PNL-10519-4

AMTEX Fourth Quarter FY95 Report

The AMTEX Partnership™

September 1995

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The AMTEX Partnership™

Fourth Quarter Report
Fiscal Year 1995

September 1995

Issued by
The AMTEX Program Office

Douglas K. Lemon, Manager
AMTEX Laboratory Program

and

Richard K. Quisenberry, Executive Director
AMTEX Industry Program

MASTER

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EXECUTIVE SUMMARY

The AMTEX Partnership™ is a collaborative research and development program among the U.S. Integrated Textile Industry, the Department of Energy (DOE), the national laboratories, other federal agencies and laboratories, and universities. The goal of AMTEX is to strengthen the competitiveness of this vital industry, thereby preserving and creating U.S. jobs.

Operations and Program Management

The operations and program management of the AMTEX Partnership™ is provided by the Program Office. This report is produced by the Program Office on a quarterly basis and provides information on the progress, operations, and project management of the partnership.

Program Office Operations and Management

The AMTEX Operating Committee (AOC), hosted by the Oak Ridge National Laboratory, met in July. AMTEX leaders provided updates on the funding outlook for FY96 and the recommendations for allocation of anticipated funds among the projects. It was noted that projects are moving through the natural research cycle with some projects being successfully closed out, some being refocused, and others moving towards field testing commercialization.

The *AMTEX Policies and Procedures* document was presented for discussion and approved at the AOC meeting. The AMTEX Policies consist of the Mission, Vision and Key Principles. The procedures covered items such as organizational structure, membership, personnel, and the procedures for developing and managing AMTEX projects. Copies of the document are available from the Program Office.

Progress continued this quarter on development of a multi-laboratory CRADA for AMTEX projects. A workshop was held in conjunction with the AOC meeting where representatives from DOE, the laboratories, and industry discussed many issues to address in developing the new CRADA document and associated Option Agreement. The Program Office staff agreed to continue working this matter with the appropriate representatives from the industry, laboratories, and DOE.

Projects

Computer-Aided Fabric Evaluation

In the past quarter, the CAFE Project has made significant progress towards all deliverables and milestones.

On-Loom Greige Inspection System - The On-Loom Greg Inspection System task team completed the Alpha test for the fabric inspection systems and machine diagnostic system. This 2-phase test was completed in July. Following completion of the Alpha testing, the industry testing team held a series of meetings to discuss issues and concerns associated with the Alpha deployment. These meetings were conducted in early August to allow ample time for the industry Alpha test team to prepare their recommendations for Beta.

At the CAFE Quarterly Review Meeting, the industry team presented their findings and recommendations regarding the sensors and central inspection computer for both Phase I and II Beta tests. The industry team voted unanimously to accept the recommendations of the industry CAFE Alpha test team. Subsequent to the decision, the laboratory on-loom greige teams (ANL, ORNL, SNL, Y-12) commenced preparations for the Beta On-Loom Greige Inspection System and continued to modify and redesign all sensor systems in light of new operational restrictions.

Color Printed Pattern System - SNL and LLNL continued to make progress in the development of the real-time implementation of detection algorithms for the Color Printed Pattern Inspection System. Technical progress included the completion of the Real-Time Implementation Concepts studies, the Algorithm Concept Document, and the conceptual design of the imaging colorimeter system. In preparation for the upcoming Color Printed Pattern Goods (CPPG) Alpha test, the team developed the proper definition for the Alpha test and its schedule, established the criteria and requirements for an Alpha test site, developed the process by which the selection would be made, and began soliciting proposals from the industry partners for site selection. The actual selection will occur at the December, 1995 Quarterly Review Meeting.

Knitting System - ANL continues their development and evaluation of a sensor approach for the knitting system. ANL has also completed the preliminary wear study on the coated knitting needles, identifying the need for a new methodology and approach. LLNL completed the software/hardware for the real-time data acquisition system that is scheduled for testing at Y-12 in October and continued the development of the detection and classification algorithms for feature extraction. In line with this, LLNL and ORNL are evaluating a new algorithm that could potentially be implemented in a low-cost digital signal processor configuration. ORNL has completed the fabrication of the camera and illumination assemblies for the vision inspection system. Due to the late delivery of the camera, the installation of the system will occur in October.

SNL continues its development, design, and building of another inspection sensor for knitting. In addition to the development of the sensor subsystem, SNL is currently conducting a material coating study to assess durability and sensitivity reduction as a function of applied wear resistance coatings. Y-12 continues the development of a subsystem to measure the positions of a knitting machine's needles and sinkers. This subsystem is a modified version of the one tested during the on-loom greige Alpha tests.

Economic Model - LBNL, in collaboration with ORNL, is modifying the CAFE Economic Model to include an influence model. The outcome will be

an integrated model combining the influence and the Taguchi approaches. LBNL has also issued a survey to the CAFE industry partners to ascertain the functional needs of a material marking system. The intent was to identify those elements that would be unique to laboratory work and those elements that could possibly be met with current market technology. From the survey, it was determined that a meeting was needed to identify the entire range of operational needs this system would address.

Cotton Biotechnology

Two major discoveries in the Fiber Development task highlight this quarterly report.

The first major finding sheds new understanding on the way cotton fibers grow. The experiments settled a long-standing question about whether cotton fibers grow along their entire length or just from the tip area. The observation that some fiber cells divide in tissue culture permitted researchers to show that fibers grow throughout their entire length in early stages of growth, rather than extending from the tip alone. This fundamental understanding is important as it guides further investigations in how to genetically increase fiber length.

The second major development this quarter was development of a technique that allows researchers, for the first time, to obtain a reliable estimate of the number of fiber cells per seed. The key to this accomplishment was development of the ability to dissociate fiber cells from maturing cotton seeds, thereby allowing them to be counted. The number of fiber cells in 34 cotton varieties were counted and found to vary by a factor of 2. Additional studies will seek correlations between fiber cells and ultimate fiber yield. Insight from this investigation may show researchers how to increase the number of fibers per seed.

Problems in obtaining clones enriched for simple sequence repeats, which slowed the Molecular Markers task, appear to have been solved.

Demand Activated Manufacturing Architecture

Highlights of major progress during the past quarter from each of the technical task areas are:

Enterprise Modeling & Simulation - The bedsheet and men's parka product line investigations concluded with process step models generated, and an overall business process model developed. This completes three of the five product lines initially envisioned for understanding the industry.

Simulation efforts continued with initial completion of an object-oriented simulation builder for the industry.

Connectivity & Infrastructure - C&I activities focused on support of the TEXNET development effort with CBM.

A Hands-on Internet Tools workshop was developed and delivered July 26. This workshop is essential in helping move the U.S. ITC to an electronic marketplace.

The DAMA World Wide Web (WWW) site is now publicly available, with access to internal portions restricted by a user name and password. This site serves as a test site for the U.S. ITC to use the WWW and provides access to all of the files and briefings on the DAMA server.

Cooperative Business Management - The TEXNET Prototype #2 and Forecasting and Inventory Management Prototype #2 development efforts concluded with an evaluation by industry in August. TEXNET will go to a pilot program, while the Forecasting and Inventory Management tool will move to a next-generation prototype development. TEXNET implementation will allow cooperative sharing of information and decisions among vertical trading partners across all sectors.

Additionally, the National Sourcing Database Pilot (NSDB) implementation occurred. Accessible over the Internet on the DAMA web site, several new data sources were added. This pilot is the first for DAMA, and will serve as a broader learning process for the project, in addition to detailed evaluation of the database. A software pilot license has been prepared to allow $[TC]^2$ to control software distribution of the NSDB.

Education, Outreach, & Commercialization - DAMA Advisory Committee assessment of the Learning Laboratory indicated that part two of the initial curriculum should not be developed, as originally conceived. New direction will have heavy focus on demonstration of DAMA products from the other project tasks, and less emphasis on required cultural changes.

A second needs assessment meeting with Small and Medium Enterprises (SMEs) was held August 22. These companies were from the Los Angeles area, and operate in a very competitive, dynamic environment. The input received from the two meetings provides a foundation of requirements for addressing the needs of SMEs in DAMA.

Electronic Embedded Fingerprints

The Electronic Embedded Fingerprint project is developing miniature electronic devices as permanent identification markers and information markers for textiles and apparel. During this quarter, the first known functional multiple read/write passive RF tag system was completed and demonstrated at the Bobbin Show. This demonstration involved completion of several prototype tags and the RF read-write system. This accomplishment signals completion of the major objective for this phase of the project.

On-Line Process Control for Flexible Fiber Manufacturing

The fourth quarter of FY95 represents OPCon's initial activities to develop sensor technology for on-line process control. During the quarter, task

meetings were held at each of the national laboratory sites participating in OPCon:

PPPL - Fiber Morphology task
PNL - Fiber Cut and Crimp task
LANL - Polymer Rheology task
ORNL - Finish Oil and Moisture task.

These review meetings provided industry research partners the opportunity to visit each of the principal investigators' laboratories and view initial results.

Rapid Cutting

Progress continued in all the major task areas: advanced mechanical cutting, laser cutting, alternative mechanical drivers and material handling.

The first phase of knife blade evaluation took place in September at the Levi Strauss facility in Wichita Falls, Texas. Several blades were installed on an automated cutter and run through standard test configurations. The blades were then sent to the Center for Materials Sciences at LANL.

LBNL completed tests on a pneumatic driver that has an excellent power-to-weight ratio and virtually staff-proof operation. The next generation of high-power linear industry motors was also fabricated and bench tested. The conceptual design for a 200 in./sec mechanical cutter was further developed.

A decision was made to down-select the laser cutting systems to the solid state laser being investigated by LLNL. A group consisting of industry participants, tasks leaders from the DOE labs and DOE, and outside consultants participated in a design review where the decision was made. This decision point marks the completion of a major milestone in this project.

The detailed design of a material picker was completed. Fabrication of a full-scale, reduced-width picker was begun.

Sensors for Agile Manufacturing

The objective of this project is to develop sensors and feedback control methods that will improve the quality and productivity of the textile industry in the cutting and sewing processes associated with garment assembly. The first tasks in this project are concentrating on the development of sensors for fabric edge detection and felled seam sensing.

A sewing laboratory has been set up at SNL. This laboratory is serving as the integration site for the felled seam and flat edge detectors. The flat edge detector has been installed on a serging machine. An experiment *to close the control loop* using this sensor was successfully completed during this quarter.

A joint industry-laboratory meeting was held in Dallas, Texas on July 24-27 to brainstorm the advanced sewing sensors task. This task will begin with the

investigation of the physics of sewing and end with the development of a prototype advanced sewing machine.

SFAM project staff participated in the 1995 Bobbin Show in September. Demonstrations of the fabric edge detection sensor were made at the AMTEX booth.

Textile Resource Conservation

During the quarter, progress with respect to milestones has been satisfactory for the TReC Project. Excellent results continue to be achieved from work in salt recovery where laboratory runs with dyebath and rinsewater for an Industry Research Partner have produced an 18% brine with highly competitive economics. Additionally, good results have been obtained on methods to improve performance in membrane systems, as well as a new approach to the recovery of cotton and polyester for selvage and apparel scrap. Investigators on air emissions monitoring are preparing for an upcoming field test in October; work on low-waste chemical application is preparing background information needed for an in-plant test. Only minor variances from the project plan have been experienced and these have been related to slight directional changes of research efforts to better align them with industry needs.

Financial Summary (DOE $ in thousands)

($K)	(A) Total FY95 Budget*	(B) Quarter Cost	(C) FY95 Cost to Date	(D) Remaining Balance (A - C)	(E) % Spent of Budget (C / A)
Program Office	1,305	378	1,185	120	91%
DAMA	13,158	2,881	9,668	3,490	73%
CAFE	6,120	953	4,776	1,344	78%
TReC	4,469	809	3,450	1,020	77%
EEF	777	309	734	43	94%
Cutting	1,991	592	1,608	383	81%
Sensors	900	208	672	228	75%
Cotton Biotech	1,724	314	928	796	54%
OPCon	528	166	194	334	37%
TA Leaders	46	0	18	28	39%
Uncommitted	0	0	0	0	0%
Total	$31,018	$6,610	$23,233	$7,786	75%

* Total FY95 Budget includes carryover from FY94. (See Project Summary Reports in the back of this Quarterly Report for details.)

OPERATIONS AND PROGRAM MANAGEMENT

Program Office Operations and Management

The Program Office provides management oversight of the daily operations and project activities of the AMTEX Partnership™ and is composed of an industry and a laboratory component. The following activities were conducted this quarter.

Industry Technical Advisory Committee

The Industry Technical Advisory Committee (ITAC) met on July 12-13, 1995 in Charlotte, North Carolina. The industry and laboratory project managers summarized the technical progress to date and plans for the coming year.

The plan for a new task dealing with the re-engineering of the slashing process was proposed within the TReC project. The ITAC members felt the technical approach was too conservative and too focused on incremental advancements, rather than breakthrough technologies. The task managers were asked to rework their plan for reconsideration at the next ITAC meeting.

The ITAC then reviewed and approved budget allocations for the projects, based on a projected FY96 DOE funding level.

CRADA and IP Workshop

More than 40 people attended a joint DOE-laboratory-industry workshop held on July 19 in Knoxville, Tennessee to review and discuss the intellectual property provisions of the AMTEX CRADA and Option Agreement. A number of key issues were clarified and others remained open to further clarification. The laboratory program office manager agreed to convene a smaller group to develop language for the multi-party AMTEX Option Agreement.

AMTEX Policies and Procedures

The official *AMTEX Policies and Procedures* document was distributed to AMTEX participants following its approval at the July 20, 1995 meeting of the Operating Committee. The *AMTEX Key Principles* are included in Appendix B of this report.

Operating Committee Activities and Actions for the Quarter

Operating Committee Meeting

The AMTEX Operating Committee met on July 20 in Knoxville, Tennessee. Brief minutes of the meeting follow:

AMTEX Operating Committee Chair, Jerry Work, welcomed the group to the Operating Committee meeting. After reviewing the uncertainty in AMTEX funding, he noted that an appropriate theme for the meeting would be *contingency planning*. He encouraged the group to "move with even-handed orderliness in uncertain times."

Alan Claflin, head of the government arm of the Operating Committee, also commented on the political and funding situation in Congress and the DOE. He reiterated DOE's support for AMTEX and noted that new alliances and support for AMTEX have recently been obtained from the EPA and NIST.

Executive Director Review

Richard Quisenberry, AMTEX Executive Director, described two articles regarding how foreign countries are implementing programs similar to AMTEX to support their respective textile industries. Organizers of one of these efforts in France specifically mentioned the need to form an AMTEX-like consortium to implement electronic commerce in France. The Japanese government also is supporting development of an electronic infrastructure to bolster their textile industry.

Budgets and Priorities

Richard summarized the criteria from the AMTEX Key Principles against which all AMTEX projects must be measured. He noted, based on these principles, that some AMTEX projects would be successfully closed out, others would be refocused, and others moved forward towards field testing and commercialization.

The budgets, as recommended by the ITAC and the Industry Operating Board, were presented and approved. The industry recommended a $32.5M budget case which is the level required to maintain all projects at their current spending rates. The *contingency plan* budget is $26.9M. The project managers have been directed to prepare their FY96 plans and CRADAs, based on the $26.9M budget.

AOC Meeting Schedule

The question was put to the AOC whether or not to reduce the number of meetings from three to two per year. Some members expressed a desire to remain with three meetings in order to keep members informed of progress. Even if the formal business does not require more frequent meetings, a strong

sentiment indicated that some mechanism is required to keep people well informed. The issue was taken under advisement. The AMTEX leadership will consider the issue and develop recommendations.

Policies and Procedures

Laboratory Program Manager, Doug Lemon, discussed Draft #4 of the *AMTEX Policies and Procedures* document that has been prepared over the last several months. He noted that whereas the Industry Operating Board has had official policies and procedures in the past, the full AOC has operated under the Vision, Mission, and Key Principles. Doug proposed two clarifications/ additions to Draft #4. The first point was to explicitly include staff from the Research Partners as potential members of peer review panels. The second point was to make more explicit the process used for selecting proposals from the DOE laboratories when staffing a new project.

With these additions, Draft #4 of the *AMTEX Policies and Procedures* were approved unanimously.

