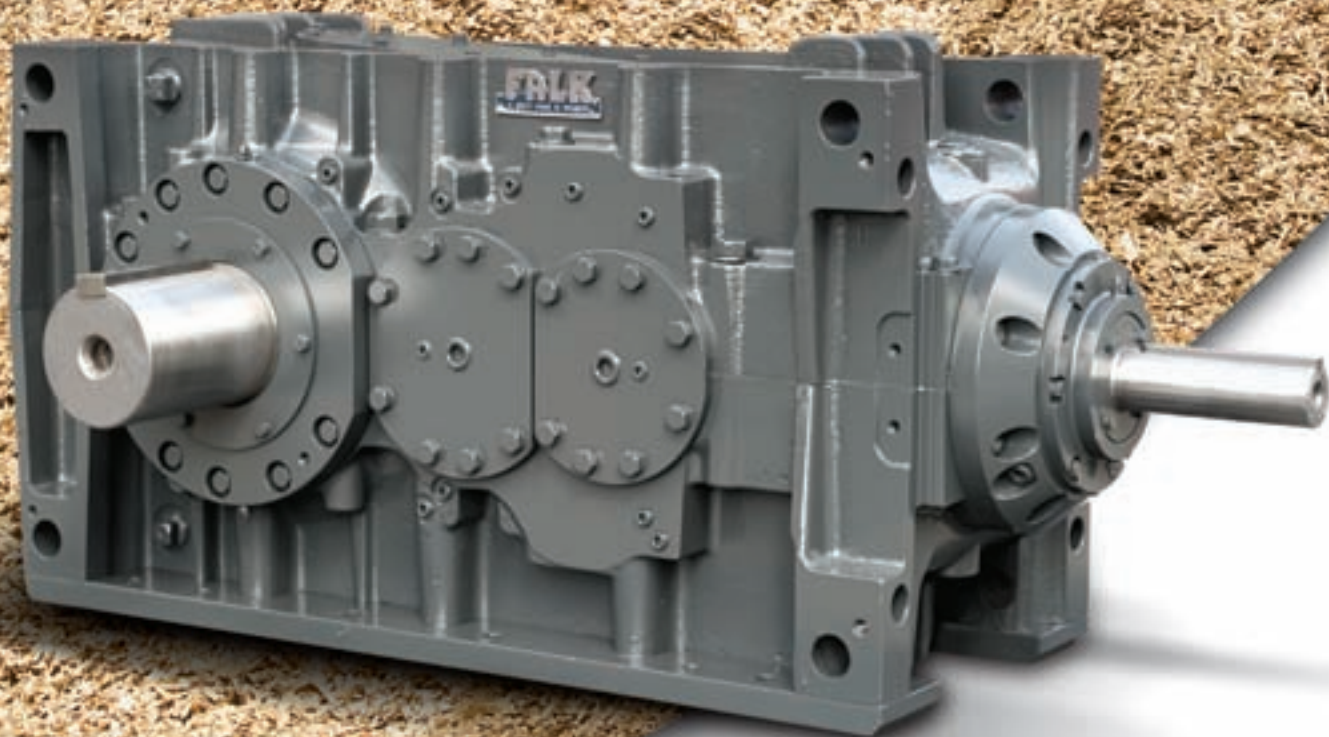




FALK
V-CLASS

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FALK™ V-Class™ WhitePaper

New Falk V-Class Gear Drive Designed to Meet Industry Needs for Cooler, Reliable Operation

Gear drives on heavy-duty material handling equipment in paper, lumber, cement and many other industries routinely are subjected to difficult conditions that can affect their efficiency, reliability and service life. The new Falk V-Class gear drive was designed from the start to provide the **strength, durability, ease of maintenance and cooler operating temperatures** needed to excel under these conditions.

The Falk V-Class design, developed through more than 100,000 engineering hours, has undergone the most rigorous testing of a gear drive and exceeded expectations for dependability by a wide margin. Development began with extensive “voice of the customer” surveys and interviews to determine what features and benefits were most critical to the end-users of these gear drives.

Thermal performance was one of the key issues, with a desire for cooler operation under:

- *Constant heavy loads*
- *High ambient temperatures*
- *Atmospheres with excessive debris*

Lowering the operating temperature by 18°F (8°C) can effectively double oil life, so a cooler-running gear drive requires fewer oil changes. With proper maintenance, the cooler temperature also increases oil viscosity for better lubrication of gears and bearing components to extend their life.

