Technology Innovation Program

NIST National Institute of Standards and Technology

Homogeneous Three-Dimensional Pultruded Processing of PEEK, PEI, and PPS High Temperature Thermoplastic Composite Profiles

Develop a state-of-the-art manufacturing process to automate, on a large scale, the production of three-dimensional fiber composites with high temperature thermoplastics.

Ebert Composites Corporation

- Project Performance Period: 2/1/2010 - 1/31/2012
- Total project (est.): $4,018 K
- TIP funds: $1,866 K

Ebert Composites Corporation is developing a novel manufacturing process to produce large, three-dimensional, fiber-composite components from a variety of high-temperature thermoplastics. Thermoplastics are strong, flexible materials than turn liquid when heated above a critical temperature. They have several valuable properties; they can be resistant to chemical attack or shock and some are able to withstand quite high temperatures.

Very strong composite materials can be made with thermoplastics. Unlike thermoset plastics, thermoplastics are relatively easy to recycle because they can be melted and reformed again and again. (PET beverage bottles, for example.) Handling thermoplastic resins in the molten state to achieve adequate wet-out of large or complex reinforcement profiles is a challenge. Current high-temperature thermoplastic composites are essentially two-dimensional. They are manufactured as a thin tape of the composite material, such as carbon fibers, impregnated with the thermoplastic. Manufacturers buy this "prepreg" tape and cut, braid and form it into more complex shapes which are then heated and formed in a mold to produce the finished part. In addition to requiring several steps and much labor, the process limits the size and complexity of the shapes that can be made.

Ebert has pioneered the production of continuously formed, three-dimensional shapes from thermoset composites using the "pultrusion" process. In this project, the company is developing a radically different manufacturing process to achieve the same thing with high-temperature thermoplastics. The process will produce components that can be larger than any existing thermoplastic mold and that are equally strong in all three dimensions (a problem with today's prepreg-based components). If successful, the project could revolutionize the composites industry, enabling larger and stronger thermoplastic composite components at a quarter the cost of the current state of the art. Develop a state-of-the-art manufacturing process to automate, on a large scale, the production of three-dimensional fiber composites with high temperature thermoplastics.

For project information: Mr. Todd E. Johnson, (619) 423-9360 x18
todd.johnson@ebertcomposites.com

TIP Project Manager Jack Christopher Boudreaux, (301) 975-3560
jack.boudreaux@nist.gov