhibit very low creep. Since they hardly stretch once installed, belts containing Kevlar® rarely require re-splicing, a process which typically consumes a whole day. This stability, combined with Kevlar® fiber's toughness, helps reduce maintenance outages.



Additionally, small damages are easier to repair, averting complete plant shutdowns to replace an entire belt, since a carcass made with Kevlar® is provided in textile form. This format helps prevent cut propagation and offers better slit resistance than steel cable conveyor belts, which typically don't have reinforcement in the weft direction.

“In mining, conveyor belts must go down into the bowels of the earth. Copper ore is sharp and hard on equipment used to extract it. The belts we have installed with DuPont™ Kevlar® fiber are durable and strong; they make a great impact on our production.”

—Patricio Porta, Analyst Specialist-Operations,
Management of Plants, Codelco Andina Division

Kevlar® fiber shows its strength.

To try out a belt made with Kevlar®, Codelco Andina Division replaced a 48-meter conveyor belt containing a 5-ply conventional nylon/polyester (EP) cord carcass with a comparable belt containing a single-layer DuPont™ Kevlar® Advanced Performance™ (AP) fiber carcass.

Belt Specifications

48 meters long x 1.83 meters wide

3300 N/mm

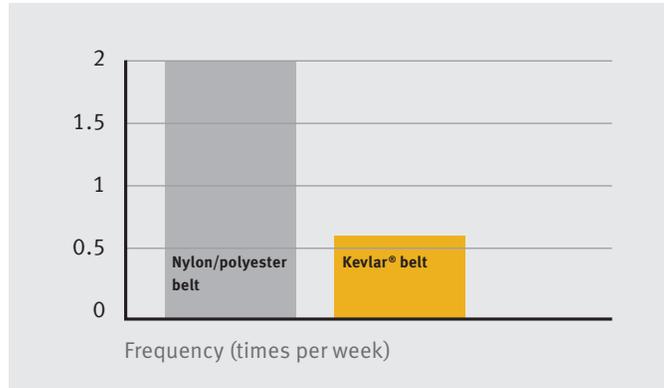
Installation of the new belt was surprisingly quick. Belts made with Kevlar® fiber are easy to integrate into an existing setup, because unlike polyester/nylon or steel, belts made with Kevlar® can go on almost any size pulley or system without reconfiguration. And because Kevlar® straight warp fabrics are lighter and thinner than 5-ply polyester/nylon or steel, longer stretches can fit on a single transport spool, meaning fewer time-consuming splices are needed to create a belt of any given length. Not only that, but Kevlar® carcass splices do not require the lengthy cure times needed for thicker, multi-layered, 5-ply polyester/nylon splices.

Elevated throughput with decreased maintenance costs.

Codelco Andina Division has ordered two more belts containing Kevlar® for future use. This performance data shows why: for this application, throughput increased almost 20% per day while annual maintenance costs were reduced 60% for this installation.

Maintenance data contrasting the old polyester/nylon conveyor belt vs. belt made with Kevlar®.

Codelco Andina Division Maintenance Comparison
5-ply nylon/polyester belt vs. DuPont™ Kevlar® containing belt



DuPont Shares Valuable Experience

High-quality finger splicing is the best way to distribute a conveyor belt's energy, reduce strain on the system, and increase belt lifespan by ensuring that the splice stays intact. As part of their customer service, DuPont enlisted the help of local partners to provide Codelco Andina Division with technical training and process improvement consultation pertaining to this particular splicing technique.

For more information on how Kevlar® can help increase productivity at your mine, go to kevlar.com