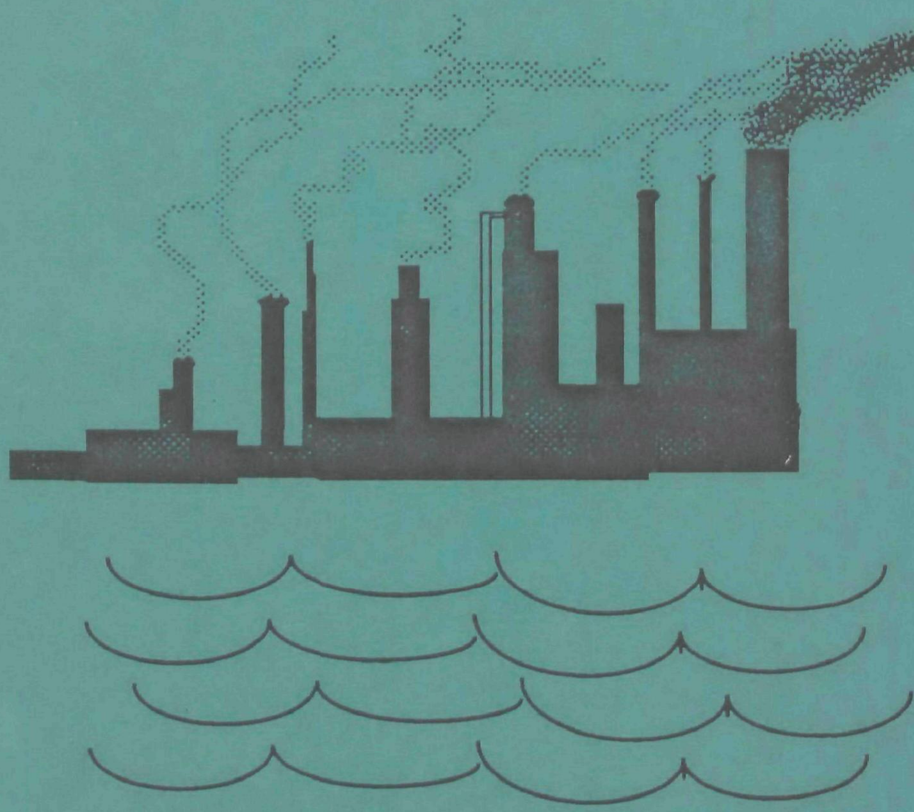
POLLUTION PREVENTION IN PUBLICLY OWNED TREATMENT WORKS

PROCEEDINGS FROM STATE/POTW GRANT RECIPIENTS WORKSHOP IN RALEIGH , N.C.
FEBRUARY 6, 7, 1992



PREPARED BY
POLLUTION PREVENTION DIVISION
OFFICE OF POLLUTION PREVENTION AND TOXICS
U.S. ENVIRONMENTAL PROTECTION AGENCY

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Forward

The Environmental Protection Agency awarded grants to five states in FY 91 to develop and implement pilot projects which will demonstrate how publicly owned treatment works at the municipal and state level can integrate pollution prevention into their programs. Grants were awarded to Utah, New Mexico, Minnesota, Massachusetts, and North Carolina.

In order to provide information on current activities in this area and to establish a pilot project network, a workshop was held on February 6 and 7, 1992 in Raleigh, North Carolina. Invited to participate in the workshop were the five state grant recipients, the municipalities participating in the project, EPA Regional staff from MWPP, pre-treatment and pollution prevention programs and headquarters staff from the Office of Water and the Office of Pollution Prevention and Toxics. A total of 35 people attended the workshop.

This report summarizes the two-day workshop and identifies some of the major issues brought out by the participants.

PARTICIPANTS

POTW's
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POLLUTION PREVENTION IN PUBLICLY OWNED TREATMENT WORKS

Workshop Proceedings

CONTENTS

Section 1 Introduction

Background

EPA, states and municipalities have made significant progress over the last 20 years in improving the quality of the environment through the implementation of the Clean Water Act requirements. Billions of dollars have been spent in the nation's wastewater treatment infrastructure resulting in substantial improvements in water quality.

Today however, we are faced with new challenges in the areas of municipal growth, newly regulated pollutants and more stringent effluent limits. These challenges, we believe, must be addressed by placing an emphasis on pollution prevention rather than on the treatment and control of wastewaters or on the expansion of the POTW.

As the federal government's role in funding municipal wastewater treatment ends, there is both the need and the opportunity to adopt pollution prevention measures to meet the expanding demands and to prepare for new federal and state requirements. Therefore, a primary focus of EPA's program is to encourage and support states and municipalities in developing pollution prevention programs.

To this end, the Office of Pollution Prevention and Toxics and the Office of Water have initiated a pilot pollution prevention grant program for publicly owned treatment works. Five states were awarded grants up to $100K, to demonstrate how pollution prevention could be promoted through pre-treatment programs and MWPP.

Purpose and Description of Workshop

On February 6 and 7, 1992 the Pollution Prevention Division in conjunction with the State of North Carolina conducted a workshop for the participants in the program. Attendees included the five state grant recipients, one or more of the states' POTW's, EPA MWPP regional coordinators and headquarters Office of Water and Pollution Prevention Division staff.

The purpose of the workshop was to develop a network of individuals interested in promoting pollution prevention in POTW's and to share information on progress, obstacles, and resource needs. Agenda topics included discussions on future program funding opportunities, measuring progress, publicizing programs and identifying obstacles and solutions. Participants also identified resource needs from the local, state and EPA Regional perspectives.

This report has been developed to provide a communication link between all interested parties and to assist in the dissemination of current information and activities regarding pollution prevention in Publicly Owned Treatment Works.

Section II Pilot Program Issues

Recognizing the need to identify and explore new methods for achieving prevention in local pre-treatment and MWPP programs, four issues were addressed in brainstorming sessions during this workshop. This section describes the suggestions and outcome of these group sessions.

Issue 1. Future Funding Opportunities

The state's pilot projects are the result of Federal Assistance Grants, however states are encouraged to begin to explore opportunities for continued funding of the pollution prevention programs. The alternative financing mechanisms that were identified by the participants include the following:

1. User and pollution discharge fees
2. Penalty fines
3. Environmental taxes
4. Bonds, lotteries and state development funds
5. Clean Water Act Funds 205-j, 106
6. Trade Associations
7. Industry sponsors
8. Environmental groups and foundations
9. Revolving Loan funds

For analysis of various funding opportunities for environmental programs, readers are directed to obtain a copy of the National Governors Association Report **Funding Environmental Programs: An Examination of the Alternatives,** published by the NGA, 1989. Washington DC.

Issue 2. Measuring Progress and Results

Measuring progress and results of the pollution prevention effort must be considered in the design of the Pollution Prevention pilot project. Numerically measuring progress can be achieved through the following activities:

1. Baseline sampling and defining critical parameters.
Sampling must be done at the facility (IU), at the influent and effluent point at the POTW. Samples should measure quantity in pounds and in quality, constituents.

2. TRI Pollution Prevention and Release data

3. Economic front end loading

4. Hydraulic and organic loading. Measure with city water bills and quantify plant life extensions.

5. Industry retention

6. Fines, violations.

7. Identify *how* the violator gets into compliance; source reduction, treatment etc.

8. Data comparison......where is it going.

9. Disclosure of sewered hazardous waste.

10. Tech transfer of successful methodologies

11. Reduction of end-of-pipe treatment and control capitol expenditures

12. Reduction of sludge generated at POTW

13. Reduction in wastewater generated per unit product.

14. Energy costs at POTW are reduced.

Issue 3. Obstacles/Solutions/Incentives

Traditionally, owners and operators of POTW's as well as state and federal regulators have placed an emphasis on pollution control rather than on conservation and prevention. POTW's have had pre-treatment programs, including sampling efforts, inspection and enforcement programs , MWPP, sludge management programs and various water conservation efforts.

Today there is greater concern on developing a *complementary* environmental protection strategy based on conservation of natural resources and on preventing pollution at the source. This strategy represents not only a major shift in the way a company will do business, but also poses substantial challenges for governments. Some of the major obstacles facing POTW's in the adoption of pollution prevention programs as identified by the participants in the meeting include the following:

1. Lack of information and data on technologies that work

2. Concentration based effluent limits

3. Lack of money and training

4. Inplace equipment produces barriers to innovation

5. Financial disincentives for IU

6. Commercial products that are counterproductive

7. Reduced income to POTW

8. No directive (mandate) from EPA to develop program

9. Existing city codes and ordinances inhibit p2

10. Conflicting regulations

Solutions and incentives for POTW's to adopt Pollution Prevention Programs include such things as:

1. Provide education and training to industry, government etc.

2. Good technical information and case studies

3. EPA assistance and incentives throughout all programs, audits etc.

4. Develop mass based effluent limits

5. Rewrite EPA H20 Guidelines incorporating P2

Issue 4. Publicizing Programs

Publicizing programs and the results of pollution prevention efforts are important to obtain necessary political and public support. Suggestions from the participants of this workshop for publicizing programs include:

1. Workshops and conferences in the community

2. Mass mailings, H20 Bills etc.

3. Newsletters, papers, radio, TV

4. Working with legislators and:
a. Economic development agencies
b. AMSA
c. League of Municipalities
d. lobbyists
e. League of Woman Voters
f. WEF

5. Utilize Public Affairs Offices

6. Attention to legislators' industries

7. Tours/outreach programs

8. Invite public to meetings and hearings

Section III Resources Required To Implement Programs

Aside from receiving Federal dollars to implement their programs, POTW's, States,EPA Regions and Headquarters all have other significant resource needs vital to the development and implementation of their projects. Though some of these resource needs are shared commonly among the groups, their are certain resources that are specific to the individually target audiences.

Representatives from the POTW municipalities and POTW's listed their resource needs to implement the pollution prevention program. POTW resource needs include:

1. Information exchange network (ask EPA to provide mini-exchange in PIES).

2. Specific pollution prevention information on industries.

3. Pollution prevention training.

4. Examples of local government ordinances (mass based effluent guidelines).

5. Management support.

6. Outreach component.

7. Support from industry and community for the program.

8. Trade associations support.

9. Help in providing new funding sources if discharge fees are reduced as a result of implementing a pollution prevention option.

EPA is exploring the possibility of developing a mini-exchange for POTW's on its Pollution Prevention Information Clearinghouse.

States

The 5 States were asked to list their resource needs. The following items were discussed:

1. Clear directive from EPA to allow for the incorporation of pollution prevention into media specific grant programs, permit and enforcement programs.

2. Ability to use funds from Clean Water Act; Section 106, 104, for pollution prevention programs.

3. Provide Best Management Practice guidelines and NPDES language to promote pollution prevention

4. Create options other than just Enforcement

5. Develop a source reduction compliance schedule

6. Need flexibility from EPA to do pollution prevention in the regulations

7. Significant non-compliance (SNU) regulations are barriers. Need to let the State and Locals have flexibility on what and who to report publicly thus encouraging visits and technical assistance to industry.

8. Less focus on bean counting and more focus on the non-regulatory, educational and technical assistance efforts.

9. Training to integrate pollution prevention into specific program sectors (pretreatment inspection and operating training).

10. Flexibility in determining when to do sampling.

11. Empower the pretreatment inspectors to be able provide pollution prevention information through an Office of Water Inspector policy.

