Conversion of the creping cylinder in a tissue paper machine

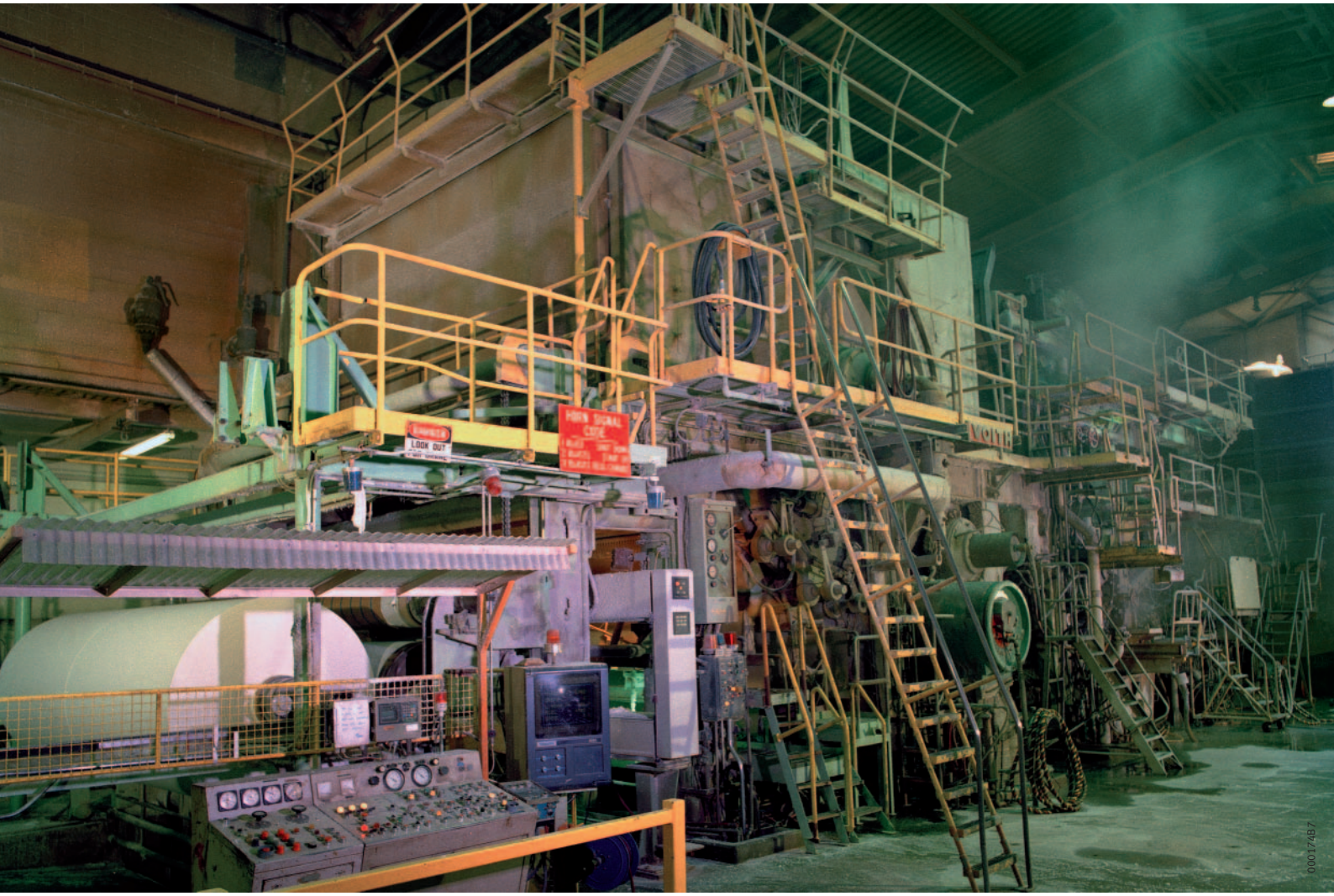

Figure 1 · View of a tissue paper machine

Tissue paper machines are used to manufacture particularly soft and absorbent paper. The most important component in this application is the large, steam-heated creping cylinder on which the sheet is dried and creped under a high temperature hood. The cylinder is heated using steam. The steam has a temperature of approx. 190 °C. On an older tissue paper machine in a paper mill in Green Bay, Wisconsin, USA, the plain bearings in the creping cylinder were replaced by rolling bearings.

Operating data

- Manufacturer, year: Beloit, 1962
- Creping cylinder
  - Diameter: 3 050 mm
  - Width: 2 740 mm
- Bearing spacing: 3 100 mm
- Mass of cylinder: 42 tonnes
- Operating speed
  - from: 60 min^{-1}
  - to: 70 min^{-1}
- Steam temperature: 193 °C
- Ambient temperature: 27 °C
- Recirculating oil lubrication.

Design and bearing selection

The new bearings for the creping cylinder were selected by employees of the paper mill working with experts from Schaeffler USA. The diameters of the bearing journal were originally 13,5 inches when new. Due to wear and grooves on the journal surface, rework to 13,386 inches (340 mm) was necessary. This did not cause any significant reduction in the strength.

