ACTIVITY-BASED COST MODELING AND QUALITY ASSESSMENT

Bernard S. Hart (ARL), Scott K. Jones, and Crystal H. Newton

University of Delaware . Center for Composite Materials . Department of Accounting & MIS

PROJECT DESCRIPTION

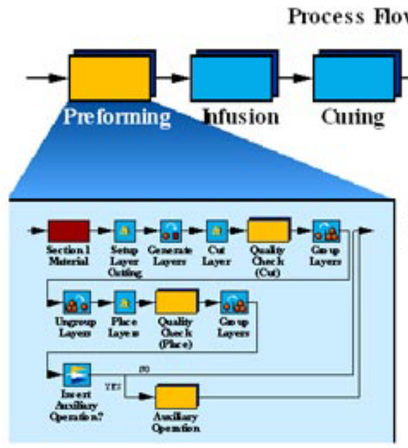
The focus of the program is on cost modeling and quality assessment to incorporate environmental and quality effects into the overall evaluation of the fabrication of a composite material component. Previous cost modeling research at UD-CCM conducted in collaboration with UD's College of Business & Economics has resulted in models for using SimPROCESS. These models will be modified to address the processes of interest and to incorporate environmental and quality issues.

The cost model utilizes an activity-based costing (ABC) and management philosophy to identify cost drivers in the hierarchy. Environmental issues such as hazardous air pollutants, hazardous emissions, and solid industrial wastes can be treated as by-products of processes as shown in Figure 6. During manufacturing of composite materials, hazardous emissions, hazardous waste, and solid waste are generated. Hazardous emissions, primarily volatile organic compounds (VOCs) and nitrogen oxides (NO_x) are given off. Hazardous and solid wastes result from the raw materials and from processing. Hazardous wastes include hazardous raw materials whose effective usage has expired and process-dependent materials that are scrapped or contaminated as part of the production process. Non-hazardous solid wastes are evaluated in a different disposal process. Addressing each of these products and processes necessary to address them provides a more realistic picture of the costs of an overall manufacturing process. Simulations for FASTRAC and E-beam curing of polymer matrix composites have been conducted during Year One of the Composite Materials Research Program. A linear scale-up from small- to large-scale parts and production rates was used. In Year Two, more accurate assumptions for scale-up will be tested. Limits of production build-up scaling are being evaluated and costs are being assigned to environmental parameters

KEY PARAMETERS OF INTEREST

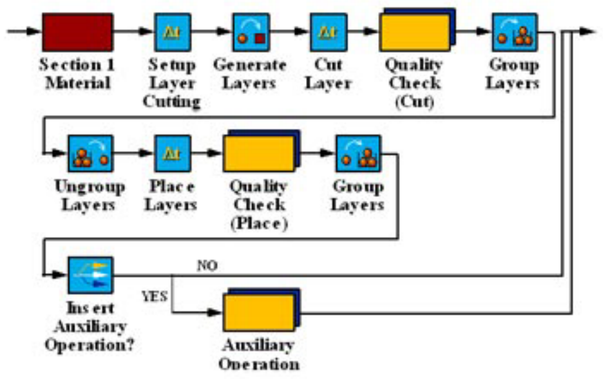
- **Process**
  - Oven cure vs. Ebeam cure.
  - Emissions from RTM molding.
- **Resource**
  - Resin cost for the different processes.
  - Disposal cost for waste.
  - Labor costs.
  - Material waste.
- **Capital**

COST MODELING WITH SIMPROCESS



SIMPROCESS® Model Layout-Section Formation Level

ACTIVITY BASED MODELING



MODEL PARAMETERS

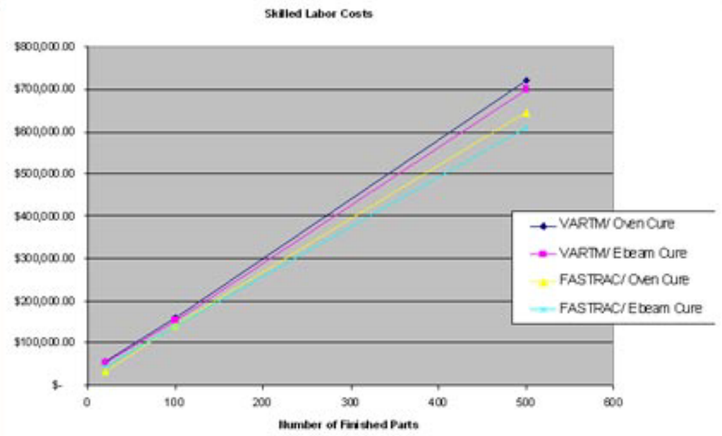
Structures

- Flat Plate
- 10' X 10' X 0.75"
- 5' X 2' X 0.75"

Processes

- VARTM process, oven cure, vinyl ester resin.
- VARTM process, ebeam cure, epoxy resin.
- FASTRAC process, oven cure, vinyl ester resin.
- FASTRAC process, ebeam cure, epoxy resin.

RESULTS – SKILLED LABOR COSTS



- Effect of linear scale-up assumption is obvious.