12. Put pollution prevention into permits. Industry should be required to have an assessment done.

13. Develop methodologies to measure progress.

14. Need EPA guidance to emphasize and integrate pollution prevention coordinators in each program office.

15. Need to incorporate pollution prevention into new guidance manuals for

municipalities;
- pollution compliance inspection
- audits

EPA

EPA Regional and Headquarters needs were identified by the participants. The following items were listed:

1. Equivalent of bean credit for pollution prevention in enforcement settlements.

2. Pollution prevention incorporated into penalty policies.

3. Pollution prevention needs to be addressed not only as cross-media, but cross-agency.

4. Resource database (outreach and training on the Pollution Prevention Information Clearinghouse).

5. Communication channel dedicated to pollution prevention in POTW's.

6. EPA needs to provide training for its consultants, contractors and operation specialists.

7. Evaluate the financial repercussions on POTW's from industries practicing pollution prevention.

8. Have POTW's involved in the development of guidances.

9. EPA needs to establish a system to provide for better internal communication.

Section IV

Pollution Prevention in Publicly Owned Treatment Works: Project Descriptions

1. Utah and Salt Lake City

2. New Mexico and Albuquerque

3. Minnesota and St. Paul/Minneapolis

4. Massachusetts Critical Mass Project

5. North Carolina Program

Pollution Prevention in Publicly Owned Treatment Works

Grant Summaries

Five States were awarded Pollution Prevention in POTW Grants in FY 91 by EPA's Office of Pollution Prevention. The purpose of these grants are to demonstrate how a municipal POTW ,through its pretreatment program and its facility operations can promote source reduction activities in industrial and business dischargers. Activities funded under this grant will include such things as conducting energy audits of specific POTW's, providing education and technical assistance to industrial dischargers and establishing water conservation programs in the community. The demonstrations will result in the development of a national pollution prevention in POTW's program plan The projects will be discussed at the 92 National pretreatment conference. The States reveiving the grants include the following:

1. State of North Carolina, Department of Environment, Health, and Natural Resources.
Contact: Trevor Clements 919 733-5083
Linda Roderick 919 733-7015

Goal: To Incorporate Pollution Prevention in Pretreatment Program Statewide

Activities will include the following:

1. Create a state level program structure to enhance coordination and communication between the States Pollution Prevention Pays Program and the states pretreatment program.

2. Establish pollution prevention technical assistance programs at a large and small POTW and set up challenge grants for additional programs.

3. Identify specified pollution prevention solutions for targeted POTW problems.

4. Provide Education and training for POTW staff and industrial dischargers.

2. Utah Department of Environmental Quality
Contact: Mary De Loretto 801 538-6146
Florence Perez 801 799-4040

Goal: Incorporate Pollution Prevention in State MWPP Program and in the City of Salt Lake City POTW.

Activities will include the following:

1. Expand MWPP to incorporate water conservation and pollution prevention

technical assistance to industry to extend life of POTW.

2. Target metal platers and other high health and ecological risk areas through pretreatment program.

3. Establish strict mass based local limits for SLC POTW

4. Target solvents for reduction and initiate awards programs

3. Minnesota Office of Waste Management
Contact Kevin McDonald 612 640-5744

Goal: Develop a pollution prevention program at the Metropolitin Waste Control Commission.

Activites that will be conducted with this grant include:

1. Integrate PP into all state POTW's using Minneapolis as a demonstration project and model.

2. Target specific industrial dischargers and pollutants

3. Develop training and conduct workshops for POTW's and industry.

4. Massachusetts Office of Technical Assistance
Paul Richards 617 727-3260

Critical Parameters Pollution Prevention in POTW's Project

Goal: To assist POTW's statewide in utilizing pollution prevention opportunities to address problems which relate to critical parameters for operations of POTW's

Activites include

1. Conducting surveys of POTW's approaching critical parameters and establish baseline measurements

2. Use pollution prevention approaches to reduce loadings

3. Demonstrate how pollution prevention approach can address problems faced by POTW's.

5. New Mexico Environment Department
Sante Fe, NM Contact: Alex Puglisi 505 827-2799
Project Description: This project will demonstrate source reduction in the City of Albequerque's POTW. The project will include educational and techncial assistance to industrial dischargers and will identify and target specific contaminants of concern.

POLLUTION PREVENTION THROUGH POTWS

Utah Division of Water Quality
Mary DeLoretto, Pretreatment Coordinator

Salt Lake City Corporation
Florence Reynolds, Water Quality Administrator

Achieve PP/WM from POTW Users by

- conducting wastewater assessments
- promoting water conservation
- conducting waste minimization assessments
- establishing stringent mass and technology based local limits
- providing information, education and technical assistance
- targeting metal finishers

PROJECT TRANSFERABILITY

- Moderate sized metropolitan city
- Semi-arid/rapid growth area
- No pollution prevention legislation
- Pilot and transfer results to many similar cities/states

ACTIVITIES

- **Education Initiative**
- **Expand Chemical Clearinghouse**
- **Metal Finishers Initiative**
- **IU Awards System Expansion**
- **City Owned Facilities Waste Minimization Initiative**
- **Project Result Dissemination Initiative**

MEASURES

Overall reduction in multi-media discharges of pollutants

-(Requires establishing a baseline)

Establishment of POTW PP capacity within DWQ and SLC

-(Testing knowledge before and after education initiatives)

EDUCATION INITIATIVE

- **Pollution Prevention Specialist**
- **DWQ/SLC Staff Workshop**
- **Metal Finishers Workshop**
- **General Industrial/Commercial Workshop**

PROJECT RESULT DISSEMINATION INITIATIVE

- Annual Regional Pretreatment Coordinators Meeting
- Annual Utah WPCA Conference
- Metal Finishers Association
- State Water Pollution Publications

SCHEDULE

Sep 91 - Initiate project

Nov 91 - Initiate development of City-Owned facilities waste minimization plan

Dec 91 - Prepare Request-for-Proposal and solicit pollution prevention specialists

Jan 92 - Establish criteria for IU pollution prevention awards

Feb 92 - Establish criteria for baseline for pollution reduction; Hire pollution prevention specialist contractor

Apr 92 - Hold DWQ/SLC staff training workshop; Test knowledge before and after to assess pollution prevention awareness

May 92 - Initiate pollution prevention assessments at industrial facilities, to be ongoing from then on

Jul 92 - Conduct industrial pollution prevention workshop, targeting metal finishers and electroplaters; Test knowledge before and after to assess PP awareness

Aug 92 - Implement chemical clearinghouse expansion

Sep 92 - Conduct industrial pollution prevention workshop for the general industrial and commercial community; Test knowledge before and after

Oct 92 - Initiate analyses to determine program success

Jan 92 - Prepare final report on program success

Apr 93 - Disseminate report information; Present findings at annual UWPCA meeting

CITY WASTE MINIMIZATION PROGRAM

SOLVENT RECOVERY Current usage minimized

PROGRAM ALTERATION

With the cooperation of the new administration and all city departments identification of the major concerns, and development of a waste minimization plan.

INITIATION

Documentation of current usage of all materials that may be environmentally damaging. Development of alternate materials and practices.

POTENTIAL OBJECTIVES

Road Salting Procedures and Salt Storage
Airport Deicing Procedures
Heavy Duty Equipment Maintenance Procedures
Fire Department Training Practices
Paint and Paint Cleanup Procedures

WASTE MINIMIZATION PROGRAM

INDUSTRIAL AWARD PROGRAM

Eligibility: all permitted industry

Criteria: 95% of all tests in compliance
submission of all required reports
spill prevention and control plan
effort and cooperation
employee training
environmental concern

1989 7 award recipients
1990 6 award recipients (1 new)
1991 5 award recipients (all new)

WASTE MINIMIZATION PROGRAM

Eligibility: all firms within the city, with or without waste flow

Criteria: Introduction of a policy or program which minimizes the use or disposal of waste materials.
demonstrable
practical
applicable to other firms in some way

Initial awards will be made in 1992.

NEW MEXICO WATER POLLUTION PREVENTION PROPOSAL

Background

The New Mexico Environment Department (NMED) has already initiated a number of water pollution prevention efforts in conjunction with Region 6 of the U.S. Environmental Protection Agency (EPA). Current efforts are oriented toward the framework of a pilot program, IMPAC, developed and implemented in 1989 and 1990. IMPAC (Improving Municipal Performance by Addressing Capacity) is a compliance maintenance program with a focus on the ability or publicly owned treatment works (POTWs) to meet the provisions of the federal Clean Water Act. It is designed to assist municipalities identify and address those performance limiting factors which have been found to adversely impact the ability of POTWs to effectively treat municipal wastewater and produce compliant effluent.

The NMED is proposing to utilize $100,000.00 in federal assistance during FY 91 to expand the scope of New Mexico's Water Pollution prevention program to include activities which encourage waste minimization and source reduction. A recent report prepared for the NMED on hazardous waste minimization program planning indicated that there is a significant potential for hazardous waste reduction in several of the major industrial categories present in New Mexico. Several industries surveyed had already undertaken important preliminary steps in the waste minimization process. The NMED hopes to encourage and foster continued efforts by industry in this arena.

The NMED initiative will focus on implementing waste minimization and source reduction strategies at the local level. In order to accomplish this, the Department will work closely with the City of Albuquerque's Industrial Pretreatment Program in establishing a pilot program to encourage waste minimization at permitted industries. The City of Albuquerque is the largest municipality in New Mexico's in terms of both population and industrial base. Twenty-nine of the state's fifty largest industries are either located in Albuquerque or utilize the city's sewer system for the disposal of their effluent. Therefore, any program targeted at New Mexico's industrial base will have its most widespread impact in Albuquerque. Additionally, the city has a widely recognized industrial pretreatment program and well established contacts with local industry.

Description

The Albuquerque Industrial Pretreatment Program already successfully regulates the introduction of many toxic contaminants into the city's POTW's by mandating the pretreatment of potentially hazardous pollutants. However, most industrial pretreatment systems transfer a portion of wastewater pollutants to other environmental media while lowering the concentration of toxic constituents in the waste stream that enters the sewer. Toxic pollutants still go to the sewer, albeit in lower amounts, and to other environmental media such as the air or toxic waste landfills. Often, there is no real net reduction in the amount of toxic pollutants discharged to the environment. Additionally, new state water quality standards and federal requirements have imposed new regulatory and financial pressures on POTW's, such as Albuquerque, in meeting more stringent discharge requirements on both the effluent discharged from their treatment facilities and the sludge produced at those facilities. Since Albuquerque is implementing mechanisms to compost and distribute their wastewater sludge, the presence of toxic contaminants in this media is also of increasing concern to city officials.

The continued fast paced and constant growth which confronts Albuquerque presently and in the coming decades, makes hazardous waste minimization and source reduction the most viable and economical way for the city to respond to potential new hazardous pollutant loads placed on its POTW. The implementation of a waste minimization program will assist Albuquerque in meeting the toxic effluent discharge limitations of its National Pollutant Discharge Elimination System permit while allowing continued industrial growth within the city. It will also assist the city in producing an environmentally safe sludge which can be distributed for beneficial use. Overall, the possible positive impacts to the environment are significant.

<u>Implementation</u>

The majority ($70,000) of the requested $100,000 federal grant will be transferred to the City of Albuquerque through a Memorandum of Understanding (MOU) for the implementation of a hazardous waste minimization program. This transfer of funds has been selected for several reasons:

1) waste minimization programs aimed at industrial wastewater discharges have been found to be highly effective when implemented at the local level;

2) Albuquerque has a well established Industrial Pretreatment program which provides an effective framework for the establishment and implementation of a waste minimization program;

3) personnel in the Albuquerque Industrial Pretreatment Program are aware of the needs and waste disposal problems of local industry;

4) the city is already implementing measures to identify and eliminate "problem" toxic waste discharges; and

5) the city has several resources at its disposal which can be utilized to match and support any waste minimization efforts.

The city will utilize the federal funds to hire the personnel and furnish any resources necessary to work with local industry in exploring and implementing measures which will reduce the amounts of hazardous or toxic discharges to the Albuquerque POTW. This personnel will be hired directly by the City or indirectly through contracts with consultant firms specializing in waste minimization techniques. The City of Albuquerque will furnish a number of in-kind services to match the amount of the federal grant. These services may include but are not limited to services such as:

1. the monitoring of industries known or suspected to discharge toxic or hazardous constituents to the city's POTW;

2. enforcement actions taken, or surcharges implemented, to induce industries to reduce the amounts of toxic or hazardous wastes they discharge into the POTW;

3. technical advice or assistance provided to industry on matters relating to the pretreatment, minimization, or elimination of toxic waste discharges;

4. activities involved in identifying and eliminating toxicity in the wastewater received by the Albuquerque POTW such as Toxicity Reduction Evaluations;

5. laboratory analyses performed to identify or quantify the concentrations of toxic or hazardous constituents in industrial wastewater discharges; and

6. the purchase of equipment necessary to perform the above listed tasks.

