PNL-SA-22022

THE AMTEX PARTNERSHIP

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Handout

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

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Richland, Washington 99352

The AMTEX Partnership

A Collaborative Partnership between R&D/educational institutions of the Integrated Textile Industry and the DOE National Laboratories

Organizational Structure

The American Textile Partnership, as its name implies, is a collaborative effort between the DOE national labs and industry-related R&D/ educational institutions. The purpose of AMTEX is to promote R&D that will enhance the competitiveness of the integrated textile industry (i.e., fibers, textiles, sewn/fabricated products). The industry-related organizations bring a vital perspective of industrial needs in addition to their own R&D capabilities. The DOE labs bring broad R&D capabilities and perspectives from other areas of research application. The strong synergy between industry and DOE will enable this collaboration to significantly impact industrial competitiveness while focusing and strengthening the labs' capabilities consistent with DOE's mission.

The structure of AMTEX is shown in Figure 1. There are three main components: DOE/ER oversight; the Operating Committee, which is composed a Laboratory Board and an Industry Board; and five Technology Area Coordination Teams (TACTs).

Operating Committee

Together, the Laboratory Board and Industry Board constitute the Operating Committee of AMTEX. The roles and responsibilities of the Operating Committee are to provide senior management for operating AMTEX; to develop, coordinate, and recommend R&D programs to DOE that are strongly driven by industrial needs; and to integrate technical strategic plans from the TACTs.

Technology Area Coordination Teams

The roles and responsibilities of the TACTS are to develop a long-term strategic plan for technology development in the context of industry's needs and DOE's programmatic interests, and to recommend the projects (including team members) to the Operating Committee. The needs and areas of technical focus are:

- Analysis, Simulation, and Computer Integration, including Demand Activated Manufacturing
- Improved Processes and Materials
- Energy
- Environmental Quality and Waste Minimization
- Automation

Point of Contact

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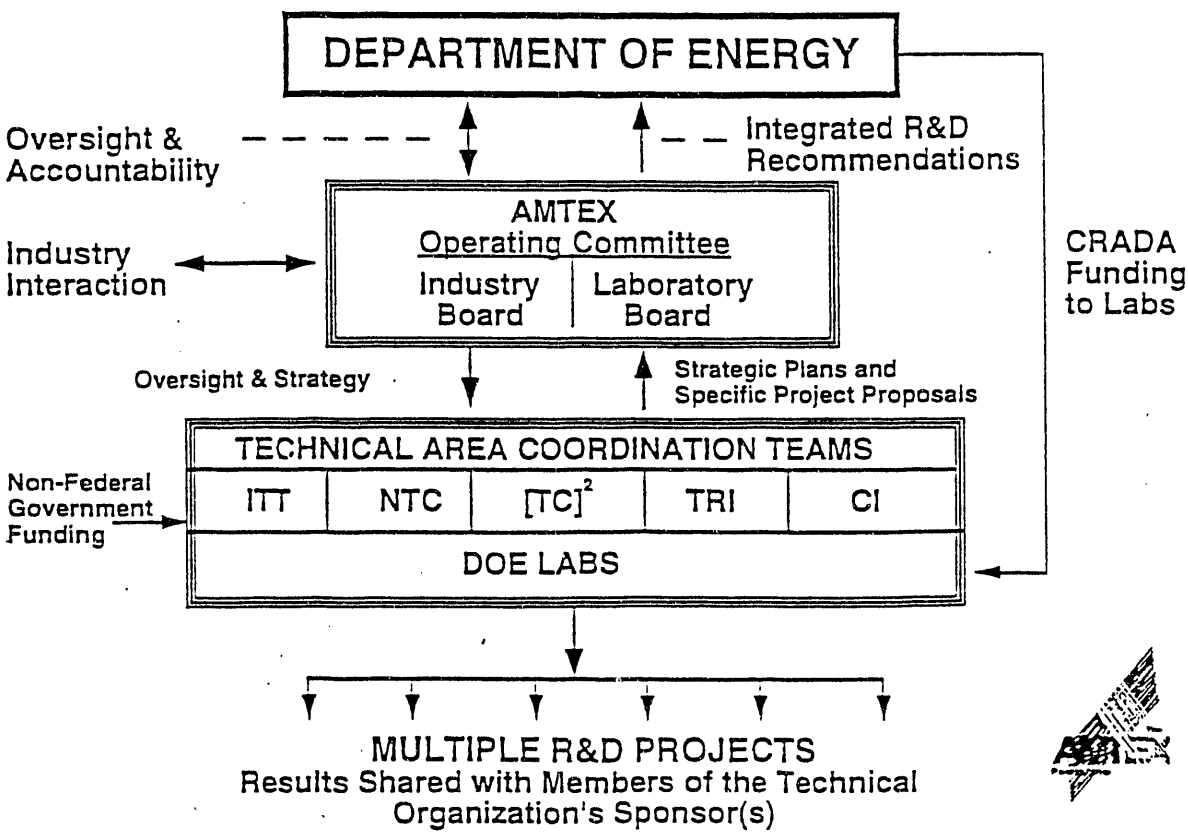

