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Prediction of active control of subsonic centrifugal compressor rotating stall. (English)

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A mathematical model is developed to predict the suppression of rotating stall in a centrifugal compressor with a vaned diffuser. This model is based on the employment of a control vortical waveform generated upstream of the impeller inlet to damp weak potential disturbances that are the early stages of rotating stall. The control system is analyzed by matching the perturbation pressure in the compressor inlet and exit flowfields with a model for the unsteady behavior of the compressor. The model was effective at predicting the stalling behavior of the Purdue University low-speed centrifugal compressor for two distinctly different stall patterns.

MSC:

76G25 General aerodynamics and subsonic flows

76U05 General theory of rotating fluids

Keywords:

vaned diffuser; control vortical waveform; weak potential disturbances; perturbation pressure

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