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The role of particles in the sealing contact of radial shaft seals

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Radial shaft seals (RSS) are used to seal the exit of rotating shafts from lubricated machinery. Their main function is to prevent fluid leaking from the machine and particles entry. The functional properties of seals like reverse pumping, friction and wear are strongly influenced by particles in two mayor ways:

1) On the one hand, special particles such as quartz or chalk are important additives in the rubber compound of the seal. They insure the formation of certain roughness structures during the wear process of the interface [1]. Those structures are crucial for the sealing function. However, under certain conditions, the hard particles in the rubber can cause excessive shaft wear, leading to a failure of the seal [2,3].
2) In dirty environment, particles can enter the sealing contact and contaminate the lubricant inside the machine, leading to failure of the lubricated gears, bearings, etc.. In such environments, RSS are equipped with a second, protective lip, which limits dirt ingress. Also a lubricating grease dam is applied between dust and main lip, which also binds particles that passed the dust lip and thus slows their migration to the main lip.

In our contribution, we will present the effects described above and show how the effects and their influence on the seals behavior can be investigated using computational methods. We will present a FE-model of RSS, used to study the wear behaviour of particle-filled rubber against a steel shaft.

Contributions can only be accepted on the understanding that they will be presented at the Congress.

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