Fluid Power System and Control Module Development
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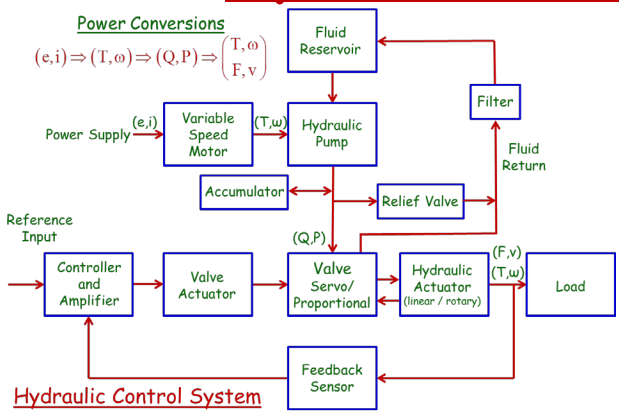
The objective for this project was to take integrated knowledge, both academic and industry best practices, in Fluid Power Systems and Control gathered by the investigator and present it in a form readily accessible to students and practicing engineers. The development of a dozen modules, with voice and /or video, was made possible with the funds requested ($3500).

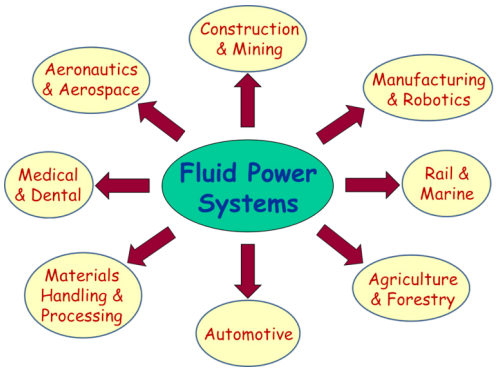
The modules created are:

Module 1: Overview: Mechatronics and Model-Based Design
Module 2: Description of the Physical System and its Components:
    Hydraulic Cylinders, Hydraulic Control Valves,
    Hydraulic Proportional Valves, Hydraulic Pumps
    Hydraulic Transmission Lines
Module 3: Physical System Modeling
Module 4: Physical Model of the Physical System:
    Hydraulic Cylinders, Hydraulic Control Valves,
    Hydraulic Proportional Valves, Hydraulic Pumps
    Hydraulic Transmission Lines
Module 5: Mathematical Modeling
Module 6: Mathematical Models of System Components
    Hydraulic Cylinders, Hydraulic Control Valves;
    Hydraulic Proportional Valves, Hydraulic Pumps
    Hydraulic Transmission Lines
Module 7: Mathematical Model of Integrated System
Module 8: Predicted Dynamic Response
    Linearization and Analytical Solution
    Numerical Solution: Simulink and SimHydraulics
Module 9: Predicted Dynamic Response of Components & Integrated System
Module 10: Experimental Validation of Dynamic Response Predictions
Module 11: Control Design
    Position, Velocity, and Force Control
    Feedback, Feedforward, Observers
Module 12: Pump-Controlled vs. Valve-Controlled Systems

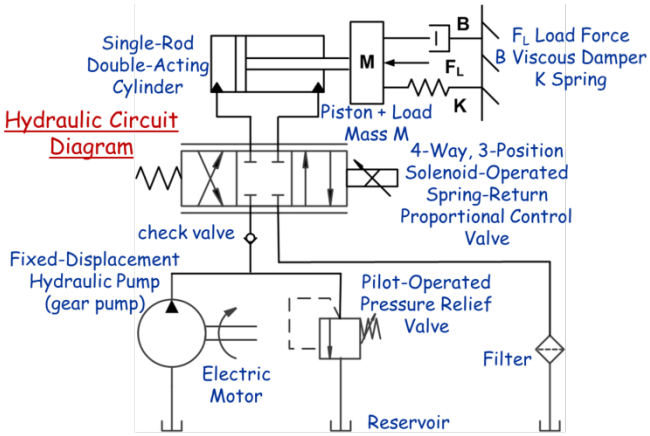
These modules will be used in the spring 2014 required junior-level mechanical engineering course *Multidisciplinary Engineering Systems* taught by the investigator with 100 students. They will then be available to NFPA for posting and distribution in the summer of 2014.

Project Motivation: Fluid Power Systems are Pervasive





Fluid Power System at Price Engineering for Marquette Engineering Students



Price Engineering Physical System

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