AMTEX on the Internet

Doug Lemon gave a demonstration of the AMTEX Home Page for the Internet. The Home Page contains information about AMTEX projects, points of contact, and sources of additional information. Members of the audience requested the AMTEX Home Page have an address that will make it easier to find, using an information search agent, and that it needs more linkages to other Home Pages. The AMTEX Home Page address is: **http://apc.pnl.gov:2080/AMTEXWWW/amtex.html.**

Project Presentations

The industry and laboratory project managers presented brief summaries of the eight AMTEX projects. The AOC members commented on the great progress made and the significance of the many technologies going into field testing and commercialization this year.

PROJECT ACCOMPLISHMENTS

During the last quarter, accomplishments within the AMTEX Partnership™ have been numerous. A review of those accomplishments for each AMTEX project is contained in the following paragraphs.

Computer-Aided Fabric Evaluation (CAFE)

The CAFE project is developing inspection systems that will provide U.S. textile manufacturers with a major leap forward in the assurance of high quality, consistent textiles.

Project Manager: Glenn Allgood, ORNL / 615-574-5673
Project Director: Mark Kametches, ITT / 803-595-0035

Performance Related to Milestones

On-Loom Greige Inspection System

1. On-Loom Greige Alpha test milestone completed. Ended with the successful completion of the Phase II Spun Alpha test (July 1995).
2. Selected Alexco as the on-loom greige vendor (August 1995).
3. Held After-Action-Reports (AAR) and meetings to discuss issues and concerns associated with the Alpha test (August 1995).
4. Industry selected Beta test site.
5. Industry selected Beta sensor suites.
6. Developed path forward for deployment of Beta sensor systems.

CPPG Inspection System

1. The CPPG Operational and Environmental Considerations document milestone was met with the completion of the report titled *RGB Field System Data Collection and Testing for Textile Rotary Screen Print Inspection* (ORNL).
2. The Algorithm Real-Time Implementation Concepts Document milestone was met with the delivery of two documents: *Hardware Architecture Study for Color Printed Pattern Defect Detection* (SNL) and *Pipeline/Parallel Image Processors* (LLNL).
3. A compilation of the algorithm concepts (major deliverable) for detection and classification was reported in *Sequential Detection Algorithm for Color Printed Pattern Defects* and *Optimal MAP Classification Algorithm for Color Printed Pattern Evaluation* (both by SNL). A companion document was delivered by LLNL, *A Statistical Labeling Algorithm for Web Inspection of Color Printed Patterns*.

Knitting Inspection

1. Vendor selection meeting held at ITT to select knitting vendor affiliate.
2. Knitting task team met at ANL to establish Alpha test requirements (August 23, 1995).
3. Knitting task team met at Y-12 to finalize the Knitting Functional Description and Requirements Document (September 20, 1995).

Economic Model and Material Marking

1. A survey was distributed to the CAFE industry partners to assess the needs for Material Marking (LBNL). The results were used to develop a

path forward for the development of a material marking system that would be used with knitting, weaving, and color prints.

2. The Economic Model was enhanced with the addition of an influence model (LBNL). This model will be integrated with the existing CAFE Economic Model (ORNL).

Activities and Technical Accomplishments for the Quarter

On-Loom Greige Inspection System

During the quarter, the on-loom greige inspection team prepared for and completed the second and final phase of the on-loom greige Alpha test, bringing to completion the CAFE Alpha test of the On-Loom Fabric Inspection and Machine Diagnostics Systems. After these tests were completed, an After Action Report was developed for all the systems. The purpose of this report was to document and identify any issues or concerns about each system's operation and performance. The report integrated a preliminary test analysis with functional issues that relate to a Beta deployed system. Each lab was asked to prepare a presentation for the Alpha testing team based on the AAR. Meetings were held during August at ITT in Spartanburg, South Carolina where each lab presented their responses. After completing the series of meetings, the industry team met to determine the path forward to Beta for the CAFE On-Loom Greige System. These findings were reported at the CAFE Quarterly Meeting held at ANL, August 24, 1995.

The industry partners decided to carry forward certain sensors and the central inspection system into an integrated Phase I & II Beta hardware/software configuration. The vision system would be carried through the Phase I Beta. One sensor approach was designated for an offline configuration. Both these systems would then be turned over to ITT for further development and consideration. The rational for continuing efforts on the two down-selected systems was that even though they may not be of complete utility as inspection technologies at this time, due to cost or operational constraints, these systems would be in the future.

Subsequent to the decision, a meeting was held at ITT in Spartanburg, South Carolina in September to begin developing the Beta system. Discussions focused on characterizing the different approaches to the embedded system concept and how this would look at the Beta implementation. This effort continues with a technology search and proposed architecture recommended for Beta. In addition to this, the team is developing a plan for incorporating Alexco and the CAFE industry partners in the design and building of the Beta Inspection System. This plan will include training and education for each of the selected sensor technologies and operational considerations for deployment.

SNL is developing a next generation sensor design. Currently, they have built a prototype that is undergoing testing. Areas under investigation are sensor pad design (warp vs. fill), sensitivity, and wear. SNL is also leading the effort to determine the architecture that will be deployed at Beta. This system will have a clear migration path to a commercial unit.

ANL continues development of their Beta sensor subsystem. In anticipation of the test being conducted in a plant, a new mounting design is being developed that would not interfere with the normal day-to-day operations of the loom, as well as reconfiguring the acoustic sensor subassembly.

Over the past quarter, the project office has contacted Alexco and Milliken to begin the preliminary design of the vision mounting system that would incorporate an 80-in. field of view cover. This activity is currently under way with a visit planned to the Milliken Beta site in October. The team continues to build enhancements into the vision system software, focusing on increasing execution speed by modifying the detection algorithm and optimizing the system operating software. In addition, ORNL and Y-12 are upgrading the Machine Diagnostic System. The major enhancements are in the areas of optimized codes, detection algorithms, and sensors. Y-12 staff are also working with Alexco to develop a new mounting design and housing for the unit. The new design is planned for integration onto an operational loom for preliminary tests in November.

Color Printed Patten Inspection System

Progress was made at LLNL and SNL in the real-time implementation of detection algorithms. Approaches for region of interest and extraction, image warping, and registration were mapped to hardware for real-time implementation. Other technical progress consisted of completion of the Real-Time Implementation Concepts studies and Algorithm Concept documents. Progress was also made in the design concept for the imaging colorimeter. In addition, a report entitled *Algorithm for Correcting Data From Imperfect Tristimulus Colorimeters* (ORNL) was completed.

The vendor selection committee for the color printed pattern defect portion of the project conducted plant visits to three interested parties. These visits entailed a more defined presentation from the industry and a question and answer period in which the lab team participated. In support of the vendor selection process, system requirements for Alpha test, Beta test, and production units of the pattern defect inspection system were drafted at the August 23, 1995 CPPG partners meeting. Similar definitions for the imaging colorimetry subsystem will be addressed next quarter.

Alpha test definition and planning was started at the partners' meeting. Requirements for plant selection were discussed and a process for selecting the Alpha test site was initiated. Proposals from industry partners were solicited and will be reviewed for a schedule selection at the December partners' meeting.

Knit Inspection System

ANL continues their development and evaluation of one of the on-line sensors. Tests on the Knitting Machine Simulator have helped establish the design for the system. Included in this effort is a task to reduce the overall size of the sensors and associated hardware. In the area of software development, modifications are currently being made to the software that was developed for the On-Loom Greige Alpha test for use on the inspection system. This effort is progressing well. Over the past quarter, the wear study for coated knitting needles has progressed with the termination of the 1050-hour wear test and

subsequent analysis. Results show that wear was slightly reduced on the coated needles. This task will continue in October with the application of a new coating methodology.

LLNL completed the software/hardware for the real-time data acquisition system scheduled for testing at Y-12 in October and continued the development of the detection and classification algorithms for feature extraction. The non-real-time defect detection module has been completed and is currently undergoing tests to assess its capabilities in isolating a defect from background texture and generating size and shape measurements. This process has provided valuable information and insight that is currently being used in the development of the Alpha real-time module. In line with this effort, LLNL is collaborating with ORNL in evaluating a new algorithm that could potentially be implemented in a low-cost Digital Signal Processor configuration.

ORNL has completed the fabrication of the camera and illumination assemblies for the vision inspection system. Due to the late delivery of the camera, the installation of the system will occur in October. A flange subassembly has also been incorporated into the design to eliminate wrinkles and off-directional movements of fabric during the knitting process.

SNL continues their development, design, and build of the new sensors. The primary task has focused on optimizing the pad geometry for enhanced detection. Based on their analysis, a new sensor board has been designed and submitted for fabrication. This new generation board will be tested for sensitivity as it applies to new pad geometry and fabric type. In addition to the development of the sensor subsystem, SNL is currently conducting a material coating study to assess durability and sensitivity reduction as a function of applied wear resistance coatings.

Y-12 is pursuing the development of a subsystem to measure the positions of a knitting machine's needles and sinkers. This subsystem is a modified version of one tested during the On-Loom Greige Alpha tests. In addition, Y-12 is working with the industry partners to develop the approach and procedures for making knit defects during the Alpha test. This training is being conducted on the knit machine at Y-12.

Economic Model

LBNL, in collaboration with ORNL, is modifying the CAFE Economic Model to include an influence model. The outcome will be an integrated model combining the influence and Taguchi approaches. Work continues in this effort.

Material Marking

LBNL issued a survey to the CAFE industry partners to ascertain the functional needs of a material marking system. The intent was to identify those elements that would be unique to laboratory work and those elements that could possibly be met with current market technology. From the survey, it was determined that a meeting will be necessary to illuminate the entire spectrum of operational needs this system would address. LBNL is currently developing the plans for this meeting.

Issues, Major Problems, and Resolutions

The project is experiencing perturbations in its schedule, due to the uncertainty in funding. The arrival date and quantity of funding will have an impact on deliverables and project structure for FY96. In the short term, the Laboratory Program Office and DOE have worked out an arrangement to keep the project solvent through the end of November (DP labs through DOE). If funds have not been identified and received, it will cause slippages in milestones that have been identified for FY96. This slippage will be significant because it will impact the On-Loom Greige Beta test and commercialization of select units, the CPPG Alpha test, and the Knit Alpha test. The loss of continuity will also cause delays in the deployment of the material marking system slated to come on-line during the On-loom Greige Beta test.

Explanation of Variances

On-Loom Greige Beta Test

A slip of the Beta test of approximately three months has occurred due to the decision of the CAFE industry partners to have a Phase II (Spun) Alpha test and the deferment of sensor selection for Beta until the August 24, 1995, CAFE Quarterly Meeting.

Color Printed Pattern Alpha Test

Due to budget reductions, the Alpha test has slipped approximately three months.

Plans for Next Quarter

The on-loom greige inspection task team will focus their efforts on the design, fabrication, and deployment of the Beta test On-Loom Greige Inspection System. These activities will include coordination of efforts by the labs, industry partners, and Alexco, visits to the Beta test sites, development of the Beta Test Plan, modifications/enhancements to selected sensor suites, enhancements to detection and classification algorithms, convening of meetings with CAFE industry partners to address MIS issues associated with deployment of CAFE systems, upgrades/enhancements to one subsystem, and design and fabrication of the integrated On-Loom Greige Inspection System (both Beta and commercial).

The CPPG task team will continue their development of the Alpha Color Print Inspection System scheduled for June 1996. Tasks will include further development of the defect detection algorithms for extracting region of interest information, formalization of the system requirements for the Alpha test, Beta test, and production units, preliminary assessment of Alpha test requirements, pre-Alpha test staging of equipment, and coordination of efforts with industry partners.

The knit inspection task team will continue their efforts towards deployment of the Alpha Knit Inspection System scheduled for January 1996. This task will require a finalization of system hardware and software and the development of the final Alpha test plans. Modifications will continue to the hardware support assemblies and mounting structures. A preliminary walk- through of the test will be conducted to ensure the conformance and repeatability of test approach.

The Economic Model will be finalized, integrating the influence with the Taguchi models. Material Marking will move ahead by conducting a meeting to overview functionality and requirements as they apply to all of the CAFE Inspection Systems. The outcome of this meeting will be the development of the Material Marking Functional Description and Requirements Document.

Invention Disclosures

- Machine Diagnostics (ORNL, working)
- Linear Diode Array (Y-12/ORNL)
- Loom Mounted Vision Inspection System (ORNL)
- Colorimeter Algorithm (ORNL, working)
- Hardware Implementation of the Imaging Tristimulus Colorimeter (ORNL, working)
- Ultrasonic Fabric Inspection System (ANL)
- In-Air Couple Transducers (ANL)
- Software Packages for the Knitting and Color Tasks (LLNL, copyrights) *(Expecting input from Sandia National Laboratories).*

Publications/Presentations

Publications

1. "RGB Field System Data Collection and Testing for Textile Rotary Screen Print Inspection" (ORNL)
2. "Hardware Architecture Study for Color Printed Pattern Defect Detection" (SNL)
3. "Pipeline/Parallel Image Processors" (LLNL)
4. "Sequential Detection Algorithm for Color Printed Pattern Defects" (SNL)
5. "Optimal MAP Classification Algorithm for Color Printed Pattern Evaluation" (SNL)
6. "A Statistical Labeling Algorithm for Web Inspection of Color Printed Patterns" (LLNL)
7. "Algorithm for Correcting Data From Imperfect Tristimulus Colorimeters" (ORNL)

Cotton Biotechnology

This visionary project in cotton biotechnology promises to provide revolutionary advancement in the qualities and performance of cotton fiber. By increasing the rate of progress in gene description tenfold, this project will enable scientists to improve the strength, length, and uniformity of cotton. The improvements will add an array of new product features for consumers and a competitive edge for U.S. companies in the world market.

Project Manager: Ben Burr, BNL / 516-282-3396
Project Director: Gay Jividen, Cotton, Inc. / 919-881-9874

Performance Related to Milestones

Three of the milestones related to gene sequencing for this quarter were not met. The 200 mapped primer pairs will not be available until the end of FY96. The last quarterly report explained that because of uncertainties in funding in FY96 work would not begin on the cDNA sequencing task. Therefore, production of the libraries and enrichment of fiber clones will not be obtained until after the start of the gene sequencing task. Simple sequence repeat (SSR) entry mechanisms have been achieved for the database.

Excellent progress has been made in the milestones related to understanding cotton fiber biology, as described in the following paragraphs.

Activities and Technical Accomplishments for the Quarter

Molecular Markers

To date we have accumulated 333 unique sequence of simple repeats from cotton. Preliminary experiments with cotton suggest that primer pairs made for only one in six of these will lead to useful polymorphic markers. Therefore, about 1200 unique sequences will be needed in order to generate 200 markers, expected by the end of the fourth quarter. The slow pace in accumulating sequences is the result of finding many redundant sequences and a low number of clones that was generated by the technique employed to obtain the simple sequence repeat bearing clones. Both of these problems now appear to be solved. First of all, the level of redundancy was shown to be a function of the relative number of helper phage used to generate the single-strand DNA plasmids. A low multiplicity of infection stimulated production of single strand DNA from a fraction of the clones available and thus resulted in finding many clones with the same sequence. Secondly, the method used for purifying single-stranded DNA either partially inactivated or added inhibitors to the DNA, which reduced the number of clones after the second strand was synthesized. Obtaining unique clones that carry simple sequence repeats is no longer a rate limiting step.

During this quarter, the markers group has also made enhancements in its sequencing capabilities. DNA templates are now purified entirely in 96-well microtitre plates, which permits one person to prepare the templates in a single day for a week's worth of sequencing. The fluorescently labeled terminators

are also removed using 96-well plates, thereby reducing the time and expense required to prepare the sequencing reaction for gel loading. These enhancements will also be useful for the cDNA sequencing project when it is started.

Fiber Development

The observation that some fiber cells undergo cell division in tissue culture was a surprising finding reported in the last quarter. This observation settled a long-standing dispute among cell biologists as to whether fiber cells grew from their tips or expanded throughout their length. The ratio of the tip to basal segments against fiber length was plotted. If tip growth predominated, proportionately longer tip segments in longer fibers would be expected. In fact, the ratio of tip to basal segment length was invariant over a range of fiber lengths, proving that young fiber cells expand overall. This finding has significant consequences for making improvements in fiber length because it is known that the process is not localized.

