installation of the GRAFTool (3D-Visions) software package and learning how to use it to draw three dimensional plots. Using this software a slide show illustrating results of the ring spinning analysis was prepared and presented at the Poster session.

Papers Published, in Preparation or Submitted since the start of the project:


Electrotechnology Applications In Textile Manufacturing

File: S92C6


NOTE: NO REPORT WAS RECEIVED FOR THIS QUARTER. BELOW IS A REPEAT OF THE PREVIOUS QUARTER REPORT.

QUARTERLY REPORT ENDING: DEC. 31, 1992

OBJECTIVE:

1. Characterize basic dielectric infrared and ultrasound properties of textile material for a database to be used to develop these energy sources in fiber, textile, and apparel manufacturing.

2. Develop textile processing utilizing electrotechnologies for improvement in productivity and environmental safety; includes IR absorption studies; dielectric properties studies; RF fixation mechanisms; and ultrasonic dyeing.

3. Develop economic analysis of existing energy intensive manufacturing technologies; expansion of existing energy models to include economic analysis; develop non-traditional economic models (multiattribute decision) of electrotechnologies.

4. Develop new processing techniques such as an accelerated process for dyeing short runs of polyester/cotton fabric. Develop a process to quickly and economically dye short runs of polyester/cotton blend fabrics; process based on radio frequency energy.

5. Develop entirely new processes using combinations of electrotechnologies such as ultrasonic dyeing and RF drying.

SUMMARY:

The first phase of a joint effort to develop a database on the interaction of infrared energy with textile materials is continuing. Each of the three universities has a significant role in the work. Briefly the work plan for the first phase is as follows:

Three (3) 100% cotton, plain weave fabrics were selected. The fabric weights range from very light to very heavy. Infrared absorption and reflectance measurements as well as drying rate studies will be made on undyed (white) and dyed (black) specimens of the fabrics. Responsibilities for the work are as follows:

Auburn-Obtain and dye fabrics; IR studies on single fibers
Ga Tech- IR studies on fabrics (large viewing area)
NCSU- Drying rate measurements

This work will be extended to include other variables such as fiber types, variation in color, and dye types if the results of the first phase suggest that such studies are warranted.

Additional joint work involving all three Universities is being done with cooperation with Dundee Mills. A group of investigators representing the Universities met with officials from Dundee Mills in Griffin, Georgia late in 1992 to plan the work. The study entails investigating the effects of washing efficiency on dielectric properties and RF drying of yarn packages.
In addition to these joint studies, other electro-technology projects are being conducted at specific sites. Work in these related projects includes use of ultrasound in dye applications, computer simulation of dyeing processes, and dye fixation using radio frequency energy.

A summary of activities at each site follows:

**Auburn -** The fabrics described above were obtained and dyed. Single fiber FTIR measurements were made on all samples on samples conditioned in a standard, controlled atmosphere. Reflectance and transmittance of spectra of the samples in the visible region were also made using fabrics containing three different levels of moisture. Transmission and reflection of visible light were significantly affected by moisture content of the material.

Work is continuing on fixation of dyes using radio frequency (RF) energy. Disperse dyes have been fixed on polyester and reactive dyes have been fixed on cotton using RF energy. The next goal is to simultaneously dye both polyester and cotton in a blend fabric using RF energy for the fixation stage. Experiments which address this goal will be performed during the next quarter.

**Ga Tech -** FTIR instrumentation required for large area measurements of IR transmittance and reflectance has been installed. Personnel are being trained to use the equipment and experience in its use is being obtained. Instrumentation for measurement of dielectric properties of materials has also been ordered.

**NCSU -** Work continues on several projects partially funded by the NTC. Especially notable progress has been made in Optimization of Radio Frequency Drying by Utilizing Intelligent Automated Handling and Controls. This project focuses on the design and development of a low-cost robotics system capable of controlling and loading a RF dryer to maximize energy savings and throughput. The system uses sensors to categorize package size, weight and material type. The information will be used by the system to adjust the loading and frying parameters to optimize the entire process. The system uses a Gantry type manipulator to pick packages from a pallet and place them at an optimal configuration in the RF conveyor belt based on the strategy defined by package considerations.

Significant progress was also made in ultrasound-assisted dyeing. Work has been directed toward moving up to large scale processing equipment. Progress has been made in understanding the principles and limitations of large scale ultrasound tanks and generators. Three companies - Greenville Machinery, Blackstone Ultrasonics, and Branson Ultrasonics have joined in a consortium to assist in development of this technology.

**Projection Of U.S. Apparel Demand And Consumer Profiles Based On Demographic Changes For The Period 1991 - 2010.**

File: S92C7


**OBJECTIVES:**

Long-Term -- 1) To create a public sector apparel/textile business database, and 2) design a demand forecasting system which will make the U.S. apparel and textile industries competitive within and outside the U.S. Specifically, this research is aimed at forecasting the apparel demands in the US. during the period 1991-2010 based on the anticipated changes in the demographic profiles, make-up of U.S. households and the apparel purchase patterns.

This (2nd) Year -- The first year's activities included: 1) definition of the database, 2) acquisition of the needed census data, labor statistics, retail data, and marketing data, 3) design and implementation (partial) of the system hardware/software, and 4) development of graphical capabilities. Having accomplished these major tasks, the second year's activities will focus on design of data storage/retrieval systems and development and validation of statistical models for forecasting the U.S. apparel demands in a number of key categories. It is expected that a prototype forecasting system will be made available at the end of the second year.

**SUMMARY:**

1. The activities during the last quarter were centered around formation of the database by pooling all data resources. All data were stored on a 1 Gb disk using ASCII format, and read into SAS datasets. We named the system as "Textile/Apparel Business Information System (TABIS)" Both the size and utility of the system were significantly enhanced by the following activities:

   a) Growth in the size of TABIS database -- The TABIS database now includes the following datasets with a user-friendly interface program to help the user select data from each:

   - Census population projections
   - National Income & Product Accounts (consumer expenditures)
   - Bureau of Labor Statistics (employment & earnings)