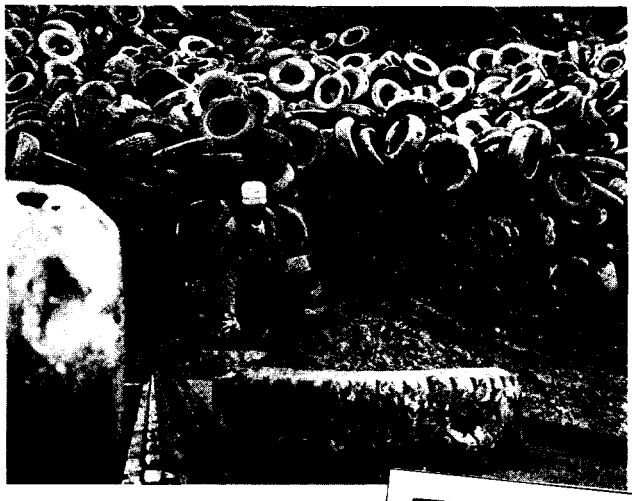
TIRE SHREDDING ISN'T THAT EASY

Sure, waste tires can be shredded, and the chips sold as fuel. But can shredders be protected against damage from steel belts?



Terminal Tire's 12 tpd shredder may soon put to use its mobility.

Terminal Tires, Inc. (Sterling, Va.), which operates a tire pick-up service for dealers and landfill operators in the Washington, D.C., metro area, has been able to turn the worst-quality segment of the area's waste tires into a resource.

Used tires are taken to the company, where they are separated and sorted by quality. Some are repaired and sold as high-tread used tires; others are sold to "recappers."

What about the remainder? These are fit only for disposal; or, they could be shredded and sold as fuel. At least, that's the strategy that Scott Fitzwater, Terminal's vice president, pursued.

Buyers of the shredded tires, mostly nearby Virginia paper mills, will not accept tire pieces bigger than two square inches. Fitzwater, a civil engineer, designed a two-stage shredding operation to produce a tire-derived fuel product that meets his customers' requirements. Terminal's system uses two industrial shredders, equipped with gear reducers and fluid couplings that deliver the high torque levels and cutting capabilities needed for this difficult application.

Stage one: avoiding jams

In the first stage, the tires are manually loaded onto an infeed conveyor, which dumps them into the cutting chamber of the Lexxel shredder (from Champion Products, Minneapolis). The shredder's 75-horsepower (hp) electric motor is driven through a Falk-Sime fluid coupling, which is connected to a Falk shaft-mounted double reduction gear drive that drives the low-speed output shaft at 22 rpm.

A tremendous amount of torque is needed to turn the cutters; most of the tires are steel-belted, and all contain thick-gauge bead wire (steel cord) on the inside rim edges. In fact, the machine will sometimes "jam" when loaded with truck tires, if two bead-wires are caught simultaneously in the cutters.

But actually, the machine is designed to avoid jams. It automatically "reverses out" rejected tires back into the cutting chamber. The Falk-Sime fluid coupling has a speed sensor that will trigger the reverse-out mechanism when the low-speed shaft is turning below a pre-determined speed. Power to the shredder is automatically cut upon completion of the reverse-out; a manual restart is required before the tire can again engage the butting blades.

The shredder's fluid coupling also ensures a smooth, soft, cushioned start. The torque delivered to the shredder starts at zero and gradually increases as the fluid coupling impeller accelerates. When the output torque of the fluid coupling exceeds the break-away starting torque of the shredder, the shredder picks up speed — uniform power is transmitted to the gear reducer at maximum efficiency.

To keep the shredder compact in physical size while still allowing it to deliver the needed power, fluid coupling power is transmitted through a shaft-mounted gear reducer. This reducer, also from Falk (located in Milwaukee), is a double-reduction unit, with a 25:1 ratio. This drives the low-speed shaft at 22 rpm and delivers the high torque needed.

Note that the output of the first-stage shredder is tire chips sized roughly at one foot by three inches.

Stage two: secondary shredder

In the second stage, shredded tire output is conveyed to a secondary Lexxle shredder. This smaller unit is equipped with a 25 hp motor and is driven by a Falk shaft-mounted gear drive. The secondary machine shreds the tire pieces down to their final approximate two-square-inch size.

Bead wire and other non-rubber materials are separated out following the second shredding operation. However, wire from steel belts is left because its small gauge allows it to burn with the rubber. Output is conveyed into a trailer. Every other day a load is hauled to a paper mill.

Plans for future growth

Terminal Tire's shredding operation is located in Callaghan, Va., near the West Virginia border. However, the shredding system is portable, and the company may put that mobility to use in the future.

Terminal shreds about 12 tpd of tires. Most of the shredded mass that is produced is sold to one major paper mill. Fitzwater is also planning to boost production with the purchase of another shredder in the near future.

Although the machine now on hand is powerful enough to cut truck tires, current production is limited to the shredding of automobile tires; the thick gauge of truck tire bead-wire takes too much toll on the cutters, diminishing their effectiveness. Fitzwater is in the process of purchasing machinery that will cut out the bead-wire before tires are conveyed to the shredder. ■