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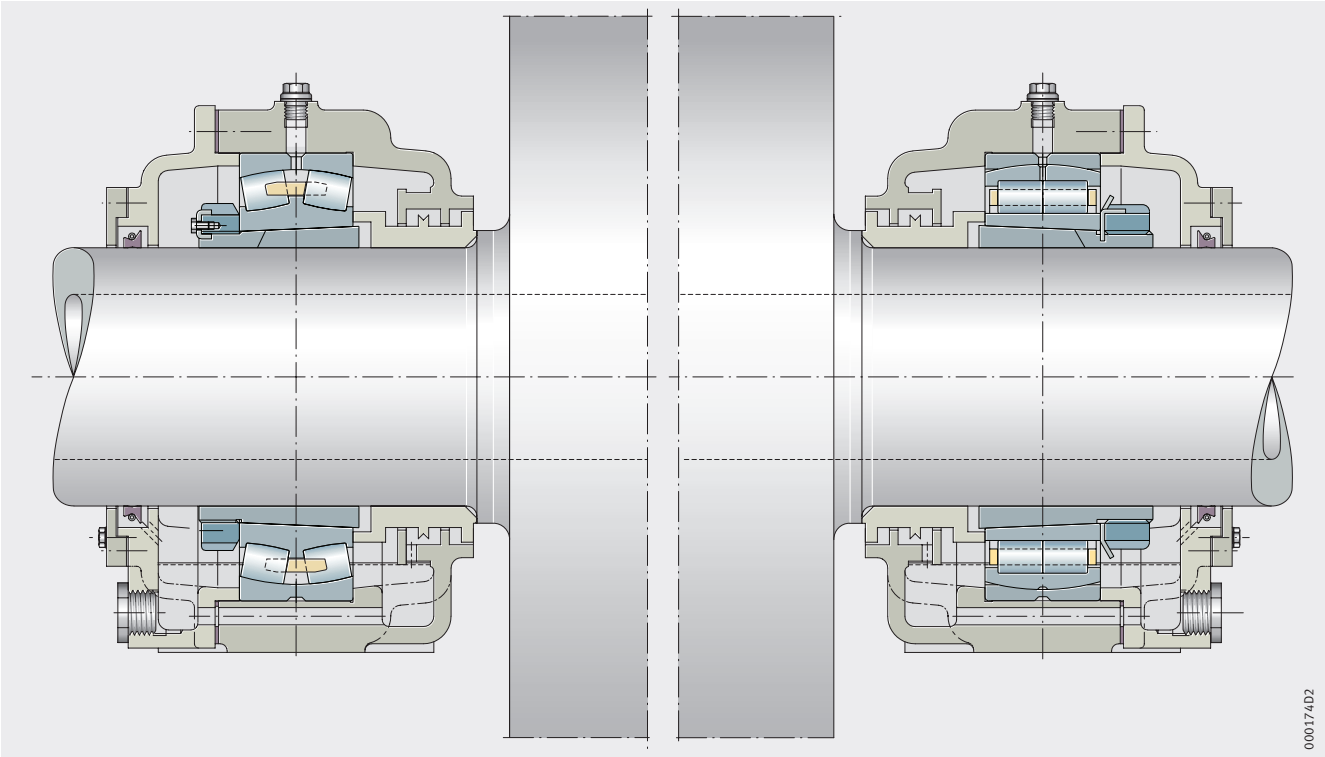

Figure 2 · Locating/non-locating bearing arrangement

Bearing arrangement

The bearing arrangement selected was a locating/non-locating bearing arrangement in split FAG plummer block housings.

Based on the operating data and the operational security required, the rolling bearings were designed for a basic rating life of more than 200 000 h.

Misalignments occurring during bearing mounting and shaft deflections occurring during operation were compensated by the design incorporating spherical roller bearings and special cylindrical roller bearings.

During heating, the creping cylinder undergoes axial elongation.
This elongation is compensated by the cylindrical roller bearing (non-locating bearing). The rolling bearings are dimensionally stabilised up to 200 °C and are lubricated using oil. The oil is fed into the centre of the bearing via a lubrication groove and lubrication holes in the outer ring.

Locating bearing – drive side

One spherical roller bearing 23072-K-MB-C4.

Non-locating bearing – operating side

One self-aligning cylindrical roller bearing Z-565673.ZL-K-C5, double row, with a plain bearing pivot ring.

Mounting

Both bearings are located on the bearing journal by means of hydraulic adapter sleeves H3072-HGJS.

Housing

Split plummer block housings Z-169016.PM3072-H-AF-L on both the locating and non-locating bearing side.

Machining tolerances

- Shaft h9
- Housing G7.

Sealing

Unsplit labyrinth seals with spacer rings ensure precise positioning of the bearings on the shaft and give good sealing protection on the inner side. Oil splash rings made from Viton are arranged on the outer side.

Lubrication

Due to the high operating temperatures, the bearing housings are connected to a central recirculating oil lubrication system. A high grade mineral oil according to ISO VG 320 is used.
The two oil collector chambers in the housings are connected in the housing base by means of level balancing holes. This ensures that oil is drained from both oil collector chambers.
The oil flow rate for each bearing is approx. 3 l/min.

Customer benefits

Due to the replacement of plain bearings by rolling bearings, lower drive power values are required. It is also possible to run at higher speeds, leading to a significant increase in productivity.

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