

**Fluid Power Initiatives in Research and Teaching at Youngstown State University
NFPA Educator/Industry Summit**

Abstract for Poster Presentation

H. Marie, Y. Panta, H.W. Kim
Youngstown State University
Youngstown, OH 44555

Fluid Power has continued to be an area of student involved research at Youngstown State University (YSU). In fact, one ongoing goal in the newly formed College of Science, Technology, Engineering, and Mathematics (STEM) at YSU is to incorporate more advanced fluid modeling techniques to the undergraduate and graduate student experience. As such, the intent of this presentation is to highlight past, current, and proposed research projects in hydraulics, fluid power, fluid modeling and control that bring students, faculty, and industry together. The projects range from basic fluid modeling for sophomore and junior undergraduate students to cutting edge research of fluid power related to microfluidics and energy storage and transmission.

Fluid flow simulations using computational fluid dynamics (CFD) software are widely used to visualize, predict and customize fluid flow parameters in various areas such as; general fluid flow, pharmaceutical, and biomedical applications. Students at YSU are able to utilize numerical software capabilities, which include access to commercial software packages FLUENT and COMSOL. One of the research areas of interest at YSU is applying CFD analyses techniques to fluid devices such as pumps. One of the highlighted projects involves the ongoing modeling and analysis of a gear pump supplied by the Gear Pump Division of Parker Hannifin Corporation. The ultimate goal of the project is to accurately model the flow and pressure profiles that occur both during start-up and steady-state operation of the pump for pump performance optimization. Another highlighted project involves Magneto-hydrodynamics (MHD) pump analysis. MHD is routinely used in industry to heat, pump, stir and levitate fluids. This specific project will involve design, modeling and optimization of MHD pumps for industrial applications. Numerical simulations will be validated by experimental results in collaboration with a local fluid power company interested in developing MHD pump.

The presentation will also highlight a few of the research projects at YSU in Fluid Power recently initiated with Babcock & Wilcox and Linde Hydraulics Corporation. The projects include two-phase flow modeling and control in drum and once through boilers, hydrostatic transmission in wind turbines, and on highway hydraulic assisted heavy vehicle drives.[ymp1]