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Vecoplan's HiTorc direct drive boosts shredding efficiency and requires significantly less maintenance:

The Tesla of motor drives

When shredders have to work long and hard, Vecoplan relies on its proven HiTorc direct drive. A controller integrated in the frequency converter ensures that the optimum torque is available at the rotor shaft at all times and in all operating conditions. As a result, the drive is extremely energy-efficient. What is more, this purely electrical solution requires no clutches, belt drives or flywheels, which means that maintenance costs are significantly reduced. The HiTorc drive has proved itself over many years, giving Vecoplan a clear technological lead on the market.

"We're working at all times to satisfy the growing demands of the market," says Martin Baldus, development manager for industrial shredding at Vecoplan AG. "We provide our customers with cost-efficient systems that give them long-term benefits." The company, which is based in Bad Marienberg in Germany's Westerwald region, develops, produces and sells machinery for shredding, conveying and processing primary and secondary raw materials in production and recycling. Shredding is becoming an increasing challenge. "Our customers' machines often run around the clock, sometimes seven days a week," says Baldus. The shredders' tasks include preparing material for the combustion furnaces in cement works and efficiently processing packaging made from plastic, metal and composite materials collected in bags. Household waste is another input material. Shredders can also process wood waste, used wood and root balls – material that is often contaminated with impurities. "Downtimes of these systems can be very expensive for operators," adds Daniel Kessler, head of electrical engineering at Vecoplan. "The machines must therefore be robust, resistant to contaminations, reliable and low-maintenance." The rotor drive is a key element. "We recommend dynamic, high-torque, quick-start drives in the HiTorc series especially to those customers who have continuous operation."

Proven over many years

Vecoplan's engineers came up with the idea for the HiTorc drive concept almost 20 years ago when searching for a more efficient drive for shredding equipment. Shredders had to take on tougher and tougher jobs, and the machines were becoming bigger and bigger. This also had an influence on the types of drives that could be used. They had to be suitable for increased throughput and deliver enough torque to handle foreign material. Wolfgang Lipowski, the design manager at that time, ran across an article about synchronous motors more or less by chance in an engineering journal. He was impressed by their power and acceleration. Their ability to start up quickly after braking seemed ideal for shredding. A further advantage of these drives is that they produce the necessary torque by means of a magnetic field that acts directly on the shredder shaft. Unlike conventional electric motors, they do not require a gearbox and instead rely on a frequency converter. "Gears always mean friction," explains Baldus. "Extraneous material causes shocks in the shredding process that must be absorbed by the flanks of the gear teeth or the drive belts. These components wear out and have short maintenance intervals. The service personnel have to replace them on a regular basis."

To find a suitable partner to build the motors, Vecoplan contacted the company Oswald Elektromotoren GmbH in Miltenberg. "Together with KEB Automation KG, a manufacturer of frequency converters, we developed a concept for drives in all the required sizes and brought it to maturity," says Kessler. The HiTorc was born. Vecoplan launched its combination of a synchronous electric motor and frequency converter onto the market in 2005. The solution was unique – a slow-running electric direct drive for shredders.

Dynamic start-up, even with a full machine

The HiTorc drive has no mechanical components like belts, gear wheels, flywheels or clutches. This makes the shredder much more robust. "A single unscheduled stoppage caused by a broken shaft, burnt overload clutch or defective gear is enough to justify the use of a HiTorc drive," says Baldus. "The drive significantly reduces both maintenance costs and downtimes."

In the absence of the above mechanical components, the flywheel effect from the solid steel rotor and the motor torque can be combined for high efficiency. "Sluggish drive trains are a hindrance," explains Baldus. "Conventional drive systems usually aren't able to start up again if a full shredder has to brake," says Kessler. "A worker first has to clean out the machine by hand." In contrast, with its considerable power, the HiTorc improves the start-up and reversing behaviour because the mass moment of inertia in the drive system as a whole is

significantly reduced. The high availability of the torque enables problem-free start-up under load, i.e. when the shredding area is full. The operator can restart the machine at any time simply by pushing a button. There is no need to empty the hopper.