The waste minimization program implemented through the Albuquerque Industrial Pretreatment Program will be structured to achieve the following objectives:

- Educational Outreach which will provide hazardous waste minimization information to industry;

- Technical Assistance to help companies identify and evaluate site-specific opportunities for hazardous waste minimization;

- Identification and Targeting of specific discharges for waste reduction in accordance with their potential impact on the ability of the Albuquerque POTW to produce a compliant effluent and safe sludge; and

- Consideration of Regulatory Alternatives which establish indirect inducements or direct requirements to promote waste minimization (i.e., mass balance discharge limits, more stringent local limits, etc...)

MINNESOTA PROPOSAL

MINNESOTA OFFICE OF WASTE MANAGEMENT

Metropolitan Waste Control Commission

Pollution Prevention in Publicly-Owned Treatment Works Grant Program

July 26, 1991

POLLUTION PREVENTION *Right From The Start*

I. EXECUTIVE SUMMARY

The Minnesota Office of Waste Management (OWM) and the Metropolitan Waste Control Commission (MWCC) propose to develop and implement a pollution prevention program at the MWCC. The program seeks reductions, through pollution prevention, of pollutants and wastewaters discharged to MWCC's wastewater treatment system. Additionally, OWM and MWCC intend to disseminate project experiences to other publicly-owned treatment works (POTWs).

The MWCC is the largest POTW in Minnesota, with a staff of over 1,000. The MWCC serves 105 communities and approximately 750 industrial dischargers. The OWM is the lead agency for implementing pollution prevention in Minnesota, with a staff of 5 in its Toxic Pollution Prevention Program. The OWM's Minnesota Technical Assistance Program (MnTAP), with a staff of 15, provides nonregulatory pollution prevention assistance to Minnesota businesses and organizations. MnTAP will play a role in providing training and delivering technical assistance to industry under this proposed grant project.

Major proposed activities include establishing a multi-media pollution prevention training program for POTW staff, providing on-site technical assistance and referrals for industrial dischargers, establishing a plan for integration of pollution prevention into MWCC programs, measuring progress, coordinating with other state programs, and soliciting industry and public input.

Activities under this proposed two-year grant would start on January 1, 1992 and extend through December 31, 1993. Training workshops are planned for April 1992, August 1992, and March 1993. An internal MWCC pollution prevention staff committee would be established in February 1992 and will meet monthly. Quarterly meetings with other state pollution prevention programs would be scheduled. Input from industry and the public would be provided at monthly meetings.

II. GOALS AND OBJECTIVES

1. Overall Goals

A. Establish Metropolitan Waste Control Commission (MWCC) programs and activities to prevent pollution at its source of generation.

B. Reduce, through pollution prevention methods and technologies, pollutants and wastewaters discharged to the wastewater treatment system.

C. Explore opportunities to realize the potential benefits of multi-media pollution prevention activities, such as:

- Reducing the risks inherent in the management of waste streams and residues that result from traditional control methods;

- Avoiding the transfer or "shifting" of pollutants from one environmental medium to another (e.g., water to air); and

- Addressing dispersed sources of contaminants.

2. Specific Objectives

A. Develop and begin implementation of a comprehensive plan to integrate pollution prevention into MWCC programs and activities.

B. Train staff from MWCC and other Minnesota publicly-owned treatment works (POTWs) to promote source reduction as a preferred strategy, and to assist businesses in identifying and implementing pollution prevention opportunities.

C. Coordinate pollution prevention activities at Minnesota POTWs with other programs in the state.

D. Provide information and referrals for technical assistance to businesses discharging wastewater and pollutants to the sewer system.

E. Develop pollution prevention activities targeted at specific dischargers and/or waste streams.

F. Using existing data sources, develop measures to determine progress in pollution prevention.

G. Design pollution prevention actions with industry and public input and solicit the involvement of these groups during program delivery.

H. Encourage other Minnesota POTWs to initiate activities based on MWCC's pollution prevention program.

III. SPECIFIC ACTIVITIES AND PROGRAM ELEMENTS

1. **Provide multi-media pollution prevention training**

A. Workshops

▸ WORKSHOP #1: Pollution prevention concepts, background on pollution prevention efforts, future directions, supplementing treatment and control with prevention, prevention activities in MN and in other states, MN Toxic Pollution Prevention Act, Federal Pollution Prevention Act, SARA Title III, Section 313 introduction to MNTAP and OWM

(Audience: MWCC pretreatment program staff, MWCC staff committee members, other MN POTW staff, MPCA industrial wastewater staff, representatives from metro county hazardous waste programs).

▸ WORKSHOP #2: Integrating prevention into pretreatment inspections and other POTW programs, identifying pollution prevention opportunities, promoting the prevention approach, coordinating with MnTAP assistance activities, prevention success stories, industry pollution prevention plans and annual progress reports

(Audience: same as Workshop #1)

▸ WORKSHOP #3: Roundtable/Forum with POTW staff and industrial users on the topic of pollution prevention; Forum designed to share ideas and experiences on pollution prevention; items addressed in Workshops #1 & #2 may also be covered

(Audience: participants from Workshops #1 & #2, other POTW staff, and interested industrial users of sewage treatment plant system)

B. MWCC will develop training materials for each workshop

C. Possible tours of successful industry pollution prevention programs and outstate sewage treatment authorities undergoing efforts to integrate pollution prevention into programs

2. **Provide on-site technical assistance and referrals**

MWCC Pretreatment Program Staff will:

A. Promote pollution prevention and provide information to industry based on skills developed in training
B. Identify opportunities to prevent pollution during inspections

C. Refer industry to MnTAP and other contacts for further assistance
D. Promote the availability of MnTAP information clearinghouse

3. **Establish staff committee to integrate prevention into MWCC programs**

The Staff Committee will:

A. Recommend pollution prevention policy statement to MWCC management and Board
B. Identify opportunities to integrate pollution prevention into programs (e.g., inspections, rulewriting, policy decisions, interpretation of existing regulations, household hazardous waste and water conservation, enforcement and agreements/settlements, fee structure)
C. Recommend a clearly defined MWCC pollution prevention program
D. Develop implementation plan to establish program
E. Identify target industrial activities and facilities (e.g., specific waste streams, processes, businesses that lack information, problem cross-media transfers, opportunities for multi-media coordination with other media-specific programs)
F. Oversee grant project
G. Review/comment on semi-annual and final grant reports

4. **Measure progress**

A. Develop method for measuring progress
B. Analyze existing data sources: MWCC monthly discharge reports, TRI, hazardous waste disclosures, and other relevant databases to measure progress
C. Cross reference databases and perform other data quality activities to identify discrepancies
D. Consider mail survey to solicit feedback and information on needs
E. Document progress in semi-annual and final grant reports

5. **Coordinate with other programs in state**

MWCC will:

A. Meet quarterly to communicate with other pollution prevention programs in Minnesota (OWM, MnTAP, MPCA, metro counties, Emergency Response Commission)
B. Continue to participate on OWM's Pollution Prevention Task Force
C. Participate at OWM's annual Pollution Prevention Conference
D. Develop fact sheets and other materials for dissemination to other POTWs

Proposal of Massachusetts Office of Technical Assistance for Pollution Prevention in Publicly Owned Treatment Works Grant.

Title: Critical Parameters Project

Summary

This proposal is to conduct a program to assist POTWs in Massachusetts in utilizing pollution prevention techniques to address problems which relate to critical parameters for operation of the POTW. Critical parameters are those measures for which loadings to the POTW are approaching or exceeding 85% capacity, necessitating capital expenditures to enlarge the system; those environmental parameters which if exceeded can have a substantial economic effect on the POTW, such as prohibiting the marketing or reuse of sludge; or those parameters of design capacity which when exceeded could cause the POTW to be in violation of its own National Pollution Discharge Elimination System permit.

The Office of Technical Assistance (OTA) would conduct a survey of POTWs affected by loadings approaching critical parameters and fund environmental evaluations to establish baseline measurements. OTA would then draw upon in-state, national or international sources to supply pollution prevention technical assistance to address the identified problems at these POTWs and conduct trials of innovative approaches to reducing loadings, working with POTW and state environmental officials. Such work would include integration of compliance in all media, promotion of water conservation in addition to source reduction of pollutants, and pilots of changes in regulatory procedures. The effort would also address contributions to loadings from non industry sources as well, for example; households, nonpoint sources, and agriculture.

OTA would then fund environmental evaluations of loadings to compare to the baselines set earlier. OTA would also set aside money to be awarded in the second year of the project to a select number of POTWs to continue work begun as part of the critical parameters project, to ensure the continuation of the pollution prevention effort at those POTWs which demonstrate commitment, understanding, and progress in the use of pollution prevention principals and techniques. OTA would act to facilitate coordination by POTWs, local, state and federal officials, and community and industry groups.

At the end of the first year, OTA would create a series of case studies documenting the work done with POTWs to demonstrate what can be achieved by the application of pollution principles to problems POTWs face. As a condition of the award of funds for special projects in the second year, documentation of work would be required, resulting in additional case studies by the POTWs themselves, reviewed by OTA. OTA would also create videotape documentation of each case.

Background

The Massachusetts Office of Safe Waste Management (OSWM, which was renamed the Office of Technical Assistance in 1990) began working with POTW pretreatment programs in 1989 as part of its Small Quantity Generator program. Several POTWs joined the office in holding a series of workshops designed to promote source reduction and good management of hazardous wastes by pollution sources not usually visited by any POTW enforcement officer (e.g.; schools, printers, typesetters, medical facilities). As a result of this program OTA's project manager was made an honorary member of a newly created organization, the Massachusetts Pretreatment Forum (MPF), which is a self-help group of pretreatment officers. OTA has continued working with POTWs, organizing with POTWS three annual fora on silver recovery techniques, and has conducted a series of talks to MPF members on recognizing pollution prevention opportunities when inspecting facilities.

OTA also conducted a program in conjunction with the state's environmental enforcement agency, the Department of Environmental Protection,to bring source reduction practices to the Worcester region, to try out multi-media inspections, and to forge cooperative efforts between OTA's technical assistance program and the enforcement program. This program, the Central Mass Pollution Prevention Project, funded by an EPA grant and commonly known as the Blackstone Project, has demonstrated not just the success of a multi-media

POTWs. He has also been a visible advocate for pollution prevention at the MPF, and has been a member of the state's Toxics Use Reduction Advisory Board. He would be eminently suitable to oversee the critical parameters program, with the assistance of Rick Reibstein. Rick was the originator of the Office of Safe Waste's POTW program, and has worked with MPF members for over two years. He is an attorney and has been doing source reduction and toxics use reduction counseling for over three years. With Nikki Roy and Lee Dane, formerly of DEP and OSWM, he developed the original idea for the Blackstone Project.

Paul is currently assigned to expanding OTA's work to the Western region of the state, where very little has been done to date. Rick is currently overseeing the Merrimack Project, which will be located in the northeastern part of the state. OTA members Rich Bizzozero and Mitch Kennedy are assigned to the Southeast region, and Joe Paluzzi is continuing the Central Mass Pollution Prevention project described above.

The critical parameters project money would be used to hire an assistant to Paul Richard, who could work in any region where necessary, coordinating with the other programs. This person would also be detailed to work for periods of time at specific POTWs once a POTW has committed to work on an identified project. Some money would be used either to fund environmental sampling by POTWs or to hire certified analysts to do the sampling and lab work. Other money would be used to pay for technical assistance projects. Such money could be used, for example, to rent wet vacuum machines to demonstrate to a food processor an alternative to simply washing down floors. It could also be used to fly in experts from other states or countries, or to visit such sites where innovative approaches are being applied. It might be used to generate informational materials or fund a conference or public event to educate pollution dischargers. The exact budget for the expenditure of the non-personnel funds will depend on the results of the evaluation of critical parameters and the research to discover appropriate techniques to address critical problems has been accomplished. The following spending plan, therefore, sets aside a certain amount of funding for as yet undetermined specific items.

In the second year, OTA will announce that $12,000 is available in a competitive award for those POTWs that wish to conduct special projects that utilize pollution prevention principles or techniques to address problems concerning critical parameters.

Sept. 1991 - Sept. 1992

Critical Parameters Project Outline: Warren, Massachusetts

BACKGROUND: Warren, a rural community of 4,500, is located in the central region of Massachusetts. The major industrial discharger (user) to the POTW is a textile company.