Mechanical performance also was high on the list of customer expectations, which included:

- *Consistently high horsepower and torque throughout a range of operation; and*
- *An overall size that would fit readily into existing equipment for ease of replacement*

Other considerations included dependability and ease of maintenance, removal, and replacement when necessary. Many users felt that the disassembly time required to maintain monoblock housings was excessive, as was removal and replacement of existing drives after years of operation.



Addressing the Issues

In designing a new gear drive to meet and exceed customer expectations, Falk V-Class engineers began by addressing these customer concerns, rather than simply redesigning an existing product.

Tough

To optimize durability, the engineers started with case-hardened and ground gears that provide greater strength and minimize wear.

- *Gear teeth are ground to a 25° pressure angle for superior strength and durability*
- *A proprietary peening process increases tooth strength and extends their life*
- *Bevel and helical gear tooth forms have been optimized to deliver smooth torque transmission by ensuring full contact under load*

The resulting gear sets provide the highest quality and exceptional durability, up to AGMA Class 12. As an added bonus, the drive train runs quietly for use in noise-sensitive areas.

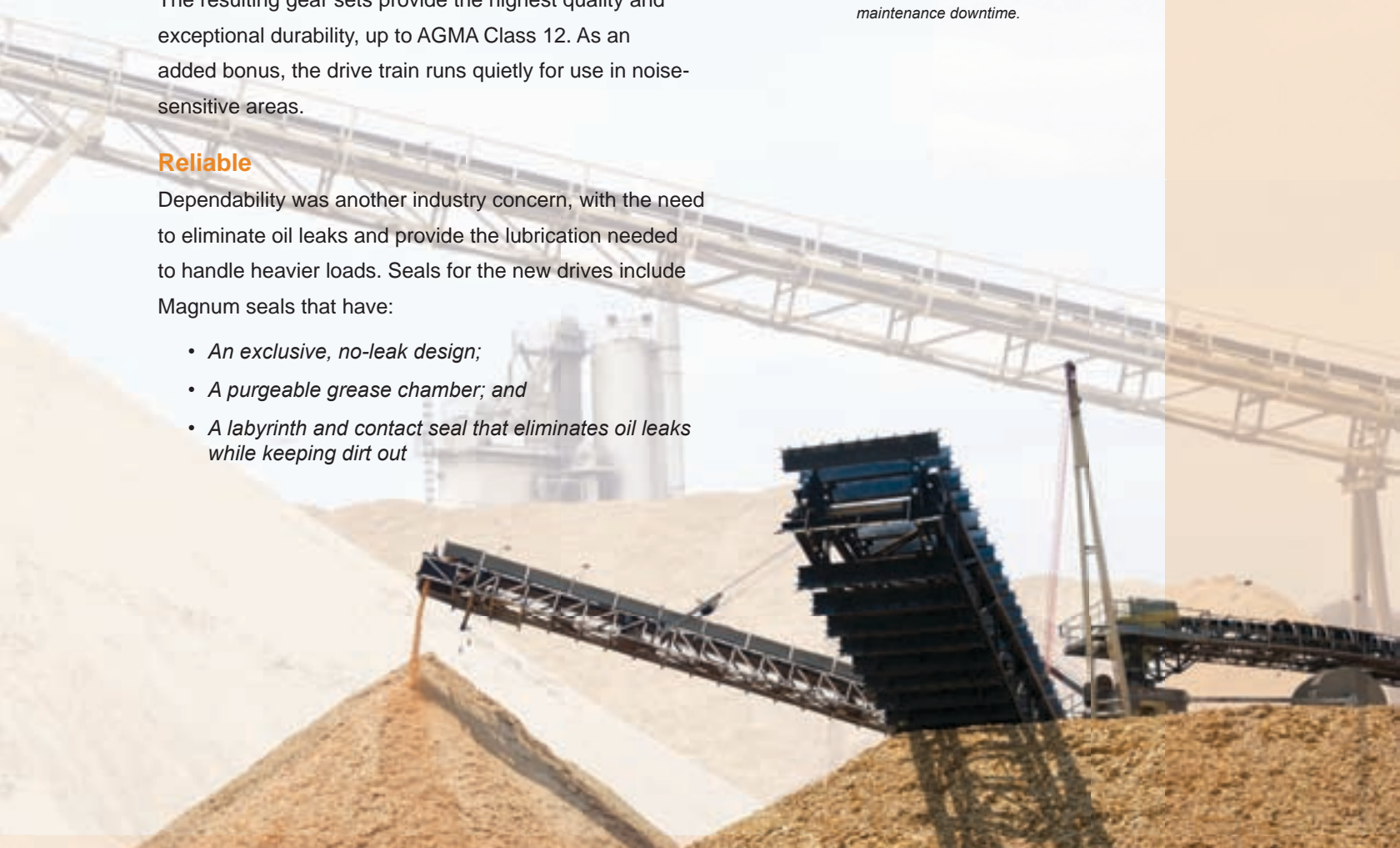
Reliable

Dependability was another industry concern, with the need to eliminate oil leaks and provide the lubrication needed to handle heavier loads. Seals for the new drives include Magnum seals that have:

- *An exclusive, no-leak design;*
- *A purgeable grease chamber; and*
- *A labyrinth and contact seal that eliminates oil leaks while keeping dirt out*



An oil sampling port is built into the Falk V-Class housing to quickly and easily check oil condition to prevent maintenance downtime.



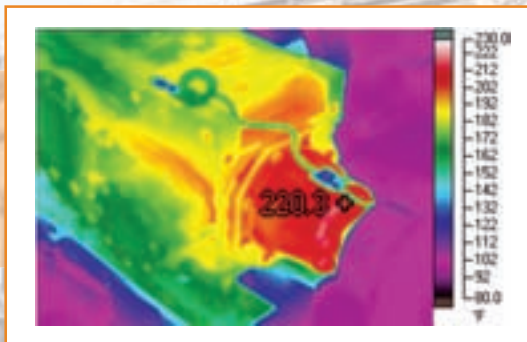
Seals are made of proven heat-resistant Viton® and nitrile materials to provide longer life, and are easily replaceable and adjustable. Other features designed to increase dependability include:

- *Cast-in oil dams that keep bearings lubricated*
- *Larger, stronger double-row spherical bearings that handle heavier loads for higher torque*
- *Housings made of heavy-duty ductile iron to withstand momentary shock loads*

Cooler Operation

