



Development of a Robust 2nd Stage Oil Sealing Device for Heavy Duty Engines

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Purpose

Cummins Inc. has proposed a project to design and develop an oil recapturing device that will collect oil that leaks past a rear crankshaft seal. The leaking oil of the crankshaft is perceived a failure in the customers eyes and also causes premature engine overhaul. A test device is also needed to show the effectiveness of the device.

Project Background

- Oil Repeatedly leaks past crankshaft seal from extensive wear due to long engine life.
- Oil can escape in the form of liquid or vapor due to thermal expansion of the material in use.
- High cost of rear crankshaft seal replacement in large diesel engines.
- Engine life exceeds 20,000 hours before overhaul, meaning long-life seals are essential.

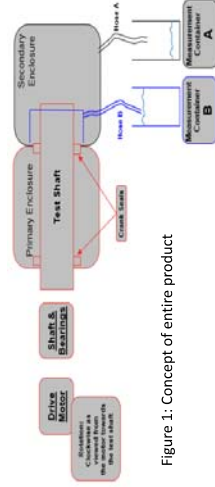


Figure 1: Concept of entire product

Background Research

- Research of multiple long-life sealing options revealed *Labyrinth* and *Centrifugal Pressure Seals* as viable options.
- Long-life seal must have capability to perform without lubrication and also when engine is not running.
- Pressurized secondary chamber behind crankshaft seal could prove solutions to oil escape prevention as well as an oil recapture method.

Objectives

- Design and develop an oil recapturing device to capture leaking oil.
- Design and Develop a test rig to prove the effectiveness of the device.
- Choose viable sealing option for long-life non-lubricated seal.
- Perform 24 hour test on sealing device using test rig at given constraints.

Future Work

- Finalize Test Device Concept
- Compile Cad Drawing to be sent to machine shop and begin ordering parts.
- Produce/Obtain Hybrid-Labyrinth Seal for non-lubricating long-life applications.
- Obtain needed components from Cummins Inc.

Concept Design

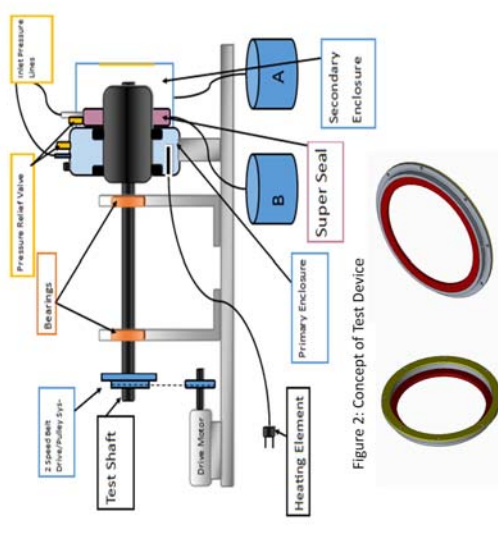


Figure 2: Concept of Test Device

Figure 3: Pressurized "Super Seal" device within secondary enclosure.

- Pressurized chamber device aids in prevention of oil leaks and also in recollection with the use of Hybrid-Labyrinth Seal.
- Measure effectiveness by:
 - $P_1 * V_1 = P_2 * V_2$
 - Find Leak rate: $\frac{\Delta V}{t} = Leak Rate$
- Successful Concept Vol.(A)<Vol.(B)

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