The wastewater treatment plant servicing the town became operational on September 16, 1989. The cost of construction for the plant was ten million dollars. Construction was 75% federally funded and a 15% state match with the town funded the remaining 10%. Yearly operational and maintenance costs are $250,000. A three member Board of Commissioners administers the operation of the plant. Staffing consists of three full-time operators. The treatment plant consists of both primary and secondary treatment. Secondary treatment is achieved by rotating biological contactors. Design flow for the plant is 1.5 MGD with an average flow of .55 MGD.

The plant discharges into the Quaboag River, a class B Massachusetts river. N.P.D.E.S. limitations established for the plant are for conventional pollutants such as B.O.D., suspended solids, chlorine and fecal coliform. Additional requirements are quarterly testing for both acute and chronic toxicity. The last two analyses for toxicity failed to meet minimum survival rates. Continued failure to meet survival rates will result in the mandatory requirement that the plant perform a Toxic Reduction Evaluation (TRE). The estimated cost for this evaluation is $70,000 based on preliminary work done by the town's consulting engineer. Once the TRE source is identified, the town would be required to reduce the toxicity through many options. The most common are implementing a pretreatment program or imposing limits directly against an industrial user. For the user this usually means adding end of pipe treatment to meet the new limits.

The environmental and economic needs facing Warren are typical of many small Massachusetts towns. The results from this study should prove that both needs can be met without extensive end of pipe treatment and heavy costs being placed on either the rate payers or the industrial user.

PROJECT GOALS: Reduce the toxicity of the final effluent through pollution prevention practices at the major industrial user. Pollution prevention practices include source reduction, on-line recycling, chemical substitutions, improved housekeeping and maintenance practices. Implementation of these practices will be accomplished by voluntary participation from the Office of Technical Assistance (O.T.A.), the Local Board of Sewer Commissioners-POTW plant operator, and the major industrial user. The results of these efforts will be evaluated from a sampling program established at the POTW.

PROJECT WORK:

1. O.T.A. will gain voluntary support from the town, the POTW, and the major industrial user.

2. The group will develop and implement a sampling program at the treatment plant. This program will establish baseline levels and detect waste load reductions as they occur. The program will include analytical testing requirements. Once requirements are established the work group will determine those tests to be sent to an outside laboratory and those to be done in house by the POTW.

3. O.T.A. and the company will develop a systematic approach to evaluating pollution prevention opportunities at the plant. Once done, options will be rated according to ease and some implementation will begin. Any prevention projects requiring additional resources will be evaluated and effected according to grant resources and or available state T.U.R. program resources.

4. O.T.A. will attempt to facilitate the implementation of quality pollution prevention teams at the industrial user. The goal is to develop whole facility support from the employees.

5. Specialty workshops already developed as part of the O.T.A. Fall River initiative will be made available to the industrial user.

6. University resources will be applied where needed.

PROJECT NEEDS:

1. A commitment from all parties to work cooperatively to achieve project goals.

2. Schedule of progress for implementation of the project. The schedule will include milestone events, meeting dates, etc.

3. Laboratory facilities to support the POTW laboratory including containers, samplers, etc.

4. University intern students to assist in the project.

5. Develop resource material from national databases and other state pollution prevention programs.

6. Data management: for the sampling program and to track any cost saving the industrial user experiences as a result of pollution prevention projects.

COST: Project Grant	Project Match
	In kind services
Staffing..... $10,000	$5000 (O.T.A. and POTW)
Laboratory.....$10,000	$7000 (in house)
Resources workshops printed materials experts bench scale.....$5,000	Company Match (?)
Travel/Other... $5,000	

Summary:

Reports will be completed and sent to O.T.A. before June 1, September 1, December 1, 1992 and March 1, 1993. These reports will be designed as progress reports. The final report will document the results of the project. It will be evaluated for pollution prevention effectiveness and waste load reductions to the P.O.T.W. The final report will incorporate recommendations made by the group rating the project on its environmental, economic, technical and political merits.

The work plan is designed to be used as a guide for the project. It is possible that other influences could result in the need to modify the plan. If necessary, O.T.A., The Board of Sewer Commissioners-POTW operator and the Industrial User will adjust the program to meet the underlining goals of the project. If any major changes occur to this workplan O.T.A. will notify Deb Hanlin, the grant administrator of EPA.

CRITICAL PARAMETER PROJECT

NON-POINT SOURCE PILOT WORK PLAN

PURPOSE:

The City of Springfield plans to develop and implement a pollution prevention pilot program to reduce the non-point source pollutant load to the City's wastewater treatment plant. The pilot will be divided into stages that will include measuring non-point pollution from several sources, evaluating the effect of those pollutants on the wastewater treatment plant, developing a pollution prevention outreach education program to reduce those pollutant loads, and post outreach monitoring of the non-point sources to evaluate the effectiveness of the program.

BACKGROUND:

The City of Springfield operates a 67 million gallon per day (mgd) regional wastewater treatment plant (SRWTP) serving eight municipalities with a population of about 250,000. The treatment facility is the largest activated sludge facility in New England and is located on Bondi Island in Agawam, Massachusetts. From the 1940s until the 1970s the Bondi Island facility was one of two plants that treated the City's wastewater using grit removal and primary settling. The plant was upgraded to a regional secondar treatment facility in 1977, adding mechanical aeration, air floatation thickening and Zimpro sludge heat treatment. Presently the sludge is belt filtered and composted. The treatment plant maintains consistent compliance with its NPDES permit for discharge to a Class B waterway and the Massachusetts Land Application of Sludge and Septage Regulations for a Type II sludge.

In accordance with EPA pretreatment regulations, the City implemented an Industrial Pretreatment Program (IPP) in 1986 to control and limit the discharge of industrial wastes to the SRWTP. The industrial community is highly diversified and includes 52 Significant Industrial Users (SIUs) contributing about 8 mgd of industrial wastewater. The program required the SIUs to install, operate, and maintain a continuous wastewater monitoring station for the purpose of determining pretreatment compliance. A networked, personal computer system evaluates industry compliance and treatment process operation, and generates enforcement notices and annual IPP cost recovery bills. The IPP was audited by the Environmental Protection Agency (EPA) in 1989 and found in compliance with the conditions of the National Pretreatment Program.

The IPP investigated the effects of conservative toxic pollutants on the SRWTP during 1990 and 1991. The SRWTP has approximately 1? tons of biomass under aeration to absorb the impact of a toxi pollutant discharge and an additional 179 tons of biomass in the clarifiers and return channels to reseed the aeration basins. The data indicated that the SRWTP biomass was not inhibited by the load of antimony, arsenic, beryllium, cadmium, copper, chromium, nickel, lead, selenium, silver or zinc, and that those metals did not pass-through the SRWTP in toxic concentrations to the receiving stream. In addition, the SRWTP passed the four quarterly effluent bioassays that were recently mandated under the plant's revised 1991 NPDES permit.

The SRWTP plans on producing Massachusetts Type I sludge for composting and marketing as a soil conditioner. Three metals, cadmium, copper and nickel were present in the SRWTP sludge in concentrations that exceed 80% of the Type I sludge limits and were identified as critical parameters that must be controlled to meet the compost marketing goal. Cadmium was identified as the restricting pollutant that prevents the sludge from being classified as Type I. Cadmium was effectively controlled at the industrial point sources, and presently exhibits a higher load from non-industrial and/or non-point sources than from industrial point sources.

Approximately 1/3 of the City's sewer system is a combined sanitary and storm sewer system that discharges to the SRWTP. The storm sewer portion of that system serves commercial, industrial and residential areas that generate pollution from loading docks, parking areas, streets, driveways and lawns. No pollutant load data is available on the City's non-point sources, and flow estimates are based on pavement area and previous inflow and infiltration studies. It is believed that the residential and non-point source cadmium load restricts the SRWTP sludge distribution and marketing options.

PROJECT:

The City of Springfield will work with the Office of Technical Assistance (OTA) and conduct a pollution prevention pilot consisting of monitoring, educational outreach and evaluation. The effect of point source pollutants on the SRWTP is well documented, therefore the project will focus on non-point source pollutants that impact the SRWTP sludge. The project will quantify the non-point source pollutant load of cadmium, copper and nickel to the SRWTP by monitoring selected sections of the combined sewer system. Based on the monitoring data the City will coordinate a pollution prevention educational outreach project targeted at the storm sewer users in the study areas. The City will repeat monitor the storm sewer in each study area at the completion of the outreach program to evaluate the effect of pollution prevention education on the load of non-point source pollutants to the SRWTP. The City will draw on the resources of three Department of Public Works divisions: the IPP, the SRWTP and Engineering Division.

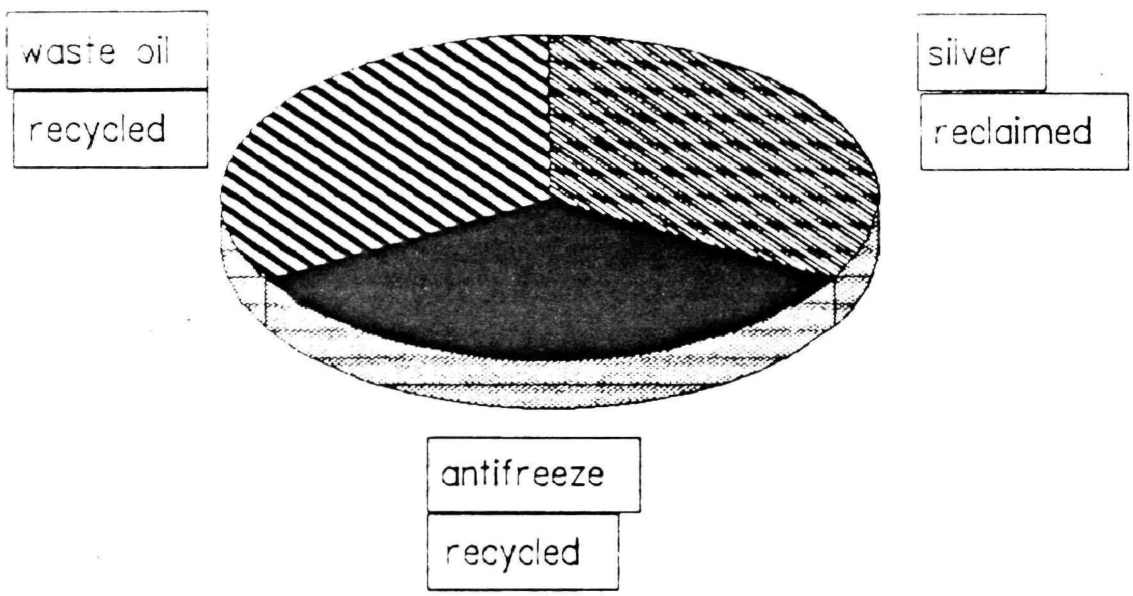
The Engineering Division will identify three storm sewer monitoring areas consisting of residential, commercial/light industrial and documenting all activities associated with the project and will report to the IPP management or delegate.

The project is scheduled to extend over a two year period and the research intern position will be budget for a $10,000 per year stipend. The SRWTP will provide a work area for the intern, the IPP will provide most of the material support and the grant will provide the stipend. A preliminary budget is delineated in Table 1. A job number system will be established by the IPP to track all contractual service, labor and material costs for the project.

REPORTS:

A project schedule will be developed by the IPP for submission to the OTA and Environmental Protection Agency (EPA). Progress reports will be filed with OTA by the IPP on May 15, August 15, November 15, and February 15. OTA will incorporate the information from those reports and submit progress reports to the EPA on June 1, September 1, December 1 and March 1. A final report will be developed by the IPP and the OTA upon completion of the evaluation phase and recommendations will be made to EPA on non-point source pollution prevention.

