

DRIVING INNOVATION

Adam L. Tietzen, Rexnord Industries, LLC, USA, provides an insight into the development of the company's new gear drive.

A rugged industry needs dependable drives

It is critical that gear drives powering conveyors, mill drives and bucket elevators are rugged and dependable enough to handle the extreme demands of the cement industry.

Rexnord, the manufacturer of Falk® gear drives and couplings, tasked itself to design and build a gear drive that would deliver the level of dependability the industry required.

The process began with investigation. What did customers want; what did the industry need? To get the most reliable information possible, Rexnord initiated in-depth industry studies and conducted extensive research, soliciting the input of cement and aggregate professionals, including end users, channel intermediaries and salespeople.

The result was a comprehensive list of 'must haves': more torque, improved thermals, better durability, a longer operating life, and easy installation and servicing.



Right angle triple reduction Falk V-Class™.



Falk V-Class™ with Falk DuraPlate™ cooling system.

The question was raised: can it be done? Rexnord's short answer was 'yes'. Its long answer was to undertake the most extensive effort in its history. The company ultimately devoted more than 100 000 engineering hours to the project and conducted the most extensive testing ever performed on a drive in order to develop the new Falk V-Class™. The company is so confident in the dependability of this drive that it is covering it with a three-year warranty, the longest standard warranty in the industry.

Conquering extreme conditions

With durability as its number one priority, the Falk V-Class drive was designed with increased torque capacity to handle the heaviest loads in the most extreme industrial applications.

This begins with larger, stronger, spherical and taper roller bearings that support an improved gear design. These heavy-duty gears are case-hardened and ground for greater strength and to help minimise wear. Tooth size and form have been optimised for maximum performance under load, while a proprietary peening process and 25° nominal pressure angle provide greater shock resistance, strength, and durability.

Ductile iron was chosen for the drive housing because it withstands shock loads just as well as a steel housing. In fact, ductile iron has twice the tensile strength of the grey or cast-iron that is generally used for drive housings. It

is stronger and more durable than cast-iron, which has a tendency to become brittle and fail under high loads.

Cool running

Because cement production generates a great deal of heat, engineers designed the drive with a number of built-in cooling options. These include a split-shaft fan, an electric fan, air-to-oil cooling, water-to-oil cooling, and the Falk DuraPlate™ cooling system (patent-pending). The end result is one of the industry's coolest-running drives.

The Falk V-Class drive maintains a lower operating temperature than drives with conventional housings even though it has less surface area to dissipate heat. This is because the unit's air and oil flow system have been optimised, and the oil temperature has been reduced as a result of:

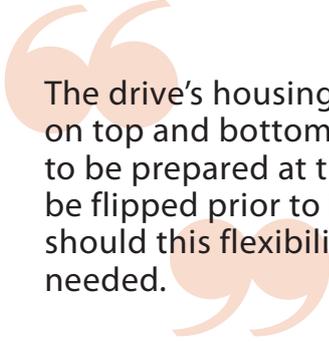
- Housing geometry and cooling fins that were designed using Computational Fluid Dynamics (CFD). The combination of sloped housing and cooling fins on both the top and bottom of the unit ensures that cooling air is continually flowing across the housing surface and removing heat. Fins are cast inside the mounting envelope for extra protection and substantially increase the drive's thermal capacity over conventional drives.
- Proprietary oil feed passages in the housing that increase oil flow to the bearings and reduce the oil temperature.
- Cast-in oil dams that ensure bearings remain lubricated and cool, protect against dry start-ups, and maintain the optimum oil level, regardless of speed.

Cooler running oil means fewer oil changes are necessary, while less oil breakdown means improved gear and bearing life. The new drive is designed with thermal options based on a lubricant sump temperature of 180 °F (82 °C), which is 20 °F (11 °C) cooler than the AGMA standard. By keeping the oil cooler, this new drive doubles the oil's service life. Cooler running oil is also more viscous, providing better lubrication of the gears and bearing components, thereby extending their life.

The proprietary Falk DuraPlate™ system provides additional surface area in order to cool the oil in extreme temperatures without using water or electricity. This unique, self-contained system circulates the drive's oil through a set of laser-welded, stainless-steel plates that are bonded to form a pocketed interior. Oil is drawn via pump from the drive's low-speed end and circulated through the DuraPlate, which is being cooled by a shaft-driven fan. Cooled oil is then circulated into the higher-temperature, high-speed end of the drive. Multiple plates can be mounted on the drive to further enhance cooling.

Clean and quiet

Falk Magnum seals are used to keep oil clean and regulate thermal performance. This proven, no-leak



The drive's housing is identical on top and bottom, allowing it to be prepared at the factory to be flipped prior to installation, should this flexibility be needed.

design has a unique drainback passage with radial and axial bush seals that keep oil contained, and a purgeable grease chamber with a contact seal that keeps contaminants out. The drive also utilises longer-lasting, heat-resistant Viton® and nitrile lip seals. Screw-in, grease purge zerks are an additional new feature that enables users to add their own grease lines if they desire.

Modifications to the gear teeth reduce transmission error and, as a result, noise. During testing, the drive consistently met a specification of 85 dB at 1 m (compared to 90+ dBA for a typical drive), making the Falk V-Class drive especially valuable for noise-sensitive areas.

Installation and service

There are multiple options for installing this drive, depending on the needs of a specific application. The

drive's housing is identical on top and bottom, allowing it to be prepared at the factory to be flipped prior to installation, should this flexibility be needed. It also has removable feet, so it can be installed and adjusted in multiple mounting configurations. Furthermore, it can be quickly adapted during replacement of existing drives that have different shaft centreline heights.

Visual inspection and oil changes are easy, no matter how the drive is installed. It has large inspection ports on both the top and bottom, as well as multiple oil ports. The drainback and grease purge are strategically located so that access to the purge location is never obstructed, even if the unit is flipped.

Another distinct feature is the drive's horizontal split housing, which allows it to be easily disassembled and assembled in the field for service of bearings and gears. Gasket creep is eliminated with steel shims, which also ensure that bearing settings are maintained, while the lip seals can be replaced without seal cage removal.

Innovation

Though the cement industry has seen many innovations over the course of its centuries-long existence, one thing has remained the same – it is a demanding, dusty, hot business. A top priority is to ensure that the drives powering conveyors, elevators, kilns, feeders and other equipment used in cement production can stand up to the stress. This drive was developed with that in mind. 🌍