Another very significant discovery was made in this quarter: how to dissociate the fiber cells from young developing ovules so that they could be counted. This discovery provides the means for the first reliable method of counting the number of fiber cells. Fiber number in 34 cotton varieties has been measured. Fiber number in commercial varieties varies about 2-fold. It will be interesting to see whether these measurements are correlated with yield. If so, this invention provides a potentially useful tool for cotton improvement.

Database

Two primary enhancements were made to the database in this quarter. A utility was added that aids the annotation of automated sequence runs, based on the sample sheet that is completed at the time the sequencing gels are run. A client-server version of ACEDB has been implemented that permits automated loading of the database. The LBNL team visited BNL for three days at the end of the quarter to discuss future enhancements and to coordinate activities with computer technicians at BNL. A utility that facilitates communication of MacIntosh computers (required for automated sequencing) with the workstation was loaded and put in operation. This visit proved to be particularly useful because it served as a review of all computational aspects of the project.

Issues, Major Problems, and Resolutions

The delay in the completion of the molecular markers project is discussed in previous paragraphs. The major problems now appear to have been resolved. Sequencing completion for this task is expected by the end of 1995 and mapping completion of the initial set of 200 markers by the end of FY96. In the previous progress report, the delay in starting the cDNA sequencing task was explained.

Explanation of Variances

Delay in obtaining mapped markers is the result of problems in obtaining enriched simple sequence repeat containing clones and in a severe underestimate of the time this task would take.

Plans for Next Quarter

Molecular Markers

During this quarter, the remainder of the simple sequence repeat sequences will be accumulated. Primers ordered, based on these sequences, will begin to be tested on a panel of cotton varieties to see if they are effective polymorphic markers.

Fiber Development

The ability to accurately count the number of fiber cells on an average cotton seed will now permit resumption of the irradiation experiments to learn what proportion of the fiber cells are determined at different stages of development prior to flowering. These experiments will be carried out on genotypes that have low, medium, and high levels of fiber cells.

Database

The primary activities for this quarter involve interfacing ACEDB with mapping software and storing and retrieving gel images.

Invention Disclosures

Filed by Jack Van't Hof (BNL) August 17, 1995:

"Estimation of ovular fiber production in cotton: A procedure for obtaining the number of fiber cells per ovule soon after flowering."

Publications/Presentations

None

Demand Activated Manufacturing Architecture (DAMA)

The objective of the DAMA project is to define, develop, integrate, and deliver an electronic marketplace system/structure that can be used by all elements of the U.S. textile industry. DAMA will enable companies to reduce process requests for apparel on demand, and establish new strategic alliances to create business opportunities. These steps will enhance industry productivity and competitiveness in the world marketplace.

Project Manager: Leon Chapman, SNL / 505-845-8668
Project Director: Jim Lovejoy, $[TC]^2$ / 919-380-2184

Performance Related to Milestones

Enterprise Modeling & Simulation (EM&S)

Milestone: *Complete product line investigations and associated industry models for Bedsheets, Men's Warm-Up Jacket, and Ladies Fashion Item*

The Product Line Investigation Teams completed work on the bedsheets and a Men's Nylon Supplex® Parka activities. Process step models and an overall business process model were developed. The Ladies Fashion Item activity has not begun, with initiation pending resolution of funding levels for FY96. The bedsheet and men's parka activities completed in September.

Milestone: *Complete Textile Industry Simulation Model Version 1*

The industry simulation model (version 1) was completed with the implementation of a simulation builder for retail analysis. The builder was presented to industry in September, completing this milestone.

Connectivity & Infrastructure (C&I)

Milestone: *Complete assessment and demonstration of secure electronic connectivity & messaging technology*

(Completed in April)

Milestone: *Implement AMTEX Collaborative Information Systems, including file formatted file transfer and video conferencing among DAMA participants.*

In addition to formatted file transfer capabilities established earlier this year, DAMA information and files are now available through the World Wide Web. Video conferencing has been used on several of the DAMA tasks for conducting business meetings. The September milestone for video conferencing was completed in August.

Cooperative Business Management Tools (CBM)

Milestone: *Demonstrate and pilot a national sourcing database*

(Completed in April)

Milestone: *Complete prototypes for forecasting, inventory, and CBM infrastructure*

A final prototype for CBM infrastructure, and initial prototypes for forecasting inventory management were completed in August with industry evaluations of both products, completing this milestone.

Architecture & Integration (A&I)

Milestone: *Complete updates to:*

- *FY96 project plan*
- *opportunity assessment demonstration plan*

Finalization of the FY96 Project and Task Plan documents is on hold, pending resolution of AMTEX and DAMA funding. Estimated completion of a final plan is November, assuming congressional action on FY96 budgets in October.

The opportunity assessment report was distributed September 5, completing this milestone.

(Demonstration plan completed in June)

Education, Outreach, & Commercialization (EO&C)

Milestone: *Develop learning laboratory curriculum*

The Learning Laboratory Curriculum was being developed in two parts: a Strategic Issues course and an Operational Issues course. The Strategic Issues curriculum was finalized in May (original draft in March). Based on results of industry assessment after a seminar held July 18-20, part two of the curriculum will not be developed as originally conceived. The overall role of the learning laboratory in the context of industry education has been revised. A draft plan outlining the new direction was completed in September, and is under review. The new direction will have heavy focus on demonstration of DAMA products from the other project tasks, and less emphasis on required cultural change.

Milestone: *Prepare DAMA briefing materials*

New DAMA briefing materials were developed and presented to attendees at the Bobbin and RISCon trade shows in September, completing this milestone.

Activities and Technical Accomplishments for the Quarter

The following accomplishments are in addition to those previously reported and are provided by DAMA Task area.

Enterprise Modeling & Simulation

A report summarizing key information, learned from the Men's Nylon Supplex® Parka product line investigation, was completed and distributed internally to DAMA. Product team meetings were held at Haggar Clothing Co., DuPont, LL Bean, and Cascade West Sportswear. Process step and high-level roadmap diagrams were completed and published documenting these product lines.

Work on the business modeling task was redirected to focus on modeling consumer demand profiles and forecasting, which will directly support the Onshore/Offshore simulation scenario. Analysis was completed on the increase in expected profits that arises when a supplier (such as an on-shore supplier) allows reorders midway through the season. A draft report is undergoing task review.

A draft report was completed, "ITC Best Practices: Building Blocks for Strategic Business Structures." This report contains approximately 50 best practices related to logistics and four strategic business structure concepts that have potential to assist the ITC.

An implementation of the simulation builder for retail analysis was completed and presented at a September workshop in Atlanta, Georgia. A working draft document was completed describing the fundamental programming structures of the Simulation Builder and instructions for using it to implement new modules.

Connectivity & Infrastructure

The TEXNET Prototype #2 development effort was completed for an evaluation, held the week of August 14. C&I co-led the evaluation with CBM, and presented technical discussions of Trading Partner Agreement maintenance, software installation, and secure services.

A Hands-on Internet Tools Workshop was developed and delivered July 26 at LLNL. The workshop was attended by 12 DAMA industry representatives.

The DAMA World Wide Web site is now publicly available with access to internal portions restricted by a user name and password.

Fieldcrest Cannon confirmed that J.C. Penney will participate with them in a demonstration of sending EDI Advance Ship Notices via Internet. Additional trading partners may also participate in this demonstration with Fieldcrest Cannon.

Cooperative Business Management

TEXNET and Forecasting and Inventory Management (FIM) evaluation sessions were held August 14-16 at $[TC]^2$. The sessions were well attended by participants from all four sectors. The results were to move TEXNET to the pilot phase, and to go forward with a next-generation FIM prototype. Results from the FIM Prototype #1 (P1) evaluation indicated two potential directions. The first one would emphasize providing more assistance to industry in the forecasting area than that provided in FIM P1. The second one would emphasize providing a supply chain level decision tool much in the spirit of FIM P1, but with more flexibility and speed.

The TEXNET Prototype #2 deliverables were completed and sent to $[TC]^2$ for further distribution to DAMA participants on an as-requested basis.

The National Sourcing Database (NSDB) activities included development of a stand-alone Windows Visual Basic interface version for accessing the American Textile Manufacturers Institute and Electronic Catalog data.

A Data Assessment Task Team was formed, with the first meeting held in Atlanta, Georgia on September 13. The initial focus is to assess the current state of data transactions with trading partners

Education, Outreach & Commercialization

Preparation for the Bobbin and RISCon trade shows occurred, including completion of a new portable display, "Get Plugged into DAMA." The display was first used at the Chicago RISCon show in September. Well-received by all booth visitors, it is portable and can be used at future shows.

Four Small and Medium Enterprises (SMEs) were recruited as members of the EO&C Project Task Group. Three are company presidents and one is Director of Sourcing for Healthtex.

A needs assessment meeting with SMEs around the Los Angeles area was held August 22 in Los Angeles, California. Drivers were much different for these companies than those identified in an earlier SME meeting held in Dallas, Texas.

A generic DAMA education/orientation article, including camera-ready art for ready adaptation/publication in Industry Partner company newspapers, was distributed to all Steering Committee members.

Preliminary measurement statistics for the AMTEX/DAMA Industry Roadmap were developed and reviewed by the Advisory Committee.

Architecture & Integration

First and second drafts of a DAMA multi-lab CRADA Statement of Work and Joint Work Statement were prepared and distributed to all DAMA participating labs and DOE Area Offices for review. This CRADA will be implemented for FY96, and is basically finished and waiting for results of AMTEX funding resolution.

FY96 budget planning adjustments were made to accommodate the current estimate of $12.25M budget expected for the next fiscal year.

A report on current World Wide Web activity in the U.S. ITC was completed and printed. For a copy of the report (DAMA-G-20-95), contact Leon Chapman at Sandia National Laboratories.

Quarterly Steering Committee and Core Management Team meetings were conducted September 20 and 21 in Chicago, Illinois.

Issues, Major Problems, and Resolutions

Uncertainty in funding levels for FY96 are negatively impacting all tasks' abilities to plan, staff, and schedule activities for the coming year. LANL and LLNL have inadequate carryover to cover them while the FY96 budget is worked. This shortage has caused them to scale back work in order to carry over as much funding as possible. Each impacted laboratory is working to obtain funds that will allow them to continue a baseline effort.

Explanation of Variances

- DAMA costing continues to run behind anticipated budget, mostly in the EM&S task. In light of uncertain funding, recruitment of qualified personnel for the task has continued to keep the spend rate down on this task.

- In general, the addition of new staff for the project has taken longer than anticipated, particularly at the DOE-ER laboratories. Concern by all the

tasks over maintaining adequate carryover to sustain project efforts through the federal continuing resolution has also slowed the project's spend rate.

The Learning Laboratory Curriculum milestone has been redirected as already mentioned.

Plans for Next Quarter

Enterprise Modeling & Simulation

An end-of-fiscal-year task report summarizing major accomplishments and deliverables for FY95 will be completed.

Development of the consumer demand profile and forecasting models will continue. Information embodied in these models will be integrated with the Onshore/Offshore simulation scenario.

The document summarizing ITC/Non-ITC Best Practices and Strategic Business Structure Concepts will be distributed.

Connectivity & Infrastructure

Examples of tools and benefits to textile business functions will be folded into the "Hands-on Internet Tools" Workshop.

Support will continue with CBM on development of the TEXNET pilot.

Cooperative Business Management

TEXNET piloting plans will continue development with emphasis on identifying required resources and potential pilot teams.

The Forecasting and Inventory Management Prototype #2 requirements will be defined and documented. Work will begin on the next generation tool.

Education, Outreach, & Commercialization

A DAMA video will be completed for use by the project and AMTEX.

A Trade Show Planning and Evaluation guide will be drafted and reviewed. This review was recommended at the recent Core Management Team meeting.

Restructuring of the educational activities for EO&C will be completed.

Architecture & Integration

The project funding situation will continue to be monitored, and support provided, as needed, to assist AMTEX in responding to events as they unfold in Congress.

After final funding is established for the project, the FY96 Project and Task plans will be revised as appropriate and submitted to the AMTEX Program Office and DOE.

Invention Disclosures

No invention disclosures were processed during this period.

Publications/Presentations

Publications:

DAMA reports and publications prepared during this quarter include:

- CBM Tools Task, National Sourcing Database Requirements, (Draft), July 1995
- Men's Nylon Supplex Parka Product Team, Report on Site Visits and Meetings, July, 1995
- Revisiting the Focus of the CBM Task, A Vital Issues Panel, August, 1995
- World Wide Web Activity in the U.S. ITC, August, 1995
- Developing a Vision, (Draft), September, 1995
- ITC Best Practices: Building Blocks for Strategic Business Structures, September, 1995
- TEXNET Prototype 2 Final Report, September, 1995
- TEXNET Prototype 2 Requirements Document, September, 1995
- TEXNET Prototype 2 Design Document, September, 1995
- TEXNET Prototype 2 Hardware/Software Specifications Document, September, 1995
- TEXNET Prototype 2 Pilot Architecture, Requirements, and Implementation Plan, September, 1995

Key Presentations:

- DAMA provided demonstrations of several tools and capabilities at the Bobbin Show in Atlanta, Georgia September 11-14, and at RISCon in Chicago, Illinois, September 17-20.

- Jane Macfarlane, LBNL, gave a presentation, "Modeling and Simulation in the Integrated Apparel Industry" September 14 for an AAMA technical session at the Bobbin Show. Focused on new technologies, it complemented two other presentations on information architectures for apparel and CIM standards.

Electronic Embedded Fingerprints (EEF)

The Electronic Embedded Fingerprints project is developing miniature electronic devices as permanent identification and information markers for textiles and apparel.

Project Manager: Mike Riley, LLNL / 510-422-3045
Project Director: Jim Caldwell, $[TC]^2$ / 919-380-2156

Performance Related to Milestones

The major milestone for the year, the demonstration of multiple tag reading and sorting capability, was shown at the Bobbin Show in September. This milestone required combining two technologies, largely developed in parallel because of time constraints. After uniting the RF part of the system to the processor portion, the system was partially redesigned in order to improve the operational performance. This redesign was accomplished by changing the receiver circuitry, transmitter, and power control circuitry.

A box of five pairs of tagged socks on a conveyor belt was read as the box was positioned within the reader. Information specific to the enclosed items, such as color, fabric type, manufacturer, and price, was displayed on a monitor. This test demonstrated the capability to communicate with electronic tags and to sort the replies without clashing, within the allotted read time of 1 second. The capability to read and write data to the EEFs within the socks, using LLNL and PNL software was also demonstrated.

A steady stream of visitors saw the EEF demonstration each day. Many of the visitors said they were impressed with the demonstration of real working hardware. No other organization appeared to be displaying electronic tag-related items at the Bobbin Show. IBM representatives visited the demonstration several times, for long periods, and asked detailed technical questions. (IBM was one of the participants in the RFID Expo held at [TC]2 in June.) Information provided in the EEF demonstration was specific about the hardware that was being operated, but no details were provided about plans, specifications, or AMTEX goals. Visitors left the display with the impression of a technically impressive working hardware prototype system, and new perspectives on possible approaches to solving many of their inventory and identification problems.

Activities and Technical Accomplishments for the Quarter

About 25 EEF prototype tags were prepared, including layout, board fabrication, and construction.

Further work is needed to correct problems related to the high sensitivity of the reader to the position (such as, antenna alignment) of the EEF-tagged items within the field of the reader. Reliable and repeatable *reads* were observed only for certain locations over the reader, and therefore at this time reading a moving box on a conveyor belt is not a viable option.

The understanding of FCC regulations indicates the EEF transmitter is not compatible with the rules of Part 15, in that the transmitted power is too high at our operating frequency. This incompatibility will dictate conversion to an acceptable frequency/power level.

Previous Quarter Progress:

- Problems were identified and corrected in the tag and reader receiver hardware.

- The prototype reader system was completed and tested.
- Multiple tags were successfully tested in the field. Simultaneous reading of up to 10 tags was demonstrated. However, communications with more than four tags was somewhat intermittent.
- A baud rate problem was isolated and a temporary fix was added to the reader circuitry. A full fix will probably require code changes in the tag software.

