Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Visualization of Internal Flows with Pressure Oscillation and Surface Modification[1] FELIX RIVERA, Inter-American University of Puerto Rico - Bayamon, JOHN BAKER, University of Alabama — A Stirling engine's displacer piston causes motion in its working fluid that exposes the fluid to pressure oscillations that directly impact flow behavior. Stirling engines are highly efficient external combustion engines that are often used in renewable energy applications and have been identified for use on near space platforms as auxiliary power units. The goal of this study was to identify the basic structures of the transient flow field within the expansion cylinder of a Stirling engine without the added complications introduced by convective heat transfer. A two-dimensional representation of the flow within the expansion cylinder of a Stirling engine was produced using an optically-accessible piston-enclosure configuration. The transient flow field within the enclosure was visualized using a rheoscopic fluid. The Reynolds number, based on the frequency of the piston oscillation and the stroke length, was varied from 1.74 to 9.05. Several transient flow structures are identified and the impact that an array of triangular fins has on these flow structures will be discussed.

[1]Work performed under REU site, NSF grant EEC 0754117, and NASA Award No. NNM07AA06A.

Amy Lang
University of Alabama

Date submitted: 23 Jul 2009 Electronic form version 1.4