Sealing solution for the mining industry
under extreme operating conditions

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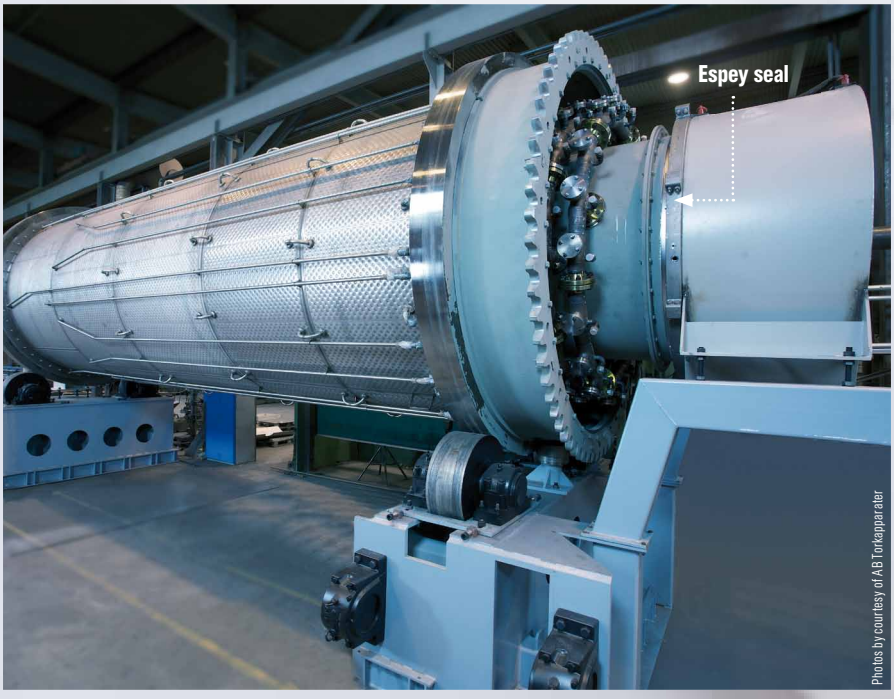
Espey WD500 Special for sealing a cooler

For mining copper and to separate copper ore mining companies need revolving cylindrical coolers. One of the worlds' biggest mining company has chosen AB Torkapparater in Sweden as supplier for separation equipment – providing latest mining technology.

Process description

The worldwide noted copper deposits in form of copper ores contain only 1-2 % copper. Main ingredients of copper ores are sulphur and toxic heavy metals as arsenic which have to be separated (roasting). For this revolving cylindrical coolers are used. The coolers with a diameter of 3 m (118.11") and a length of 8.75 m (344.49") rotate with 3 revolutions per minute and are filled with approx. 20 tons (44,092.45 lb) powdered copper ore with a temperature of 700 °C (1,292 °F). The roasted ore is cooled down to ambient in an inert nitrogen atmosphere as protection against oxidation. The coolers are equipped with an in and outlet to charge and discharge ore and copper respectively.
The residence time of the ore inside the cooler is 20-30 minutes. The initial high temperature is needed to burn out sulphur and arsenic ingredients.



Revolving cylindrical cooler for mining copper (separation copper ore)

Problem and challenge

Cylindrical coolers make great demands to the sealing systems, also in consideration to high lifetime and low maintenance effort. The seals have to be designed with barrier gas ports to guarantee a permanent protection against the atmosphere oxygen not to enter the cooler and oxidize the copper inside. In case of a power breakdown the seal must offer a back-pressure system to keep the nitrogen inert atmosphere inside. The seal on the inlet side has to be designed for a temperature of 70 ... 500 °C (158 ... 932 °F) at which 500 °C (932 °F) will only emerge in case of a power breakdown

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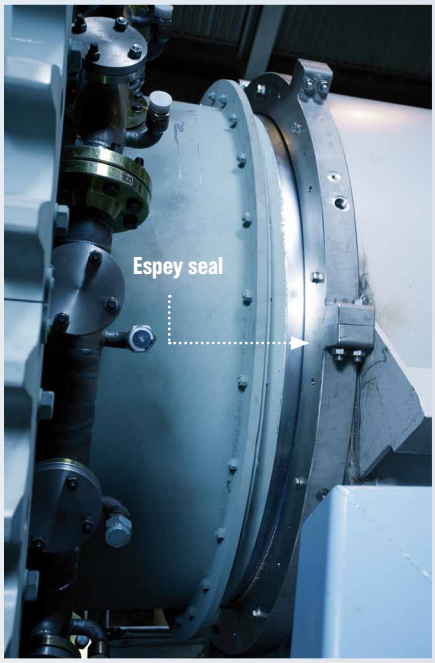
whereby the revolutions will drop down to 1/10 of the norm revolutions, driven by an emergency rotation system. The seal for the outlet side has to be designed for a temperature of 50 ... 80 °C (122 ... 176 °F). The mechanical high stressed seals require segmented housings for seal diameters of 1,300 and 1,800 mm (51.18" and 70.87") with a width of only 90 mm (3.54"). The seal rings have to bear a radial play of 3 mm generated by the cooler shafts. The permanent alternation of heating the cooler by feeding with copper ore with a temperature of 700 °C (1,292 °F) and cooling the ore to ambient generate steady axial movements of the cooler shafts which have to be borne by the seals.

EagleBurgmann Espey solution

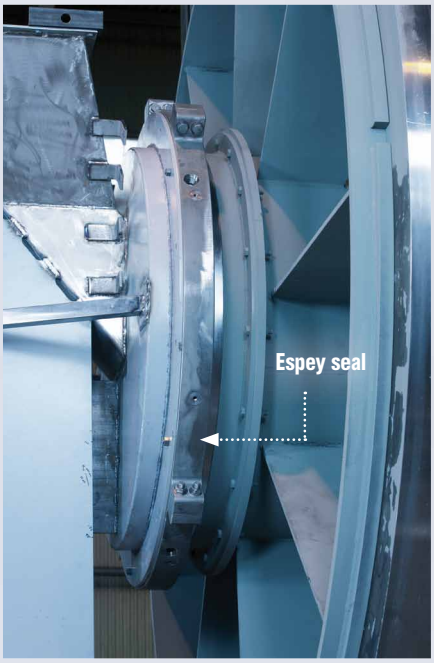
To expand copper mining production the mining company is focused on latest roasting technique and qualified sealing systems. To fulfil the application requirement of lowest leakages Espey designed for in and outlet side of the cooler carbon floating ring seals type Espey WD500 Special with a width of 90 mm (3.54") and seal diameters of 1,300 and 1,800 mm (51.18" and 70.87"). The housings are designed 5-part for easy installation and maintenance and consist because of the high temperatures of 1.4301. Each seal is equipped with 4 barrier gas ports and includes 4 seal rings made of inorganic impregnated carbon, designed 18 and 16 piece. The seals guarantee a long-term operation time.

Operating conditions

Application: revolving cylindrical cooler
Seal type: Espey WD500 Special
Medium: nitrogen, sulphur und heavy metal containing gases
Operation temperature:
50 ... 80 °C (122 ... 176 °F)
Maximum temperature: 500 °C (932 °F)
Pressure abs.: atmosphere
Revolutions: 3 min^{-1}
Shaft diameter: inlet 1,800 mm (70.87"), outlet 1,300 mm (51.18")
Radial play: max. 3 mm (0.12")
Barrier gas: nitrogen



Inlet side revolving cylindrical cooler



Outlet side revolving cylindrical cooler

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