SURFBOARD SHELLS:

By Britt Corra

BACKGROUND

Surfing is an inherently dangerous sport with crashing waves and razor-like coral only feet below. The last thing a surfer needs to be thinking about when out in these conditions is whether or not the equipment will be able to perform correctly. It is essential to create a strong and effective surfboard to withstand the forces that will be acting upon it out in the surf. The making of the surfboard starts with a materials selection process to identify the best material to use for safety and performance.

OBJECTIVE

The objective of this project is to choose the material that will give the user a strong, cost effective surfboard. In determining the materials of choice, several properties should be considered. First the surfboard must be strong; a wave delivers a great deal of force on the board when it breaks on top of it. If the board is pinned between a breaking wave and the bottom of the ocean, it is subject to forces in many directions that could break it apart. Due to the nature of surfing, the board must obviously be very light. A grown person must be able to float on the board therefore no heavy materials will be sufficient for this application. A lighter board will also travel faster through the water and enhance performance; this is a critical aspect of the sport. Since the surfboard is going to be mass produced, the material that it is made out of must be easily formed and processed. If it is a difficult material to shape, production cost will be much higher and the board will end up costing too much. Cost is always an issue when considering a material to be sold to the public. Other mechanical properties such as stiffness, elasticity, and density are also to be factored in when choosing a material.

REQUIREMENTS

Some of the mechanical properties that must be met to withstand the force of a wave are as follows:

- -Young's Modulus 1.5 * 10^6 psi
- -Elastic Limit 10 ksi
- -Tensile Strength 15 ksi
- -Compressive Strength 15 ksi

These are all minimum values that must be met if the material is to be strong enough. Since the board should retain its shape under varying temperatures as found in the hot sun to the cold ocean, the thermal expansion should be no more than 20 microns strain/degree F. The material must be able to operate under temperatures ranging from 45 to 110 degrees F. Again, the material needs to be easily formed and shaped. In the CES Selector the material should have a processability ranging from 4-5, which is very good. Cost requirements are not set in stone; the materials that pass the criteria should then be reviewed and the best material chosen based on density (how light it is) and price.