Pilot Pollution Prevention Project



The State of North Carolina's Pilot Approach to POTW Pollution Prevention

Presentedat EPA Grant Recipients Roundtable Meeting

February 6, 1992

Raleigh, NC

Major Project Goals:

- Create State-level Program Infrastructure
- Establish Local-level Program Structure
- Execution of Pollution Prevention Problem-solving
- Provide for Information Transfer

1. Create State-level Program Infrastructure:

Enhance & improve cooperative efforts between two established, successful programs

Integrate PP evaluation techniques into pretreatment program elements

Lay groundwork for new program elements such as TRAP

Provide example for other states

2. Establish Local-Level Program Structure:

Establish pilot PP program at a large POTW

Develop model PP program designed to meet needs of a small POTW

Establish additional POTW programs through the award of challenge grants

3. Execution of Pollution Prevention Problem-Solving:

Address specific pollution problem in model applications

Develop mechanisms for identifying and reducing uncontrollable sources through pollution prevention techniques

4. Provide for Information Transfer:

Document pilot program experiences

Produce and distribute guidance materials describing the development of POTW Pollution Prevention programs at the State & Local Level

Produce and distribute guidance for specific industries and/or specific waste types regarding PP techniques and their implementation

State Staff devoted to Project:

From Pretreatment Program: Project Manager and part-time services of State Coordinator and Environmental Engineer

From Pollution Prevention: One full-time Environmental Engineer and part-time services of Program Director and Environmental Chemist

Both programs will contribute clerical assistance

QTRLY Status Report:

- State hired engineering staff
- Negotiating contract with large POTW
- Reviewing existing info for specific problem

Cd Report Elledge May 1990 - April, 1991

Controllable	Permitted Flow (MGD)	Max Cd (Max)	No. Obs.	Average Flow (MGD)	Conc. mg/1)	lbs.
Metal Finishing Electroplater (10 facilities)	.211	.26	16/facility	.1290	* .0568 (.0025 - .420)	.0374 (3.9-4.5 %)
Uncontrollable						
Industrial Commercial (25 facilities)	7.190		16-48/facility	7.1974	* .0109 (.002-.015)	.5006 (52-60%)
Domestic				11.61	.003	.2904 (35-44%)
Septage				.0036	.088	.0026 (0.3%)
Influent	30			18.94	.0061	.964 41% R.
Effluent	30			18.94	.0036	.569

* Arithmetic Average for this category of facility during this time fram - not flow weighted.

Section V Program Example

1. Sanitation District of Orange County

HIGHLIGHTS OF WASTE MINIMIZATION
AT
THE COUNTY SANITATION DISTRICTS

100% Completion of Study

.50 120

Baseline monitoring.

7/25/91

INTRODUCTION TO THE COUNTY SANITATION DISTRICTS OF ORANGE COUNTY

Service Territory

- 439 Square Miles
- 29 Cities
- 9 Districts
- Number of Permittees:

Class I	=	429
Class II	=	337
Class III	=	215
Others	=	53
Total	=	1034

INTRODUCTION TO THE COUNTY SANITATION DISTRICTS OF ORANGE COUNTY (CONTINUED)

Industrial Source Control

1954 • First Ordinance

1970 • Industrial Waste Division Established

1976 • First Waste Minimization Outreach and Ordinance Revision to Include Heavy Metal Limits

1983 • Ordinance Revision to Include Enforcement of EPA's Federal Categorical Limits

1984 • Industrial Pretreatment Program Approved by EPA

1989 • Waste Minimization Policy Approved by Board of Directors

• Ordinance was revised

• Industrial Waste Division was renamed to Source Control Division

INTRODUCTION TO THE COUNTY SANITATION DISTRICTS OF ORANGE COUNTY (CONTINUED)

Treatment Plants

Treatment Plant No. 1:

- **Location - Fountain Valley**
- **Present Average Capacity - 97 MGD**
- **Masterplanned Expansion By Year 2020:**

219 MGD Average
408 MGD Maximum

10-15 Industrial \ Commercial Consumer.

Treatment Plant No. 2:

- **Location - Huntington Beach**
- **Present Average Capacity - 180 MGD**
- **Masterplanned Expansion By Year 2020:**

180 MGD Average
360 MGD Maximum

WASTE MINIMIZATION ACTIVITIES AT THE COUNTY SANITATION DISTRICTS OF ORANGE COUNTY

TIER 1	1984 - 1991	• Enforcement of Mass Emission Rates • Promoting Wastewater Reduction • Promoting Better Housekeeping • Enforcing Waste Minimization, and Permittee Assistance • Multi-Agency Coordination • Field Inspector Training • Workshops and Speakers • Mass Mailings • Information Clearinghouse • Results
TIER 2	1992 and Beyond	• Advanced Planning • Enforcement and Implementation • Workshops • Multi-Agency Coordination

TIER 1 - WASTE MINIMIZATION ACTIVITIES
1984 - 1991

ENFORCEMENT OF MASS EMISSION RATES

- To control and reduce the quantity of toxic materials discharged by permittees to the Districts' sewer system and to prevent dilution, mass emission limits (instead of concentration limits) were determined and enforced based on the standard water usage at each permittee's facility.

lbs / day

Ind. conc. avg + lbs/day

PROMOTING WASTEWATER REDUCTION

- As part of the pretreatment program, the Districts required the permittees to have flow restrictors or control valves to assure wastewater reduction and avoid dilution. The permittees' facilities are inspected and checked for water conservation control equipment at least annually.

1 violation = weekly self-monitoring required by industry

TIER 1 - WASTE MINIMIZATION ACTIVITIES 1984 - 1991 (CONTINUED)

PROMOTING BETTER HOUSEKEEPING AND INSTALLATION OF BASIC WASTE MINIMIZATION EQUIPMENT

- Through permitting and enforcement activities, the Districts promoted and implemented good housekeeping practices and installation of waste minimization equipment (such as waste segregation, installation of dragout tanks/trays, spray rinses, and flow restrictors) to reduce the volume of waste generated and the cost of the pretreatment system and user charges (economic incentive).

ENFORCING WASTE MINIMIZATION, AND PERMITTEE ASSISTANCE

- All permittees in violation with discharge limits are required to implement waste minimization techniques and are provided advice, checklists, and information in conjunction with enforcement activities.

  Permit application supplements containing plant-wide and process-specific waste minimization checklists will be implemented shortly.

  Selected Source Control Division staff respond to all permittee inquiries.

TIER 1 - WASTE MINIMIZATION ACTIVITIES
1984 - 1991
(CONTINUED)

MULTI-AGENCY COORDINATION	•	A multi-agency county task force on waste minimization provides interagency contact and coordination of workshops and technology transfer. The Districts are voluntarily participating in a four-county, "Technical and Educational Assistance Model Project" which is demonstrating multi-agency coordination of waste minimization promotion.
FIELD INSPECTOR TRAINING	•	A training program for field inspectors is being developed into ten 2-hour sessions. A multimedia oriented training is planned for implementation in late 1991.
WORKSHOPS AND SPEAKERS	•	Three workshops organized in cooperation with the University of California on "Industrial Wastewater Treatment and Waste Reduction". A workshop on "Switching from Solvents to Water-Based Cleaning Processes" was sponsored. Speakers at industry association meetings to discuss industrial waste ordinance and promote waste reduction.

TIER 1 - WASTE MINIM TION ACTIVITIES
1984 - 1991
(CONTINUED)

MASS MAILINGS

- Mass mailings are made to notify permittees of government grant funds available and upcoming meetings, conferences, and workshops on industrial waste minimization.

INFORMATION CLEARINGHOUSE

- A library and supporting computer database of over 300 publications on waste minimization have been assembled for Districts' staff and permittees' reference.

RESULTS

- Reduction of toxics by the Source Control program and enforcing mass emission rates have been so effective that for the last three years, the influent metals to the Districts' plant meet the effluent standards.
- The influent heavy metals have been reduced about 50% during the past five years.
- Over 95% of all the metal finishers and categorically regulated industries have flow restrictors or control valves to reduce the water usage and installed the basic waste minimization equipment to reduce the volume of hazardous wastes and wastewater discharge to the sewer system.

TIER 2 - WASTE MINIMIZATION ACTIVITIES 1992 AND BEYOND

ADVANCED PLANNING

- Determine pollutants of concern.
- Determine sources (industrial, commercial, domestic).
- Evaluate pollutant management alternative:
  - Minimization of waste materials.
  - Conversion of hazardous waste into non-hazardous or less hazardous waste.
  - Perpetual storage.
- Evaluate economic feasibility of pollutant management alternative and available techniques.
- Evaluate effectiveness.
- Establish preferred waste management alternative.
- Establish pollution prevention strategies (waste minimization techniques, product bans, recovery systems) and standards for implementation.

ENFORCEMENT & IMPLEMENTATION

- Enforce pollution prevention standards to the applicable sources through the permitting process.
- Mandate installation of waste minimization equipment.
- Mandate reuse/recycle of material and process wastewater.
- Mandate product bans and material substitution.
- Mandate extended water conservation for commercial and domestic sources, if necessary.

TIER 2 - WASTE MINIMIZATION ACTIVITIES
1992 AND BEYOND
(CONTINUED)

WORKSHOPS	•	Workshops for promoting advanced technologies for waste reduction will be held in cooperation with University Institutes, industrial/commercial communities, the U.S. EPA pollution prevention technology transfer and information exchange, and industrial associations.
MULTI-AGENCY COORDINATION	•	The pollution prevention strategies and advance planning will be coordinated within a multi-agency task force as needed. Multi-agency cooperation on advanced planning studies and technology transfer will be a goal.

APPENDICES

a. Agenda

b. List of Attendees

c. Case studies from PPIC

Pollution Prevention in Publicly Owned Treatment Works

EPA Grant Recipients Roundtable Meeting

DATE: February 6 and 7, 1992
TIME: 9:00am-4:00pm
LOCATION: State of North Carolina Archibald Bldg.
512 N. Salisbury St., Raleigh, N.C.

The purpose of this meeting is to develop a network of people and agencies that are interested in promoting pollution prevention in POTW's, pre-treatment programs and MWPP. The attendees will share ideas, problems, and goals associated with this pilot project.

AGENDA

Feb. 6

Morning

1. States will describe the pilot programs. Each of the five grant recipient will have 20 minutes to discuss their approach to this project. The first quarterly report will be presented orally by state participants . Q&A /discussions

9:00-9:30	Welcome and Introductions	Deborah Hanlon
9:30-10:00	Utah P2 Program	Mary DeLaretto
10:-10:30	New Mexico	Alex Puglisi
break		
10:45-11:15	Minnesota	Kevin McDonald
11:15-11:45	Massachusetts Critical Mass P2	Paul Richards
11:45-12:15	North Carolina	Trevor Clements

Lunch Break

Afternoon

2. Examples and case studies from other POTW's and state programs that provide pollution prevention technical assistance will be presented. Participants will share ideas on how Regions and states can assist in training, coordination, and in conducting joint inspections.

1:30-2:00 Sanitation District of Orange County — Mahin Talibei

2:00-2:30 Case Study from North Carolina — Stephanie Richardson

Break

3:00-4:00 -Group Problem Solving and Discussion — Hanlon

Discussion issues:
- Future funding options
- Measuring progress and results
- PublicizIng programs

Feb. 7

Morning

1. EPA will discuss reporting requirements and expectations. Participants will discuss needs and availability of resources. EPA Project Officer, regional coordinators, State Pollution Prevention Programs, MWPP and Pre-treatment program coordinators will share perspectives on this project.

9-10 What are your resource needs? What resources are available?
PPIC, Grant Programs, etc. — Hanlon, Hann,
Southeast Waste Reduction Cente — Bob Carter

10-12:00 EPA HQ and Regions/ Perspective on Grant Projects:

MWPP	Valerie Martin
Pre-treatment	
Permits	Wendy Bell
Enforcement	Walter Brodtman
Reporting Requirements	Lena Hann

Lunch

1:30-3:00 Tour of Raleigh POTW

*Agenda subject to change

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Following are some of the more than 120 case studies on the PIES database dealing with wastewater:

****
****
***** DOCNO: DOCUMENT NOT AVAILABLE *****

1.0 Headline: Reuse of Water in a Woollen mill

2.0 SIC Code: 2299, Textile Goods, NEC

3.0 Name & Location of Company: Shanghai Second Woollen Mills, Shanghai, China

4.0 Clean Technology Category
This technology involves the recycling and reuse of wastewater

5.0 Case Study Summary

5.1 Process and Waste Information: Coloured wastewater effluents from two workshops at a woollen mill were treated using dissolved air flotation and biological towers. Decolorization was achieved by coagulation and adsorption with activated carbon. After biological treatement and decolorization, the wastewater was diluted with 20% tap water. This water was used to prepare dyeing liquors. A neutral dye and a mordant dye were selected. The dyeing recipe w adjusted to account for the effect of hexavalent chromium ion present in low concentrations in the reuse water.