Issues, Major Problems, and Resolutions

The statement from last quarter is still applicable, with some modification: "The major non-technical issue facing the EEF Project at this time is determining whether or not the commercial organizations represented at the recently held RFID Expo at [TC]2 are adequately addressing, or will address in the near future, the AMTEX EEF partnership's needs and requirements. These are stated in the "User's Needs" statement, compiled by Amy Walker of Levi Strauss and Ron Gilbert of PNL, with input from the 20-member EEF AMTEX partnership."

In view of the ITAC decision to limit future funding for this project, delivery will be limited to the current prototype unit. Reserving about one-third of the allocation is recommended for continued technical work to correct some of the more pressing problems identified in the prototype system and discussed previously.

Explanation of Variances

Although it is disappointing that the goal of reading 50 EEF tags within one second was not achieved, it should be realized that this was a very complex and ambitious target. Substantial progress was made towards this goal, and in fact developed and demonstrated the basic technology in an alpha prototype embodiment. And, since the project was not fully funded until November of 1994, it was technically accomplished in less than one year!

Plans for Next Quarter

A fairly detailed technical report will be compiled, incorporating a sufficient level of detail so the technology developed thus far can be transferred to some interested manufacturer for further R&D and eventual production.

Invention Disclosures

An invention disclosure was filed in September at LLNL associated with the RF communication link with the tag. A previous disclosure is being filed for a patent.

Publications/Presentations

In July, an EEF Project review presentation was given at the ITAC meeting.

On-Line Process Control in Flexible Fiber Manufacturing (OPCon)

The OPCon project's goal is to strengthen the worldwide competitive position of U.S. fiber manufacturers by identifying and developing technology which provides the means for: (1) faster transition between products, (2) efficient production of small lots, and (3) improved economics via elimination of off-quality production and off-line testing.

Project Manager: Marc Simpson, ORNL / 423-574-4171
Project Director: Jack Scruggs, TRI / 803-627-8040

Performance Related to Milestones

No milestones for this period.

Activities and Technical Accomplishments this Quarter

Following are highlights of the technical activities within each of the four OPCon tasks.

Fiber Cut and Crimp - The subset of crimp characteristics being investigated by PNL was refined to crimp shape. Two techniques are currently being evaluated at PNL for the measurement of crimp shape using fiber tow bundles furnished by industry partners.

Finish Oil and Moisture - Laboratory measurements have been made at ORNL on an AMTEX generic finish on fiber using ultraviolet absorption, Raman scattering, near-infrared absorption, and mid-infrared absorption. The generic finish was formulated by industry partners for OPCon and will be used in the laboratory and field experiments. Several techniques have been identified that hold promise for on-line measurements of percent finish on yarn (FOY).

Fiber Morphology - Initial measurements using optical scattering were made on a variety of fibers provided by industry partners. From these measurements, a technique has been developed at PPPL to provide accurate, noncontact birefringence determinations as well as measurements of fiber diameter.

Polymer Rheology - A laboratory test was performed at LANL to look at differences in polymer viscosities using acoustic sensors. Initial results indicated low sensitivities to viscosity with the present configuration. Researchers at LANL have identified the reasons for the low sensitivity and are now performing further tests.

Issues, Major Problems, and Resolutions

None

Explanation of Variances

No variances to report

Plans for Next Quarter

A combined Industry/Laboratory OPCon Project Meeting will be held on October 26 and 27 at the Hoechst Celanese Research Center in Charlotte, North Carolina. The meeting will provide a forum for information exchange between industry and laboratory partners. Break-out sessions at the meeting will be chaired by the individual task PIs to review progress on the tasks and refine FY96 goals and activities.

Scheduled technical activities next quarter include; a laboratory demonstration of spectroscopic measurements of finish on fiber with a final report on Phase I activities in the Finish task; initial laboratory experiments on moving fibers in the Fiber Morphology task; and continuing experiments using samples provided by industry in the Polymer Rheology and Fiber Cut and Crimp tasks.

Invention Disclosures

None

Publications

None

Rapid Cutting (RCUT)

The Rapid Cutting (RCUT) project is developing a new generation of cutting systems and technological advancements in current systems that will improve cutting quality and efficiency. Such systems will enable true demand activated manufacturing of apparel. The Rapid Cutting project consists of six national laboratories, each with laser and optical technologies appropriate for the mechanical cutting of textiles using new materials and photonics.

All teams were actively involved with their tasks during this quarter.

Project Manager:	Craig Fong, LBNL / 510-486-5298
Project Director:	Jim Caldwell, $[TC]^2$ / 919-380-2156

Performance Related to Milestones

Four key milestones were scheduled for this quarter:

1) A project technical review - originally scheduled for September 21, this quarterly meeting was postponed until the FY96 AMTEX budget is approved by Congress. Until then, technical communication will occur through smaller task-specific or topical meetings, such as blades testing or laser workshops. A CRADA-protected information year-end or annual technical report, as well as this quarterly report, will serve as information vehicles until the FY96 budget is approved. Hence, this milestone has been postponed and redefined.

2) Selection of the optimum laser source - as scheduled, a laser design review was held on August 8. The industry and lab teams convened to hear technical work accomplished over the last 12 months. Because of FY96 budget constraints, one developmental laser technology was selected for the next phase of scaled prototyping. This milestone occurred six weeks ahead of schedule.

3) Completion of magnetic driver alpha prototype tests - bench scale and first prototypical linear magnetic drivers were tested on a test stand. First tests and performance data runs were completed at the end of September in preparation for the year-end project technical review. This milestone was completed within 10 days of the scheduled milestone.

4) Completion of material handling prototype - a prototypical piece part handler was fabricated and tested. This procedure was based on a completed conceptual design. The results are documented in the year-end report. This milestone was completed two weeks ahead of schedule.

Activities and Technical Accomplishments for the Quarter

Administratively, four notable events occurred within this reporting period. They are described as follows:

- ITAC, Charlotte, North Carolina - a comprehensive project status report was given by Jim Caldwell and Craig Fong to the ITAC and DOE on July 12. Based on a strawman AMTEX budget of $26.9M for FY96, they recommended the RCUT project be authorized $1050K, based on the high probability of technical success and the projected cost of technologies in the intermediate term.

- Project Management Workshop, Knoxville, Tennessee - The RCUT project managers attended sessions on intellectual property and the mechanics of master CRADA procedures on July 19.

- AOC, Knoxville, Tennessee - The RCUT project managers attended and presented a brief project summary to the AOC on July 20. They endorsed the working ITAC budget of $1050K for FY96.

- Bobbin Show - the RCUT project team participated in the Atlanta Bobbin Show AMTEX booth September 12-15. Partners from industry and laboratories manned the RCUT display. Laser cut textile samples, coated blades, updated videos, and graphics were shown. An updated RCUT project brochure was distributed. Relevant contacts were up this year. $[TC]^2$ will follow up with these companies.

Specific activities and technical accomplishments follow.

Blades

A test plan for the evaluation of blades was developed. It addresses a suite of canonical mechanical properties tests together with a structure for conducting accelerated wear tests at the Los Alamos Center for Material Science (CMS). A procedure was spelled out for on-machine tests at Levi Strauss' Wichita Falls, Texas facility.

On September 26, task leaders from ANL, LBNL, LANL, and ORNL met at Levi Strauss, Wichita Falls, Texas to commence the testing of lab-developed blades. This started off the industry test and evaluation phase of Beta prototypical blades and marks a major milestone on the project.

Several blades were installed on Levi's Gerber automated cutter and a standard marker for 501 jeans was cut on 60-ply blue denim. These specimens were returned to LANL's CMS for examination. Results to date are presented in the year-end technical report.

An outcome of these tests was the recognition of the need for additional instrumentation on an automated, multiple-ply cutter and the use of a standard marker. The labs are presently developing on-board instrumentation for blade temperature, driver motor current, and lateral force on the blade. This instrumentation will be deployed at LWF due to the very rigorous duty; 60 plies of denim are cut two shifts per day.

At $[TC]^2$, a lighter multiple-ply cutter that uses a significantly smaller reciprocating blade will be used on a test marker. ANL, LBNL, LANL, and ORNL are processing over 30 blades to this new configuration. These tests will provide a flat baseline for blade lifetime and will include three axis force and three channels of motor current instrumentation.

Mechanical Cutting

LBNL completed tests on the pneumatic cutter bench facility. Besides the salient benefits of excellent power-to-weight, a major feature to pneumatic power is that the driver is virtually stall proof. Compared to electric motors, over-current protection and over-rating (an artifact of otherwise burned electric motors) are not needed, as the pneumatic driver stall mode is benign.

The next iteration of high-power linear induction motors has been fabricated along with power supplies and a control. A DC servo motor amplifier was used as a power supply; the input was a sine, square, or sawtooth waveform signal from a signal generator. Bench test and evaluation cutting of limited multiple plies of denim have started.

The conceptual design for a 200-inches-per-second mechanical cutter was further developed. Various schemes to secure a single ply of extremely porous textiles such as knits (without the use of an overlay plastic sheet) were studied by measuring fabric air flow resistance for several textiles. Designs for a single-channel prototypical cutter, planned for development through FY96, were started.

Laser Cutting

ANL's work on continuous-wave Nd:YAG and CO_2 commercial sources was completed. Cut textile samples were evaluated by the industry partners. Significant work was performed on the survivability of the backing surface. In previous commercial CW CO_2 systems, substrate damage and, hence, lifetime have become significant operating issues.

LANL completed a data set for a revised array of textiles provided by the industry partners. Cuts with xenon fluoride, xenon chloride, and krypton fluoride were performed. Pulse repetition rates at threshold power levels were determined and an overall assessment was made of cut quality. Best candidate sources from the excimer class were selected and concepts for beam transport were generated. Preparations were made for the laser design review.
At LLNL, work using a copper vapor laser was completed. Similar tests using a Q-switched Nd:YAG laser on the standard array of textiles were completed and, again, an overall assessment of cut quality was made. Designs for beam transport and subsystems were generated in preparation for the laser design review.

Industry participants and task leaders from ANL, LANL, LLNL, and DOE participated in a design review to select which laser technology would proceed to alpha prototype development in FY96. This in-depth review focused on all laser cutting work over the first project year. All salient data from tests conducted over the last year were reviewed. Cost projections for each leading source were presented.

The LLNL diode pumped solid state laser was selected as the most viable candidate for continued development, primarily due to its near immediacy to the commercial market. The time frame is short and cost point conducive to project goals, due to the metal cutting segment of the laser industry. This approach should provide decisive results in the next one to two years. The excimer source approach could be employed if the diode pumped laser is relinquished. This decision marks the completion of a major milestone within the RCUT project.

Material Handling

The detail design of the piece picker is now complete. A full-scale, reduced-width picker is now being built, scheduled to be completed by October 10. The piece sorter has been redesigned to significantly reduce cost and address issues raised by AMTEX industry partners about the handling of the UPS racks. The control system for the overall machine and the control system design are complete. The cost of analog motor control channels (stepper and servo motors) and actuators has factored heavily into the new design, resulting

in a system that uses the absolute minimum of analog motor controls to meet the stringent cost target.

Issues, Major Problems, and Resolutions

Several in-house reviews were conducted by each national lab technology transfer department on current and multiple year CRADAs. Responding to a need to rescind previous FY95 technology transfer budgets, each lab either prioritized or held exempt the review of AMTEX projects. However, LBNL, operating on a schedule extension granted by DOE, opted to rescind $50K from the LBNL RCUT project. This action appears to be contrary to previous guidance. For LBNL tasks, fabrication and procurements of components for alpha scale prototypes have been postponed until FY96. No other laboratories exercised rescissions on AMTEX projects. That this practice may be exercised in FY96 is a concern; however, no resolution appears to be present in policy at the moment.

Explanation of Variances

The RCUT national lab team is operating in the first quarter of FY96 on carryover funds from FY95. Plans based on a January 1996 budget authorization for $1050K are being generated.

Plans for Next Quarter

A year-end annual report is being generated. This CRADA-protected document will be a compulsory technical tome that fully describes work performed by the project partnership since the commencement of the project. It will be distributed only to participating members of the RCUT project.

A revised RCUT project plan will be completed based on a $1050K FY96 budget, a budget authorization date of January 3, 1996, and a prescribed budget breakdown between laboratories, as prescribed by the LPMO.

The industry test and evaluation of ANL, LBNL, and ORNL blades, or Beta testing, will continue. A statistically significant number of smaller automated cutter blades are being processed and fabricated. $[TC]^2$ will test these blades on their resident automated cutter in Cary, North Carolina. Non-invasive instrumentation will be developed for the Levis' Wichita Falls cutter. A decision to return to this facility will be made in the next quarter.

Preliminary designs and a parts procurement package will be prepared by LLNL. They plan to purchase diodes as part of a larger procurement in December 1995, contingent on FY96 budget authority being available.

A preliminary design will be generated for one prototypical channel of a mechanical cutter. Procurement and fabrication packages will be prepared for immediate FY96 processing.

Invention Disclosures

LBNL has submitted the following disclosures:

- Pressure wheel cutting machine concept using a vacuum drum to hold fabric
- Variation of the drum cutter concept using parallel cutting drums with moving buffer drums
- Novel cutting arm assembly (to be filed shortly).

At SNL, invention disclosures are beginning on the following items related to the new design concept:

- Passive piece picker
- Multiple-gate piece removal system
- Genetic algorithm control system.

LLNL has filed an invention disclosure for the DPSSL cutting of textiles.

Publications/Presentations

None.

Sensors for Agile Manufacturing (SFAM)

The Sensors for Agile Manufacturing (SFAM) project team is developing sensors that will allow the automation of sewing processes to improve product quality and process productivity in the apparel manufacturing sector of the U.S. textile industry.

Project Manager:	Kevin Widener, PNL / 509-375-2487
Project Director:	Jim Caldwell, $[TC]^2$ / 919-380-2156

Performance Related to Milestones

Laboratory demonstrations of the fabric edge sensor were made.

A statement of work and task plan for the advanced sewing sensors task were generated.

Activities and Technical Accomplishments for the Quarter

In July, a stepper motor was attached to the serging machine and used feedback from the flat edge detection folder to move the motor and *steer* fabric into the machine. The experiment was successful and showed the sensor can be used to control sewing processes. These results were reported at the

meeting in Dallas, Texas at the end of July. The flat edge detection sensor is ready for further testing with industry partners.

Work is ongoing to instrument the felled seam machine with the new flexible sensor, replacing the current optical sensor. Sensors are mounted on the machine in place of the optical sensors, and new sensor arrangement is verified as compatible with the existing fabric drive mechanisms (the gears that feed the fabric into the folder). New signal conditioning electronics have been designed that should be more robust and require less calibration than the previous electronics. This redesign of the electronics has been quite challenging and research continues into the best and most economical solution to this problem. Plans are to demonstrate a working prototype of the automated felled seam sewing machine in November.

Work has begun on new, second generation sensor designs that will incorporate design modifications suggested by our partners, as well as lessons learned from laboratory experiments with the first generation sensors.

The task to develop advanced sewing sensors began with a brainstorming session held in Dallas, Texas during the last week of July. This task will be comprised of four phases. The first phase is to research the physics of sewing by instrumenting various types of sewing machines and measuring machine parameters. Parameters include, but are not limited to: sewing speed (stitches/minute); multiple stitch types (lockstitch and chain stitch); needle temperature and mechanical stress; production unit cost and reliability. These measurements will provide the ability to begin the baseline modeling of the sewing process. After the requirements have been identified and documented, a conceptual design for a new sewing system will take place. Component prototypes may be developed and demonstrated to prove critical aspects of the design. With the conceptual design approved by both industry and peer review, the design team will develop a working proof-of-concept machine. When the machine is developed and laboratory tested, it will be released to the industry team for testing and evaluation. This third phase will conclude with the transfer of this technology to an industrial partner that can successfully implement this prototype as a commercial sewing machine. The fourth phase will investigate integrating this new machine into a new sewing system and will look at 3D sewing, material handling, and machine/plant interface.

Issues, Major Problems, and Resolutions

None.

Explanation of Variances

None.

Plans for Next Quarter

Continue the development of the fabric edge and felled seam sensors at SNL.

Begin the first phase of the advanced sewing sensors task by setting up a sewing machine laboratory of different types of sewing machines to be obtained from $[TC]^2$.

