

Engineering Advancement Trust (EAT) Report to Donors

The following provides an update on some projects undertaken under the umbrella of the EAT during 2012-13 and 2013-14.

Advanced Flow Measurement System



Our students are benefiting from access to the newest flow measurement equipment with the advanced flow measurement system. This equipment is rapidly being adopted in engineering practice to measure flows in pipes and rivers. It comprises two components: an Acoustic Doppler Current Profiler and an Acoustic Doppler Velocimeter. In the upcoming year, student exposure to the system will include using it in hands-on lab activities and to look at velocity measurements in a turbulent flow. The advanced flow measurement system provides our students with valuable experiential learning opportunities they will be able to use for decades to come in civil engineering practice.

Impact Testing Facility

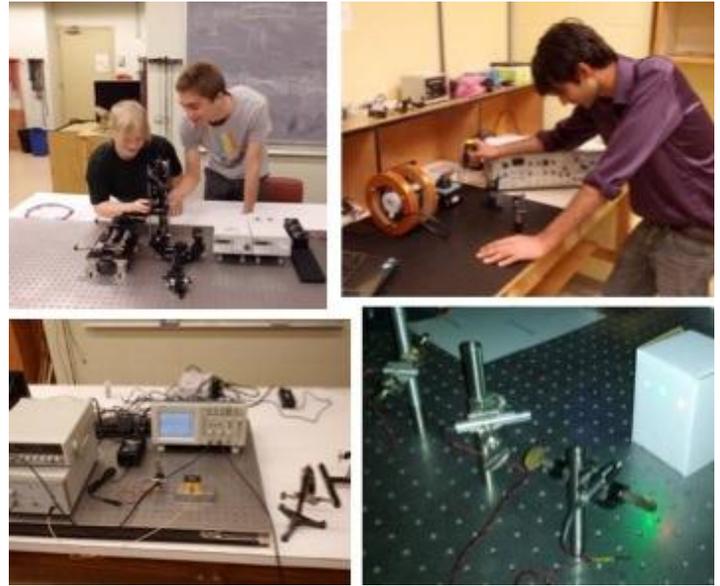
The newly-purchased Instron 450MPX Charpy Impact Tester replaces an instrument that was more than 50 years old. Due to safety concerns, the old tester could only be used for demonstrations; students will now benefit from hands-on use of the new instrument. The transparent enclosure enables safe, up-close viewing during testing—a significant improvement from the old tester, which required students to stand back two metres behind a bench. The student experience is further enhanced with data acquisition capability that displays the impact curve, as well as higher capacity that offers more repeatable results. The new impact tester is being used both in classes and for research.





Optics and Photonics Equipment

New optics and photonics equipment have provided a big boost to the new Advanced Optics Laboratory program in Physics and Engineering Physics. The equipment was purchased and installed in the labs for fall 2013, but even prior to that, undergraduate Physics and Engineering Physics students used the equipment and helped with lab development during their summer projects in 2013. With EAT's support, our college has an exciting twenty-first century optics lab program with a wide array of new laser sources operating at different wavelengths across the visible spectrum, advanced light modulators of the type used in modern communications systems, new laser precision measurement equipment, and a leading-edge optical tweezer system based on a Massachusetts Institute of Technology design. Advanced imaging equipment has also been purchased, enabling our students to work on designing new, leading-edge microscope systems.



EAT-Funded Optics Equipment (clockwise from upper left) 1. Optical Tweezer Kit (from Thorlabs Inc.) 2. Diode Laser Optical Pumping System (from TeachSpin) 3. Multicolour solid-state lasers (Thorlabs Inc.) 4. Electro-optic Modulator System (Thorlabs Inc.)

