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Final Technical Progress Report

**Environmentally Conscious Manufacturing & Technology Access Project
Center for Technology Transfer & Maine Metal Products Association**

Period Covered - April 1, 1994 - September 30, 1996

This final report is being submitted in fulfillment of the management obligations associated with the TRP/DOE grant which funded the Environmentally Conscious Manufacturing & Technology Access (ECM) Project. A "Federal Assistance Project Status Report" is also being submitted with this form. This report will elaborate on the successful completion of this project in achieving and in most cases exceeding its programmatic goals and fulfilling its statutory financial match obligation.

A review of the Year 1 "Technical Progress Report" and the Quarterly Reports filed during the project period, clearly portray that, in all substantive areas, the Environmentally Conscious Manufacturing & Technology Access Project (ECM Project) achieved or exceeded its goals. The success of the Project is largely due to the tremendous support provided by the Center for Technology Transfer (CTT) and the Maine Metal Products Association (MMPA). Both organizations provided extensive administrative and financial support and were instrumental in promoting the work of the project within the metals industry. The programmatic oversight provided by the industry Steering Committee and the broad partnership represented on the Board of Advisors were invaluable in developing, promoting and implementing the work of the ECM Project.

This report is being submitted by the Center for Technology Transfer which became the formal grant recipient on October 1, 1995. The project was transferred on this date to facilitate administrative requirements. Minor revisions to the Workplan and a six month no-cost extension accompanied this transfer. It is noteworthy that only two years funding was available to implement the four year program which was originally proposed. Nonetheless, all of the two year goals were met or exceeded and the technology transfer and technical assistance services of the ECM project will be continued through other federal grants and industry support as part of CTT's core competencies.

The ECM Project which began with no staff, equipment, office space, furniture or supplies has developed into a highly respected provider of technical assistance to not only the metal products industry, which was its primary target, but to all of Maine's precision manufacturing industry. During its first year of operation it received the Governor's Award for Excellence in Pollution Prevention and in its second year was chosen by EPA to pilot a project for metal finishers and was recently chosen by DOE to become the statewide coordinators for the ClimateWise and NICE3 programs. Even more recently, a new statewide partnership was forged between CTT, the Maine Metal Products Association, the Maine Chamber and Business Alliance and the Department of Economic and Community Development to provide comprehensive energy and

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environmental services to Maine's business community as an outgrowth of the ECM Project.

Following is a detailed report on the accomplishments of the ECM-TA project organized by the activities identified in the Workplan.

Technical Progress Report - Year 1

Environmentally Conscious Manufacturing - Technology Access Project Maine Metal Products Association

Task 1 - Administer Project

Major Administrative and managerial duties for the project. Steps will include:

- Refine job descriptions for staff
- Hire Staff
- Obtain office space, furniture and equipment
- Adopt operating procedures
- Develop system to evaluate progress
- Conduct biennial evaluation of progress
- Conduct annual financial audit/review
- Acquire needed professional services
 - Financial auditor
 - Accountant
 - Consultants for systems and/or temporary staff
 - Consultants for evaluation of process/progress

Progress

All administrative tasks for this project were carried out by the ECM Project staff and the Center for Technology Transfer(CTT). CTT provided bookkeeping and accounting services during the first eighteen months of the project under contract to the Maine Metal Products Association and directly during the remaining twelve months of the project. The Center for Technology Transfer became the formal grant recipient on October 1, 1995. The project was transferred on this date to facilitate administrative requirements. Revisions to the Workplan and budget and a six month no-cost extension accompanied this transfer.

Two on-site visits were conducted with DOE personnel from the Office of Industrial Technology in May 1995 and October 1996. These sessions provided an excellent opportunity to discuss our progress and present our success stories. During the October 1996 meeting, the project reported exceeding its statutory match obligation and presented case studies of companies that had achieved substantial cost savings, improved process efficiency, reductions in waste streams, raw material and energy use and improved environmental performance as the result of ECM Project technical assistance.

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Progress was routinely tracked and summarized on a quarterly basis for DOE. The financial status report was prepared following a financial review conducted by CTT's accounting firm as part of its annual A-133 program audit.

The Boards of Directors of CTT and MMPA were regularly informed and involved in the oversight of the Project. More specifically the industry Steering Committee and broad partnership of the Project's Board of Advisors were extensively involved in the administration and programmatic direction of the Project. Both of these groups met at least quarterly and occasionally more often.

This project provided a unique opportunity for Maine to create a technology transfer and technical assistance infrastructure and establish a working relationship with DOE and its national laboratories. Individual Maine companies and whole industry sectors have benefited from this opportunity. One of the most significant events of the ECM Project was a Technology Tour of DOE's Lawrence and Sandia Laboratories in Livermore, CA and Sandia and Los Alamos National Laboratories in New Mexico in May 1995. As the result of this contact, CTT and the State of Maine are engaged in ongoing technology transfer opportunities with DOE's Office of Industrial Technology.