Invention Disclosures

No invention disclosures this quarter. An invention disclosure on felled seam sensing is currently pending at SNL.

Publications/Presentations

Presentations on project status were made at the ITAC meeting on July 11, 1995. Project staff participated in the AMTEX booth at the Bobbin Show in September.

Textile Resource Conservation (TReC)

The objective of the Textile Resource Conservation (TReC) project is to define, develop, integrate, and deliver processes, devices, and techniques to be used by all elements of the U.S. textile and soft goods product chain to enhance environmental quality and minimize the production of wastes.

Project Manager: Paul Farber, ANL / 708-252-6522
Project Director: Don Alexander, ITT / 803-595-0035

Performance Related to Milestones

Performance related to milestones has been, for the most part, satisfactory during the present quarter. The Recovery of Colorants tasks that were scheduled to begin in-plant field testing during this quarter will be delayed until the second quarter of FY96. This delay was due to a necessity to confirm results from spent dyebath and rinse water samples from a partner, the need for the industry partners to confirm locations for the inplant testing, and the arrangements for establishing demonstration units at the selected sites. Progress in developing a process for the recovery and recycle of solid fibrous wastes is continuing on schedule and is in continuous feedback with the industry partners, as are the quantification of methods for metals speciation.

The Slashing Initiative approach was deemed by the Industry Technical Advisory Committee (ITAC) to need revision towards a more ambitious goal. Efforts by the coordinating laboratory (Savannah River Technology Center) and the industry and laboratory project managers have been directed towards developing this approach. The Alternative Cleaning Task successfully completed a field test on a method for dye machine cleaning. An initial report on this test is expected during the next quarter. All other tasks within the TReC Project are performing according to the project plan and did not have milestones within this quarter.

Activities and Technical Accomplishments for the Quarter

The AMTEX Textile Resource Conservation (TReC) Project was active in all of its tasks during the quarter. Salt recovery results have been consistent for all samples of spent dyebath and rinse water supplied by the partners. Membrane system flux enhancement techniques seem to be successful, and applicable to a wide variety of membrane systems. Additionally, recovery of dyes from spent dyebaths has been reasonably successful. Liquid extraction techniques for dye and salt recovery work is progressing but, based on an industry review of projects at ANL, needs to concentrate on reducing system losses of chemicals.

The fibrous solid waste recovery task team has, based on an economic and technical assessment of their approach, redirected their efforts. It was agreed with the industrial partners that a different path for chemical recovery would be followed. Preliminary experimental results of this new path have been positive.

Air emissions monitoring researchers are making progress in packaging their sensors for field testing. A field test to characterize certain emissions from a finishing process was completed in July at a partner's plant. At this field test, a commercial sensor for a specific chemical compound was also tested and found, compared to GC/MS data, to be performing satisfactorily.

Low waste chemical applications work is proceeding, although some difficulties are found in achieving the flowrates and evenness of coverage with the system being developed at ORNL. Advanced washing technique research is proceeding to the industry's satisfaction with some initial engineering work being completed on a scale-up design for an in-plant test.

Alternative Cleaning Technologies has completed an in-plant field test at a partner's plant. This test involved an environmentally benign method for rapid cleaning of Jet Dye machines, and seems to have been moderately successful. A report on the results of this test will be issued by the principal investigator from the INEL during the next quarter. The Laboratory Task Coordinator of the Environmental Decision Tools (TReC-7) Task reported that EPA has accepted the proposal submitted under the Environmental Technology Initiative. This $300,000 award will be used to advance the tasks efforts. The Slashing Initiative approach was reviewed by the ITAC. The result of the review was a request by the ITAC for a revision with a bolder approach. During the quarter, the Laboratory Task Manager (from SRTC) has met with industry and Laboratory participants in slashing to develop this bolder approach. The revised approach will be presented to the ITAC at their October meeting.

Issues, Major Problems, and Resolutions

Issues that have arisen this quarter center primarily around the concerns for FY96 funding for continuation of tasks of interest and need by the industry. An additional issue during this quarter, which has been presented to the industry partners for resolution, is the need to ascertain sites for upcoming in-

plant tests of colorants recovery, and the arrangements for ensuring that needed in-plant test equipment will be available.

Explanation of Variances

Variances in milestones and deliverables from the Project Plan are minor and have been due to some slight modification in direction of some laboratory efforts, based on recommendations and continued contact between the textile industry teams and the principal investigators in order to better align National Laboratory research efforts with textile industry needs.

Plans for Next Quarter

During the next quarter (October-December, 1995) Laboratory researchers will continue their programs with directions that are modified slightly, based on the TReC Industry partner overviews of progress. Field tests are planned for air emissions monitor testing during the month of October.

Invention Disclosures

An invention disclosure was filed at Argonne National Laboratory on a method for preparation of permanent sizing agents for natural and man-made fibers. The inventors of the subject invention disclosure are Yuval Halpern, Paul Farber, and Norman Sather.

Publications and Presentations

None during this quarter have been reported to the Project Manager's Office.

FINANCIAL SUMMARY

Appendix A contains program financial summary information.

APPENDIX A

AMTEX FINANCIAL SUMMARY

PROGRAM SUMMARY REPORT

1. IDENTIFICATION (CONTRACT NO.)	2. TITLE	3. REPORTING PERIOD
21286	AMTEX PROGRAM	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE / 6. COMPLETION DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	5. START DATE: OCTOBER 1994 6. COMPLETION DATE: SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000 / GB-01-06-010

c. FIN. NO.:

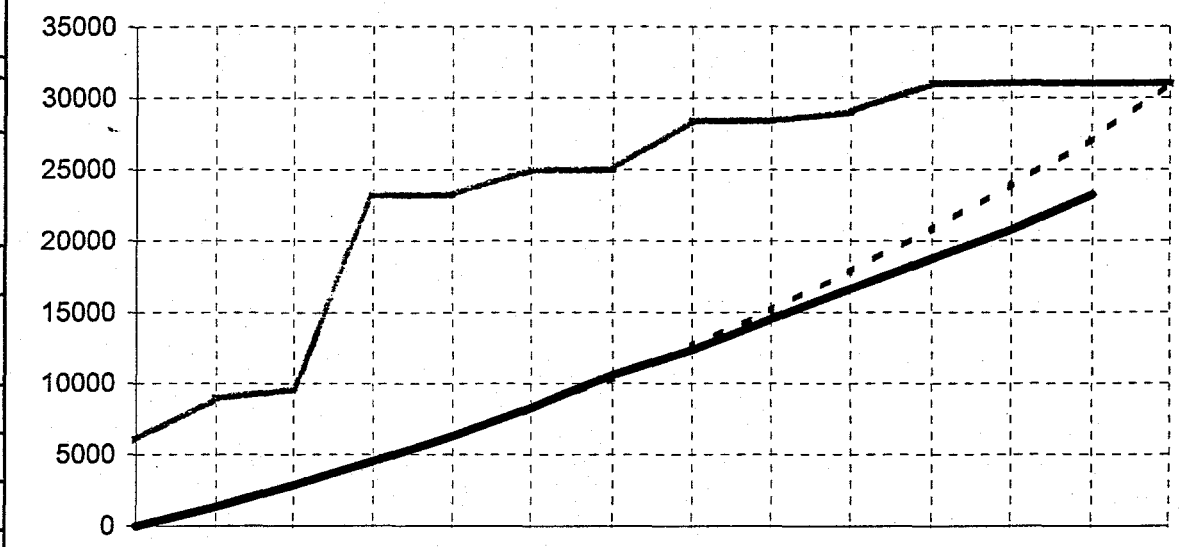
d. ACTUAL COSTS PRIOR YEARS: $13,860

e. ER BUDGET *: $18,779

f. DP BUDGET *: $12,239

g. ER FUNDS AUTH: $18,779

h. DP FUNDS AUTH: $12,239



LEGEND: PLANNED — ACTUAL — PROJECTED - - - - - - FUNDS AUTH — 90% SPENT ▷

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	711	860	1006	1125	1234	1232	1426	1499	1649	1809	1884	1956	2388
	ACTUAL	721	867	987	1106	1162	1059	1038	1174	1176	1388	1170	1378	
	VARIANCE	-10	-7	19	19	72	173	388	325	473	421	714	578	2388
	CUM PLANNED	711	1571	2577	3702	4936	6168	7594	9093	10742	12551	14435	16391	18779
	CUM ACTUAL	721	1587	2574	3680	4842	5901	6939	8113	9289	10678	11848	13226	
	CUM VARIANCE	-10	-16	3	22	94	267	655	980	1453	1873	2587	3165	18779
j. DP COSTS	PLANNED	585	620	680	700	730	860	890	1010	1040	1170	1185	1220	1549
	ACTUAL	604	645	703	631	830	1266	737	997	921	714	867	1092	
	VARIANCE	-19	-25	-23	69	-100	-406	153	13	119	456	318	128	1549
	CUM PLANNED	585	1205	1885	2585	3315	4175	5065	6075	7115	8285	9470	10690	12239
	CUM ACTUAL	604	1249	1952	2583	3413	4679	5416	6413	7334	8048	8915	10007	
	CUM VARIANCE	-19	-44	-67	2	-98	-504	-351	-338	-219	237	555	683	12239
k. TOTAL COSTS	PLANNED	1296	1480	1686	1825	1964	2092	2316	2509	2689	2979	3069	3176	3937
	ACTUAL	1325	1512	1690	1737	1992	2325	1775	2171	2097	2103	2037	2470	
	VARIANCE	-29	-32	-4	88	-28	-233	541	338	592	876	1032	706	3937
	CUM PLANNED	1296	2776	4462	6287	8251	10343	12659	15168	17857	20836	23905	27081	31018
	CUM ACTUAL	1325	2836	4526	6263	8255	10580	12355	14526	16623	18726	20763	23233	
	CUM VARIANCE	-29	-60	-64	24	-4	-237	304	642	1234	2110	3142	3848	31018

9. MILESTONES

(REFER TO INDIVIDUAL PROJECT REPORTS)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $4,014K, DP - $2,238K, TOTAL - $6,252K).

10. NAME OF PARTICIPANT'S PROGRAM MANAGER

DOUGLAS K LEMON

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	AMTEX PROGRAM OFFICE	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE
AMTEX PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	OCTOBER 1994 6. COMPLETION DATE SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000

c. FIN. NO.:

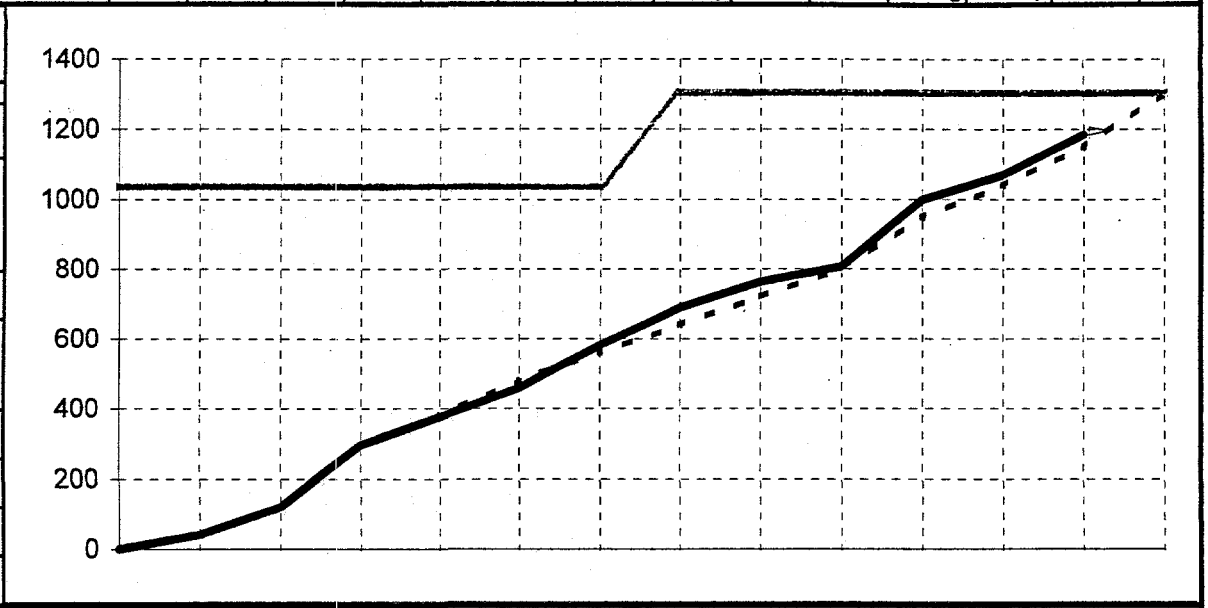
d. ACTUAL COSTS PRIOR YEARS: $1,659

e. ER BUDGET *: $1,305

f. DP BUDGET *: $0

g. ER FUNDS AUTH: $1,305

h. DP FUNDS AUTH: $0



LEGEND: PLANNED ACTUAL PROJECTED FUNDS AUTH 90% SPENT

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	40	80	180	80	100	80	80	80	80	150	90	110	155
	ACTUAL	41	80	177	78	83	123	108	74	44	192	70	116	
	VARIANCE	-1	0	3	2	17	-43	-28	6	36	-42	20	-6	155
	CUM PLANNED	40	120	300	380	480	560	640	720	800	950	1040	1150	1305
	CUM ACTUAL	41	121	298	375	458	581	689	763	807	999	1069	1185	
	CUM VARIANCE	-1	-1	2	5	22	-21	-49	-43	-7	-49	-29	-35	1305
j. DP COSTS	PLANNED	0	0	0	0	0	0	0	0	0	0	0	0	0
	ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	0
	VARIANCE	0	0	0	0	0	0	0	0	0	0	0	0	0
	CUM PLANNED	0	0	0	0	0	0	0	0	0	0	0	0	0
	CUM ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	0
	CUM VARIANCE	0	0	0	0	0	0	0	0	0	0	0	0	0
k. TOTAL COSTS	PLANNED	40	80	180	80	100	80	80	80	80	150	90	110	155
	ACTUAL	41	80	177	78	83	123	108	74	44	192	70	116	
	VARIANCE	-1	0	3	2	17	-43	-28	6	36	-42	20	-6	155
	CUM PLANNED	40	120	300	380	480	560	640	720	800	950	1040	1150	1305
	CUM ACTUAL	41	121	298	375	458	581	689	763	807	999	1069	1185	
	CUM VARIANCE	-1	-1	2	5	22	-21	-49	-43	-7	-49	-29	-35	1305

9. MILESTONES

MILESTONES	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
AMTEX Quarterly Report				▲			▲		▲			▲	
AMTEX Policies & Procedures Manual												▲	
AMTEX FY 1996 Operating Plan											△	□	

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $39K, DP $0K, TOTAL - $39K).