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Briefing Paper

February 17, 1993

AMTEX -- The American Textile Partnership

A New R&D collaboration Between the Department of Energy, the Integrated Textile Industry, and the DOE National Laboratories

EXECUTIVE SUMMARY

A collaborative R&D program has been developed between the Laboratory Technology Transfer Program of DOE's Office of Energy Research the integrated U.S. textile industry and DOE's national laboratories. The mission and purpose of this program is to engage the unique technical resources of the DOE labs to develop and deploy technologies that will increase the competitiveness of the integrated U.S. textile industry. This will be accomplished through multiple Cooperative Research and Development Agreements (CRADAs) between DOE laboratories and R&D/educational institutions associated with the integrated textile industry.

The Department of Energy and the laboratories are working with the integrated textile industry (i.e., fibers, textiles, and apparel/fabricated products) are working together via "The AMTEX Partnership," a consortium of five R&D/educational institutions associated with the integrated textile industry. This AMTEX institutions include the Institute of Textile Technology, Textile/Clothing Technology Corporation, Textile Research Institute/Princeton, Cotton Incorporated and the National Textile Center. The first four institutions are independent organizations with R&D staff and facilities. The National Textile Center is a consortium of four leading textile research universities: North Carolina State, Auburn, Clemson, and the Georgia Institute of Technology. The U.S. Department of Commerce has been a strong supporter of the textile industry and provides partial funding to the National Textile Center and to the Textile/Clothing Technology Corporation.

This AMTEX initiative has two distinguishing features: 1) joint, long range strategic R&D planning between the DOE labs and an entire integrated industry, and 2) an operational framework that brings about up-front coordination of proposed work among both ER and DP laboratories. Through this operating mechanism, the AMTEX members and DOE labs will bring forward recommendations for consideration by DOE program offices that are industry-driven, coordinated and prioritized. The Laboratory Technology Transfer Program in the DOE Office of Energy Research is leading this program. They coordinate program direction and support with other DOE program offices, including Defense Programs and Conservation and Renewable Energy. Other Program Offices such as Environmental Restoration and Waste Management are likely to participate as the program becomes established.

BACKGROUND

Critical Technologies Workshop

In May 1992, the Office of Energy Research, Laboratory Technology Transfer Program, sponsored a workshop on Critical Technologies between the ER Labs and U.S. industry. The workshop's goal was to provide a means for industry to influence DOE's investment priorities and to form collaborative relationships between the national labs, industry, and universities. The integrated textiles industry was one of the industries participating in the workshop. The AMTEX Partnership is an outgrowth of that workshop interaction. Pacific Northwest Laboratory (PNL), leader of the manufacturing session of the workshop, has been leading the initiative from the laboratory side and assisting the DOE/ER Technology Transfer office in developing this program.

The Industry

The integrated textiles industry has four components: fibers, textiles, sewn or fabricated products, and wholesale/retail. Its products include all forms of fibers and fabrics such as apparel, carpet, domestic and sporting goods, automobile and furniture upholstery, industrial fibers, composites, and specialized military materials, etc..

