

The reliability of the parameter PV limit for evaluating performance of mechanical seals

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Mechanical seals are gradually replacing soft packings in the field of dynamic shaft sealing. The key factor of mechanical seal technology is tribological design of seal faces, which consists of material selection and tribological characterization. The most common approach for seal face evaluation is to determine performance limits by the pressure-velocity product – or simply the *PV limit*. The parameter PV limit proved its value in the field of journal bearings; however, in mechanical seals there are contradictions on its reliability as failure criteria and therefore used with care. In literature, for example, a single PV limit data is usually given for a specific material pair, although it was shown the PV limit is not a constant but rather depends on many factors. Material properties, roughness of mating surfaces, lubricating conditions and seal design are a few of them. Furthermore, there is really no seal theory as such to compare PV limits to.

The PV limit as failure criteria was extensively studied on the case of self-mated alumina. Two types of short-interval PV tests were performed on a model test rig of our own design. One with constant sliding speed and varying net sealing pressure and another with constant net sealing pressure and varying sliding speed. In this way, the influence of the testing procedure was also verified. All tests were performed with tap water as a process fluid. Lubricating conditions during tests were analyzed with Stribeck curves. Tests under dry conditions were also performed in order to compare the PV limit data. In general, results show that lubricating regime present in the seal is the governing factor which determines the level of PV limit. Therefore, presenting the PV limit values without some information about the state of lubrication is insufficient.

Key words: mechanical seals, PV limit, failure criteria, lubrication, tribology, roughness.