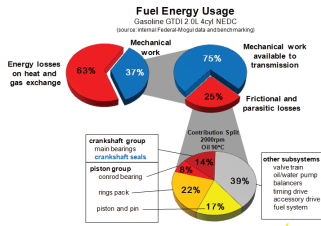
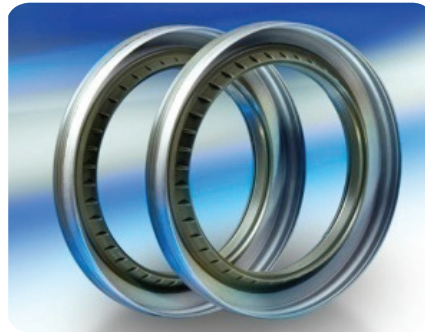


Innovative low friction seal capable of handling pressure and vacuum



Seal Torque × Shaft Speed = Power Loss



Challenge

Stringent fuel economy and emissions requirements driving the need to reduce parasitic energy losses while maintaining leak-free performance over the life of the engine.

To meet emissions requirements, modern engines exhibit increased levels of pressure and vacuum in the crankcase.

Zero tolerance for leakage and extended warranty coverage demands robust seal technology.

Solution

- MicroTorq® delivers less frictional torque than other seal alternatives without impacting performance
- Lower parasitic friction losses result in 0.31% engine efficiency improvement
- Small packaging space of seal enables design flexibility for next-generation engines
- Durability performance consistent with modern engine requirements

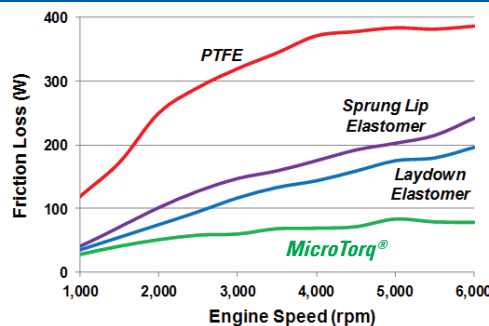
Specifications

- Dual-hinge flex section:
 - allows the seal to maintain uniform contact with the shaft under high geometry conditions
 - stabilizes the lip so that it is resistant to deformation or change in contact due to crankcase pressure or vacuum
 - contains installation feature and stabilizing ribs for robust assembly
- Static band provides reliable air seal with hydrodynamic aids delivering positive fluid pumping with reduced contact pressure

| Benefit | PTFE | Sprung Lip Elastomer | Laydown Elastomer | MicroTorq® |
|--|-------------|----------------------|-------------------|------------|
| Frictional torque (98mm shaft @ 3000 rpm) | 1.02 Nm | 0.47 Nm | 0.37 Nm | 0.19 Nm |
| Vacuum capability (DRO 0.2mm TIR, STBM 0.5mm TIR) | >15 kPa | >15 kPa | <3.5 kPa | 15 kPa |
| Maximum shaft offset maintaining air seal (<5mL/min@14kPa; w/o use of grease or other sealing aid) | Not capable | 1.3 mm | 0.6 mm | 1.4 mm |
| Allowable installation misalignment (shaft offset capability w/o use of installation tool) | Not capable | 1.2 mm | Not capable | 2 mm |

Current/Proposed Applications

- Rear crankshaft seal
- Front crankshaft seal
- Camshaft seal
- Integrated front or rear covers



CO₂ Reduction Performance Durability Enabling Technologies Friction Reduction

