Leakage flow reduction in the gas turbine shroud gap

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The presentation contains the results of experimental investigation and numerical calculations of flow through the labyrinth seal of a gas turbine. The calculations and measurements were carried out for 3 gap sizes and wide range of pressure ratios. The global parameters of mass flow and discharge coefficient resulting from the calculations were compared with experimental data obtained for the same geometry and conditions. The comparison showed discrepancies that resulted from improper manufacturing of the seal. The manufacturing errors caused up to 3% difference in the area of the gap between the seal and the casing. Exact measurement of the geometry was performed with coordinate measurement machine (CMM), which showed the profile of the surface of the fins of labyrinth seal. The geometry correction was introduced to the numerical model based on CMM measurements. After the correction, numerical calculations show better agreement with the experimental data. Additionally to the global parameters comparison, static pressure at the top wall was compared for the calculations and the experiment. It showed good prediction of trends, but values of pressure between the fins were underpredicted by the numerical model. The study is a preparation step in an effort to introduce new geometry of the labyrinth seal, which aims at reducing leakage flow.

References

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