Small Business

Small businesses are a vital link in the supply chain of this industry where they are a key part of the textiles sector and a large majority of the sewn/fabricated products sector.

The Threat

The fibers and textiles sectors are highly sophisticated, capital-intensive, and internationally competitive. The labor-intensive fabricated products sector is losing ground to offshore competition. If the sewn/fabricated products sector goes offshore, the other sectors will follow.

Over 500,000 jobs have been lost due to imports in the last 12 years. If current trends continue, it is projected that an additional 1 million jobs will be lost in the fiber/textiles/sewn-fabricated products industry by the year 2002.

Impact on the US Economy

The industry consists of over 26,000 companies representing 1.8 million jobs which is 10% of the entire manufacturing work force, with women and minorities at double the level of manufacturing in general.

This industry represents over $200 billion in annual consumer sales in the U.S.. It is the largest sector (23% share) of the non-durable goods manufacturing sector and contributes $53 billion (1989 data) to the Gross Domestic Product. This is more than the automotive, petroleum, or primary metals industries. Only the aerospace industry contributes more.

The industry consumes 5.5% of the industrial energy.

It produces chemical wastes (dyes and solvents) and solid waste (primarily fibers).

STATUS OF RESEARCH AND DEVELOPMENT IN THE INDUSTRY

The industry has integrated itself both horizontally and vertically via R&D/educational institutions, trade associations and supplier/user partnerships. The primary R&D institutions are the National Textile Center, the Textile/Clothing Technology Center, the Textile Research Institute/Princeton, the Institute of Textile Technology, and Cotton Incorporated. The combined annual R&D budgets of these institutions is approximately $34 million. The results are shared among the respective members of each organization.

Proprietary research is also conducted by individual companies. The R&D investment of the fabricated products sector is small -- perhaps $5M-$8M, primarily by a few large companies. The textiles sector annual R&D investment is approximately $15M-$20M annually, again with the dominant share from a few large companies. Thus, the combined industrial R&D investment in textiles and sewn/fabricated products is $35M-$40M annually. The man-made fibers sector, with such large firms as DuPont, Hoechst-Celanese, and Monsanto, investment on the order of ten times this amount. This does not include the industry's investment in development of specific products.

NEED AND SCOPE OF A DOE PROGRAM

The technological needs of the integrated textiles industry map strongly into DOE's mission areas and historical strengths. Five areas of R&D focus have been established for initial concentration. They are:

Analysis, Simulation and Computer Integration
(leading to Demand Activated Manufacturing)

Environmental Quality and Waste Minimization
Energy
Apparel Automation
Improved Materials and Processes

A long-term, broad based R&D program is envisioned with programs being supported by the Offices of Energy Research, Defense Programs, Conservation and Renewable Energy, and Environmental Restoration and Waste Management.

ORGANIZATION AND OPERATIONAL MODEL

The programmatic relationship between DOE/HQ, the DOE labs,. and The AMTEX Partnership is shown in figure 1. There are three main components: DOE/ER oversight, the AMTEX Operating Committee which is comprised of a Laboratory Board and the Industry Board, and five Technology Area Coordination Teams (TACTs). The roles, responsibilities and composition of these groups are described below.

DOE/HQ Roles and Responsibilities

The Laboratory Technology Transfer Program in the DOE Office of Energy Research provides overall programmatic leadership and oversight for the AMTEX program. The DOE/HQ roles and responsibilities are:

* Provide overall program oversight including high level guidance to the AMTEX Operating Committee.

* Provide guidance on long term strategic planning and program direction.

* Determine and respond to any concerns from industry.

* Monitor and track program implementation.

* Coordinate funding of AMTEX proposals with other DOE program offices.

Operating Committee

The Operating Committee consists of two boards: the Laboratory Board and the Industry board. The Laboratory Board consists of representatives from the participating DOE labs. The chair of the Laboratory Board also serves as chair of the joint Operating Committee. This person is a senior representative from one of the participating ER lab (currently, Jerry Work, from the Pacific Northwest Lab). The Industry Board consists of one executive officer from the AMTEX members (i.e., ITT, NTC, (TC)2, CI and TRI) and other industry/university representatives as the industry board deems advisable. The chair of

the industry board serves as vice-chair of the Operating Committee (currently, Tom Malone, President of Milliken & Company.)