5.2 Scale of Operation: Information not provided

5.3 State of Development: Pilot stage field experiments were performed

5.4 Level of Commercialization: Information not provided

5.5 Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:	N/A	N/A
Feedstock Use:		
$Al2(SO4)3$	120 ?/day	156 ?/day
Activated Carbon	--	300 ?/day
Water Use:	1450 m3/day	300 m3/day
Energy Use:		
Electricity	420?/day	650?/day

6.0 Economics

6.1 Investment Costs: Information not provided

6.2 Operational and Maintenance Costs: Operational use of activated carbon reported to cost 12 Yuan/day (1974). An increase in energy use resulted in a net cost increase of 23 Yuan/day. Wastewater treatment costs increased by 46

Yuan/day. Costs of $Al_2(SO_4)_3$ increased by 13 Yuan/day.

6.3 Payback Time: Information not provided

7.0 Cleaner Production Benefits: Economic benefits were calculated to be 90 Yuan/day (1974) and resulted form the decreased use of tap water.

Use of the technology minimizes discharges of coloured wastewater

8.0 Obstacles, Problems and/or Known Constraints

Economic feasibility of the technology depends on the availability of activated carbon, and the lack of costs associated with carbon regeneration in this case.

9.0 Date case study was performed: 1974 and 1976

10.0 Contacts and Citation

10.1 Type of Source Material: Conference Proceedings

10.2 Citation: A Study on Reuse of Water in a Woollen Mill. Hu Hiajue et al. Purdue Universty Conference on Industrial Waste Treatment

10.3 Level of Detail of Source Material: Additional information is available in the source material

10.4 Industry/Program Contact and Address: Industry contact not provided

10.5 Abstractor and Address: Reformatted: Isaac Diwan, SAIC, 8400 Westpark Dr., McLean, VA 22102

11.0 Keywords

11.1 Waste Type: Coloured water

11.2 Process Type/Waste Source:

11.3 Waste Reduction Technique:

11.4 Other Keywords:

12.0 Assumptions: None

13.0 Peer Review: Unknown

KEYWORDS: CLOURED WATER, WASTEWATER REUSE, TEXTILES

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Displaying item number 78

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***** DOCNO: DOCUMENT NOT AVAILABLE *****

1.0 Headline: Water Conservation in a Textile Industry.

2.0 SIC Code: 22, Textile Mill Products

3.0 Name and Location of Company: Binny Textile Mills, Madras, India.

4.0 Clean Technology Category: This case study focusses on reuse of wastewaters and water conservation.

5.0 Case Study Summary:

5.1 Process and Waste Information: Four areas within the facility are the major wastewater producers: (1) process and treatment department; (2) captive power generation unit (coal fixed thermal power station); (3) sizing department; and (4) yarn dyeing and printing department. The following changes were undertaken to conserve water and reduce wastewater generation.

Reuse of pressure filters backwash water. Suspended solids that can easily settle are the main pollutants in pressure filter backwash water. By collecting the backwash water in a pond, with a minimum hydraulic retention time of 12 hours, the supernatant freed from the suspended solids can be reused for gardening purposes. Periodically, the retained suspended solids are removed from the pond and disposed of a solid waste in a landfill site. The net effect is conservation of 20 cubic meters/day of fresh water, which the facility used for gardening purposes.

Reuse of wastewater from the dyeing and finishing department. About 1,200 cubic meters/day of fresh water, including the evaporation loss, was used for quenching hot ash from the boiler house prior to its disposal. Laboratory experiments confirmed that it is feasible to reuse hard to treat wastewater from the dyeing department for ash quenching in lieu of fresh water. Due to adsorption of colors and dyes on the ash particles, there is a approximately a 20% reduction in BOD content in the reused dye department wastewater. Approximately 1,200 cubic meters per day of fresh water was conserved, with a reduction of 552 kg. BOD/day.

Reuse of wastewater from the sizing department. In order to avoid spontaneous combustion and to reduce the fines loss, freshwater was used to wet coal in the yard. By collecting in a pond the low volume, high organic strength wastewater from the sizing department, all of the wastewater could be reused for coal wetting. Appropriate facilities must be available at the pond to avoid septicity. Wastewaters from the sizing department were completely reused and 27 cubic meters per day of fresh water were conserved.

5.2 Scale of Operation: Unknown.

5.3 Stage of Development: The technology was fully implemented.

5.4 Level of Commercialization: Not applicable.

5.5 Material/Energy Balances and Substitutions:

6.0 Economics*

6.1 Investments Costs: Investment costs include the facility for pH neutralization pumps and pipeline costs.

6.2 Operational & Maintenance Costs: Savings and reduction in the capital investment is Rs. 7 lakhs annually, and annual O&M costs are Rs. 6 lakhs. Annual savings for 300 workings days per year for purchase of fresh water from the municipal corporation totalled Rs. 4 per cubic meter.

6.3 Payback Time: Not reported.

7.0 Cleaner Production Benefits: Wastewater reused equals 2,690 cubic meters per day and freshwater consumption was reduced 1.227 cubic meters per day. The overall reduction in wastewater quantity and BOD load were 31% and 25% respectively.

8.0 Obstacles, Problems, and/or Known Constraints: Not available.

9.0 Date Case Study Was Performed: 1984

10.0 Contacts and Citation

10.1 Type of Source Material: Unpublished materials.

10.2 Citation: Mr. L. Paneerselvam, Director (PC), National Productivity Council, Lodhi Road, New Delhi 110 003, India.

10.3 Level of Detail of Source Material: Unknown.

10.4 Industry/Program Contact and Address: Unknown.

10.5 Abstractor Name and Address: Mary L. Wolfe, Science

Applications International Corporation, 8400 Westpark Drive, McLean, VA 22102.

11.0 Keywords

11.1 Waste type: Wastewater.

11.2 Process Type/Waste Source: Textile Mill Products, SIC Code 22.

11.3 Waste Reduction Technique: Wastewater Reduction.

11.4 Other Keywords:

12.0 Assumptions: The information in this case study was derived from abstracts provided by the United Nations Environment Program (Paris). This abstract was prepared directly from the abstract without access to the case study cited.

13.0 Peer Review:

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations, and other factors.

KEYWORDS: Wastewater, Textile Mill Products, SIC Code 22, Wastewater Reduction

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Displaying item number 79

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***** DOCNO: DOCUMENT NOT AVAILABLE *****

1.0 Headline: Elimination of the Problems of Sulfides by Chemical Substitution in the Textile Industry

2.0 SIC Code: 22, Textile Mill Products

3.0 Name and Location of Company: Century Textiles and Industries Limited, Worli, Bombay 400 025, India.

4.0 Clean Technology Category: This case study presents chemical substitutions for sulphur dyes.

5.0 Case Study Summary:

5.1 Process and Waste Information: Sulphur dyes are water insoluble and must be converted into a water soluble (leuco) form before application to textile materials. The traditional method is treatment with an aqueous solution of sodium sulfide. Since the leuco compounds have an affinity for cellulosic fibers and are sensitive to atmospheric oxygen, they must be applied from the aqueous solution. After the dye has been absorbed on the fiber surface, the reduced form of the dye must be reconverted into the water insoluable form. Generally, this is carried out through exposure to air or by using a chemical oxidizing agent.

Black dye is an important member of the sulfur series due to its fastness in washing and light and its low cost as compared to other synthetic dyes. It is converted using the process described above. The facility encountered difficulties, however, when the State pollution control board established a 2 ppm maximum sulfide content for treated effluent from textile mills.

Rather than attempt to reduce the sulfide in the effluent, the facility sought options to reduce or replace the sodium sulfide. During studies conducted by the facility, it was discovered that an alkaline solution of glucose can satisfactorily reduce the sulfur colors, enabling the facility to substitute the glucose solution for the sodium sulfide. Because the glucose solution prepared in the studies would be cost prohibitive, the facility sought an inexpensive source of glucose. This lead to the use of liquid glucose, a by-product of the starch industry.

The facility replaced 100 parts sodium sulfide (50%) with 61 parts liquid glucose (80% solids) and 26 parts caustic soda in its sulfur black color dye operations. The facility continued to have difficulties with this mixture because the thick glucose solution required special arrangements for emptying drums. The operation was still cost intensive.

The facility finally substituted an alkaline solution from sugar reduction for the sodium sulfide. A by-product containing 50% reducing sugars was technologically and financially feasible. The facility substitutes 100 parts sodium sulfide (50%) with 65 parts of the product (containing 50% reducing sugars) plus 25 parts caustic soda. Dye qualities were equivalent to the standard process for depth of shades, fastness, and other properties.

5.2 Scale of Operation: Unknown.

5.3 Stage of Development: The technology is fully implemented.

5.4 Level of Commercialization: The substitute materials are commercially available.

5.5 Material/Energy Balances and Substitutions:

6.0 Economics*

6.1 Investments Costs: No capital expenditure was involved.

6.2 Operational & Maintenance Costs: Not provided.

6.3 Payback Time: Not applicable.

7.0 Cleaner Production Benefits: The facility met the mandatory effluent level for sulfide and eliminated the foul smell of sulfide in the workplace.

8.0 Obstacles, Problems, and/or Known Constraints: The high cost of glucose was the main constraint in making the technology have practical applications. Further, the glucose solution required special handling when drums were emptied and solution replacement was cost intensive. These problems were resolved by the use of suitable by-products containing reducing sugars.

9.0 Date Case Study Was Performed: 1990.

10.0 Contacts and Citation

10.1 Type of Source Material: Unpublished materials.

10.2 Citation: Mr. Mahesh A. Sharma, Chief Chemist, Century Textiles and Industries Limited, Worli, Bombay 400 025, India.

10.3 Level of Detail of Source Material: Unknown.

10.4 Industry/Program Contact and Address: See citation.

10.5 Abstractor Name and Address: Mary L. Wolfe, Science Applications International Corporation, 8400 Westpark Drive, McLean, VA 22102.

11.0 Keywords

11.1 Waste type: Wastewater.

11.2 Process Type/Waste Source: Textile Mill Products, SIC Code 22.

11.3 Waste Reduction Technique: Chemical Substitution

11.4 Other Keywords:

12.0 Assumptions: The information in this case study was derived from abstracts provided by the United Nations Environment Program (Paris). This abstract was prepared directly from the abstract without access to the source material cited.

13.0 Peer Review:

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations, and other factors.

KEYWORDS: Wastewater, Textile Mill Products, SIC Code 22, Chemical Substitution

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Displaying item number 80

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***** DOCNO: DOCUMENT NOT AVAILABLE *****

1.0 Headline: Dye-bath Reuse in Carpet Dyeing

2.0 SIC Code: 2273, Carpets and Rugs; 22, Textile Mill Products

3.0 Name and Location of Company: Bigelow, USA

4.0 Clean Technology Category: Recycle and Reuse

5.0 Case Study Summary:

5.1 Process and Waste Information: Carpets were dyed with conventional procedures and then with dye-bath reuse. Data on pollution reduction showed significant improvements due to dye-bath reuse. Dyeings in Bigelow production runs were done on two different shades and styles of carpet. A pair of conventional atmospheric becks were used and dye-bath was pumped back and forth between them. Over twenty reuse cycles could be obtained.

5.2 Scale of Operation: Unknown.

5.3 Stage of Development: The technology was fully implemented at the facility.

5.4 Level of Commercialization: Not applicable.

5.5 Material/Energy Balances and Substitutions:

6.0 Economics*: A savings of $60,000 per pair of becks.

7.0 Cleaner Production Benefits: The consumption of dyes was reduced, thereby lowering the cost of effluent treatment.

8.0 Obstacles, Problems, and/or Known Constraints: None reported.

9.0 Date Case Study Was Performed: 1983

10.0 Contacts and Citation

10.1 Type of Source Material: Journal.

10.2 Citation: Berganthal, J. et. al., "The Case for Direct Dye-bath Reuse," Carpet and Rug Industry, October 1984, p. 16.

10.3 Level of Detail of Source Material: Unknown.

10.4 Industry/Program Contact and Address: Unknown.

10.5 Abstractor Name and Address: Mary L. Wolfe, Science Applications International Corporation, 8400 Westpark Drive, McLean, VA 22102.

