



ECO Green

# Powering the tire recycling evolution with Hägglunds

**U.S.-based ECO Green ([www.ecogreenequipment.com](http://www.ecogreenequipment.com)), North Salt Lake, Utah, sold its first tire recycling equipment when its founders sketched their concept on a napkin during dinner with a prospect in 2001. Since then, the company has met evolving demand by developing next-generation equipment, including its ECO Krumbuster® cracker mill, a fine rubber processing mill powered by Hägglunds direct drive hydraulic motors from Bosch Rexroth.**

## **MEETING THE NEEDS OF A FAST-EVOLVING GLOBAL MARKET**

Every year millions of tires are broken down into rubber crumb that is used to manufacture other goods, like athletic surfaces, rubberized asphalt and commercial flooring. In particular, larger rubber

crumb, which is typically processed to sizes ranging from 5 mesh to 30 mesh, is used to make products like artificial sports fields and play surfaces.

There is also increasing global demand for commercial quantities of finer crumb rubber sizes or powder, such as 50 mesh material, which is about the size of table salt. Finer sizes can be mixed with recycled plastics to make plastic rubber pellets that can be injection molded or extrusion molded into a range of products.

Even smaller crumb rubber can be used to make asphalt binding or mixed into roofing materials like epoxies – applications that tend to bring the highest value for the rubber material. As a result, tire recyclers are looking for more productive milling machines, including alternatives to more traditional gearbox-driven equipment, that can efficiently and cost-effectively grind these smaller crumb particles.

These trends create challenges for many tire recyclers because traditional gearbox-driven mills are built to process mostly larger crumb rubber sizes with the smaller crumb being a by-product of big crumb processing. This is not an efficient way to produce small crumb in large volumes. For example, the production of 400,000 pounds of 8 mesh to 18 mesh may generate roughly 100,000 pounds of -20 mesh crumb; however, the

amount of small crumb byproduct produced with traditional equipment is not enough to fulfill the growing need for the smaller sized materials. The ECO Green Krumbuster® allows the processor the flexibility of producing very high volumes of both larger and smaller crumb rubber sizes with minimal effort required to change nip (roller spacing), friction ratios, and roller corrugation design, thus offering the best option for both large and small crumb rubber production.

### MEETING DEMAND

ECO Green designed its patented ECO Krumbuster® Fine Grinding Mill to process wire-free and fiber-free tires, which previously have been processed into rubber chips 6 mm or smaller, into rubber powder down to 0.850 mm and smaller, depending on the screening. The capability of this next-generation cracker mill to process rubber into finer material allows tire recyclers to take potentially unusable large crumb rubber and produce smaller, higher-value material that aligns with this upward demand.

“Our mission at ECO Green has always been to make tire processing equipment more efficient, as well as less expensive and easier to maintain.



The direct drive hydraulic motor delivers the full energy of operation to the shaft being driven and uses the hydraulic fluid as the medium to absorb the surges and drops, rather than having mechanical gears that lash in a gearbox system.

That's what made our investment in developing this type of solution a natural evolution for our product line," said Bruce Bart, ECO Green Equipment North American sales manager.

Although the ECO Krumbuster® has evolved since it was first introduced, the hydraulic grinding mill has always operated with two corrugated rollers, one small and one large, each powered by a compact and powerful Hägglunds CA 100 direct drive motor from Bosch Rexroth.

### HIGH PERFORMANCE

In a tire grinding mill, each of the two rollers operates at a different speed to grind the tire rubber into usable crumbs. The speed differentials, or friction ratio, help determine the quality and size of the crumb being produced. One significant advantage to using Hägglunds direct drive technology is that it allows operators to run the mill's rolls at much higher speeds than a gear-driven mill, so the mill can produce a wider range of sizes, including smaller crumb.



Larger rubber crumb is used to make products like artificial sports fields and play surfaces. There is increasing global demand for commercial quantities of finer crumb rubber (lower right) which can be used in a range of higher-value products.

