

# **HYDRAULIC MATERIAL TESTING MACHINE**

Progress Report for January – September 2005

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## **Design and Fabrication of Structures**

- During the spring 2005 semester, a team of four students designed a frame for the materials testing machine. Their design served as the team's project in a required capstone course named MET 4123, Senior Design Projects. The design goals included a frame that could support tests on standard (1/2" - diameter) carbon steel samples for tensile tests. The frame supports a large hydraulic cylinder at the bottom for applying tension or compression loads on the sample. The frame is designed to match the supporting flange of the cylinder. The top of the sample is attached to a cross-member support on the frame, which can be adjusted for various heights. According to calculations made by the students, the deflections of the frame are sufficiently small so that these deflections do not significantly affect the accuracy of the readings for the sample strain and load force. Refer to Figure 1.
- More detailed design drawings will be made in spring 2006, and machining will begin.

## **Design of Fluid Power Circuit**

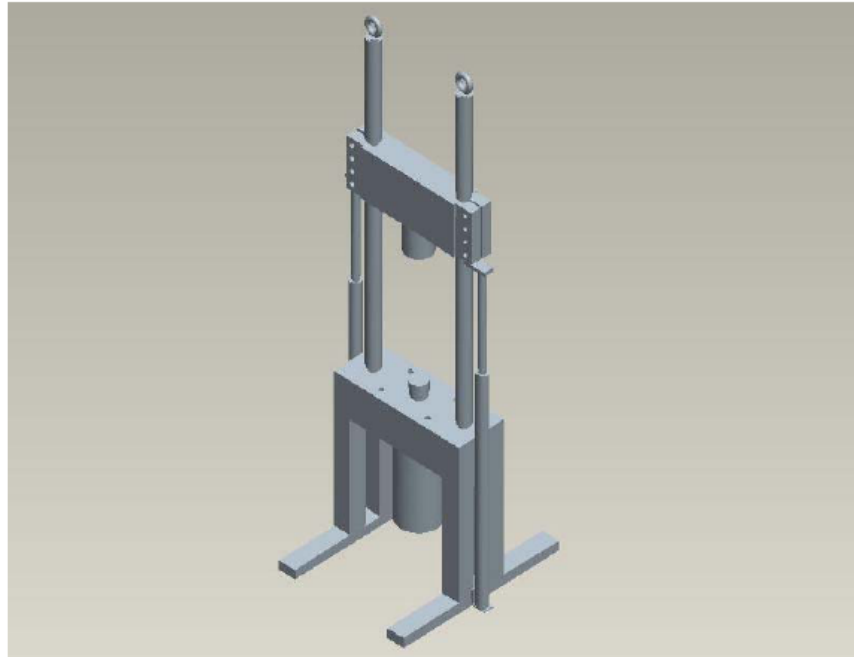
- During the spring 2005 semester, students in MET 4313 Electrohydraulics class suggested various possible designs of the hydraulic circuit. They used Automation Studio software for design and simulation of the circuits. Figure 2 is one of the circuits suggested by students. Initially the hydraulic material testing machine will be controlled mainly by directional control valves, flow control valves, and a hand pump. The hand pump is for very small movement of the cylinder when needed.
- In spring 2006, the MET 4313 Electrohydraulics class will assemble and test different circuits before structures completed.

## **Funding and Purchasing**

- Two major components of the hydraulic material testing machine, a hydraulic power unit and a cylinder, were purchased. The hydraulic unit is powered by a 5 hp electric motor, and its maximum flow rate is 4.5 gpm. The bore of the hydraulic cylinder is 8 inches, and the stroke is 12 inches. Refer to Figure 3.
- The full amount of funding from the National Fluid Power Association (\$5000) and that from Womack Machine Supply (\$2000) was spent. Solicitation to Eaton Corporation was not approved. During the next few months, hydraulic fittings and accessories will be purchased with supports from Sun Hydraulics and the MET Department.
- Requests will be made to local manufacturing companies including the Charles Machine Works for donations of materials and machining of large-size structural parts.

