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Project Summary

Innovative Clean Technologies Case Studies, Second Year Project Report

Angel Martin-Dias, Editor

The Innovative Clean Technologies Case Studies contained herein are the products of the "Pollution Prevention by and for Small Business" Program (P2SB). The P2SB was an outreach program directed to small businesses that had developed innovative concepts for pollution prevention in their industries. The P2SB focused on high-risk concepts without emphasis on media or industry in order to provide an open program where ground-breaking concepts were given a fair opportunity.

The P2SB provided awards of up to $25,000 to assist small businesses for conducting their own demonstrations of pollution prevention techniques and technologies and for advancing their products towards a practical stage.

In its second year, the P2SB funded projects in a variety of industries across the nation. This publication provides a history of the P2SB and lists case histories of the projects funded in the second year. An earlier report entitled "Innovative Clean Technologies Case Studies" (EPA/600/R-93/175) covering the first year of the program is already available.

This Project Summary was developed by EPA's Risk Reduction Engineering Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information on back).

Introduction

In 1989, the U.S. Environmental Protection Agency established a 2% set-aside program to fund pollution prevention initiatives from across the Agency. These set-asides were instituted to encourage the research, development and demonstration of pollution prevention concepts, techniques, and technologies nationwide.

One such initiative, Pollution Prevention by and for Small Business (P2SB), was proposed by EPA's Office of Small and Disadvantaged Business Utilization (OSDBU) with the support of EPA's Office of Research and Development (ORD). This initiative was selected for funding under the pollution prevention 2% set-aside, with co-funding provided by ORD. The P2SB was managed through a cooperative agreement with the Center for Hazardous Materials Research (CHMR), and some of the P2SB small businesses received additional support for the commercialization of their technologies through the National Environmental Technology Applications Center (NETAC). Nineteen trade associations supported the program though promotion, advice, and information transfer.

The P2SB provided awards of up to $25,000 to assist small businesses for conducting their own demonstrations of pollution prevention techniques and technologies and for advancing their concepts to a practical stage. The P2SB was a 3-year program, ending September 1993, with awards being made in the 1991 and 1992 fiscal years of the federal government.

The recipients of the grants applied their own knowledge and expertise in the field to structure their projects and data collection activities in a manner they determined

would provide the most effective means of furthering the development of their concepts. The reader should be aware that the data provided in these summaries are not the results of third party evaluations.

The in-house demonstrations were completed in 14 to 16 months, and reports were filed with CHMR, which in turn developed research briefs for Agency review. These research briefs have been reorganized into the chapters of this publication. The technologies are considered promising research and development concepts, and while several have advanced towards commercialization, others require further investigation and testing. All are presented to provide the reader the opportunity to contact the small business demonstrator for potential uses.

The success of the P2SB program depends on the involvement of the trade associations who sponsor presentations by the participating small businesses at annual conferences and regional workshops. This initiative was developed to support critical pollution prevention efforts in a variety of facilities and industries that might not otherwise have the chance or the resources to reduce wastes or to test and implement their innovative ideas. The P2SB was an attempt to support promising ventures and encourage further development. It also expanded EPA's knowledge of pollution prevention needs in different sectors, supporting government, business, and public cooperation in finding ways to prevent pollution.

The full report was submitted in fulfillment of Cooperative Agreement # 817670 by Center for Hazardous Material Research under the sponsorship of the U.S. Environmental Protection Agency.