Drive users also expressed a desire for cooler-running drives. Falk V-Class engineers were determined to avoid the need for the customer to route additional services such as electric or water lines to the drive. Instead of simply adding an external fan or radiator, they opted to design a naturally cooled gearbox by integrating cooling fins into the top and bottom of the gearbox. Proprietary oil feed passages in the housing improve lubrication and provide optimal cooling. Computational Fluid Dynamics (CFD) were used to achieve advanced engineering designs that optimize thermal dissipation.

These and other internal design changes also minimize churning to reduce temperature. An optional, patent-pending DuraPlate™ cooling system controls oil temperatures under the most extreme conditions. The ultimate goal was to achieve a power-dense drive that required no external cooling to maintain a 180°F (82°C) sump temperature.



Comparable Gear Drive



Falk V-Class





The new Falk V-Class drive is mounted with other drivetrain components that include a 100 hp motor and a Falk fluid coupling, protected by a Falk Orange Peel® guard.

Maintenance Made Easy

Ease of service also was a key item on the list of customer needs. The Falk V-Class design features:

- *A horizontal split housing for easy disassembly and reassembly for maintenance of bearings and seals, as well as any repairs*
- *Base-mounted units that can be repaired in place*
- *Removable, adjustable feet that allow drop-in replacement for current Falk products and adapt easily for replacement of competitive drives and different shaft centerline heights*
- *Multiple oil ports for fast, easy oil changes that help minimize maintenance downtime*
- *Easily adjustable bearing floats with steel shims simplify shaft alignment and ensure bearing settings are maintained for life*
- *Pre-cast condition monitoring locations make it easy to check drive health*
- *Globally compatible for ease of service anywhere in the world*

Testing

Once the basic Falk V-Class design was established, prototypes were built and tested extensively for endurance and durability. Testing of specific components was followed by full prototype testing under extreme conditions and high loads, and the **drive exceeded all expectations**. In addition to operational testing, the serviceability of the drive design also was evaluated. In a timed trial, a worker was able to disassemble a typical model in slightly less than 12 minutes, due in part to the split housing design.

The Falk V-Class line consists of optimized drive sizes for applications of 15-10,000hp (11-7455 kW) or 3,000,000 in-lbs. (341,000 Nm). Standard packages are available for monitoring conditions such as vibration, bearing temperature and oil condition. The Falk V-Class line is backed by a three-year warranty, with 24/7/365 engineering support.



