

# Mechanical Engineering Master's Defense

## Low Cost Gas Turbine Off-Design Prediction Technique

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### abstract

This thesis seeks to further explore off-design point operation of gas turbines and to examine the capabilities of GasTurb 12 as a tool for off-design analysis. It is a continuation of previous thesis work which initially explored the capabilities of GasTurb 12. The research is conducted in order to: 1) validate GasTurb 12 and; 2) predict off-design performance of the Garrett GTCP85-98D located at the Arizona State University Tempe campus.

GasTurb 12 is validated as an off-design point tool by using the program to predict performance of an LM2500+ marine gas turbine. Haglind and Elmegaard (2009) published a paper detailing a second off-design point method and it includes the manufacturer's off-design point data for the LM2500+. GasTurb 12 is used to predict off-design point performance of the LM2500+ and compared to the manufacturer's data. The GasTurb 12 predictions show good correlation.

Garrett has published specification data for the GTCP85-98D. This specification data is analyzed to determine the design point and to comment on off-design trends.

Arizona State University GTCP85-98D off-design experimental data is evaluated. Trends presented in the data are commented on and explained. The trends match the expected behavior demonstrated in the specification data for the same gas turbine system.

It was originally intended that a model of the GTCP85-98D be constructed in GasTurb 12 and used to predict off-design performance. The prediction would be compared to collected experimental data. This is not possible because the free version of GasTurb 12 used in this research does not have a module to model a single spool turboshaft. This module needs to be purchased for this analysis.



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