Project Title	Author(s)	Research Institution	Abstract
Phase II and III Vented Two Stages Valves for Internal Combustion Engines	Reggie D. Huff	Acro-Tech, Inc., Tigard, OR 97223	This project assessed a concept to improve the induction process of the internal engine. The task of the induction cycle is to move air and fuel molecules from an inlet Venturi so they can be burned efficiently. This design facilitates a reduction in mechanical stress and an increased efficiency in air flow dynamics. The net results are expected to be improved engine performance, decreased emissions, and enhanced fuel efficiency.
Pollution Prevention Through Use of a Formaldehyde-Free Biological Preservative	Arthur Schwartz & Barbara Schwartz	Earth Safe Industries, Inc., Belle Mead, NJ 08502	Formaldehyde, a major component of most biological preservatives, is a toxic air pollutant; 67 billion lb of this substance are produced in the United States annually. NoToX is a nontoxic, biological preservative intended to replace formaldehyde in a variety of applications. This project demonstrated the effectiveness of NoToX in eliminating air pollution and in acting as an effective, long-term preservative and fixative.
Substitution of Biodegradable Low Toxicity Natural Products for the Killing of Fire Ants	Joe S. Wilkins, Jr. & Joe Wilkins, Sr.	Environmental Pesticide Group, Pasadena, TX 77502	Low toxicity, biodegradable, natural products (terpenes isolated from citrus fruit peel) can be substituted for toxic chemicals for the effective killing of fire ants in agricultural settings or on residential lawns. This project showed that citrus fruit terpene compounds are as effective as commonly used insecticides, less expensive, and rapidly biodegradable in the environment.
Pollution Prevention in Cadmium Plating	Mandar Sunthankar	IonEdge Corporation, Fort Collins, CO 80526	Cadmium is electroplated on many industrial components because of its desirable lubricity and corrosion resistance. However, the use of cyanide baths in electroplating and the toxic waste disposal related to cadmium are of significant environmental concern. In recent years, 50/50 zinc-cadmium alloy coating has shown promise as an alternative to cadmium. A novel dry plating has been developed that eliminates liquid chemicals and prevents solid waste generation by using *in situ* reclamation. This project showed that the lubricity of this alloy is competitive with that of cadmium and superior to that of known values of zinc.
Particulate and Hydrocarbon Emissions Reduction during Wood Veneer Drying Operations	Guy Lauziere Jim Wilson	Production Machinery, Inc., Bend, OR 97709; Oregon State University, Forestry Products Department, Corvallis, OR	This project assessed whether particulate emissions are reduced or eliminated when wood veneer is dried using Radio Frequency (RF) energy as compared to conventional energy sources. Current dryers use natural gas, wood waste, or electric resistance heating of veneers. The premise is that RF energy, attracted directly to the water in the wood, is able to heat the water and drive it from the wood cells at lower temperatures than are required by conventional dryers. Due to the lower temperatures, there is little or no release of hydrocarbons from the wood compared to emissions generated from other types of dryers.

