High-temperature Dry-gas Seal Development and Testing for sCO_2 Power Cycle Turbomachinery 08740

Dry-Gas Seal Component Testing to 500°C

1. Impact

High Temperature Dry Gas Seals are a high priority for sCO_2 turbines. The inclusion of a high temperature dry gas seal is expected to improve isentropic efficiency by 2-4% and in turn, increase cycle efficiency by 1-2%.

2. Project Goal

The main objective of this project is to develop a dry gas seal capable of 500°C at 7.4 MPa. The first phase focused on first designing and testing the temperature dependent components, particularly the balance sealing element.

3. Method(s)

The team narrowed over 20 concepts to three balance seal designs (temperature limiting component of the dry gas seal). The seals were then built and tested with both slow and dynamic movement (axial). The down-selected seals were tested at ambient conditions and then high temperature. The next phase will test a complete dry gas seal assembly with the newly designed balance seal.

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4. Outcome(s)

The balance seal saw insignificant increases in leakage due to the high temperature CO_2 (testing was performed on a “leaky” design). Additionally, current seal design met the leakage target at ambient conditions. The final design will be tested at high temperature and pressure in the final quarter of Phase I.

5. Conclusion/Risks

The static seals presented a larger challenge than expected, but the balance seal currently meets expectations. The team has to perform a final high temperature, high pressure test to meet the final milestone (performed during the last quarter). The next phase of the project will be focused on assembling and testing a full DGS with a rotating test rig.

6. Team

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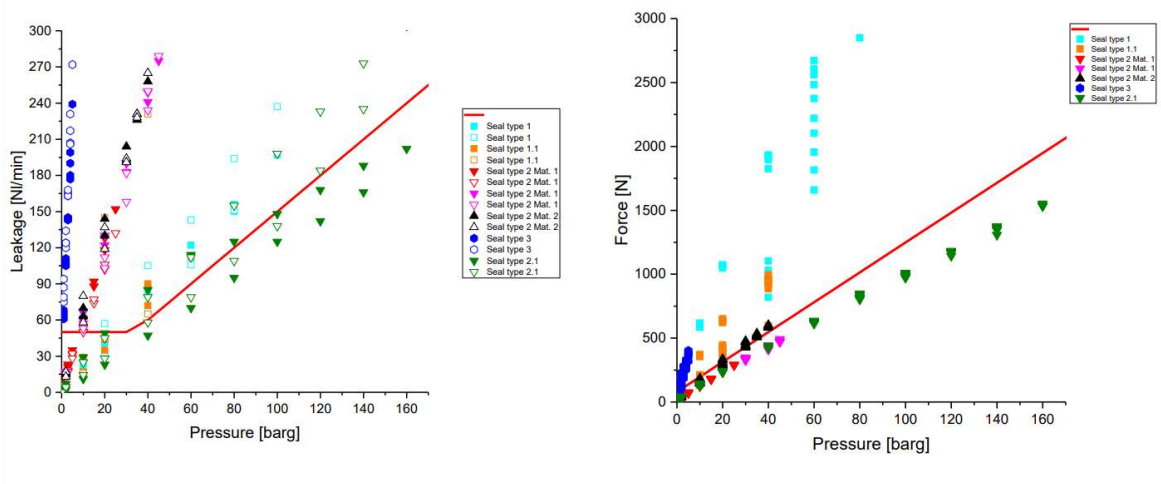

Figure 1. Leakage and Friction Results of the Balance Seal