11.0 Keywords

11.1 Waste type: Dye; Wastewater.

11.2 Process Type/Waste Source: Carpets and Rugs, SIC Code 2273; Textile Mill Products, SIC Code 22.

11.3 Waste Reduction Technique: Reuse, dye bath reuse.
11.4 Other Keywords:

12.0 Assumptions: The information in this case study was derived from abstracts provided by the United Nations Environment Program (Paris). This abstract was prepared directly from the abstract without access to the journal article cited. It is not known if the economic data is based on annual savings.

13.0 Peer Review:

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations, and other factors.

KEYWORDS: Dye; Wastewater, Carpets and Rugs, SIC Code 2273; Textile Mill Products, SIC Code 22, Reuse, dye bath reuse.

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Displaying item number 81

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***** DOCNO: DOCUMENT NOT AVAILABLE *****

1.0 Headline: Nordic Project on Water Used Reduction in Textile Industries

2.0 SIC Code: 22, Textile Mill Products

3.0 Name and Location of Company: 15 textile facilities in Denmark, Finals, Norway, and Sweden.

4.0 Clean Technology Category
Process/Equipment Modification: This technology involves the introduction of automatic water stops to encourage water conservation.

5.0 Case Study Summary:

5.1 Process and Waste Information: Between 1976 and 1981, a Nordic "water care" project was launched to examine avenues of water conservation in textile industries in Denmark, Finland, Norway, and Sweden.

The following changes were reported for batch operations:

* Winch dyeing: By dropping the dye batch and avoiding overflow rinsing, water consumption could be reduced 25%.

* High and Low Pressure Jet Dyeing: Approximately 50% of water consumption could be reduced by replacing the overflow with batchwise rinsing.

* Beam Dyeing: Avoiding overflow during soaking and rinsing can reduce water consumption by approximately 60%.

* Jig Dyeing: Switching to stepwise rinsing from the overflow practice resulted in water consumption reductions of 15%-79%.

* Cheese Dyeing Apparatus: A water consumption reduction of 70% can be expected with the use of an intermittent rinsing procedure.

For continuous operations, a savings of 20%-30% was reported by the introduction of automatic water stops. Counter current washing was found to be most effective. Horizontal washing equipment was found to deliver the performance of two vertical washing machines for the same water consumption.

5.2 Scale of Operation: Initially, laboratory studies were carried out to ascertain potential possibilities. Approximately 25 setups were installed at 15 textile plants.

5.3 Stage of Development: At the time the case study was reported, the technology was in the pilot stage.

5.4 Level of Commercialization: It is unknown whether the technology was commercially available at the time of the case study.

5.5 Material/Energy Balances and Substitutions:

6.0 Economics:

6.3 Payback Time: The only technology with a known payback time is beam dyeing, which has a payback time of about four months.

7.0 Cleaner Production Benefits: Substantially reduced fresh water consumption and reduced cost of effluent treatment plant.

8.0 Obstacles, Problems, and/or Known Constraints: None reported.
9.0 Date Case Study Was Performed: 1976

10.0 Contacts and Citation

10.1 Type of Source Material: Conference Proceedings.

10.2 Citation: H. Asnes, "Reduction in Water Consumption in the Textile Industry," IFATCC Conference, London, 1978.

10.3 Level of Detail of Source Material: Unknown.

10.4 Industry/Program Contact and Address: Unknown.

10.5 Abstractor Name and Address: Mary L. Wolfe, Science Applications International Corporation, 8400 Westpark Drive, McLean, VA 22102.

11.0 Keywords

11.1 Waste type: Wastewater.

11.2 Process Type/Waste Source: Textile Mill Products, SIC Code 22.

11.3 Waste Reduction Technique: Wastewater Reduction, Equipment Modification.

11.4 Other Keywords:

12.0 Assumptions: The information in this case study was derived from abstracts provided by the United Nationals Environment Program (Paris). This abstract was prepared directly from the abstract without access to the conference proceedings cited.

13.0 Peer Review:

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations, and other factors.

KEYWORDS: Wastewater, Textile Mill Products, SIC Code 22, Wastewater Reduction, Equipment Modification.

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Displaying item number 82

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***** DOCNO: DOCUMENT NOT AVAILABLE *****

1.0 Headline: Heat Recovery in Textile Industry.

2.0 SIC Code: 2259, Knitting Mills NEC; 22, Textile Mill Products

3.0 Name and Location of Company: Ellen Knitting Mills, Spruce Pine, North Carolina, USA.

4.0 Clean Technology Category: This case study presents heat recovery technology.

5.0 Case Study Summary:

5.1 Process and Waste Information: The temperature of the dye bath water, which was discharged to the municipal sewer system, was 123 Deg. F. The water temperature cause breakage of the terra cotta sewer piping. To alleviate this problem, heat recovery was required.

Spent dye water is discharged into a holding vat from which it enters a stainless steel heat exchanger. The exchanger is composed of five 50-foot long, eight-inch diameter pipes. Inside each pipe is a bundle of smaller tubes that allow heat transfer. Heat recovered from the water is used to preheat incoming feed water from the dye tubes from 55 Deg. F to about 105 Deg. F. The preheating operation saves about 52,000 gallons of fuel oil per year.

5.2 Scale of Operation: Unknown.

5.3 Stage of Development: The technology is fully implemented at the facility.

5.4 Level of Commercialization: Unknown.

5.5 Material/Energy Balances and Substitutions:

6.1 Investments Costs: In 1981, the company invested $100,000 in a heat exchange system.

6.2 Operational & Maintenance Costs: Not reported.

6.3 Payback Time: Not reported.

7.0 Cleaner Production Benefits: The facility reduced its fuel oil use.

8.0 Obstacles, Problems, and/or Known Constraints: Unknown.
9.0 Date Case Study Was Performed: 1981

10.0 Contacts and Citation

10.1 Type of Source Material: Government publication.

10.2 Citation: Profits of Pollution Prevention: A Compendium of North Carolina Case Studies, North Carolina Department of Natural Resources and Community Development, North Carolina.

10.3 Level of Detail of Source Material: Unknown.

10.4 Industry/Program Contact and Address: Unknown.

10.5 Abstractor Name and Address: Mary L. Wolfe, Science Applications International Corporation, 8400 Westpark Drive, McLean, VA 22102.

11.0 Keywords

11.1 Waste type: Wastewater.

11.2 Process Type/Waste Source: Textile Mill Products, SIC Code 22.

11.3 Waste Reduction Technique: Heat Exchange.

11.4 Other Keywords:

12.0 Assumptions: The information in this case study was derived from abstracts provided by the United Nationals Environment Program (Paris). This abstract was prepared directly from the abstract without access to the publication cited.

13.0 Peer Review:

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations, and other factors.

KEYWORDS: Wastewater, Textile Mill Products, SIC Code 22, Heat Exchange.

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Displaying item number 83

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***** DOCNO: 400-121-A *****

1.0 Headline: Zinc Recovery in the Rayon Industry in Netherlands.

2.0 SIC Code: 22, Textile Mill Products

3.0 Name and Location of Company: Enka B.V., Velperweg, Kleefsewaard at Arnheim, Netherlands.

4.0 Clean Technology Category: This case study addresses recovery of zinc.

5.0 Case Study Summary:

5.1 Process and Waste Information: The main production steps in the rayon industry are (1) the reaction of cellulose with sodium hydroxide, followed by pressing and grinding; (2) the reaction of sodium-cellulose with carbon disulfide; (3) the creation of a solution of reaction product in water, called viscose; (4)the spinning of viscose by injection through a spinning head into a spinning bath, where the viscose is transformed into cellulose yarn by coagulation; and (5) finishing of rayon tire cord by washing, lubrication, and drying.

During the spinning process, zinc sulphate is used to slow down the formation of the yarn. This is necessary in order to obtain the desired strength and elongation of the yarn. The wastewater from the spinning process contains mainly sulfuric acid, sodium sulphate, and zinc salts. This wastewater is treated in the biological wastewater treatment plant. Removal of zinc++ is effected by precipitating it to form inert zinc sulfides.

The biological sludge containing this zinc sulfide is dumped on the land. For the wastewater, the discharge draft standard for zinc in some areas of the Netherlands is 20 kg/day. The maximum allowable amount of zinc in any given sample of wastewater effluent is 3 mg/liter. Over a 24-hour period the maximum allowable zinc content in the wastewater effluent is 2 mq/liter.

The low-waste technology concerns the recovery and recycling of zinc from the acid effluent of the rayon spinning process. The zinc++ containing acid effluent is treated with a mixture of D.E.H.P.A. (10%) and solvesso 150 (90%). The ratio of acid effluent to organic solvent is generally less than one. Treatment occurs in a tank fitted with agitators. The dispersed water and organic solvent is transported to a separation tank in order to obtain separation between water and the organic phase. The extraction process is carried out in three steps with counter-flow of the effluent and the organic solvent. The reaction product of zinc++ and D.E.H.P.A. dissolves in the organic phase. This organic phase has to be stripped in order to recover the zinc++.

In order to obtain high efficiency of zinc++ removal, the pH of the water phase must be controlled by addition of sodium hydroxide. During the first extraction step the pH is greater than 2.8 and afterwards it is greater than 3.0. The zinc++ removal efficiency is generally more than 98%. The zinc-free water phase is neutralized and charged together with 10 times the amount of caustic wastewater in the wastewater treatment plant. The effluent from the wastewater treatment plant is dumped together with three times the amount of other wastewater into open water.

To recover the zinc++ from the organic extraction solvent, the solvent is stripped with a water-based solution of sulfuric acid (20%) and a flocculent. This is, however, a one-step process. During stripping, the zinc++ is re-worked as zinc sulphate. It dissolves in the waster phase. This solution is used again in the spinning process. The addition of a flocculent is essential in order to obtain high efficiency of zinc++ recovery and to prevent large losses or organic solvent. This flocculent neutralizes the cation-active substances.

The zinc++ recovery efficiency is about 100%.

5.2 Scale of Operation: The plant maximum capacity for treatment is 40 cubic meters of effluent per hour.

5.3 Stage of Development: The technology is fully implemented.

5.4 Level of Commercialization: Unknown.

5.5 Material/Energy Balances and Substitutions: Figures based on tone of rayon tire cord production in the effluent discharge.

6.0 Economics*

6.1 Investments Costs: While the total investment for the conventional process is 2,000,000 Fl, the investment for the low-waste technology is 5,600,000 Fl. The cost of rayon tire cord per year increases from 70 Fl for the conventional method to 85 Fl for the low-waste technology. Zinc recovery results in savings of 225,000 Fl per year.

6.2 Operational & Maintenance Costs: Unknown.

6.3 Payback Time: Unknown.

7.0 Cleaner Production Benefits: Because the zinc removal efficiency is high, there are economic benefits as well as regulatory benefits.

8.0 Obstacles, Problems, and/or Known Constraints: Not available.

9.0 Date Case Study Was Performed: 1982

10.0 Contacts and Citation

10.1 Type of Source Material: United Nations document.

10.2 Citation: United Nations Economic and Social Council, Economic Commission for Europe, Compendium on Low- or Non-Waste Technology, Monograph ENV/W).2/5/Add.121, May 1985.

10.3 Level of Detail of Source Material: Unknown.

10.4 Industry/Program Contact and Address: Unknown.

10.5 Abstractor Name and Address: Mary L. Wolfe, Science Applications International Corporation, 8400 Westpark Drive, McLean, VA 22102.

11.0 Keywords

11.1 Waste type: Wastewater.

11.2 Process Type/Waste Source: Textile Mill Products, SIC Code 22.

11.3 Waste Reduction Technique: Wastewater Reduction, Reuse, Recovery.

11.4 Other Keywords:

12.0 Assumptions: The information in this case study was derived from abstracts provided by the United Nations Environment Program (Paris). This abstract was prepared directly from the abstract without access to the document cited.

13.0 Peer Review:

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations, and other factors.

KEYWORDS: Wastewater, Textile Mill Products, SIC Code 22, Wastewater Reduction, Reuse, Recovery.

Displaying item number 84

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Document No.: 327-005-A-000

1.0 Headline: Cadmium Waste Management Progam Utilizes Good Operating Practices to Reduce Generation of Metal Hydroxide Sludge at A Plating Facility

2.0 SIC Code: 3471, Electroplating, Plating, Polishing, Anodizing and Coloring

3.0 Name & Location of Company

Bass Plating Company
Old Windsor Road
Bloomfield, Connecticut

4.0 Clean Technology Category: The technology involves implementation of good operating practice and waste minimzation options such as increasing drip times, elevating plating bath temperatures, improving drip containment and redesigning plating racks.