Task 2 - Industry Needs Opportunities Assessment

Identify all industrial target areas and obtain data regarding their defense-related work and their interest in ECM.

Further refine understanding of industry needs and opportunities.

Progress

A formal survey was conducted of the metals industry during the initial phase of the project. This information was combined with other industry surveys on an ongoing basis to provide a relatively accurate, if not comprehensive overview of the industry and its interest and need for ECM technical assistance. A substantial number of the fifty companies identified in the original proposal participated and received technical assistance through this project.

Task 3 - Develop and Maintain "Assessment Team" and "Tech-Source" Team

Maintain a pool of resource people who can carry out the technical assistance required of the program. The Assessment Team will identify ECM opportunities on the shop floor and the Tech-Source Team will identify emerging ECM Technologies. This task will:

- Refine roles and capabilities of team members
- Contact potential additions as team members
- Conduct team sessions to share experiences

Progress

Eighty persons received training in the techniques for performing an environmentally conscious manufacturing assessment. A two-day training program for ECM Assessment Team volunteers was offered in October 1994. Twenty-seven persons representing

industry, private engineering consultants, state agencies, and the technical college system attended. A follow-up course on regulations was offered in January 1995 and many of these individuals attended a paint and coatings technology conference in March 1995. An additional forty-six individuals were trained in conducting assessments through the fifteen week ECM course developed by the project staff and with a local technical college and offered in 1995 and 1996. Many of these individuals participated in the ECM Assessments and are available for future assessments.

The experience and qualifications of the persons who attended the training sessions and volunteered to be on the assessment teams was of such high quality, that the need to have separate assessment teams and tech-source teams did not prove to be a useful distinction and therefore the tech-source distinction was dropped. The assessment teams, volunteers and the ECM staff proved more than capable of identifying new technologies for individual companies.

Task 4 - Coordinate Ongoing Program of Basic ECM Assessments

Provide the basic appraisal of possible ECM Opportunities within target firms by members of the Assessment Team. This task will:

- Develop basic audit procedures from Assessment Team member experience
- Conduct audit training
- Coordinate audits
- Publicize results and lessons learned
- Follow-up activities for future enhancement steps for firm

Progress

An Assessment methodology and manual were developed by the project staff and consultants for the initial training in October 1995 and were constantly tested and improved based on experiences with individual companies.

It was anticipated that twelve to sixteen assessments would be completed in the two years of this grant. Fourteen detailed on-site assessments were completed that identified significant pollution prevention opportunities and economic savings.

Formal case reports were prepared for ten of the companies after follow-up visits to assess the implementation of recommendations and the measurement of cost savings, improved efficiencies and waste reduction. These case reports are now accessible via the internet on MMPA's homepage.

Although it was originally thought that most of the technical assistance would be provided by on-site visits, project staff have provided research and technical support to 110 companies through written materials, phone assistance and on-site visits.

Task 5 - Develop and Implement "TRIAL" Program of "Packaged Technical Assistance

During the trial program, the scope of technical assistance will be limited. The focus will be on TUR techniques and a few broader elements of ECM. Emphasis will be on compliance with environmental regulations that can be easily implemented. This task will:

- Develop criteria for selecting firms
- Select 4-6 firms using results from Task 2
- Conduct detailed audit for ECM opportunities using Assessment Team
- Develop preliminary package for each firm
- Coordinate with firm's employees and refine package
- Return, as needed to technology sources
- Craft final package with specific recommendations
- Document efforts and successes

Progress

The ECM assessments were much more in-depth than had been originally anticipated. This meant that each company received a greater value because the assessment was more thorough and identified more opportunities for improvement. This allowed in-depth technical assistance to be provided much more quickly and as a core component of the assessment process. The distinction envisioned in the original proposal between the technical assistance provided during an assessment and in-depth technical assistance was not very clear.

Consequently, in response to this opportunity, a second strategy was offered to companies which had particular processes or problems they felt needed to be assessed or changed. In order to identify and support this need, proposals were solicited for projects which needed engineering or consulting assistance. Six proposals were submitted and two were funded. One project developed an alternative to a process which used substantial quantities of lead and cadmium. The other proposal explored powdered coating options in a metal-finishing process.

Task 6 - Develop and Administer "ECM Technology Fund"

Task 7 - Facilitate Industry Attendance at Conferences, Participation in Study Tours and Exchange of Ideas

Encourage and assist in ECM information dissemination by facilitating industry attendance at ECM conferences, study tours, and roundtables. This task will include:

- Develop conference attendance policies
- Identify key conferences
- Coordinate study tours
- Identify topics and speakers for roundtables
- Coordinate roundtable sessions

Progress

Attendance at sponsored events has been very good and demonstrates that the topics which have been chosen are relevant to industry needs.

