

The Development of a Truly Hands-on Strength of Materials Lab Using Torque Wrenches for Breaking Metal Fasteners

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Traditionally, strength of materials labs would normally include tensile testing of metal samples. This is normally done with an automated tensile testing machine with data acquisition system (hardware and software). Even though students may need to load the part into the fixture manually, however, during the pulling process, students are mostly just watching. This is simply because it is impossible for humans to pull apart a metal piece. Some education technology providers such as PASCO, Inc., provides a hand-cranked tensile testing machine that would give students a “feel” of the strength of materials. But the equipment is costly considering what limited tests it can do. In this paper, some “quick and dirty” low-budget torsional lab has been developed that would allow students maximum exposure to hands-on material testing. The required equipment list for this lab is short and affordable. Students will also have a chance to learn some basic skills using the lathe, the grinder, the vise and calipers, etc. all in a machine shop setting. Simple torsional load calculation is required for this lab to help students review the mechanics of materials theory and correlate that theory to practice. This lab can also serve as a lead-in to the study or discussion of industrial fasteners which normally is only covered in mechanical components class.