

# Voith SafeSet Couplings Prevent Catastrophic Failure at City Scrap & Salvage

Edited by Matthew Jaster, Senior Editor

**City Scrap & Salvage, Akron, Ohio, began operation in 1947 as a small, family-owned scrap yard.** For three generations, the company has provided a place where everyone, from large corporations to residential neighbors, can exchange scrap metal for profit. From automobiles and auto parts, to aluminum siding, stainless steel and appliances, City Scrap has the technology and equipment to meet a variety of scrap metal needs.

The organization boasts the area's only automotive shredder. This shredding machine has two, 1,500 hp natural gas engines, known as 'Thunder Pumpkins.' These gas engines are designed to perform reliably in isolated, mission-critical, and demanding applications. Featuring a durable design, these flexible 'rich-burn' and 'lean-burn' alternatives cover a wide variety of applications and varying emissions compliance levels. They are specifically designed for demanding industrial applications and backed by more than a century of engine-building experience.

## Retrofit Saves the Day

When City Scrap & Salvage experienced a catastrophic failure of the driveline between the motor and rotor of its automotive shredder, the company called on Voith Turbo for a potential manufacturing solution. Without torque overload protection, an unshreddable item entered the shredder and the machine stopped suddenly. The inertia continued, causing unexpected damages and machine shutdown.

Voith offered a solution to City Scrap & Salvage to prevent unshreddable items from causing large-scale damage, by installing a protective line of security against torque overload. Voith's SafeSet torque limiting coupling was chosen.

Kyle Kluttz, vice president, new business sales, Voith, said that the SafeSet torque limiting coupling was created to prevent costly damages, shutdowns, and downtime. This retrofit to the existing automotive shredder gave Voith an opportunity to demonstrate the value of its SafeSet products.

According to Kluttz, SafeSet torque limiting couplings prevent machine damage in high value rotating equipment.



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They work like a mechanical fuse in the driveline by protecting the system from costly breakdowns.

SafeSet only releases when the set torque is really exceeded. This allows the driveline to always operate at the maximum level, without risking damage from overload. The set release torque remains constant over time, regardless of the number of load cycles. SafeSet provides accurate protection throughout the life span of the driveline and avoids unnecessary downtime and repairs.

The SafeSet coupling includes a twin-walled hollow sleeve. Friction is generated upon expansion by pressurized hydraulic oil. The integrated shear tube holds pressure to ensure a constant but easy adaptable torque transmission. In an overload situation the SafeSet slips and the shear tube shears off. Oil pressure drops and the frictional surfaces separate. Then the SafeSet rotates on the bearings without transmitting any torque. Torque capacity is available between 1 and 20 000 kNm. These couplings run on the simple principle of friction and flexibility—there’s no material fatigue, a constant torque transmission and adaptability.

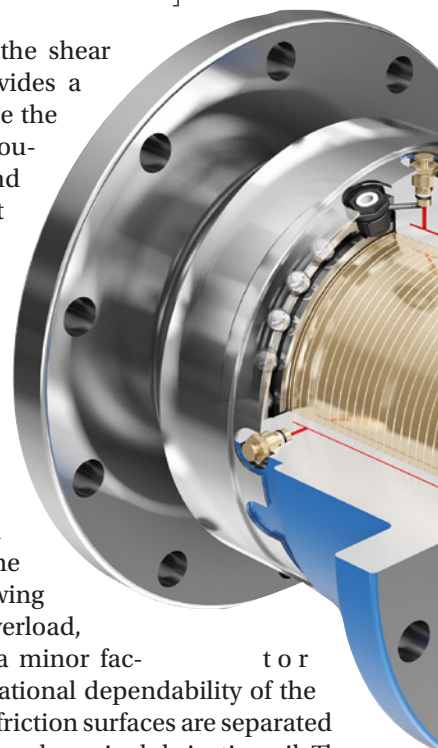
**Design Specifications**

The basic hydraulically pressurized, friction-based torque limiting coupling is made up of an inner and outer sleeve that are assembled and welded at the ends. This assembly forms a twin-walled hollow sleeve which can be oil pressurized up to 1,000 bar/14,500 psi after the machining of the necessary pressurization and shear tube ports have been

completed. The design of the shear tube and mating seat provides a reliably sealed system, while the size of the torque limiting coupling determines the size and quantity of shear tubes that are to be used. The friction surface is specially treated to prevent wear during the slip phase of the coupling release. Once the SafeSet coupling has released it rotates on bearings preventing wear on those friction surfaces.

