KYOCERA

ENERGY EFFICIENCY THROUGH CERAMIC CONTAINMENT SHELLS

High-performance ceramics

EFFICIENT SOLUTION: ZIRCONIUM OXIDE CONTAINMENT SHELLS

Kyocera manufactures the containment shells used in magnetic drive pumps from the ceramic material zirconium oxide FZM. Ceramic containment shells enable energy-efficient operation and a consequent reduction in electricity costs and CO_2 emissions.

Ceramic containment shells are a central element in magnetic drive pumps, such as those used in the chemical industry and in the extraction and processing of oil and gas. Large production facilities often operate tens of thousands of such pumps. The use of ceramic containment shells in magnetic pumps enables a reduction in energy consumption and greenhouse gas emissions in comparison with metal containment shells. This effect is particularly noticeable when operating continuous duty pumps.

Unlike metallic containment shells, ceramic containment shells are not capable of being magnetized. Eddy currents that reduce performance are prevented and energy efficiency is significantly improved It is therefore possible to reduce the drive power of a pump by up to 15%. In addition, losses due to eddy currents generate up to 20 kW of heat, which may constitute a safety risk depending on the process and the media conveyed. In the case of substances close to their boiling point or explosive materials, any additional heat input should be minimized. This can minimise risks due to any boiling distortions or deflagrations that may occur.

The potential savings in energy, greenhouse gas emissions and also costs are enormous: Electric drives in industry and commerce consume almost two-fifths of all electricity in Germany. In these two sectors, their share of electricity consumption is even around 80%. The Federal Environment Agency, for example, calculates that the use of energy-efficient pumps alone could save around 5 bn kWh of electricity[1]. The latest climate balance published by the Federal Environment Agency states that this would correspond to around 401 kt of CO_2 in 2019. Assuming an electricity price of 15 ct/kWh, the industries concerned could also reduce their energy costs by around EUR 750 m.

Companies have as such an efficient way of meeting the requirements of the new European climate law and the carbon pricing stipulated in the national climate protection program for Germany. Model calculations show that the annual savings for a pump range from around EUR 2,600 to around EUR 19,600, depending on the speed and electricity price (assumptions: 8,000 operating hours per year, speed 1,500 or 3,000 rpm, electricity price between 12 and 18 ct/kWh). In this way, the higher purchase costs of a ceramic containment shell compared to its metal counterpart are usually amortised by the electricity savings after a maximum of half a year. The CO_2 savings per pump applying the assumptions mentioned are between 13 and 68 t per year.

In addition, BAFA (German Federal Office of Economics and Export Control) subsidizes investments in high-efficiency centrifugal pumps, glanded pumps and glandless circulators as well as for frequency converters for pumps with variable volume flow with 30% of the investment - for SMEs there is even a maximum of 40% with a maximum subsidy of EUR 200,000[2].

[1] Source: https://www.umweltbundesamt.de/themen/klima-energie/energiesparen/energiesparen-in-industriegewerbe#energieeinsparpotenziale

[2] Subsidy prerequisites: https://www.bafa.de/DE/Energie/Energieeffizienz/Energieeffizienz_und_Prozesswaerme/Modul1_Querschnittstechnologien/modul1_querschnittstechnologien.html

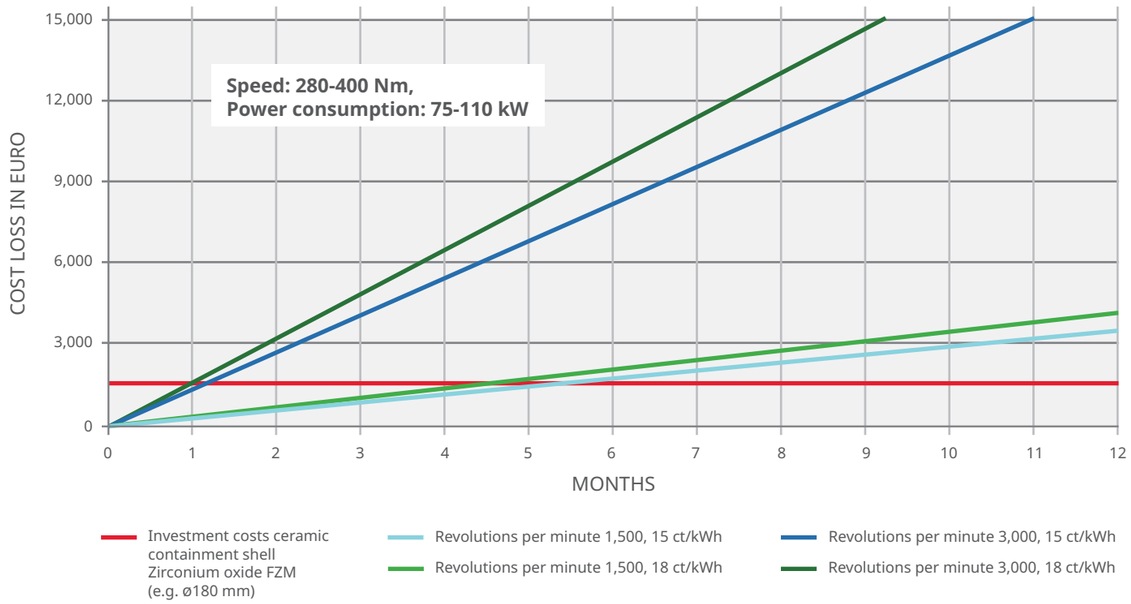
INVESTMENT IN THE FUTURE: COST AND ENERGY SAVING

Magnetic coupling with metal containment shell

Revolutions per minute [rpm]	1,500	3,000
Power loss [kWh]	20,000	100,000
Cost loss at 12 ct/kWh [Euro]	2,600	13,000
Cost loss at 15 ct/kWh [Euro]	3,300	16,000
Cost loss at 18 ct/kWh [Euro]	4,000	20,000
Cost loss at 3 ct/kWh [Euro]	650	3,300
CO_2 reduction [kg]	13,400	68,000

Assumptions: 8,000 operation hours per year, speed with 280-400 Nm, power consumption with 75-110 kW

Costs due to eddy current loss with metallic containment shells



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