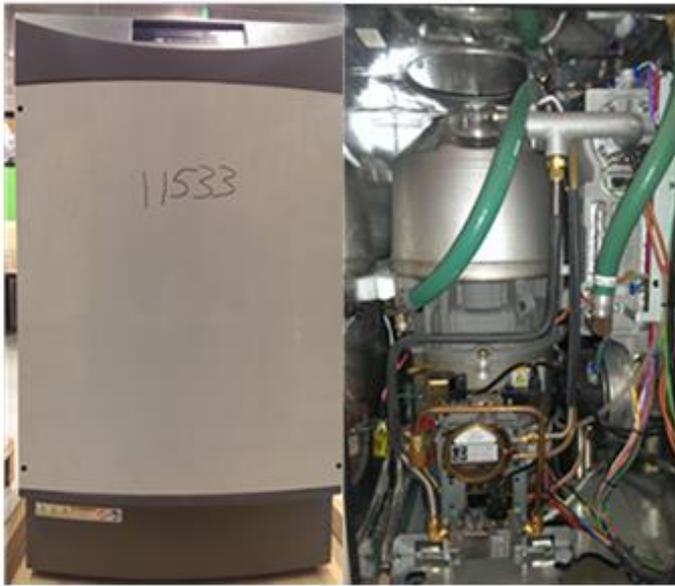
Dissolved Air Flotation Apparatus

Fourth-year chemical engineering students benefit from the dissolved air flotation apparatus, which they use to learn—on a practical level—a mineral processing method that's important in the mining industry in Saskatchewan and elsewhere. Flotation, or more specifically 'froth' flotation, is a physio-chemical method of concentrating ground ores. An ore pulp is chemically treated to enable pre-chosen mineral particles to attach to air bubbles. The air bubbles carry the selected minerals to the surface of the pulp, forming a stabilized froth that can be skimmed off. The pre-determined mineral particles are then recovered from the froth, while other minerals remain submerged in the pulp.





Combined Heat and Power Laboratory



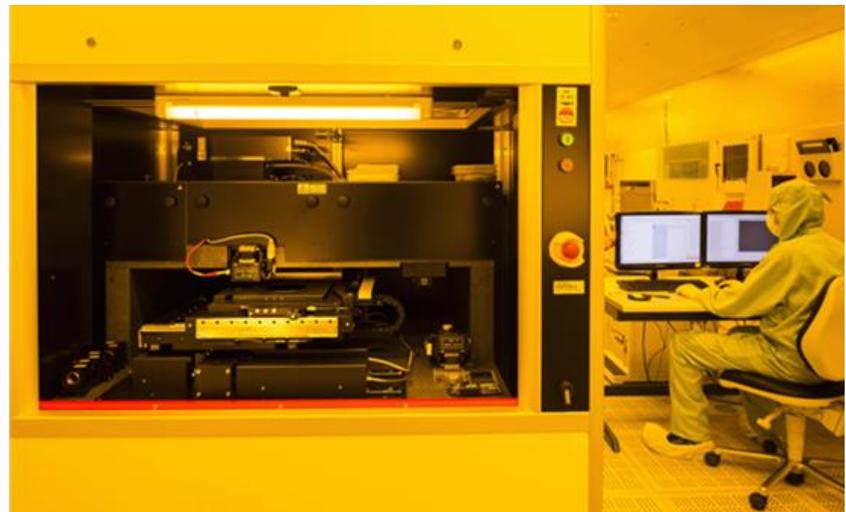
Most of the expenditures for this project are not related to the purchase of a single piece of equipment. Our college was extremely fortunate to have several WhisperGen Combined Heat and Power units donated to us from Enmax in Calgary. That is the only expenditure so far. The remaining funds from EAT will be used for installation and instrumentation costs. These will be incurred in the coming months as we install the equipment and continue to develop the laboratory.

The image at left shows the outside and inside of a WhisperGen Combined Heat and Power unit.

Direct Laser Writer

With the upcoming addition of the direct laser writer made possible with EAT's support, our undergraduate students will benefit from holistic training in the area of micro and nanotechnology. The direct laser writer is a new fabrication tool currently being tendered with support from the EAT. It will be housed in the Synchrotron Laboratory for Micro and Nano Devices (*SyLMAND*) at Canada's national synchrotron research facility, the Canadian Light Source. The direct laser writer will allow rapid prototyping of UV-lithography patterned polymer micro structures. This means that the time it takes to manufacture microelectromechanical systems (MEMS) components will be dramatically reduced, and students can thus try out selected micro-fabrication sequences in the lab.

Our students will be able to, for the first time, experience high-tech processing of MEMS components as part of their programs. Previously, students only experienced a simple field trip to the *SyLMAND* lab. With the addition of this device, they will experience a complete design, fabrication, inspection, and analysis sequence—in other words, an entire chain of learning from theoretical concepts in design through fabrication and testing. Add to that the multidisciplinary approach and the *SyLMAND*'s clean room facilities, and a truly unique learning experience is created. The direct laser writer will be the only one of its kind in western Canada.



A typical direct laser writer instrument in its cleanroom environment (courtesy of Karlsruhe Institute of Technology, Germany). The operator, in cleanroom gowning, is controlling a fabrication sequence, with part of the writer itself depicted in the foreground.