

Tribological performance of polymer compounds in gaseous hydrogen

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In this study, friction and wear of conventional and alternative high performance polymer compounds for compressors were investigated in gaseous hydrogen and nitrogen up to 80 bar of gas pressure. The compounds used were a commercial PEEK matrix with 10 wt.% each of PTFE, graphite, and short carbon fibres (Polytron), a PPS matrix with 10 wt.% each of PTFE and graphite (MOCOM), and an experimental PA12 matrix with PTFE, chemically coupled with an oleyl alcohol, as additive (supplied by the polymer research institute IPF). For all compounds a steel counter disc (type 316L / 1.4404) with a lapped surface finish was used in a cylinder-on-disc setup.

Due to the cylindrical shape of the polymer samples, the contact area and pressure change if wear occurs. Therefore, experimental results of pre-screening tests have been used as input for FEM and an analytical model to determine the decreasing contact pressure over time. Afterwards, the outcome of the models was used to determine the duration of the experiments to reach typical contact pressures of seals in hydrogen compressors.

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