The Industry Board has the primary responsibility to ensure that the R&D programs recommended by AMTEX are market driven and sensitive to the technical and commercial needs, priorities and concerns of industry.

Together, the Laboratory Board and Industry Board constitute the Operating Committee for this program. The roles and responsibilities of the Operating Committee are:

* Develop, coordinate and recommend R&D programs that are strongly driven by industrial needs.

* Integrate technical strategic plans from the TACTs and resolve any conflicts among them.

* Prioritize projects based on inter-TACT assessments

TECHNOLOGY AREA COORDINATION TEAMS

The Technology Area Coordination Teams are comprised of senior-level technical representatives from the participating DOE labs and the AMTEX industrial organizations, universities. The TACTs are chaired by a representative from a DOE lab with the vice-chair coming from an AMTEX institution. TACTs are organized initially in the following technology areas:

Improved Materials and Processes
Analysis, Simulation and Computer Integration
Environmental Quality and Waste Minimization
Energy
Apparel Automation

The roles and responsibilities of the TACTS are:

* Develop a long term strategic plan for technology development in the context of industry's needs and DOE's programmatic interests.

* Develop and recommend to the Operating Committee those projects which draw upon the unique capabilities of the participating industrial/university organizations and DOE laboratories and have the greatest potential for contribution to competitiveness of the industry.

* Provide periodic technical reviews and monitoring of ongoing projects within that TACT.

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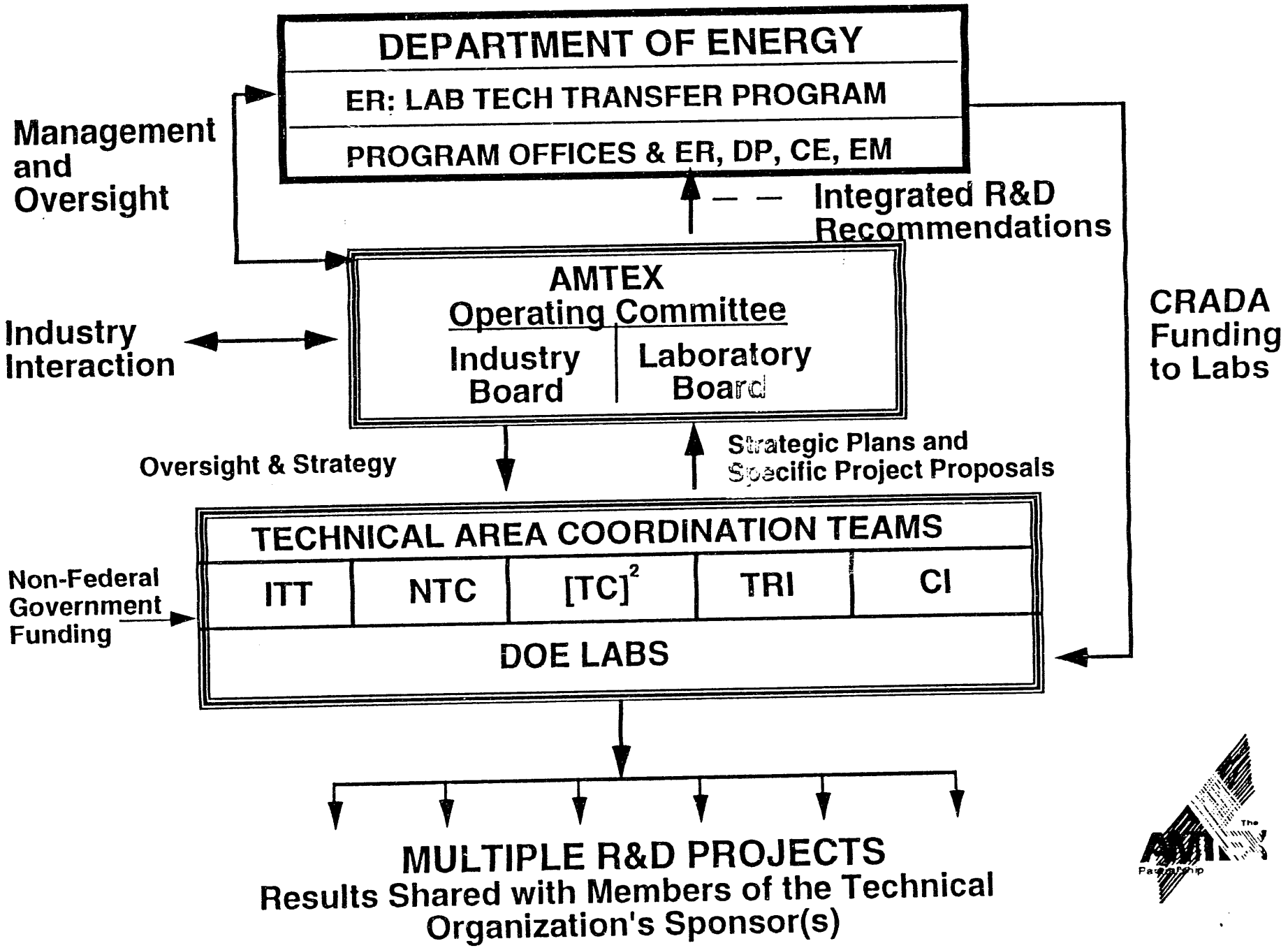