Hägglunds technology also allows the ECO Krumbuster® to produce roughly 1,500 to 1,800 pounds per hour of -30 mesh crumb — about three to five times the additional material output per hour over a mechanical mill. According to Bart, "With the Krumbuster, our customers can run the roll so much



## Direct Drive Hydraulic Motors

When the motor is mounted, its cylinder block is fixed on the drive shaft using the through hole at its center. The cylinder block becomes one with the shaft, with its pistons radiating outward toward the cam ring. During operation, oil is pumped into a connection block, which in turn distributes it to the cylinder block and pistons. This causes the pistons to act against the cam ring, producing a momentum that makes the shaft rotate smoothly. The speed of the shaft's rotation is determined by the flow of oil, and the direction of rotation is changed by reversing the direction of flow through the inlets and outlets. Since the motor itself has a very low moment of inertia, all starts, stops and speed changes are directly controlled with the oil flow.

faster using the Hägglunds motor, and then back down the speed of the other roller as well. That gives customers a high 80:1 friction ratio that's simply not available with traditional gear-driven mills."

### DIRECT DRIVE DELIVERS

One of the primary challenges in designing a mill for shredding applications is to account for shock loading. During production of crumb rubber, the mill is subject to varying levels of feed load into the system, which creates pressure drops or load spikes depending on how much or how little material is loaded. The drive must be able to respond to the shock load without undue wear and tear on drive components. Failure to compensate for this can lead to considerable costs from breakdowns and downtime.

The Hägglunds motor can better adapt to these shifts because it uses direct drive technology, in which the hydraulic motor is mounted directly to the drive shaft, eliminating the need for gear reducer,

belts, chains or sprockets. The unique design delivers the full energy of operation to the shaft being driven and uses the hydraulic fluid as the medium to absorb the surges and drops, rather than having mechanical gears that lash in a gearbox system.

Hägglunds direct drive systems also offer superior speed and directional control compared to gearbox-coupled drive solutions. Since the variable flow of oil from the pump determines the speed and direction of the drive, speed and directional control are not compromised by the limitations of the electric motor. And due to the hydraulic motor's low moment of inertia, the response is almost instantaneous. With this design, customers can feed material up to two or three inches deep along the entire length of the ECO Krumbuster® roller. The motor's resistance to shock loads and its ability to easily start, stop and reverse make it ideal for this type of application, which requires robust components.

In addition, the CA 100 consumes at least 30% less power than big mills, which often run direct drives up to 250 horsepower. "The efficiency of the Hägglunds motors helps optimize the efficiency of the entire system, much like a race car is built with optimal parts from each manufacturer," said Jaime Sabogal, market segment manager for Hägglunds.

#### **LOW MAINTENANCE, HIGH SERVICE**

An additional aspect Bart likes about using Hägglunds is the simplicity and ease of maintenance. "Not having to replace gearboxes is always a good thing, and the reliability has been outstanding," he said. "We haven't had many issues with Hägglunds,

but when something does come up, their engineers work with us to resolve it very quickly. That makes us happy, and it makes our customers happy."

Hägglunds' long reputation for building reliable, quality motors also helps sell ECO Green products. "When people see photos of that orange motor in the brochure or see the machine at a trade show, they immediately recognize that it's a Hägglunds," said Bart.

"Even though our cracker mill has evolved over the years as we implement new technology improvements, the Hägglunds motor continues to be the best choice for powering all versions of our ECO Krumbuster®," Bart added.

#### **SUMMARY**

##### **POISED FOR THE NEW EVOLUTION IN TIRE RECYCLING**

As the needs of the global market rapidly change, the ECO Krumbuster® incorporates precisely the compact yet powerful hydraulics needed to meet the rigorous demands of tire recycling. With its long history in the recycling industry as well as its dependable technology and expert support, Hägglunds serves as a valued partner for companies like ECO Green, who are at the forefront of an industry impacting sustainable practices. ●