The bearings remain static during operation. The bearings only rotate following a release due to torque overload, which makes bearing life a minor factor when considering the operational dependability of the coupling. The bearings and friction surfaces are separated from the pressurized sleeve and require lubrication oil. The lubrication oil is used for two things: Bearing lubrication during a release condition, and to maintain a predictable friction coefficient across the friction surfaces which results in a precise release torque relative to the applied pressure.

Another advantage is that torque limiting couplings have



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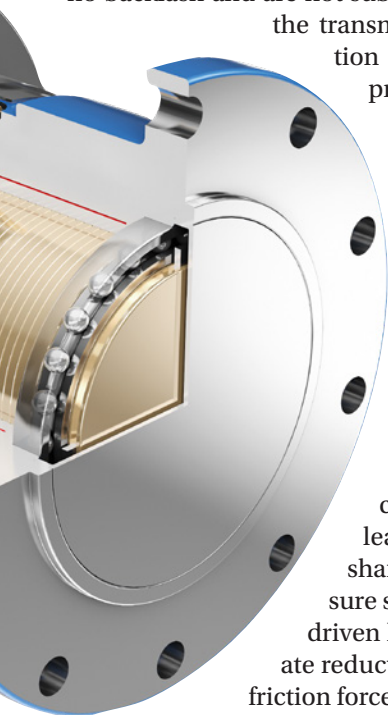
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no backlash and are not subject to material fatigue because the transmitted torque is through a friction surface. The applied hydraulic pressure generates a defined frictional force between the pressure sleeve and the shaft. The applied pressure determines the release torque of the coupling. Therefore, an increase or decrease of applied pressure, working within the torque limiters adjustment range, will result in an increase or decrease of the release torque.

If the operating torque exceeds the pressure-based release torque setting, the driving shaft will rotate relative to the pressure sleeve which is connected to the driven load. This results in an immediate reduction in applied torque when the friction force changes state from static to dynamic. The shear ring that is fixed to the driving shaft rotates relative to the pressure sleeve and breaks off the top of the shear tubes. Upon contact, the oil pressure in the coupling drops and the applied frictional force in the coupling is reduced releasing the torque limiting coupling



and providing full separation of the driving and driven components of the drive chain.

### Back on Track at City Scrap

The SafeSet disengaged the driveline a total of four times in 40 months, each time protecting the driveline from catastrophic damages at City Scrap. The initial investment was paid back with the first torque overload within 12 months of start-up. The coupling disengages the shredder driveline upon sudden unplanned stops due to unshreddables.

Sudden stops create a high torque event that stresses drive components resulting in damages, reduced life, and ultimately catastrophic failure. Even worse, catastrophic failure creates a life-threatening safety hazard for shredder operating personnel.

Thankfully, the retrofit coupling solution allows the automotive shredder to do what it does best—smash, crush and grind metal down to smaller, more manageable pieces. **PTE**

#### For more information:

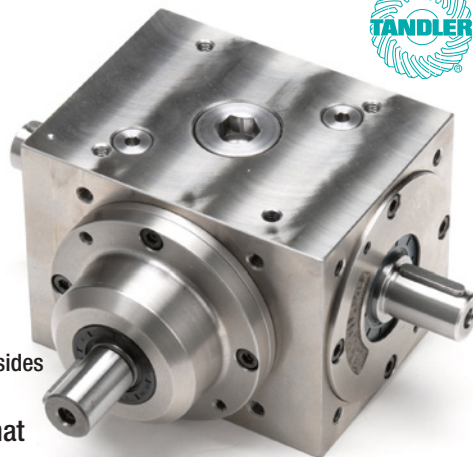
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