



MECH 493 project: Development of a Pressure Bar for high-strain rate testing of materials.

Background and research goal

The project is focused on designing an apparatus to understand the high strain rate behaviour of materials. Usually, the high-strain rate behaviour of materials differs from quasi-static properties because loads are applied very quickly and the material deforms differently in these conditions. This is important in many fields of engineering, such as machining, impact applications and collisions of vehicles. The project focuses on developing a Pressure Bar to test materials, from the conceptual design to manufacturing and calibration of the device with amplifiers and strain gauges involving many areas of Mechanical Engineering. The device will be combined with high-rate video cameras available in the Department to understand the failure of materials. 3D CAD design (SolidWorks or similar). Intermediate/Advance Machining of Metals (MECH training and proven machining skills). Good hands-on experience in machines and design. Analytical skills on mechanics of materials. Good use of electronics (amplifiers, strain gauges, welding, etc.) and instrumentation.

Tasks to be performed by the student

The successful candidate will design, manufacture and calibrate the device from scratch. Due to the constrained timeline, the candidate should have a good background in the machining of metals and the use of strain gauges if possible. Selection of materials and profiles is required (for instance be familiar with McMaster Car Catalogue). Once the device is built, the student will perform several tests on specimens made of steel, aluminum and magnesium, which are widely used in the aerospace industry.

Facilities and team:

The Modelling and simulation group (led by Dr. Ponga) has computational and experimental laboratories located in CEME and ICICS. The group has access to high-performance clusters and supercomputers, finite element software, and other techniques such as atomistic and molecular dynamics software. Other capabilities such as microscopic analysis, mechanical testing and high-velocity cameras are available through shared facilities at UBC.