Following is a list of programs organized and sponsored by the project:

- ◆ ECM Roundtable seminar pilot test the industry survey. 15 participants.
- ◆ Seminar at the Maine Manufacturing Trade Show - "*The Clean Air Act & Practical Alternatives to Solvent-based Coatings*". 40 persons attended.
- ◆ "Pollution Prevention for Small Manufacturers" a half day interactive TV series prepared by Kansas State University. 30 person attended representing 10 companies.
- ◆ A program on "Pollution Prevention and the ECM Project" was prepared by Maine Public Television for its *Made in Maine* series which was seen by 48,000 viewers.
- ◆ Seminar on "Pollution Prevention and Industrial Competitiveness". 9 companies attended.
- ◆ A one-day conference on "Environmental Regulations and the Metals Industry: *Determining which Laws Apply to Your Facility*". 45 persons attended.
- ◆ A one-day conference on Paints and Coatings Technology. 250 persons attended.
- ◆ MMPA Monthly Meeting - ISO 14,000 & Environmental Management Systems. 100 persons attended.
- ◆ Pollution prevention Resources on the Internet - 26 persons attended.
- ◆ Technology Tour - four companies visited four DOE National Labs.

The ECM-TA Project was presented at the following events:

- ◆ "Chemical Safety and Hazardous Waste - New Issues in Maine" organized by the Cambridge Institute and the law firm of Pierce, Atwood, Scribner, Allen, Smith and Lancaster.
- ◆ "The Incorporation of Pollution Prevention into Manufacturing Extension Services" at the National Pollution Prevention Roundtable in Minneapolis, Minn.

- ◆ "Industry Trade Associations and Chemical Use: Taking the Initiative in Pollution Prevention and Environmental Management" sponsored by the EPA in Washington, DC.
- ◆ "Low VOC Painting Operations for the Metals Industry" at the Northeast Waste Management Officials Association in Stamford, Conn.
- ◆ "Energy and Environmental Services" at the quarterly meeting of the Environmental Business Council of Maine.
- ◆ "Environmentally Conscious Manufacturing & Sustainable Economic Development" at the annual conference of the Maine Businesses for Social Responsibility.

The Project also sponsored industry representatives to attend the following:

- ◆ "Conducting ECM Assessments" sponsored by the Department of Energy at the Allied Signal Company in St. Louis, Missouri.
- ◆ "Pollution Prevention Conference" sponsored by the National Association of Metal Finishers and the American Electroplaters and Surface Finishers Society in Orlando, FL.
- ◆ "Industry Trade Associations and Chemical Use: Taking the Initiative in Pollution Prevention and Environmental Management" sponsored by the EPA in Washington, DC.
- ◆ Technology Tour to the DOE National Laboratories - Sandia and Lawrence in Livermore, CA and Sandia and Los Alamos National Laboratories in New Mexico.

Task 8 - Establish ECM "Clearinghouse"

Develop and organize library of ECM information and make it available to interested parties. This task will:

Issue bulletins regarding new ideas or technologies
 Publish case studies from the TUR project and the "trial program"
 Provide information for articles and newsletters or participating institutions

Progress

A Clearinghouse was created at the Office of Pollution Prevention (OPP) at the Maine Department of Environmental Protection. The OPP is now capable of handling research requests. The ECM-TA Project is capable of handling research requests through its on-line capabilities through the internet.

The case studies from the TUR project have been published and widely distributed. The case reports of from the ECM Assessments have been published and are also accessible through the internet on MMPA's homepage.

Numerous articles were presented in the monthly newsletter of MMPA - The "Metalworks". Many Factsheets on technical processes were collected and distributed to individual companies.

Task 9 - Provide Worker Training in ECM

Central Maine Technical College will develop and deliver new training efforts that incorporate ECM principles. This task will:

Develop a 45 hour course designed to raise shop-floor consciousness about ECM opportunities.

Develop a 4-hour seminar that provides an overview of ECM for use over Maine's interactive television network.

Increase availability of customized training in ECM technology.

Progress

The ECM course was developed and offered to 46 students at three locations - twice in 1995 and once in 1996. Each course taught the basic techniques of conducting ECM assessments and during the fifteen weeks analyzed eight processes at three separate companies. The course was developed by the project staff and faculty at the Central Maine Technical College. All of the technical and process methodology were taught by ECM project staff and industry engineers.

The 4-Hour seminar was not developed based on an assessment of the need by the ECM Steering Committee.