Sealing solution for mechanical vapour compression in the milk industry

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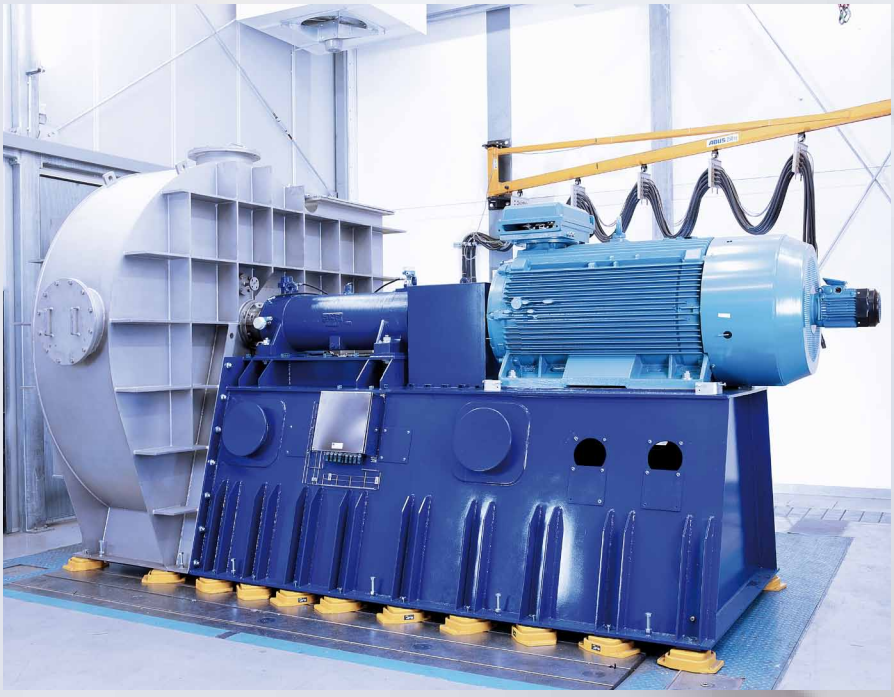
Espey WD500 for a vapour compressor

In several industry sectors the use of vapour compressors is increasing – main-ly to replace turbo compressors in respect of purchase and maintenance costs. Vapour compressors are used in processes where process-related high temperature differences are required.
Through a serial connection of one or more vapour compressors an increase of temperature can be achieved. In the milk industry vapour compressors are widespread. Several milk processing creameries have chosen Piller Industrie-ventilatoren GmbH as their supplier – providing latest compression technology.

Process description

The essential steps in the production of milk powder are evaporation and drying. After heat treatment the milk is handled to the evaporator which is basically fed by a vapour compressor (blower), working on the principle of a heat pump. The vapour compression under vacuum increases the heat of the milk and thereby the concentration of milk dry substance which is separated as milk powder in the final drying sub-process.
The provided energy is used efficient through multiple recovery. Vapour with low temperature level is taken from the process, compressed and returned as hot vapour with high temperature level to the process again.



Vapour compressor for the milk industry

EagleBurgmann Espey GmbH
Thomas Edison-Strasse 19
47445 Moers / Germany

Phone +49 2841 99827 0
Fax +49 2841 99827 56

info.espey@de.eagleburgmann.com
www.eagleburgmann-espey.com

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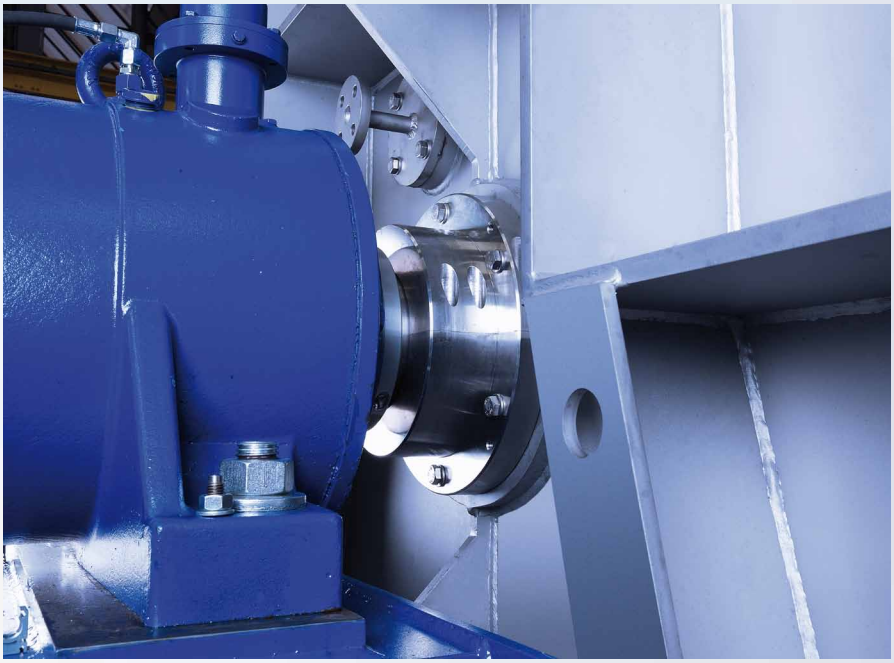

Carbon floating ring seal Espey WD500, type WDSA

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Problem and challenge

Vapour compressors make great demands to the sealing systems, mainly in consideration to vapour tightness and to keep the vacuum inside the system. Inlet and outlet temperature of the vapour compressor are 66.4 °C and 71.2 °C (151.52 °F and 160.16 °F). The system pressure is 0.23 bar (3.36 PSI) absolute. The seal medium is water vapour. The shaft diameter is 120 mm (4.72”). The shaft rotates with 3,000 revolutions. For the small space between the blower housing and shaft bearing, the seal has to have a small axial installation length, a maximum of 105 mm (4.13”). All seal components must have FDA compliance due to the use in the food industry.

EagleBurgmann Espey solution

To fulfil the application requirements of vapour tightness, FDA compliance and keeping the vacuum inside the system Espey designed the carbon floating ring seal Espey WD500, type WDSA, with split housing for easy assembly and maintenance. The seal is fitted with 5 overlapped mortised resin-impregnated seal rings with gas-tight joints. To achieve vapour tightness the seal has a barrier gas port which is fed with water vapour taken from the process.
To conduct condensed vapour the seal is designed with a leakage port. The seal guarantees a long-term operation time.

Operating conditions

Application: blower (vapour compression)
Seal type: Espey WD500, type WDSA
Medium: water vapour
Operation temperature: 66.4 ... 71.2 °C (151.52 ... 160.16 °F)
Pressure abs.: 0.23 bar (3.36 PSI)
Revolutions: 3,000 min^{-1}
Shaft diameter: 120 mm (4.72”)
Barrier gas: water vapour

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