LEGEND: SCHEDULED △ COMPLETED ▲ DEVIATION □ TIMELINE PROGRESS PROPOSED DEVIATION APPROVED DEVIATION

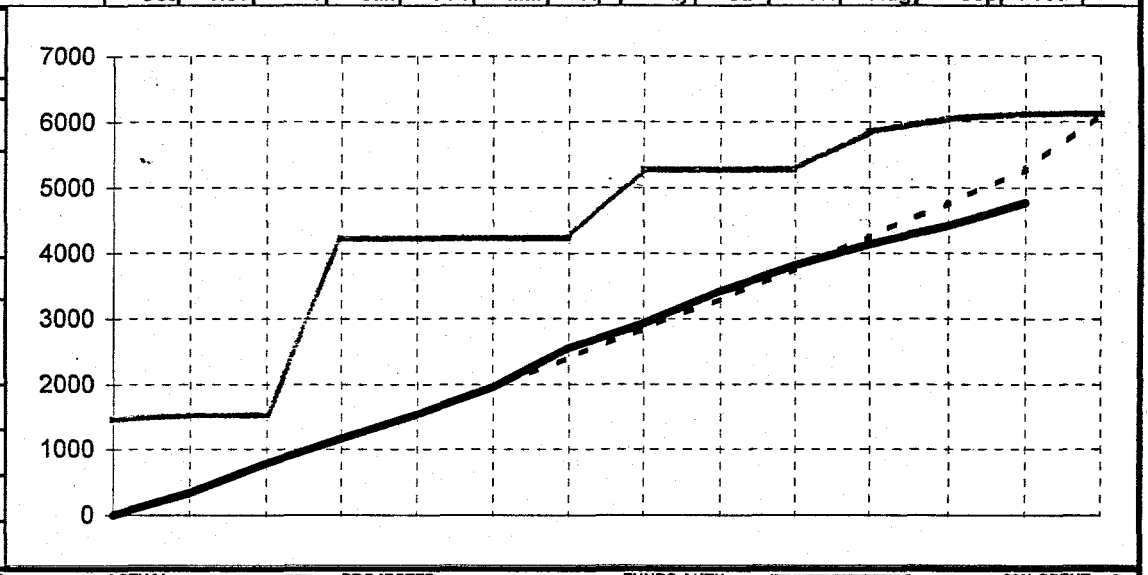
10. NAME OF PARTICIPANT'S PROJECT MANAGER
DOUGLAS K LEMON

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	COMPUTER-AIDED FABRIC EVALUATION (CAFE)	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	OCTOBER 1994 6. COMPLETION DATE SEPTEMBER 1995

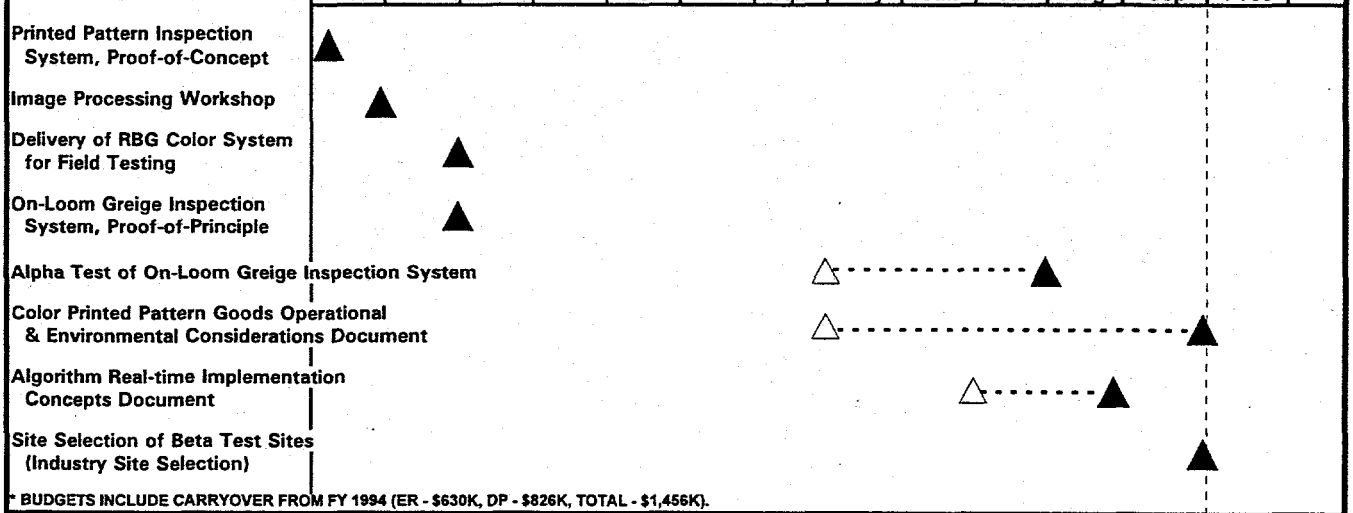
7. PROJECT YEAR	FY 1995
8. COST STATUS	
a. $ EXPRESSED IN	THOUSANDS
b. BUDGET & REPORTING NO./SUB. ACCT NO.	KU-01-00-000 GB-01-06-010
c. FIN. NO.	
d. ACTUAL COSTS PRIOR YEARS	$1,906
e. ER BUDGET *	$2,873
f. DP BUDGET *	$3,247
g. ER FUNDS AUTH	$2,873
h. DP FUNDS AUTH	$3,247



LEGEND: PLANNED - - ACTUAL ——— PROJECTED - - - - - - - FUNDS AUTH ——— 90% SPENT ▷

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	190	260	110	150	180	180	200	200	200	220	240	240	503
	ACTUAL	185	264	114	203	209	173	184	271	202	196	117	223	
	VARIANCE	5	-4	-4	-53	-29	7	17	-71	-2	24	124	17	503
	CUM PLANNED	190	450	560	710	890	1070	1270	1470	1670	1890	2130	2370	2873
	CUM ACTUAL	185	449	563	766	975	1148	1332	1602	1804	2000	2117	2340	
	CUM VARIANCE	5	1	-3	-56	-85	-78	-62	-132	-134	-110	14	31	2873
j. DP COSTS	PLANNED	150	180	270	240	240	250	250	260	260	270	270	280	327
	ACTUAL	151	184	265	168	214	421	191	231	195	114	175	128	
	VARIANCE	-1	-4	5	72	27	-171	59	29	66	156	95	152	327
	CUM PLANNED	150	330	600	840	1080	1330	1580	1840	2100	2370	2640	2920	3247
	CUM ACTUAL	151	335	600	768	981	1402	1593	1825	2019	2134	2309	2436	
	CUM VARIANCE	-1	-5	0	72	99	-72	-13	15	81	236	331	484	3247
k. TOTAL COSTS	PLANNED	340	440	380	390	420	430	450	460	460	490	510	520	830
	ACTUAL	336	448	379	371	423	594	375	502	396	310	292	351	
	VARIANCE	4	-8	1	19	-3	-164	76	-42	64	180	219	169	830
	CUM PLANNED	340	780	1160	1550	1970	2400	2850	3310	3770	4260	4770	5290	6120
	CUM ACTUAL	336	784	1163	1534	1956	2551	2925	3427	3823	4134	4425	4776	
	CUM VARIANCE	4	-4	-3	16	14	-151	-75	-117	-53	126	345	514	6120

9. MILESTONES



* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $630K, DP - $826K, TOTAL - $1,456K).

LEGEND: SCHEDULED △ TIMELINE ——— PROPOSED DEVIATION - - - - - -
COMPLETED ▲ DEVIATION □ PROGRESS ——— APPROVED DEVIATION — — — —

10. NAME OF PARTICIPANT'S PROJECT MANAGER

GLENN ALLGOOD (ORNL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	COTTON BIOTECHNOLOGY	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	OCTOBER 1994 6. COMPLETION DATE SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000

c. FIN. NO.:

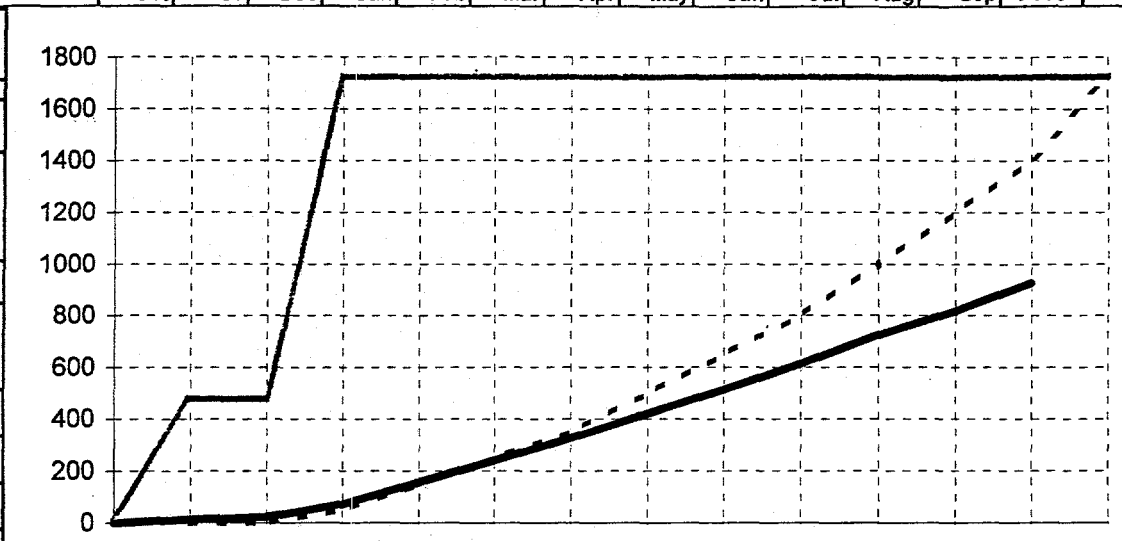
d. ACTUAL COSTS PRIOR YEARS: $0

e. ER BUDGET *: $1,724

f. DP BUDGET *: $0

g. ER FUNDS AUTH: $1,724

h. DP FUNDS AUTH: $0



LEGEND: PLANNED ACTUAL PROJECTED FUNDS AUTH 90% SPENT

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	0	0	50	100	100	100	150	150	150	200	200	200	324
	ACTUAL	13	9	50	86	82	86	95	93	101	110	95	109	
	VARIANCE	-13	-9	0	15	18	14	55	57	50	90	105	91	324
	CUM PLANNED	0	0	50	150	250	350	500	650	800	1000	1200	1400	1724
	CUM ACTUAL	13	22	72	157	240	326	420	513	614	724	818	928	
	CUM VARIANCE	-13	-22	-22	-7	11	24	80	137	186	276	382	473	1724
j. DP COSTS	PLANNED	0	0	0	0	0	0	0	0	0	0	0	0	0
	ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	
	VARIANCE	0	0	0	0	0	0	0	0	0	0	0	0	0
	CUM PLANNED	0	0	0	0	0	0	0	0	0	0	0	0	0
	CUM ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	
	CUM VARIANCE	0	0	0	0	0	0	0	0	0	0	0	0	0
k. TOTAL COSTS	PLANNED	0	0	50	100	100	100	150	150	150	200	200	200	324
	ACTUAL	13	9	50	86	82	86	95	93	101	110	95	109	
	VARIANCE	-13	-9	0	15	18	14	55	57	50	90	105	91	324
	CUM PLANNED	0	0	50	150	250	350	500	650	800	1000	1200	1400	1724
	CUM ACTUAL	13	22	72	157	240	326	420	513	614	724	818	928	
	CUM VARIANCE	-13	-22	-22	-7	11	24	80	137	186	276	382	473	1724

9. MILESTONES

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
Time of Fiber Cell Commitment						▲							
Imaging and Automated Scoring of Gels						△	- - - - - - - - - - - -		▲				
Initial Database Structure								▲					
cDNA Libraries Characterized												△ - □	
200 Polymorphic Primer Pairs Mapped												△ - - - - □	
Enriched Fiber Clones												△ - □	
SSR and cDNA Data Entry Mechanisms												▲	

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $24K, DP - $0K, TOTAL - $24K)

LEGEND: SCHEDULED △ TIMELINE PROPOSED DEVIATION - - - - - - - - - - -

COMPLETED ▲ DEVIATION □ PROGRESS ━━━ APPROVED DEVIATION ▬ ▬ ▬ ▬ ▮

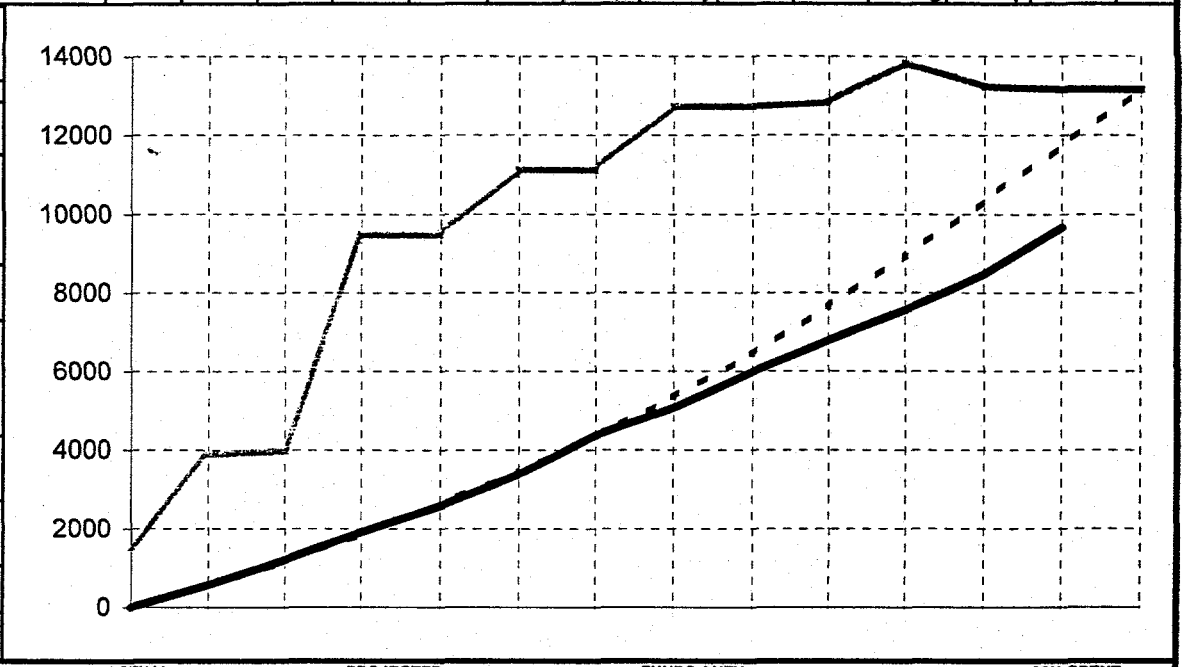
10. NAME OF PARTICIPANT'S PROJECT MANAGER: BEN BURR (BNL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	DEMAND-ACTIVATED MANUFACTURING ARCHITECTURE (DAM	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE / 6. COMPLETION DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	5. START DATE: OCTOBER 1994 6. COMPLETION DATE: SEPTEMBER 1995

7. PROJECT YEAR	8. COST STATUS	a. $ EXPRESSED IN	b. BUDGET & REPORTING NO./SUB. ACCT NO.	c. FIN. NO.	d. ACTUAL COSTS PRIOR YEARS	e. ER BUDGET *	f. DP BUDGET *	g. ER FUNDS AUTH	h. DP FUNDS AUTH
FY 1995		THOUSANDS	KU-01-00-000 GB-01-06-010		$7,527	$7,149	$6,009	$7,149	$6,009



LEGEND: PLANNED ACTUAL PROJECTED FUNDS AUTH 90% SPENT

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	270	310	410	500	500	500	600	600	700	700	800	800	459
	ACTUAL	268	311	403	357	393	351	325	381	336	376	469	545	
	VARIANCE	2	-1	7	143	107	149	275	219	364	324	332	255	459
	CUM PLANNED	270	580	990	1490	1990	2490	3090	3690	4390	5090	5890	6690	7149
	CUM ACTUAL	268	579	982	1339	1732	2083	2408	2789	3125	3501	3969	4514	
	CUM VARIANCE	2	1	8	151	258	407	682	901	1265	1589	1921	2176	7149
j. DP COSTS	PLANNED	280	310	270	300	300	400	400	500	500	600	600	600	949
	ACTUAL	297	334	292	316	415	631	380	529	467	391	442	660	
	VARIANCE	-17	-24	-22	-16	-115	-231	20	-29	33	209	158	-60	949
	CUM PLANNED	280	590	860	1160	1460	1860	2260	2760	3260	3860	4460	5060	6009
	CUM ACTUAL	297	631	923	1239	1654	2285	2665	3194	3661	4052	4494	5154	
	CUM VARIANCE	-17	-41	-63	-79	-194	-425	-405	-434	-401	-192	-34	-94	6009
k. TOTAL COSTS	PLANNED	550	620	680	800	800	900	1000	1100	1200	1300	1400	1400	1408
	ACTUAL	565	645	695	673	808	982	705	910	803	766	911	1205	
	VARIANCE	-15	-25	-15	127	-8	-82	295	190	397	534	489	196	1408
	CUM PLANNED	550	1170	1850	2650	3450	4350	5350	6450	7650	8950	10350	11750	13158
	CUM ACTUAL	565	1210	1905	2578	3386	4368	5073	5983	6786	7553	8464	9668	
	CUM VARIANCE	-15	-40	-55	72	64	-18	277	467	864	1397	1887	2082	13158

9. MILESTONES

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
Complete Bed Sheet & Men's Warm-Up Jacket Product Lines, & Industry Simulation							▲			▲		▲	
Complete Connectivity, Technology Assessment, & Implement ACIS							▲	▲			▲		
Demo & Pilot Nat'l Sourcing Database									▲				
Complete Prototypes for Forecasting, Inventory, & CBM Infrastructure											▲		
Complete Demo Plan & Opportunity Assessment, & FY96 Project Plan										▲		▲ □	
Develop Learning Laboratory Curriculum (this effort has been redirected) & DAMA Briefing Materials							△	- - - - - - - - - - - - - - - - - -				□ ▲	

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $714K, DP - $813, TOTAL - $1,527K).

