

Needs Assessment and Project Scope

EML 4551C – Senior Design – Fall 2012 Deliverable

Team 13: Smart Materials Museum Exhibit Design

Glen Ashworth, Laura Wainikainen, Daniel Roque, and Isaac Piersall

Department of Mechanical Engineering, Florida State University, Tallahassee, FL

Project Sponsor

Challenger Learning Center



Project Advisor:

Dr. William S. Oates, Ph.D

Department of Mechanical Engineering

Needs Assessment

The purpose of this project is to demonstrate smart materials and their principles to educate and entertain students at the Challenger Learning Center through the use of a museum exhibit.

Project Scope

Problem Statement

The Challenger Learning Center requires a new exhibit to demonstrate smart materials and their uses to students and the public.

Justification/Background

The Challenger Learning Center will benefit from having another interactive display for a target audience of K-12th grade. Students are not familiar with smart materials and their applications. The Learning Center already contains other exhibits that deal with space missions and exploration.

Smart materials are materials that can be controlled by some external stimuli. These stimuli include, but are not limited to, stress, temperature, moisture, pH, and magnetic or electric fields. This project focuses primarily on the piezoelectric ceramic type of smart material. Piezoelectric materials produce stress within the sample when a voltage is applied. The reverse is true as well; when stress is applied to a piezoelectric material a voltage is produced. Piezoelectric ceramics are currently used in sonar transducers, ultrasound medical devices, nanopositioners, and vibration control.

Objective

The objective of this senior design project is to design, build, and test a museum exhibit that demonstrates the performance of the piezoelectric ceramic materials and their engineering uses to excite and educate K-12 students.

The goal of this senior design project is to design, build, and test a museum exhibit that excites and educates K-12 about the constitutive behavior of these materials and how they may be used in engineering applications

Methodology

The methodology will be determined later in the engineering process.

Expected Results

The museum exhibit and website describing the project are the expected results. The website will include the deliverables and presentations created by the team. The final project should be delivered to the museum ready for display.

Constraints

1. Budget: The budget is currently undetermined. After our group formulates a basic project design and materials needed, grants for extra money will be applied for. Certain materials can be used for free if available through the FSU surplus program or if the Challenger Learning Center can supply them.
2. Interactivity:
3. Safety: The exhibit must be safe for use with kids as young as kindergarten. No exposed electrical hazards or other potentially dangerous mechanical devices
4. Related to space/NASA
5. Geared towards 5th-8th grade students
6. Space: 5 feet cubed
7. Time: Finish preliminary design soon so as to have time to apply for money. Have completed museum exhibit done by the end of spring 2013 semester.