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FLSmidth launches MAAG™ LGD – integrated side drive system

In 2003, FLSmidth MAAG Gear entered the market with its own integrated side drive. With the purchase of Darimec in July this year, the company will be able to deliver its MAAG™ LGD with own girth gears.

Darimec is a highly specialised gear manufacturer, which develops and produces girth gears, pinions and custom-made reducers. With more than 1100 girth gears sold worldwide, it is one of the market leaders. The Darimec™ product range encompasses kiln girth gears up to 10 m dia., mill girth gears up to 11.2 m dia., pinions of all kinds, special reducers up to 10 000 kW, kiln rollers and tyres, overhaul, rebuilding and re-engineering of existing gears.

Benefits

With this merger, the customer will receive a complete side drive system from one source instead of single components from different suppliers. This will ensure optimised adjustment between gearbox and girth gear. Additionally, specific customer requests can be carried out more efficiently. It is not only the drive system that comes from one source; the service of all parts will be accomplished completely through FLSmidth MAAG Gear specialists.

Overview

The design is based on state-of-the-art technology and enhances the already tried and tested design that is available on the market. The MAAG LGD was developed to save cost and space for mills with integrated side drive.

The gearbox is divided up into four overall sizes, optimally adapted to the mill sizes. To keep the cost down, mostly standard parts are used. Nevertheless the gearbox can be adjusted to customers' requests.

The first MAAG LGD was put into operation in 2003 and is still running smoothly. Since then, over 35 MAAG LGD's have been delivered and are in operation. The biggest MAAG LGD is running with over 10 MW. The biggest girth gear is available up to 11.2 m dia.

MAAG LGD system

The success of the MAAG LGD is based on its design. It is positioned 40° under the mill, which demands a compact type of construction and leads to lower building and foundation costs as a lot of space is saved. This ensures full tooth contact even at a small run out error of the girth gear. The new position of the side drive is combined with many additional advantages:

- Low risk of vibration in the gear unit foundation.
- Easy installation.
- Easy access for service and maintenance.
- Easy replacement for rotating parts.
- Direct lube oil return from the girth gear to the integrated lube oil tank prevents contamination of oil.
- Minimum oil flow in the girth gear guard.
- Simple foundation for gear unit, motor and auxiliary drive.

Further advantages are as follows:

- High efficiency.
- Integrated oil system.
- Optimised tooth contact with self-aligning pinion.
- Equal torque split on two pinions.
- A tooth safety factor of at least 2.3 (AGMA).
- Calculated bearing service life of 80 000 h.
- Bearings are temperature controlled.
- Vibration monitored.

One of the major benefits of the MAAG LGD system is the torque split between the two pinions. It ensures that the total torque to the mill is always equally distributed from both pinions. Any deviations in torque between the two pinions is automatically equalised by axial adjustment of the intermediate shaft triggered by the deviations in the axial forces. A toothed coupling between the pinion and the pinion shaft enables the pinions to self align. This ensures full tooth contact even at a small run out error of the girth gear.

MAAG LGD ready for shipment.

Design

The MAAG LGD unit is a three-stage spur gear with load distribution. It drives the ball mill directly via the pinions of the two output shafts and reduces the speed of the mill drive motor to the pre-determined speed of the mill. The casing is of cast and comprises three different parts that are horizontally divided into the lower, middle and upper parts.

In contrast to other lateral drive equipment suppliers, no separate oil tank is needed. For the lubrication of all the teeth and bearings, the MAAG LGD has an integrated lube oil system in the lower casing. With the gearbox positioned partly below the mill, it is possible to return the lubrication oil directly from the girth gear guard to the gearbox.

Installation/commissioning

The low foundation level and the easy access to the measuring points through the inspection covers make the girth gear's installation and the alignment of the LGD comfortable. Access has also improved to other components such as the auxiliary drive and the motor.

After the service work is carried out it is easy to reposition the gearbox. The foundation insert shows the exact position, so no new alignment is needed. Generally no special heavy installation equipment is needed to install the MAAG LGD.

The installation of the girth gears is simplified by its design and from the precision and tight tolerances obtained during the manufacturing process. Axial and radial run-out are kept close to zero in order to guarantee a long life of the drive unit and to reduce the level of vibration to a minimum. The junction plate is connected to the calibrated screw pin and special bolts, in order to reduce the time of assembly. The girth gear is able to absorb part of the load of the mill and improve the contact between the teeth.

Engineering

FLSmidth MAAG Gear is constantly adapting its gear units to ensure the highest possible reliability and to provide the latest technology. Since the market entry of the MAAG LGD, the following re-engineering has taken place:

- The casing was changed from a welded casing to a cast casing to save costs.
- The pinions were adapted to improve performance.
- The instrumentation was refined, e.g. the temperature of the bearings is monitored to avoid overheating.
- The lube oil system and the bearing lubrication were standardised to reduce the delivery time.
- The auxiliary drive was re-engineered to control the balancing of the mill.

Conclusion

The MAAG LGD saves cost and space due to its compact design and easy maintenance, and is a great solution for mills with an integrated side drive.