LEGEND: SCHEDULED △ TIMELINE ——— PROPOSED DEVIATION - - - - - -
COMPLETED ▲ DEVIATION □ PROGRESS ▬▬▬ APPROVED DEVIATION ▬ ▬ ▬ ▬ ▪

10. NAME OF PARTICIPANT'S PROJECT MANAGER

LEON CHAPMAN (SNL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	ELECTRONIC EMBEDDED FINGERPRINT (EEF)	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE / 6. COMPLETION DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	5. START DATE: OCTOBER 1994 6. COMPLETION DATE: SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000 / GB-01-06-010

c. FIN. NO.:

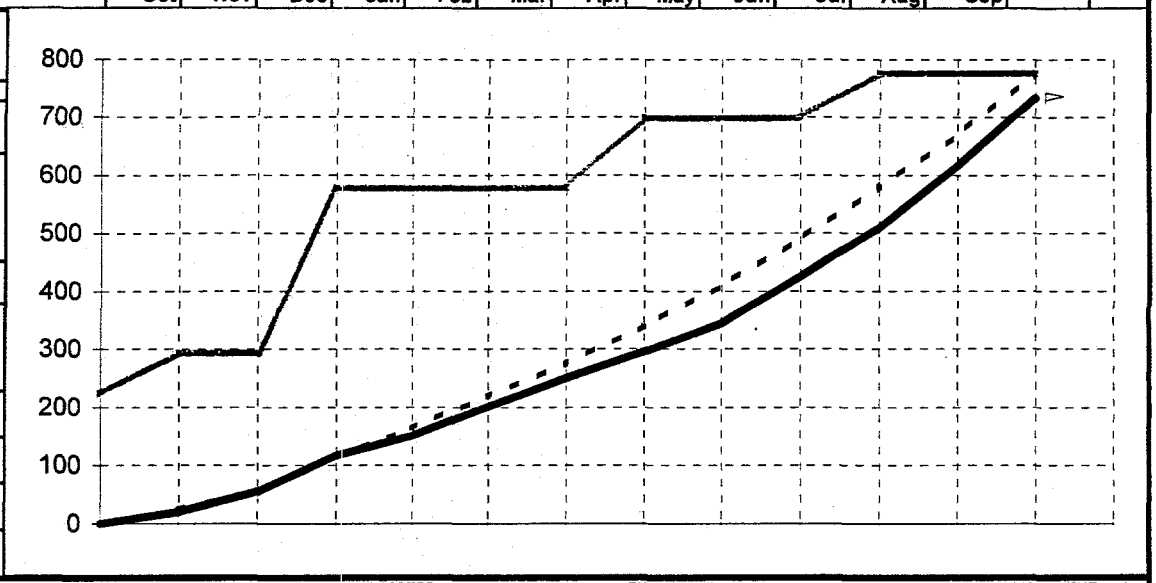
d. ACTUAL COSTS PRIOR YEARS: $107

e. ER BUDGET *: $232

f. DP BUDGET *: $545

g. ER FUNDS AUTH: $232

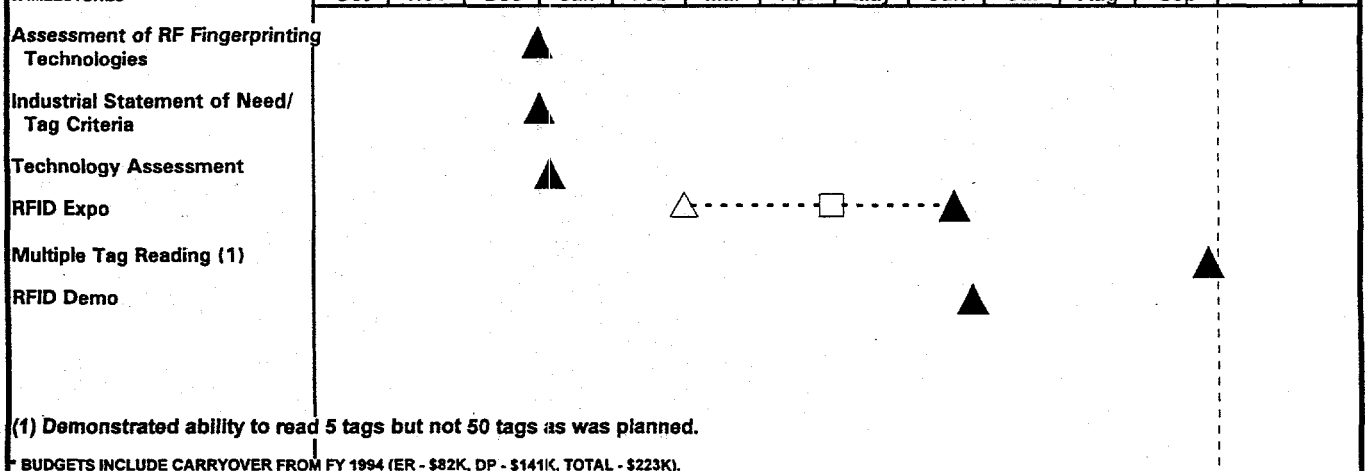
h. DP FUNDS AUTH: $545



LEGEND: PLANNED ACTUAL PROJECTED FUNDS AUTH 90% SPENT

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
i. ER COSTS	PLANNED	15	10	10	10	15	15	15	20	25	30	30	37
	ACTUAL	14	12	9	4	10	12	12	9	18	35	34	35
	VARIANCE	2	-2	1	6	6	3	3	11	8	-5	-4	2
	CUM PLANNED	15	25	35	45	60	75	90	110	135	165	195	232
	CUM ACTUAL	14	26	35	39	48	60	72	81	99	134	168	203
	CUM VARIANCE	2	-1	1	7	12	15	18	29	36	31	27	29
j. DP COSTS	PLANNED	10	20	50	40	40	40	50	50	55	60	60	70
	ACTUAL	6	23	54	30	40	37	33	40	64	49	73	83
	VARIANCE	4	-3	-4	10	0	3	18	10	-9	11	-13	-13
	CUM PLANNED	10	30	80	120	160	200	250	300	355	415	475	545
	CUM ACTUAL	6	29	83	113	153	190	223	263	326	376	449	531
	CUM VARIANCE	4	1	-3	7	7	10	27	37	29	39	26	14
k. TOTAL COSTS	PLANNED	25	30	60	50	55	55	65	70	80	90	90	107
	ACTUAL	20	35	63	34	50	49	45	49	81	84	107	118
	VARIANCE	5	-5	-3	16	5	6	20	21	-1	6	-17	-11
	CUM PLANNED	25	55	115	165	220	275	340	410	490	580	670	777
	CUM ACTUAL	20	55	117	151	201	250	295	344	425	509	617	734
	CUM VARIANCE	5	0	-2	14	19	25	45	66	65	71	53	43

9. MILESTONES



(1) Demonstrated ability to read 5 tags but not 50 tags as was planned.

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $82K, DP - $141K, TOTAL - $223K).

LEGEND: SCHEDULED △ COMPLETED ▲ DEVIATION □ TIMELINE ——— PROGRESS ——— PROPOSED DEVIATION - - - - - - APPROVED DEVIATION — — — —

10. NAME OF PARTICIPANT'S PROJECT MANAGER

MIKE RILEY (LLNL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	ON-LINE PROCESS CONTROL (OPCon)	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	OCTOBER 1994 6. COMPLETION DATE SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000; GB-01-06-010

c. FIN. NO.:

d. ACTUAL COSTS PRIOR YEARS: $0

e. ER BUDGET: $413

f. DP BUDGET: $115

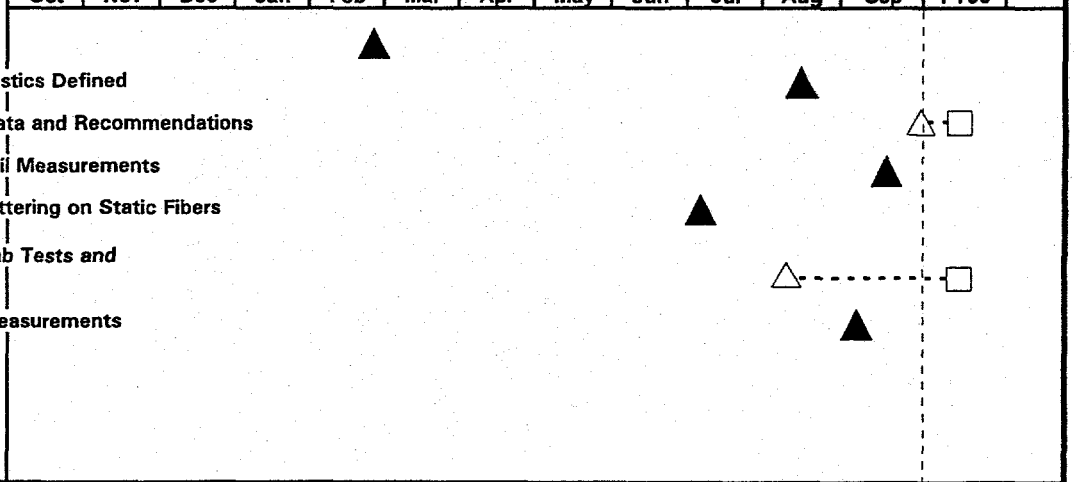
g. ER FUNDS AUTH: $413

h. DP FUNDS AUTH: $115

LEGEND: PLANNED - - ACTUAL ——— PROJECTED - - - - - - - FUNDS AUTH ▬▬ 90% SPENT ▷

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	0	0	0	5	9	7	7	35	50	65	80	96	60
	ACTUAL	0	0	0	5	9	7	3	4	0	23	25	36	
	VARIANCE	0	0	0	0	0	0	4	31	50	42	55	59	60
	CUM PLANNED	0	0	0	5	14	21	28	63	113	178	258	353	413
	CUM ACTUAL	0	0	0	5	15	21	24	28	28	51	76	112	
	CUM VARIANCE	0	0	0	0	-1	0	4	35	85	127	182	241	413
j. DP COSTS	PLANNED	0	0	0	0	0	0	0	10	15	20	25	30	15
	ACTUAL	0	0	0	0	0	0	0	0	0	30	27	26	
	VARIANCE	0	0	0	0	0	0	0	10	15	-10	-2	5	15
	CUM PLANNED	0	0	0	0	0	0	0	10	25	45	70	100	115
	CUM ACTUAL	0	0	0	0	0	0	0	0	0	30	58	83	
	CUM VARIANCE	0	0	0	0	0	0	0	10	25	15	12	17	115
k. TOTAL COSTS	PLANNED	0	0	0	5	9	7	7	45	65	85	105	125	75
	ACTUAL	0	0	0	5	9	7	3	4	0	54	52	61	
	VARIANCE	0	0	0	0	0	0	4	41	65	31	53	64	75
	CUM PLANNED	0	0	0	5	14	21	28	73	138	223	328	453	528
	CUM ACTUAL	0	0	0	5	15	21	24	28	28	82	134	195	
	CUM VARIANCE	0	0	0	0	-1	0	4	45	110	141	194	258	528

9. MILESTONES



LEGEND: SCHEDULED △ TIMELINE ——— PROPOSED DEVIATION - - - - - - - -

COMPLETED ▲ DEVIATION □ PROGRESS ▬▬ APPROVED DEVIATION ▬ ▬ ▬ ▬ ▬

10. NAME OF PARTICIPANT'S PROJECT MANAGER

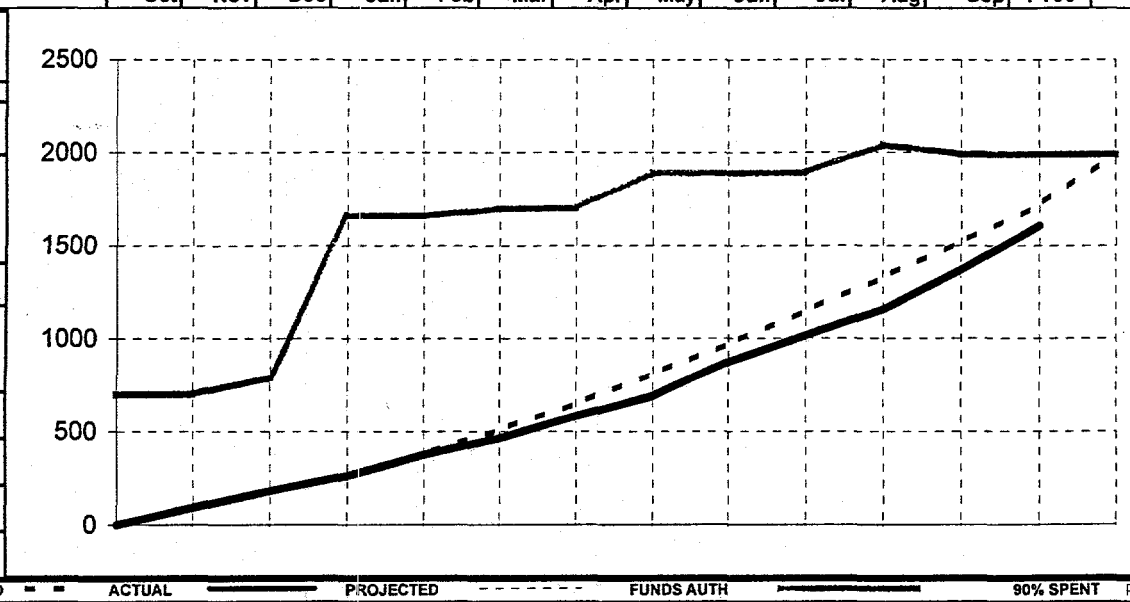
MARC SIMPSON (ORNL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	RAPID CUTTING	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE / 6. COMPLETION DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	5. START DATE: OCTOBER 1994 6. COMPLETION DATE: SEPTEMBER 1995

7. PROJECT YEAR	8. COST STATUS	a. $ EXPRESSED IN	b. BUDGET & REPORTING NO./SUB. ACCT NO.	c. FIN. NO.	d. ACTUAL COSTS PRIOR YEARS	e. ER BUDGET *	f. DP BUDGET *	g. ER FUNDS AUTH	h. DP FUNDS AUTH
FY 1995		THOUSANDS	KU-01-00-000 GB-01-06-010		$209	$1,082	$909	$1,082	$909



LEGEND: PLANNED ACTUAL PROJECTED FUNDS AUTH 90% SPENT

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	60	60	60	60	70	80	80	80	90	90	90	100	162
	ACTUAL	61	62	54	82	56	55	52	83	62	77	117	100	
	VARIANCE	-1	-2	6	-22	14	25	28	-3	29	13	-27	0	162
	CUM PLANNED	60	120	180	240	310	390	470	550	640	730	820	920	1082
	CUM ACTUAL	61	122	176	258	315	369	421	504	566	642	759	859	
	CUM VARIANCE	-1	-2	4	-18	-4	21	49	46	75	88	61	61	1082
j. DP COSTS	PLANNED	30	30	30	50	60	60	80	80	90	90	100	100	109
	ACTUAL	31	27	30	30	33	65	54	101	80	66	95	138	
	VARIANCE	-1	3	0	20	27	-5	26	-21	10	24	5	-38	109
	CUM PLANNED	30	60	90	140	200	260	340	420	510	600	700	800	909
	CUM ACTUAL	31	57	87	117	150	215	269	370	449	515	610	748	
	CUM VARIANCE	-1	3	3	23	50	46	71	50	61	85	90	52	909
k. TOTAL COSTS	PLANNED	90	90	90	110	130	140	160	160	180	180	190	200	271
	ACTUAL	91	88	84	111	89	120	106	184	141	142	212	239	
	VARIANCE	-1	2	6	-1	41	20	54	-24	39	38	-22	-39	271
	CUM PLANNED	90	180	270	380	510	650	810	970	1150	1330	1520	1720	1991
	CUM ACTUAL	91	180	264	375	464	584	690	874	1015	1157	1369	1608	
	CUM VARIANCE	-1	0	6	5	46	66	120	96	135	173	151	113	1991

9. MILESTONES	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
Project Technical Review (Lab & Industry)				▲									
AMTEX Program Technical Review					▲								
Project Technical Review at (TC)2												△ - □	
Optimum Laser Source Identified											▲		
Advanced Cutting Head Magnetic Driver Alpha Prototype Tests Complete												△ - □	
Material Handling Alpha Prototype Complete												△ - □	

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $507K, DP - $194K, TOTAL - $701K).