**Senior Design  
MET 4123  
Spring 2005**

**Material Testing Machine**



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Figure 1. Senior design project report

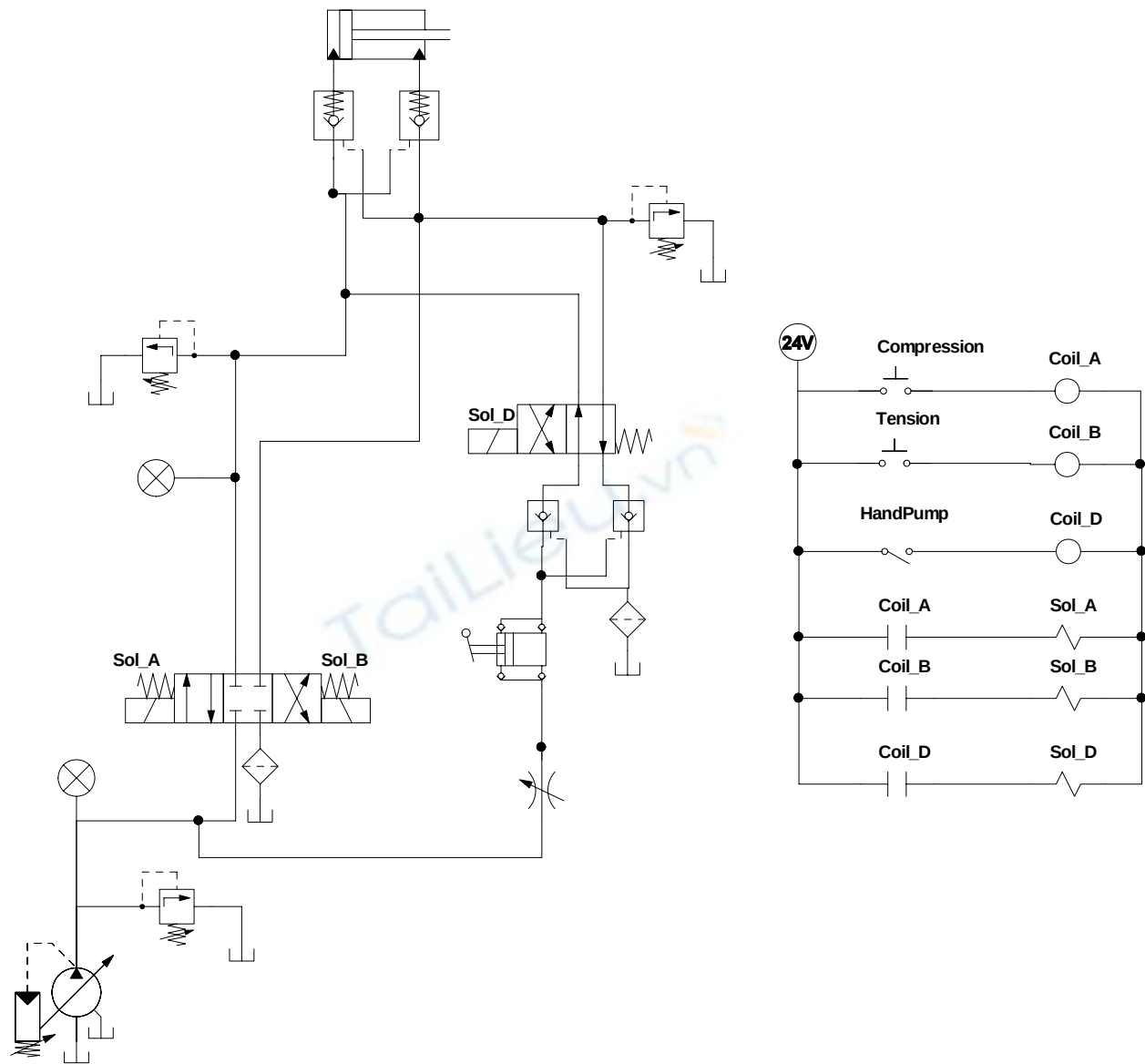


Figure 2. A sample circuit



Figure 3. Pictures of the hydraulic power unit and the 8-in bore cylinder