Solution for extreme operating conditions

EagleBurgmann®
Rely on excellence

NMB magnetic coupling for hydrocarbon pumps

Information **EN10103**

Operating conditions

Medium: hydrocarbons C_2 and C_4
Temperature: -32 °C and +40 °C
Pressure: 65 bar
Speed: 2,980 min^{-1}
Drive power: 315 kW direct start
Design torque: up to 1,700 Nm
Seal type: NMB 22P-10R-65-ND2 magnetic coupling

Materials:

Can: Hastelloy®, 1.4571, PTFE,
Inner rotor: 1.4571, neodymium iron boron
Outer rotor: carbon steel, neodymium iron boron

Problem and challenge

As part of the TMC (total monomer concept) process, modifications were made recently to an ethylene cracker and a new olefin conversion unit (OCU) was built to boost ethylene and propylene productivity at a German refinery. During the course of this project, EagleBurgmann was awarded a contract to provide hermetic sealing for four multi-stage vertical can pumps. The pumps are used to circulate highly flammable liquid hydrocarbons (C_2 and C_4).

Magnetic couplings have several advantages in this type of application. On the one hand, they seal hermetically and there is no need for an external supply system. On the other hand the coupling only require minimal maintenance, and they are extremely low wearing. However, the application represents a signficant challenge from the engineering and materials point of view (e.g. the can on the coupling). The requirements profile includes high pressure, extremely high torque, high power rating and a highly flammable medium.

Initially, an NMB 22P-8R-65-ND2 was used, but it became apparent after only a few starts that a coupling with a higher power rating was needed. The sealing function did however remain intact at all times.

The reason was high torque which resulted in a break-away of the magnetic coupling between the rotating outer rotor (connection to the motor) and the synchronous inner rotor (connection of the impeller). Strong vibration and elevated temperatures were evident in the can.

An identical magnetic coupling which started gently with the aid of a frequency converter was provided as an interim solution, and it worked satisfactorily (startup profile: 0 to 2,980 min^{-1} in 60 s).

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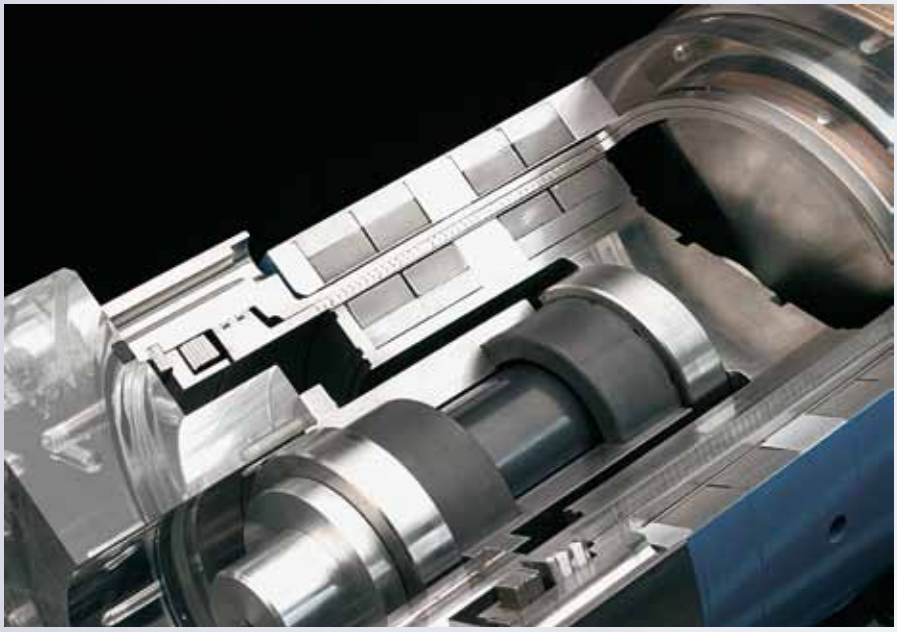

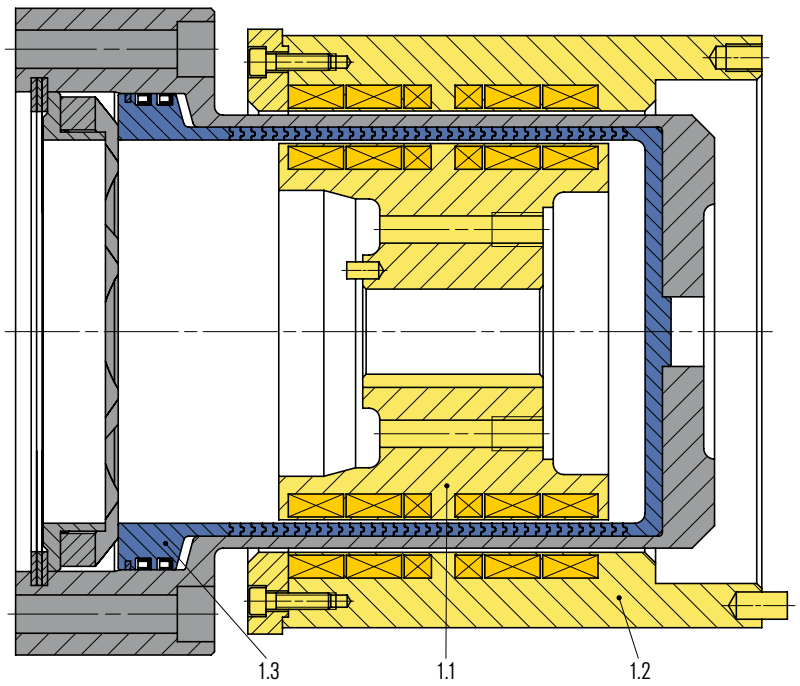

NMB Magnetic coupling: 1.1 Inner rotor, 1.2 Outer rotor, 1.3 Can

EagleBurgmann solution

NovamagneticsBurgmann Ltd. designed a new magnetic coupling with a significantly higher power rating, which supports direct start and provides a more efficient and reliable solution. The coupling withstands high pressure at high rotational speeds and high torque without problems. Hastelloy® (which has high strength and low electrical conductivity) was used for the can in place of 1.4571 to minimize eddy current losses and increase the efficiency and safety of the coupling. With this design, torque was increased by 63 % and eddy current losses were reduced by 35 %.

High-performance magnetic couplings

Magnetic couplings offer distinct advantages compared to other sealing systems: they are hermetically sealed, require little maintenance and help suppress vibration. For high drive power applications (>75 kW), NovamagneticsBurgmann developed a special can which continues to operate extremely efficiently at high pressure and speed (only around 2 % eddy current loses compared to 10 % on a conventional can). Lamination and electrical insulation between the layers reduce the generation of eddy currents, increasing efficiency. Engineers can provide solutions which ensure safe and cost-effective sealing and operation on large pumps.