LEGEND: SCHEDULED △ COMPLETED ▲ DEVIATION □ TIMELINE PROGRESS PROPOSED DEVIATION APPROVED DEVIATION

10. NAME OF PARTICIPANT'S PROJECT MANAGER

CRAIG FONG (LBL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	SENSORS FOR AGILE MANUFACTURING (SFAM)	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	OCTOBER 1994 6. COMPLETION DATE SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000 / GB-01-06-010

c. FIN. NO.:

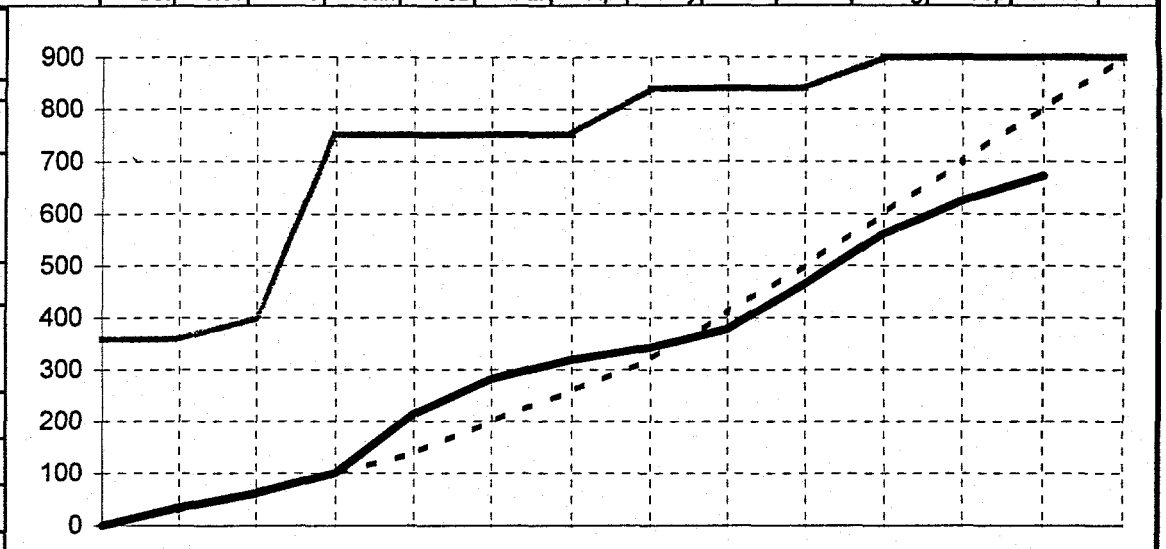
d. ACTUAL COSTS PRIOR YEARS: $100

e. ER BUDGET *: $441

f. DP BUDGET *: $459

g. ER FUNDS AUTH: $441

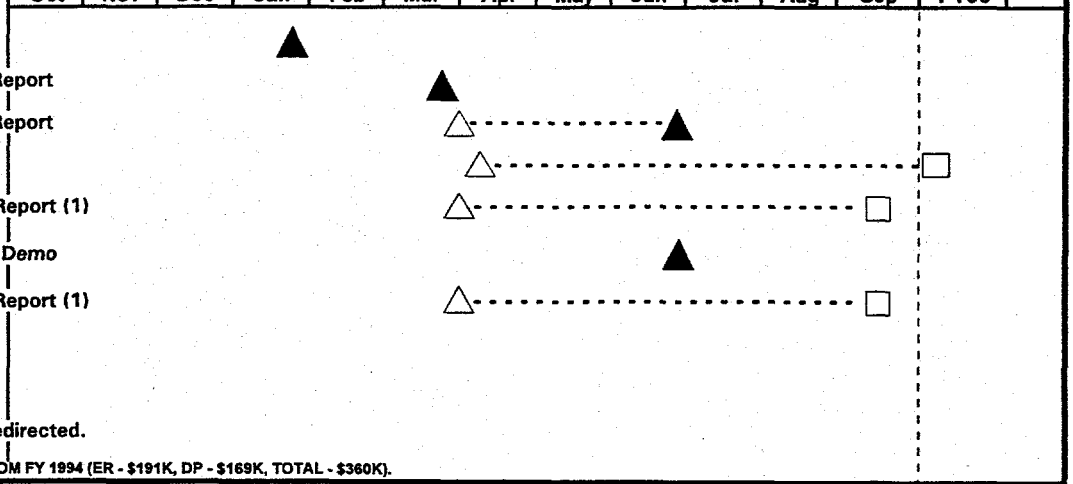
h. DP FUNDS AUTH: $459



LEGEND: PLANNED — ACTUAL —— PROJECTED - - - - - - FUNDS AUTH ▬▬ 90% SPENT ▷

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	15	15	15	20	30	20	20	50	50	50	50	50	56
	ACTUAL	21	9	15	78	20	9	13	24	60	71	20	22	
	VARIANCE	-6	6	0	-58	10	11	7	26	-10	-21	30	29	56
	CUM PLANNED	15	30	45	65	95	115	135	185	235	285	335	385	441
	CUM ACTUAL	21	30	45	123	143	152	166	189	250	320	341	362	
	CUM VARIANCE	-6	0	0	-58	-48	-37	-31	-4	-15	-35	-6	23	441
j. DP COSTS	PLANNED	15	20	20	20	30	40	40	40	40	50	50	50	44
	ACTUAL	14	18	24	36	47	28	11	12	25	26	43	26	
	VARIANCE	1	2	-4	-16	-17	12	29	28	15	24	7	24	44
	CUM PLANNED	15	35	55	75	105	145	185	225	265	315	365	415	459
	CUM ACTUAL	14	32	56	92	139	167	178	190	215	241	284	310	
	CUM VARIANCE	1	3	-1	-17	-34	-22	7	35	50	74	81	105	459
k. TOTAL COSTS	PLANNED	30	35	35	40	60	60	60	90	90	100	100	100	100
	ACTUAL	35	27	39	114	67	37	24	36	85	97	63	48	
	VARIANCE	-5	8	-4	-74	-7	23	36	54	5	3	37	53	100
	CUM PLANNED	30	65	100	140	200	260	320	410	500	600	700	800	900
	CUM ACTUAL	35	62	101	215	282	319	344	379	465	561	625	672	
	CUM VARIANCE	-5	3	-1	-75	-82	-59	-24	31	35	39	75	128	900

9. MILESTONES



(1) These efforts have been redirected.

* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $191K, DP - $169K, TOTAL - $360K).

LEGEND: SCHEDULED △ TIMELINE —— PROPOSED DEVIATION - - - - - -

COMPLETED ▲ DEVIATION □ PROGRESS ▬▬ APPROVED DEVIATION ▬ ▬ ▬ ▬ ▪

10. NAME OF PARTICIPANT'S PROJECT MANAGER

KEVIN WIDENER (PNL)

PROJECT SUMMARY REPORT

1. IDENTIFICATION (CONTRACT N	2. TITLE	3. REPORTING PERIOD
21286	TEXTILE RESOURCE CONSERVATION (TReC)	4TH QUARTER FY 1995

4a. PARTICIPANT NAME AND ADDRESS	4b. CLIENT NAME AND ADDRESS	5. START DATE
AMTEX LABORATORY PROGRAM OFFICE PACIFIC NORTHWEST LABORATORY RICHLAND, WASHINGTON 99352	U.S. DEPARTMENT OF ENERGY WASHINGTON, DC 20585	OCTOBER 1994 6. COMPLETION DATE SEPTEMBER 1995

7. PROJECT YEAR: FY 1995

8. COST STATUS

a. $ EXPRESSED IN: THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.: KU-01-00-000; GB-01-06-010

c. FIN. NO.:

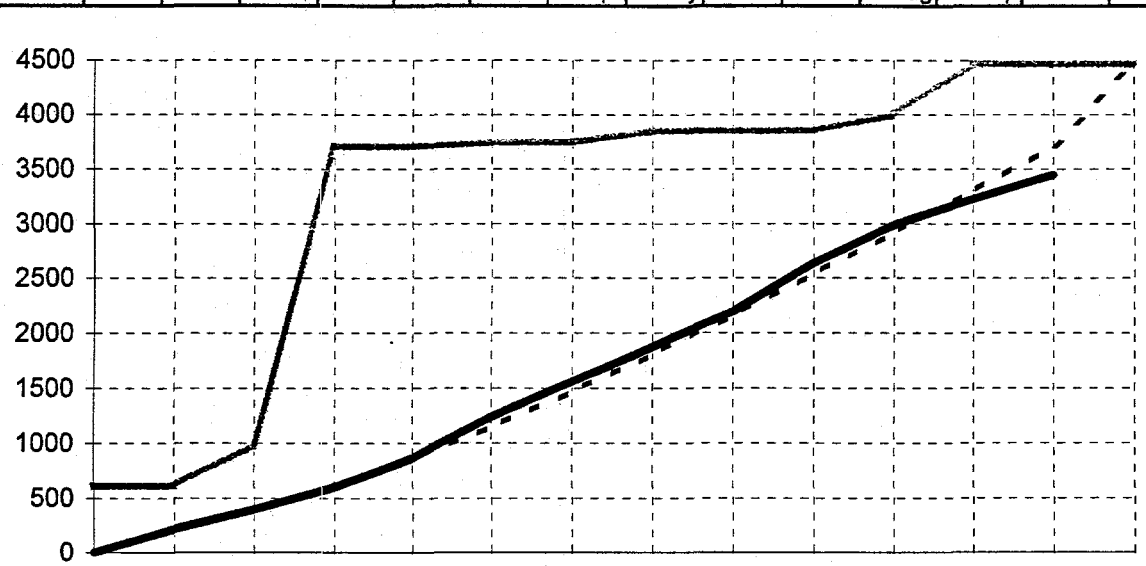
d. ACTUAL COSTS PRIOR YEARS: $1,779

e. ER BUDGET *: $3,529

f. DP BUDGET *: $940

g. ER FUNDS AUTH: $3,529

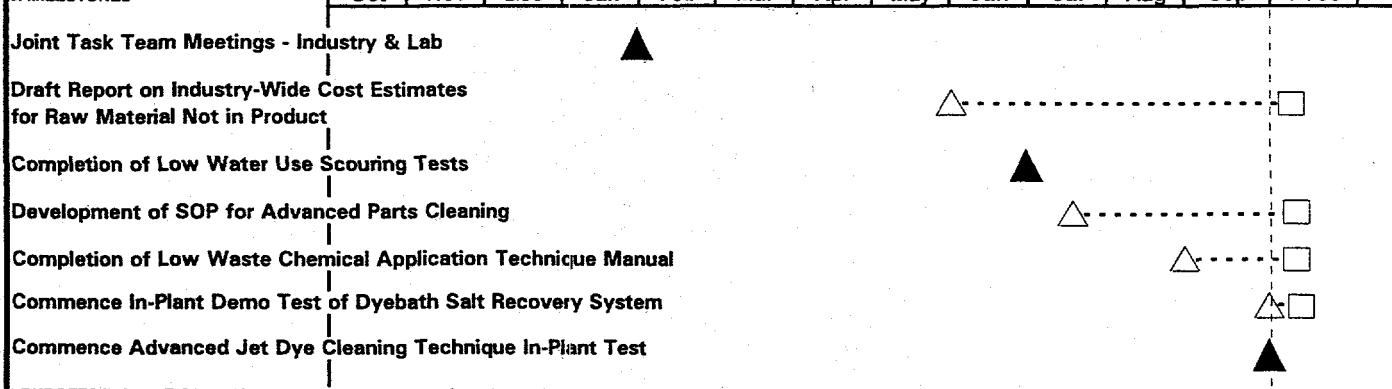
h. DP FUNDS AUTH: $940



LEGEND: PLANNED ACTUAL PROJECTED FUNDS AUTH 90% SPENT

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	FY96
i. ER COSTS	PLANNED	120	120	170	200	230	250	270	280	300	300	300	320	669
	ACTUAL	117	115	166	212	295	237	245	236	356	309	224	192	
	VARIANCE	3	5	4	-12	-65	13	25	44	-56	-9	76	128	669
	CUM PLANNED	120	240	410	610	840	1090	1360	1640	1940	2240	2540	2860	3529
	CUM ACTUAL	117	232	398	611	906	1143	1388	1624	1979	2288	2513	2705	
	CUM VARIANCE	3	8	12	-1	-66	-53	-28	16	-39	-48	27	155	3529
j. DP COSTS	PLANNED	100	60	40	50	60	70	70	70	80	80	80	90	90
	ACTUAL	105	59	38	51	81	84	68	84	90	39	12	33	
	VARIANCE	-5	1	2	-1	-21	-14	2	-14	-10	41	68	57	90
	CUM PLANNED	100	160	200	250	310	380	450	520	600	680	760	850	940
	CUM ACTUAL	105	164	202	254	335	419	487	571	661	700	712	745	
	CUM VARIANCE	-5	-4	-2	-4	-25	-39	-37	-51	-61	-20	48	105	940
k. TOTAL COSTS	PLANNED	220	180	210	250	290	320	340	350	380	380	380	410	759
	ACTUAL	222	175	204	264	376	321	312	320	446	348	236	225	
	VARIANCE	-2	5	6	-14	-86	-1	28	30	-66	32	144	185	759
	CUM PLANNED	220	400	610	860	1150	1470	1810	2160	2540	2920	3300	3710	4469
	CUM ACTUAL	222	396	601	864	1241	1562	1874	2195	2640	2988	3224	3450	
	CUM VARIANCE	-2	4	9	-4	-91	-92	-64	-35	-100	-68	76	260	4469

9. MILESTONES



* BUDGETS INCLUDE CARRYOVER FROM FY 1994 (ER - $530K, DP - $80K, TOTAL - $610K).

LEGEND: SCHEDULED COMPLETED DEVIATION TIMELINE PROGRESS PROPOSED DEVIATION APPROVED DEVIATION

10. NAME OF PARTICIPANT'S PROJECT MANAGER

PAUL S FARBER (ANL)

APPENDIX B

KEY PRINCIPLES OF THE AMTEX PARTNERSHIP™

Key Principles
of
The AMTEX Partnership™

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1. To best serve the nation's interests, the AMTEX Partnership™ must access and integrate all of the nation's research capabilities to address the needs of the fibers, textiles, fabricated products and retail sectors of the US Integrated Textile Industry. The necessary R&D resources include relevant universities, federal laboratories, and industrial research institutions.

2. The proper point of interface between government and industry is through industry-integrating organizations, rather than through specific companies.

3. The industry will ensure that the results of AMTEX sponsored R&D projects are available to benefit all industrial operations within the US Integrated Textiles Industry.

4. To best serve the nation's interests, the federal laboratories participating in AMTEX will work together as a collaborative team to ensure that the best available resources of the federal laboratories are utilized to meet Industry's needs.

5. AMTEX R&D projects must be driven by the Industry's Technology Road Map and have the potential for making a major impact on US competitiveness. AMTEX projects must focus on technical objectives that pose such high risk and technical complexity that no one company or group of companies could undertake them alone. The results of AMTEX projects will be generic manufacturing processes and systems that can be implemented by many companies to develop their individual proprietary products and services.

6. Projects must be judged by the laboratories and government as making effective use of the unique facilities and capabilities of the federal laboratory system. Furthermore, projects must have the potential to strengthen the ability of the government agencies and federal laboratories to meet their core missions.

7. To have a major impact on the Industry's competitiveness, AMTEX must demonstrate a strong bias for responsible action.

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