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Half page Synopsis of Reports for website

Title of Report: Liquid and Gas Impeller Rotordynamic Coefficients, Project No: 258124-00059

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Summary:

API 617 level-II analysis requires detailed computed rotordynamic coefficients if level-I criteria fails. Thus, calculating more accurate rotordynamic coefficients is crucial to analyze rotordynamic stability. In the proposed work, a CFD approach is utilized to

(a) Develop Artificial Neural Network (ANN) software ANN-PSILP to predict centrifugal pump face seal front shroud rotordynamic coefficients.

(b) Perform system-level stability analysis of centrifugal compressor. Designed three unique swirl-brakes to facilitate system-level rotordynamic stability of the compressor eye-labyrinth seal and front shroud.

(c) Provide investigative studies and tutorial on using commercial CFD codes to obtain the stiffness, mass, damping and impedance characteristics of centrifugal pump and compressor seals, impellers and swirl brakes.

(d) Develop a stand-alone (non-commercial TRC) code for impellers (open/closed), diffuser and volutes with EXCEL GUI that appends to XLTRC^2. The database would be a mixture of Bulk-flow, CFD-based and theoretical models.

Development of a centrifugal pump impeller test rig has been started in order to verify CFD predictions of whirling impeller rotordynamics. Present state of the ANN software ANN-PSILP is delivered with an interactive GUI and it showed stellar results in predicting direct and cross-coupled stiffness, damping and mass coefficients for centrifugal pump face seal and front shroud. The ANN software development would be continued to include more training data and seal geometries. Analysis results and CFD tutorials would be provided for labyrinth seal and swirl brakes under two-phase flow (both bubbly flow and wet gas regions) conditions.