Appendix A: The R&D Agenda --matching industry needs with DOE capabilities.

The needs of industry and the unique capabilities of the DOE labs are being matched up and projects pursued in the following five areas:

Improved Materials and Processes

Need: In order to compete internationally in the long term, the industry needs continual innovations in new fibers, coatings, inspection and process control, industrial engineering practices, and fabric-forming technologies that result in improved product quality and features. The focus will be on improving the underlying processes. Development of specific products is the province of the commercial sector.

DOE Technologies: The labs have a broad scientific base in fundamental chemistry, chemical engineering, inspection technology, coatings technology and materials science. Since the industrial investment in fiber technology is large, the DOE labs will collaborate in highly specialized niches where they have unique facilities and scientific expertise that will effectively augment industrial and university capabilities.

Analysis, Simulation and Computer Integration

Need: The industry loses over $25 billion annually due to products that are unsold or sold at deep discounts to liquidate inventory. This inefficiency stems from two sources: 1) a lack understanding of how the various industrial sectors interact with one another and their customers and 2) lack of a real-time information system that links the supply chain together from the point of sale to the fiber manufacturer. To address this deficiency, the industry needs a dynamic systems model, coupled with an electronic network for simultaneous sharing and analysis of information among all sectors of the supply chain. This simulation capability would allow industry to explore the underlying nature of the complex interactions among thousands of components, and then design a more efficient system for the future.

Research is needed in developing a dynamic systems simulation, gathering and analyzing vast quantities of data on sales and interactions in the entire vertical supply chain, from customer through fiber manufacturer. Given this understanding, then research will be needed to develop computer software architectures for implementing a system infrastructure that will enable the industry to optimize its operations. This research would enable the industry to implement true "Demand Activated Manufacturing," the keystone in their strategy for increasing their share of the U.S. market.

DOE Technologies: Expertise in analysis and modeling of complex systems using advanced computational systems and mathematical methods, high performance computing, dynamic systems modeling, model-based reasoning, analysis of large data sets, and development of large, distributed information systems.

Environmental Quality and Waste Minimization

Need: The industry is focusing on development of environmentally conscious products through zero-discharge and waste minimization strategies. Methods are required to reclaim and reuse solvents, dyes, fibers, and to recycle other solid waste. New processes such as direct color-to-fabric dyeing are needed that replace water-based dyeing, for example. High efficiency separations technologies are needed to reclaim dyes and solvents in process streams.

DOE Technologies: DOE has broad expertise in dealing with both chemical and solid wastes, drawing upon expertise in chemical engineering, solvent destruction, metals removal from water, chemical separation methods, and waste policy issues. The technologies being developed by the DOE for application to the DOE complex will have many direct applications to the problems facing the textile industry.