Thanks to continuous speed analysis and electrical current evaluation, the fully automated control system can detect machine overloads at an early stage of the ongoing shredding process. If an obstruction is encountered, the rotor shaft stops in just a few milliseconds. This prevents damage to important parts. After a short counter-rotation, the Vecoplan drive turns in the required direction again in a few seconds. "A shredder equipped with the HiTorc has a lively response like an electric car," says Kessler. "It can achieve a high torque from a standing start without first getting up to a certain speed."

Significantly better efficiency

The HiTorc drive is considerably more efficient than systems with gears. The absence of mechanical drive elements alone accounts for a gain of about ten to 15 percent. This factor makes the synchronous motor especially efficient under partial loads. During idling it draws only about a tenth of the power required by a comparable asynchronous motor. Situations like this are especially common with inhomogeneous materials and irregular input. "All in all, users benefit from lower energy consumption," says Kessler. "Energy savings of up to 40 percent are possible as compared with other electromechanical drives. For hydraulic drives, the figure can be as high as 60 percent. Some Vecoplan customers have saved as much as 50,000 euros per year."

Matched to the application

Vecoplan offers HiTorc drives in various performance classes, depending on the application. "We find the right combination of frequency converter and direct drive motor based on the output, torque and rotor speed required in the given case," says Kessler. Bag openers, for example, turn very slowly because the main job of the machine is to open waste bags. A fairly large torque is required here. Re-shredders usually turn faster. The VEZ 3200 TT, for example, is powered by two synchronous drives, each with a peak torque of 110,000 newton metres. In optimised master/slave operation, the drives are regulated via two frequency converters in extended vector control mode. The controller integrated in the frequency converter ensures that the optimum torque is available at the rotor shaft at all times and in all operating conditions. The speed- and torque-dependent control enables economical operation. Torques are available when they are needed. Power is also reduced if it is not required for the shredding process.

Another advantage of the HiTorc drive over competitors is its compact size. It occupies less space, which is advantageous for the machine design. The drive is also easier to install because no alignment work is necessary.

Not always, but very often

What applications is the HiTorc drive ideal for? Martin Baldus doesn't have to ponder long. "Continuous multi-shift operation is clearly where the HiTorc is superlative. Here it is the Tesla of motor drives."

The HiTorc drive has enjoyed a very positive reception on the market. "It is certainly one of our unique selling points," says Baldus. "The excellent reputation of this drive concept has often brought customers to us. But ultimately, the decisive factor was our overall solution for their particular application." And how long does a drive in the HiTorc series last? "On occasion we've had to replace a few roller bearings after five or ten years," says Baldus. "But otherwise it will last forever." Recently he talked with a customer who had three shredders in use with a total of six HiTorc drives. "To date, they've racked up 25,000 operating hours and are running trouble-free." Another customer with a very demanding application didn't have to replace the HiTorc until after 58,000 operating hours. "The customer had only done the usual maintenance; during that time we never had to overhaul or repair the motor."

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Captions:



Photo 1: Shredders efficiently process packaging made from plastic, metal and composite materials. Household waste is another input material. The rotor drive is a key element.



Photo 2: Vecoplan has relied for years on its proven HiTorc direct drive.

Photo credit: Vecoplan AG

You can download the high-resolution images [here](#).

Vecoplan AG is a leading manufacturer of machines and systems for the resources and recycling industry for shredding, conveying and reprocessing wood, biomass, plastics, paper and other recyclable materials such as domestic and industrial waste. Vecoplan® develops and manufactures the systems and components, and sells them worldwide in the wood reprocessing and waste processing industries. It currently has around 380 employees at its locations in Germany, the USA, Great Britain, Spain and Poland.

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