



Composite Challenge

In technology, a composite is a combination of materials selected and manufactured to provide a range of properties not provided by any of the materials alone. Such properties include strength, stiffness, and the ability to endure conditions of prolonged or extreme stress. Composites are used in the manufacture of automobiles and airplanes as well as sports equipment and are essential in spacecraft where extreme conditions must be endured.

Combined materials such as alloys have long been known, but the term composite is reserved for materials in which particles or short fibers ("whiskers") are dispersed in, or long fibers are woven in, some form of matrix. One familiar composite is *Fiberglass*. Fibers are commonly made of the elements carbon or silicon and their compounds, and if the composite does not have to experience extreme temperatures, the matrix is usually some form of plastic.

Composite materials are often used to increase strength while simultaneously reducing weight. For example, composite materials have been used in aviation flight surfaces and have recently become a standard material in the automotive industry. Composites are also being used in sporting equipment (e.g., shafts of golf clubs, baseball bats).

DeWilde, W., and Blaine, W., (1990). Composite Materials

Your Challenge

Design and construct a composite beam that will exceed the strength values and reduce the weight values by 10% of the test beam material. Base your design and construction on solid research & design principles and calculations.

Limitations/Specifications:

1. Composite beam must be 10" long X 3/8" thick X 1/2" wide.
2. Composite beam must weigh less than test beam by at least 10% (student-to-student comparisons will be made).
3. Composite beam will be evaluated on a strength-to-weight ratio.
4. Composite beam will be tested in the strength analyzer.
5. Composite beam must be of solid construction (the use of open space/air gaps is prohibited).
6. Composite materials are unlimited.

Strength Analyzer Testing:

1. Place composite beam in strength analyzer and establish test hardware positioning.
2. Insert safety shield in place on strength analyzer.
3. Check for alignment in strength analyzer.
4. Initiate strength analyzer test program.
5. Print graph and data for test.
6. Conduct post test analysis.

Scoring:

Scoring will be based on:
Your rationale for your solution (grounded on strong research)
Technical design of your solution (technical drawing & parts list)
Craftsmanship and construction of composite beam
Functional test of your composite beam
Post test analysis of your solution
Re-testing of experiment
Accurate documentation and application of Engineering Design Notebook

You will be expected to give a short presentation using the poster session format to describe your rationale for your composite design and structure. See attached Poster Session instructions.