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ABSTRACT TITLE: Textile Laser-Optical System For Inspecting Fabric Structure And Form

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ABSTRACT TEXT:

The American textile industry has lost an estimated 400,000 jobs to offshore competitors since 1980. If the trends continue unchanged, it is predicted they will lose an additional 600,000 jobs by the year 2002. These losses and their resulting economic threat to the U.S. textile industry can be attributed to the low operating costs of their offshore competitors' extensive use of cheap labor. In order to stem these rising losses and gain back lost market shares, the American textile industry has entered into a cooperative research and development agreement (CRADA) with the U.S. Department of Energy (DOE) in a program called the American Textile Partnership (AMTEX™). AMTEX™ is a working relationship aimed at leveraging technologies that currently exist at the DOE laboratories for the benefit and development of a competitive market edge for the U.S. textile manufacturers. The application of these technologies to identified needs will result in new and emerging manufacturing innovations for the U.S. textile industry and its vendors.

Since the minimum U.S. labor rate is well above that of its offshore competitors, one of the competitive factors the U.S. industry hopes to gain is a higher quality fabric. To facilitate this, a Computer-Aided Fabric Evaluation (CAFÉ) System (automated greige inspection system pick measurement device) has been developed by researchers at the Oak Ridge National Laboratory and Lockheed Martin Energy Systems, Inc. This system was developed under exacting functional, operability, and utility requirements while being constrained by a cost function.

The system is based on a class 3-a laser and a set of cylindrical lenses allowing for 1-D imaging of single yarns thrown in the fill direction (horizontal). It has been designed to be located close to the point of fabric formation providing data and information on structure, patterns, and material

composition of the fabric as it is being formed. The system is capable of providing defect classification and process information on web velocity, number of picks, etc. The system can act as its own encoder. Discussions with loom manufacturers have identified its use as a control point for let-off and take-up which could eliminate start/stop marks altogether.

This paper describes the system in detail, reporting on the extensive field tests that have been ongoing for the past two years and providing an overview of the product development activities.

KEY WORDS:

U.S. textile industry, AMTEX™, 1-D image fabric reconstruction, automated defect detection, laser/optical system, economic constraints, defect and structure interrogation, pick measurement device, real-time defect classification

BRIEF BIOGRAPHY (of principal author):

Glenn O. Allgood has degrees in math, electrical engineering, operations research, and engineering science and mechanics; his Ph.D. being awarded in the latter two. He is a member of the Instrumentation and Controls Division at Oak Ridge National Laboratory and an active member in IEEE and the International Society of Measurement Science (ISA). He has worked in the fields of human factors, economics, and advanced systems designs. His current research interests include the application of advanced methods to biomedical systems, smart functional distributed systems, and anticipatory prognostics and health assessment.