Tapered bushing with the Falk V-Class drive will make it easier to remove and eliminate the need to destroy components, as with the previous drives.

In the Field

A global, multi-billion-dollar manufacturing company with a paper mill facility in southeastern U.S. used the Falk V-Class to replace a previous drive that was near the end of its service life and for which parts were becoming difficult to get.



The headshaft had to be removed, along with the previous drive, because they were impossible to separate without cutting the shaft.

The site's Maintenance Manager said the facility has two similar chip reclaimers: one for hardwood and one for pine. The drive on the hardwood unit had failed recently, and was replaced with the company's only remaining spare. Because the drives on both reclaimers were of similar age and service history, the Maintenance Manager wanted to replace the old drive on the pine unit with the new Falk V-Class drive to avoid unplanned downtime.

Operating conditions included high vibration and a dusty atmosphere with falling debris. In addition, the climate was humid and hot, with temperatures frequently above 90°F (32°C). Despite these conditions, auxiliary cooling, such as fans or a DuraPlate cooling system, was not needed because of the drive's excellent thermal performance.

Based on the site's experience with the hardwood reclaimer drive, the Maintenance Manager knew that the pine unit would be difficult to remove. It took a crew about four days to pull the old drive.

"We had to take the whole headshaft out with the drive and cut them apart, and then we had to replace the damaged shaft," the Maintenance Manager explained.



Completed installation shows neat appearance and ease of access for maintenance.

The drive was replaced with a shaft-mounted 157VRT3-AS Falk V-Class drive, 98.65:1 ratio, rated at 147 hp@1750rpm, which is mounted on a swing base, along with a 100 hp electric motor connected to the drive through a Falk 370HFD20 fluid coupling. A Falk Orange Peel® guard protects the coupling and shafting.

To provide the data needed to monitor its performance in the field, this drive was equipped with a special condition monitoring system that provided continuous data on bearing temperatures, oil sump temperature, ambient temperature, drive speed and power input. Also included was a high-viscosity oil sampling port that checks oil condition. Standard condition monitoring packages are available to meet individual customer requirements.

Once the motor was installed and aligned, and special condition monitoring instrumentation was installed, actual installation of the drive package was accomplished easily in less than half a day. The drive and headshaft are connected by a tapered bushing that ensures they will be easy to separate when necessary, and without damage to the shaft.

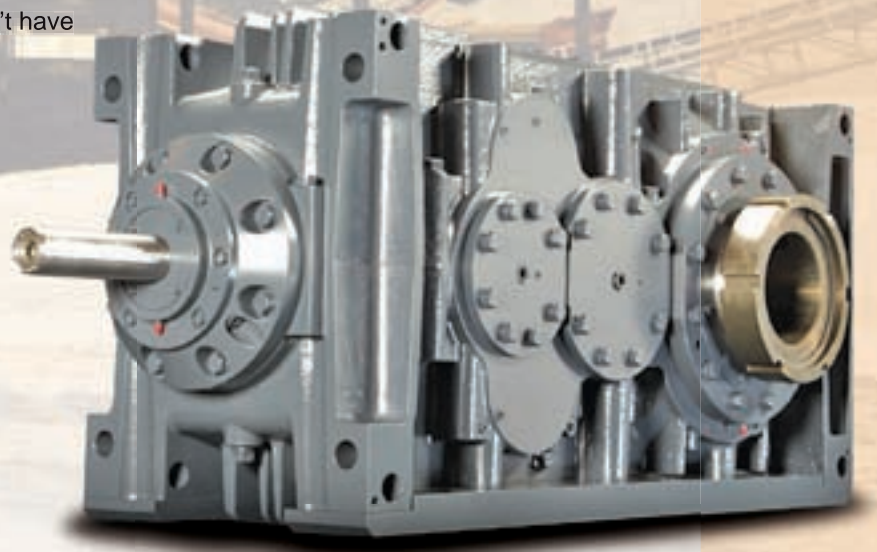
After seeing the new drive in operation for several months, the Maintenance Manager said, "I don't have to think about it—and that's good."



After three months of 24/7 operation with heavy debris buildup, the new drive was running quietly, with excellent gearing contact and sump temperatures in the 140°F (60°C) range, despite high ambient temperature and humidity. The temperature of the drive did not change dramatically from a "clean" housing to the conditions shown above. On one typical day, with the outside temperature at 97°F (36°C), the sump was running at less than 150°F (65°C) degrees, despite a heavy buildup of debris.



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C O U P L I N G S



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