Rolling Bearings in ALSTOM Beater Wheel Mills

FAG

Examples of Application Engineering

WL 21 516/2 EA

Beater wheel mill N 535.43V built by ALSTOM Power Stuttgart, Germany Photo courtesy of: ALSTOM Power Stuttgart

ALSTOM Power, Stuttgart, builds modern high-capacity beater wheel mills for pulverising coal in atmospheric steam power plants. These beater wheel mills are used to pulverise the crude lignite needed to generate steam.
Hot flue gas is sucked into the beater wheel mill to dry the coal. While the coal is being pulverised, the coal dust is mixed with the flue gas, resulting in a high drying efficiency.

The lignite/flue gas mixture is blown to the pulverised coal burner through pulverised coal pipes.

The N 535.43V beater wheel mill is the biggest one built by ALSTOM Power to date.
It has an overall height of ca. 12 m, which is as tall as a four-storey building.
There are 16 beater wheel mills of this type in the two blocks of the 1100 MW power plant in Neurath, Germany

The mill has a lignite throughput of 170 tons per hour, corresponding to about seven truckloads of 25 tons each.

Technical data
- Gas throughput 535 000 m^3/h
- Beater wheel diameter 4,30 m

The beater wheel is cantilevered. This permits easier access to the mill's wearing parts and consequently time and cost saving bearing replacement.

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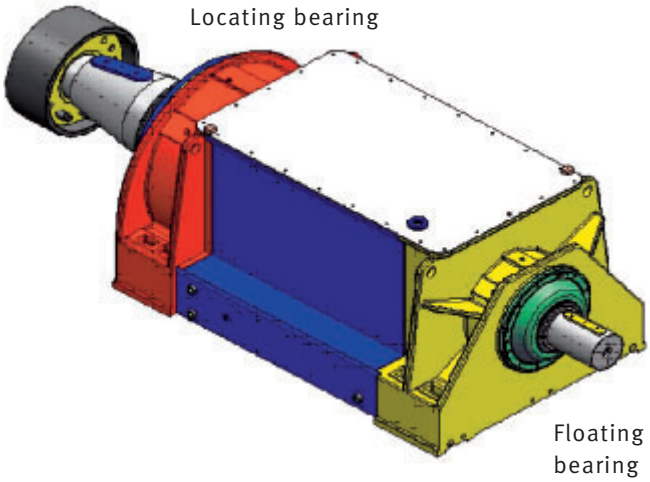
Demands on the bearing concept

- Accommodation of the radial and thrust loads from the grinding process and of the resulting imbalance
- Compensation of shaft length variations under operating conditions
- Compensation of misalignments (shaft deflection and production tolerances)
- High level of operational safety
- Service life demanded by the customer L_{h10} > 100 000 hours

Bearing concept

Temperature differences cause thermal expansions of the shaft that have to be compensated by taking appropriate measures. This is achieved by means of a spherical roller bearing at the coupling end which is fitted tightly in a sliding sleeve.
This angular sleeve, which is mounted into the housing with a sliding fit, compensates the shaft's axial length variations.
The shaft is axially fixed by the bearing at the beater wheel end.



Mill housing with beater wheel
(graphic courtesy of ALSTOM Power, Stuttgart)

Beater wheel bearings

Due to the high external loads and the imbalance forces, demands on the rolling bearings are very high.
FAG spherical roller bearings of series 241 are the ideal solution. The bearings offer a high dynamic load rating in a small mounting space.

Locating bearing: **241/530-B-K30-MB-C3**

Bore diameter	d =	530 mm
Outside diameter	D =	870 mm
Width	B =	335 mm
Dynamic load rating	C_r =	9 500 kN

Floating bearing: **24160-B-K30-C3**

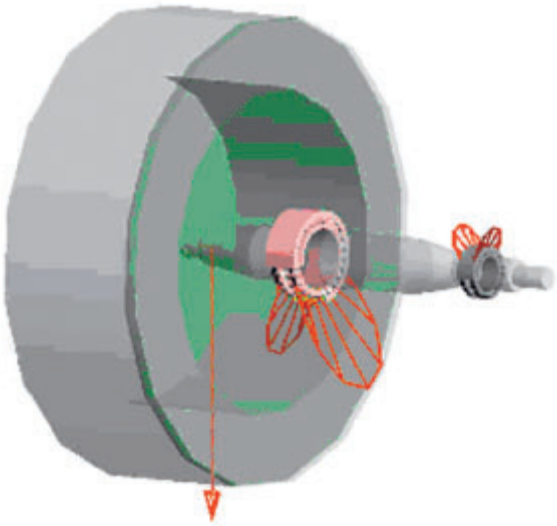
Bore diameter	d =	300 mm
Outside diameter	D =	500 mm
Width	B =	200 mm
Dynamic load rating	C_r =	3 250 kN

Lubrication

Depending on the operating conditions, and to further increase the level of operational safety, the beater wheel mills are provided with an oil sump or circulating oil lubrication system.
ALSTOM Power and Schaeffler KG therefore recommend to use lubricants to DIN/ISO VG 680 or 1000 whose effectiveness was tested in rolling bearings.

Calculation

The necessary calculations were carried out using the calculation program Bearinx. Apart from the external loads and the machine geometry, this program takes into account the internal bearing design as well as the load distribution within the bearing.



Pressure distribution in both spherical roller bearings

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20110600 / WL 21 516/2 / EA / pdf only