PROJECT TITLE: Experimental Setup for Evaluating 3-D Printed Enhanced Heat Exchanger Surfaces

Physical Requirement : Be able to put together the experimental set up and work with data acquisition system
Project's Technical Skills Requirement : Some familiarity with fluid flow and heat transfer concepts, desire for hands-on experience with experimental research

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Project Description

From electronic cooling to battery thermal management in electric cars, heat exchangers are ubiquitous in engineering industries and applications. There is active research in developing heat transfer passages that provide enhanced heat transfer to make heat exchanger more efficient and compact so as to lower energy utilization while meeting process objectives. Additive manufacturing techniques provide a method to produce novel heat exchanger designs that were not possible to produce in the past. To fully utilize this potential, convective heat transfer performance of different designs must be determined to evaluate their relative merit and energy saving potential in different applications. In this project, students will assemble an experimental set up to test heat exchange surfaces. They will use the developed experimental apparatus to test and compare several surfaces including wavy fin coupons, plain fins, and 3-D printed novel designs. Most of the parts of the experimental set up have been fabricated and will be available to students to assemble. Students will need to instrument the set up for pressure, flow, temperature, and heat transfer measurements. Students will test the setup, document measurement precision and uncertainties, and develop a procedure manual for the test set up for later use by other students. Students will document their experimental results in a report. Two students will work as a team to complete the objectives of this project. A graduate student from the Thermal Fluids and Thermal Processing Lab will work closely with the team. In this coop assignment, students will learn
experimental techniques including temperature, pressure, and flow measurements, determination of experimental uncertainty, design of experiments, concepts in advanced heat transfer and sustainability.