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Mechanical Engineering 493 project:
Engine Fuel Injector Test Apparatus for Fast Flow Measurements

Background and research goal
Modern engine fuel injectors require repeatable, controllable multiple pulses of fuel. If the injections are not repeatable, either shot-to-shot or injector-to-injector, engine performance is degraded and exhaust emissions can increase.

See also http://www.sites.mech.ubc.ca/~rogak/research/injector.html

Westport Innovations manufactures natural gas injectors that require special test equipment. Although Westport and UBC have some devices for characterizing injectors, a new improved device is needed. In particular, the device requires:
- Momentum flux measurements for individual injector holes on a multihole injector
- Mass flow measurement for all holes using rate tube or other principles.
- Some visual access for gas and diesel jet imaging.
- Capable of simulating injections in 150 bar backpressure.

Tasks Performed by Student
The student will work with graduate student Ehsan Faghani and engineers at Westport Innovations to develop shop drawings and parts lists for the new device by December 2012. This will require some design calculations be done first, specifically related to the flow measurement via pressure measurements. In term 2 the device will be constructed and calibrated.

Resources Available
(Please list financial, supervisory or other in kind support that will be made available to the team. Note: these may be contingent on how well the student's progress through the project.)

- Meetings with UBC PhD student Ehsan Faghani to get help with the fluids modeling needed to estimate the operation of the apparatus.
- Meetings with Westport injector designers to refine requirements.
- Limited access to injector dimensions so that a device can be made that holds the Westport injectors.
- Loan or purchase of key sensors such as pressure transducers.
- It is expected that the student will prepare a budget proposal in term 1, and well-justified project costs of $3000-6000 will be supported.