



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description

Company Name	Technimark	Date Submitted	12Jun2017
Project Title	Test apparatus to apply calibrated forces to cap opening tests (TEC_SOUND)	Planned Semester	Fall 2017

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	1
Computer		Systems	
Other ()			

Project Overview:

Caps, lids and closures are used in consumer products all over the world. There is a fine line between making caps and lids strong enough to remain closed under normal usage yet be easy enough to open when the product is desired. One of the issues with lid design is testing the right amount of interference between parts to determine that optimum opening and closing force.

Standard force measuring apparatus are fine most of the time but spike once the lid is open or closed. Consider pressing down to close a cap; the force increases until the cap “snaps” into place at which time the force instantly jumps as the cap is hitting against a hard stop.

The other issue for many closures is they cannot be tested more than once. The initial testing will slightly deform the plastic and thus every closure thereafter will be different. This presents a difficulty when a firm such as Technimark is molding 96 caps at a time every 12 seconds!

Currently, caps are tested using an existing test fixture. These caps make a distinct sound when opened. The objective of this project is to determine scientifically, if there is a relationship between the sound the caps make and the opening or closing force. Building test fixtures that can accurately and repeatedly measure these forces is costly and cumbersome. If we can correlate the forces to sound, the fixture could be less expensive to make and more accurate.



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Initial Project Requirements:

This project would be to measure the sound the caps make during opening and determine if this sound correlates to opening force with enough accuracy that sound could be used as a reliably substitute for force measurement. The next part of the project would be to design and build a device that can be integrated to the current mechanical force test fixture to allow sound/mechanical force testing to be done at the same time and correlation databases to be created and analyzed. Sequentially, the project will have the following steps: First, the team will collect data on the existing parts and correlate that data to the sound the parts make. Second, the team will design a test stand (integrated to the existing fixture) to test parts using sound as the measurement. Third, the team will validate the test stand. Data collection must be part of the design using Labview to record the testing results into a database and analyze and report on the correlation of the results.

Expected Deliverables/Results:

- Test apparatus that provides the following functionality:
 - Accommodates the range of plastic parts required
 - Collects testing data and records results to a database using Labview software
 - Accurately records the force required to open and close a cap
 - Provide calibration validity for the apparatus via comparison testing with current known methods.
 - Train client in the operation of the unit.

Disposition of Deliverables at the End of the Project:

Technical Supporter to take possession of unit after Expo

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- LabView software.
- Ability to travel to Asheboro site for data gathering, design reviews, as required. Travel required to client site for data gathering and Design Reviews. Travel costs will be reimbursed from Project budget.
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- Web meetings need to work with schedule of project leaders.
 - For the fall term, Thursdays 8am until 1pm and Friday 8am to 9am and 10am to 11am are available.
 - For the spring term, Tuesdays and Thursdays are open and Fridays from 10am to 11am.

Existing Test Stand



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