Energy

Need: There are high energy costs associated with heating of thermoplastic fiber stock, operating numerous large textile production machines, heating of water for dyeing, and in the repeated drying of textiles after dyeing and finishing processes. There are needs for more efficient drying processes and methods to reclaim the heat value of process waste water. There are also energy savings associated with improved processes that reduce waste since there is a significant energy costs associated with the raw materials and the processes that transformed them to fabrics.

DOE Technologies: The DOE labs have expertise in efficient separations, demand side management techniques, improved diagnostic and controls methods to increase efficiency in both chemical treatment and the drying processes; use of by-products and waste heat to reduce overall energy costs; and base technologies that could enhance research in alternative methods of drying (such as infrared or microwave), and ultrasonically aided dyeing.

Apparel Automation

Need: The most threatened sector of the industry is the fabricated products industry. U.S. workers are already the most productive in the world per labor hour, but offshore wage differentials make offshore products less expensive. Methods are needed to further improve the productivity of operators making sewn products, or conversely, to invent entirely new ways of fabricating apparel. Such developments will not eliminate jobs since the resulting growth in global market share will mean more jobs for Americans.

One direct application of DOE-developed technology appears to be in making counterfeit-proof tags that permanently identify U.S.-made apparel. The U.S. industry loses a few billion dollars of potential export sales because some foreign manufacturers sell counterfeit apparel under U.S. name brands in foreign markets.

DOE Technologies: DOE's capabilities in sensors, machine vision, and automation technologies are especially relevant to this need. Emerging technologies such as micro/nano fabrication, laser cutting of fabric, three- dimensional weaving, adhesive bonding, and other alternative methods for creating non-sewn products will be explored.

The measurement and analysis technologies developed by DOE for identifying and tagging treaty limited items (e.g., missiles) under international treaty protocols promises to provide an inexpensive solution to the problem of foreign counterfeiting of U.S. name brand apparel. If successful, this DOE investment could bring enormous economic returns to the U.S. economy by increasing U.S. export sales.

PROFILE OF THE AMTEX PARTNERSHIP MEMBERS

Cotton Incorporated (CI)

The mission of Cotton Incorporated is to provide research, development and technical services and promotion/marketing for use of cotton fibers in the textile/apparel complex. The organization is funded by the cotton producers of America. The R&D Center in Raleigh, NC has approximately 65 staff and an annual R&D budget of $13.3 million.

Institute of Textile Technology (ITT)

The Institute, founded in 1944, is a research and educational organization that operates a manufacturing focused graduate program at the M.S. level. It is an industry-funded collaboration of 32 corporations with 400 plant locations, representing over 1/3 of the U.S. textile manufacturing capacity. They have state-of-the-art research staff and facilities for development of new textile technology. They also serve the industry with numerous continuing education programs. The Institute's annual budget is $4.5M.

National Textile Center (NTC)

The Center is a research consortium of four universities: Auburn, Clemson, Georgia Tech, and North Carolina State University. The Center's mission is to provide the academic research base for the continuing viability of the U.S. fibers/textiles/fabricated products industrial complex. The institutions share personnel, equipment, and facilities to attain common objectives. The Center's annual budget is $7.5M.

Textile/Clothing Technology Corporation (TC)2

Spawned by a Congressional study in 1979, (TC)2 (pronounced T-C-squared) focuses on technology development, demonstration, and education. With $4 million in consigned equipment, (TC)2 develops and trains industry in state-of-the-art in apparel manufacturing and modern manufacturing practices (such as just-in-time manufacturing and self-directed work teams.) Their efforts also resulted in new machines for automated seaming and stitch inspection. The annual budget is $7.0M.

Textile Research Institute/Princeton (TRI/Princeton)

Located in Princeton, New Jersey, the Institute conducts fundamental research in fiber and textile science and development of specialized testing and measurement methods. In conjunction with Princeton University, they offer opportunities for graduate programs in fiber and textiles science. Their annual R&D budget is approximately $2M.

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