



DEPARTMENT OF MECHANICAL ENGINEERING Purdue School of Engineering and Technology

FALL 2003 SEMINAR SERIES

Date: **Thursday, December 4, 2003**

Time: 11:00 am - 12:00 pm

Room: **SL 165**

Reception at 10:45 am (cookies and refreshments served)

Everyone is invited

Analytical Design Procedure for Wave Rotors Enhancing Gas Turbine Cycles

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Abstract. Wave rotors are a family of unsteady-flow devices used to reach the high performance targets for thermodynamic cycle implementations. An analytical design procedure of four-port reverse-flow wave rotors for gas turbine applications will be introduced. This methodology employs a thermodynamic cycle analysis proving the performance improvement of a small gas turbine (microturbine) by implementing various advantageous four-port wave rotor topping cycles. General performance maps are generated showing the design space and optima for baseline and topped engines. A one-dimensional analytical gas dynamic model of the high-pressure phase is also employed to calculate flow characteristics inside the wave rotor channels. Useful design parameters such as port widths and rotor size are determined by computing transit times of the waves inside the channels. Finally, ideas of integrating wave rotors in ultra-micro gas turbines (UMGT) and refrigeration systems will be introduced.

About the Speaker. Mr. Pezhman Akbari is a Ph.D. Candidate in the Turbomachinery Laboratory of Mechanical Engineering at Michigan State University (MSU). Since 1999, he has been involved in the development of wave rotor machines and is currently investigating the potential of utilizing wave rotors for small gas turbines. In 2003, he received the AIAA Foundation Graduate Award for studies in the potential of wave devices in gas turbines and was recognized as the most outstanding Mechanical Engineering graduate student at MSU. He has been also awarded the McClure Fellow Award for the outstanding performance during his doctoral study. He has a Bachelor of Science degree (B.S.) and a Master of Science degree (M.S.) in Aerospace Engineering from Sharif University of Technology in Iran, where he has started his academic career with analytical and experimental investigations of combustion instability in ramjets.