Project Title	Author(s)	Research Institution	Abstract
Conductive Polymer Composites to Replace Heavy Metals in Coatings and Adhesives	Harry S. Katz & Radha Agarwal	Utility Development Corporation, Livingston, NJ 07039	Improved polymer matrix conductive coatings and adhesives are needed to replace current products that use heavy metals. This project presented a low-cost polymer adhesive that has equivalent conductivity to those currently available and assessed its physical and electrical properties. It focused on the inclusion of short graphite fibers, carbon/ graphite microspheres, and conductive carbon powder fillers and the conductive elements.
Compound Adiabatic Air Conditioning for Transit Buses	Jamends F. Mattil	Climatran Corporation, Englewood, CO 80155	Adiabatic air conditioning (AAC) is a water-based cooling process that requires minimal energy and uses no refrigerants, such as chlorofluorocarbons (CFCs). This project assessed the performance of an AAC system installed on a bus and operated under a variety of climate conditions representative of summer design conditions in selected metropolitan areas.
Reducing Heavy Metal Content in Offset Printing Inks	Roger Telschow	Ecoprint, Silver Spring, MD 20910	A commercial offset printing ink is created using pigments with no heavy metals, thus preventing pollution in three key areas: (1) the waste ink that must be handled as a hazardous waste; (2) the printed materials that are landfilled or incinerated; and (3) the sludge that is created during the deinking and repulping of waste paper fibers as they are made into recycled paper. The result of the testing throughout the project was the creation of a “palette” of colored inks with a low heavy metal content.
Reusing Zinc Plating Chemicals	Douglas Brothers	Global Plating, Inc., Fremont, CA 94538	The project proposed to recover zinc chloride and other chemicals used in zinc plating through ultrafiltration and reverse osmosis membranes in order to reduce the amount of hazardous waste generated, remove chlorides from the wastewater, and permit reuse of the reclaimed metals. It assessed the effectiveness of the membranes, but technical difficulties prohibited the actual recycling of zinc and plating bath chemicals.
In-Ground Plastic Container Production System to Reduce Nitrate and Phosphate Pollution	Carl E. Whitcomb	Lacebark, Inc., Stillwater, OK 74076	The use of a new in-ground, plastic container system was investigated that reduced nitrate and phosphate pollution from above-ground container nurseries. Above-ground container nurseries may use in excess of 2,000 lb of nitrogen per acre per year; much of the fertilizer applied to containers may be lost through leaching and spillage. The project proposed the technique that could reduce fertilizer application rate by 50% or more (compared with conventional above-ground containers) when plants are grown in plastic containers submerged in the earth. In addition, irrigation water demand could be reduced.
Reuse of Metal Fabrication Wastewaters via a Novel Ultrasonic Coalescence Process	Scott R. Taylor	S.R. Taylor and Associates, Bartlesville, OK 74003	Metal working and finishing operations generate wastewater containing cutting and cooling fluids along with metal particles and oils. Currently, this entire volume of wastewater must be disposed of as a hazardous waste. This project studied the effectiveness of a novel ultrasonic technique that separates the hazardous contaminants from the fluids so that the bulk microemulsion phase can be reused. A multistage, multifrequency operation was built to assess the commercial potential of the recovered oil phase and the solid sludges, and to evaluate the long-term stability and usefulness of recycled fluids.

Project Title	Author(s)	Research Institution	Abstract
Reduction or Elimination of Cooling Tower Chemicals	Larry Stenger & Thomas Dobbs	Water Equipment Technologies, West Palm Beach, FL 33411	Cooling towers used in air conditioning applications are a familiar site near many buildings. Since cooling towers are vast heat exchangers, the water in the tower becomes a perfect incubator to grow bacteria, algae, and fungi. Cooling towers are also plagued by corrosion, scale, and sediment accumulation. This project utilized a zinc and copper alloy placed in the cooling tower sump. The reaction of the cooling tower water with the alloy raises the water's pH, thus reducing corrosion, preventing algae formation, and destroying bacteria. This reduces or eliminates the need for chemical algaecides, fungicides, corrosion inhibitors, and scale inhibitors currently used to maintain cooling towers.
Pre-Charged Vacuum Liquid Extractor/Containerization Device	Lowell Goodman	Technical Support Services, South Thomaston, ME 04858	An innovative device has been developed and tested that provides simple, spill-free extraction of used oil from equipment during routine maintenance activities such as engine oil changes. The objective of this project is to design, test, and evaluate this device for use in other applications. Successful development of this device will provide a mechanism to remove and contain material in otherwise difficult extraction situations, thereby promoting recovery and recycling of material that is frequently disposed.
Environmentally Safe Fountain Solutions for the Printing Industries	David R. Johns	Summit Resource Management, Inc., Fort Wayne, IN 46804	An ecologically compatible fountain solution for the printing industry was formulated. This new solution eliminated isopropyl alcohol and mineral acids. Ethylene glycol was also reduced through the substitution of propylene-based glycol. These reductions and substitutions decreased the levels of harmful vapors in the air and reduced the amount of toxins released into the printer's wastewater system.

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***Kenneth R. Stone** is the EPA Project Officer (see below).*
The complete report, entitled "Innovative Clean Technologies Case Studies, Second Year Project Report," (Order No. PB95-100079; Cost: $36.50, subject to change) will be available only from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650
The EPA Project Officer can be contacted at:
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