5.0 Case Study Summary

5.1 Process and Waste Information: The company specializes in zinc, cadmium, nickel-cadmium, and tin plating and passivating. Metal hydroxide sludge is generated from the three plating lines which all contain cadmium. The company conducted a waste minimization assessment at the facility.

Many of the low-cost, good operating practice and waste minimization options identified were implemented. These included increasing drip times, elevating plating bath temperatures, improving drip containment and redesigning plating racks.

5.2 Scale of Operation: The company employs 35 people.

5.3 Stage of Development: The options identified above have been implemented. Other options have been identified which may be implemented in the future.

5.4 Level of Commercialization: The technology is fully commercialized.

5.5 Material/Energy Balances and Substitutions:

Information not provided.

6.0 Economics*

6.1 Investment Costs: The cost was reported as $12,000.

6.2 Operational & Maintenance Costs: Savings in operating expenses were reported as $96,100 per year.

6.3 Payback Time: Payback period is 5.8 months.

7.0 Cleaner Production Benefits: 120 tons of metal hydroxide sludge were expected to be generated in 1989, representing a 15% decrease in sludge generation in 1988.

8.0 Obstacles, Problems, and/or Known Constraints: None reported.

9.0 Date Case Study Was Performed: The project was completed in June 1989.

10.0 Contacts and Citation

10.1 Type of Source Material: Technical assistance program summary

10.2 Citation: ConnTAP Matching Challenge Grants - 1988-89, Connecticut Hazardous Waste Management Service, pp. 4-5. "Summary Report, Cadmium Waste Management Program, Bass Plating Company," Bass Plating Company, June, 1989.

10.3 Level of Detail of the Source Material: Additional information is available concerning the funding of this project.

10.4 Industry/Program Contact and Address: Rocco Mastrobattista, Project Manager, Bass Plating Company, Old Windsor Road, Bloomfiled, CT 06002, (203) 243-2557.

11.0 Keywords

11.1 Waste type: wastewater, plating baths

11.2 Process type/waste source: electroplating, zinc plating, cadmium plating, tin plating, passivating, SIC Code 3471

11.3 Waste reduction technique: drip confinement, process redesign, equipment modification

11.4 Other keywords:

12.0 Assumptions

None

13.0 Peer Review: Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: wastewater, plating baths, electroplating, zinc plating, cadmium plating, tin plating, passivating, SIC Code 3471, drip confinement, process redesign, equipment modification

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Displaying item number 85

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Document No.: 327-005-A-000

1.0 Headline: Pilot Scale Test of "Ionnet" Electrolytic Recovery Unit Plates Out Nickel from Wastewater

2.0 SIC Code: 3471, Electroplating, Plating, Polishing, Anodizing, and Coloring

3.0 Name & Location of Company

Pioneer Industries, Inc.
700 Lordship Blvd.
Stratford CT 06497

4.0 Clean Technology Category: A pilot scale test of an "Ionnet" electrolytic recovery unit was conducted to plate out nickel from wastewater.

5.0 Case Study Summary

5.1 Process and Waste Information: The facility performs contract plating, utilizing both rack and barrel techniques and works with nickel and gold electroplating and electroless nickel plating. A pilot scale test of an "Ionnet" electrolytic recovery unit was conducted to plate nickel out of wastewater. The metal-bearing stream enters the unit and is channeled downward through a eries of electrolytic chambers each containing an anode and a cathode. The metal ions readily adhere to the cathode due to an increase in mass transfer efficiency. Solids which accumulate during the electrowinning process are swept to the cell bottom and contained for draining. The Ionnet cell can be used for batch recovery or continuous treatment. The wastewater was processed through the recovery unit until it contained less than 20 ppm of nickel. The wastewater was then further processed using existing technology before being discharged.

5.2 Scale of Operation: The company employs ten people.

5.3 Stage of Development: The technology was tested in a pilot scale demonstration.

5.4 Level of Commercialization: The technology is commercially available.

5.5 Material/Energy Balances and Substitutions:

Information not provided.

6.0 Economics*

6.1 Investment Costs: The cost of the system is $11,900.

6.2 Operational & Maintenance Costs: Savings are $17,000 in waste treatment costs.

6.3 Payback Time: Payback time is 8.4 months.

7.0 Cleaner Production Benefits:

If a full-scale electrolytic recovery unit were installed, the generation of metal hydroxide sludge and the need for off-site disposal would be eliminated.

8.0 Obstacles, Problems, and/or Known Constraints:

None mentioned

9.0 Date Case Study Was Performed: The project was completed in September 1989.

10.0 Contacts and Citation

10.1 Type of Source Material: Technical assistance program summary.

10.2 Citation: ConnTAP - Matching Challenge Grants, 1988-89, Connecticut Hazardous Waste Management Service, pp. 6-7. "Electrolytic Recovery of Nickel from an Electroplating Process, Project P500," Precision Metal Finishing, Inc., September 1989.

10.3 Level of Detail of the Source Material: A diagram of the Ionnet cell is given in the source document.

10.4 Industry/Program Contact and Address: Jeff Collins, Prject Manager, Pioneer Industries, Inc. 700 Lordship Blvd., Stratford, CT 06497, (203) 378-6116.

11.0 Keywords

11.1 Waste type: wastewater, metal-bearing wastes

11.2 Process type/waste source: electroplating, nickel plating

11.3 Waste reduction technique: electrolytic recovery, Ionnet cell

11.4 Other keywords: pilot scale test

12.0 Assumptions

None

13.0 Peer Review: Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: wastewater, metal-bearing wastes, electroplating, nickel plating, electrolytic recovery, Ionnet cell, pilot scale test

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Displaying item number 86

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Document No.: 327-005-A-000

1.0 Headline: Waste Minimization Study Identifies Alternatives for Reducing Wastes at a Metal Finishing Plant

2.0 SIC Code: 3471, Electroplating, Plating, Polishing, Anodizing and Coloring

3.0 Name & Location of Company

Seaboard Metal Finishing Co., Inc.
50 Fresh Meadow Road, West Haven, CT 06516

4.0 Clean Technology Category: A waste minimization study, including performing a mass balance and waste inventory, identified alternatives for future implementation.

5.0 Case Study Summary

5.1 Process and Waste Information: The facility has six process plating lines, including copper, automatic nickel, barrel copper/nickel, bulk chrome, hard chrome and rack nickel/chrome plating. The resulting F006 sludge requires off-site disposal.

A waste minimization study of the six electroplating lines was conducted. A mass balance was determined by analyzing the discharges for metals and determining an average discharge rate. A waste inventory was peformed and critical sources of waste were identified. Waste minimization alternatives were analyzed for technical feasibility and cost effectiveness. The proposed alternatives included recycling rinsewaters, automating plating lines, installing evaporation technology and additional rinse tanks with reduction of countercurrent flow.

5.2 Scale of Operation: The facility employs 45 plant personnel.

5.3 Stage of Development: The proposed alternatives had not been implemented at the time the case study was written.

5.4 Level of Commercialization: The technology is commercially available.

5.5 Material/Energy Balances and Substitutions:

Information not available.

6.0 Economics*

6.1 Investment Costs: The cost is estimated at $13,500 for several new rinse tanks and evaporation unit.

6.2 Operational & Maintenance Costs: Annual savings of more than $15,000 are anticipated.

6.3 Payback Time: The payback period is estimated at 1.2 years.

7.0 Cleaner Production Benefits: If the alternatives were implemented, a reduction of 75% would be achieved for copper, hexavalent chromium, cyanide, and nickel wastewater. About 16 tons of F006 sludge, now requiring off-site disposal, would be eliminated.

8.0 Obstacles, Problems, and/or Known Constraints: None mentioned.

9.0 Date Case Study Was Performed: The project was completed in April 1989.

10.0 Contacts and Citation

10.1 Type of Source Material: Technical assistance program summary

10.2 Citation: ConnTAP Matching Challenge Grants - 1988-89, Connecticut Hazardous Waste Management Service, pp. 8-9. "Waste Minimization Study." YWC, Inc., April 1989.

10.3 Level of Detail of the Source Material:No additional information is provided.

10.4 Industry/Program Contact and Address: John Conroy, Project Manager, Seaboard Metal Finishing Co., Inc., 50 Fresh Meadow Road, West Haven, CT 06516 (203) 933-1603.

11.0 Keywords

11.1 Waste type: wastewater, plating baths

11.2 Process type/waste source: electroplating, nickel plating, chrome plating

11.3 Waste reduction technique: waste minimization study, bath recycling, flow reduction evaporation

11.4 Other keywords:

12.0 Assumptions

None

13.0 Peer Review: Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: wastewater, plating baths, electroplating, nickel plating, chrome plating, waste minimization study, bath recycling, flow reduction evaporation

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Displaying item number 87

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Document No.: 327-005-A-000

1.0 Headline: Evaporative Recovery Systems Evaluated for

Reducing Volume of Hazardous Wastewater

2.0 SIC Code: 3842, Orthopedic, Prosthetic, and Surgical Appliances and Supplies

3.0 Name & Location of Company

Davis & Geck
Danbury, CT

4.0 Clean Technology Category: The technology involves use of an evaporative recoery system to reduce hazardous waste produced from a silk dying process.

5.0 Case Study Summary

5.1 Process and Waste Information: The facility manufactures surgical equipment, such as arthroscopic and ophthalmologic devices. A silk dying process is used which generates hazadrous wastewater.

Two evaporative methods for wastewater reduction were investigated. A "CALFRAN" cold evaporation unit, which operated under a vacuum of 10 to 20 torr, and a "SAMSCO" hot evaporation unit, which is a natural gas fired air assisten water evaporator, were considered. The "SAMSCO" system was selected due to a lower capital expenditure, higher annual savings, low maintenance, flexibility to add capacity and fewer state permit requirements.

5.2 Scale of Operation: Information not provided.

5.3 Stage of Development: The system was selected but had not been purchased or installed at the time of the case study.

5.4 Level of Commercialization: The equipment is commercially available.

5.5 Material/Energy Balances and Substitutions:

Information not provided.

6.0 Economics*

6.1 Investment Costs: The investment cost is $68,000.

6.2 Operational & Maintenance Costs: Savings of $51,000 are anticipated.

6.3 Payback Time: The payback period is estimated as 2.1 years.

7.0 Cleaner Production Benefits: The installation of the system is expected to reduce the volume of hazardous wastewater in need of disposal by at least 152,000 gallons per year.

8.0 Obstacles, Problems, and/or Known Constraints:

None

9.0 Date Case Study Was Performed: The project to assess the systems was completed in November 1989.

10.0 Contacts and Citation

10.1 Type of Source Material: Technical assistance program summary.

10.2 Citation: ConnTAP Matching Challenge Grants - 1988-89, Connecticut Hazardous Waste Management Service, pp. 16-17. "Engineering Report for Silk Dye Waste Reduction Project," American Cyanamid Company, Davis and Geck Division, November 1989.

10.3 Level of Detail of the Source Material: Additional information is available on the SAMSCO system.

10.4 Industry/Program Contact and Address: Joseph Lacalamito, Project Manager, American Cyanamid Company, Davis and Geck Division, 1 Casper Street, Danbury, CT 06810, (203) 743-4451.

11.0 Keywords

11.1 Waste type: wastewater

11.2 Process type/waste source: silk dying, SIC Code 3842

11.3 Waste reduction technique: evaporation, hot evaporator

11.4 Other keywords: volume reduction

12.0 Assumptions

13.0 Peer Review

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: wastewater, silk dying, SIC Code 3842, evaporation, hot evaporator, volume reduction

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Displaying item number 88

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Document No.: 222-003-001

1.0 Headline An adsorbent-based system for effective removal of low concentration toxic metals from rinse waters has been developed and tested in the metal plating industry.

2.0 SIC Code: 3471, electroplating, surface finishing, metal finishing

3.0 Name & Location of Company
Aluminum Company of America
Alcoa Technical Center
Alcoa Center, PA 15069

4.0 Clean Technology Category
A specialty activated Mg-Al oxide adsorbent, which acts as an inorganic anion exchange material, is a used as a wastewater treatment technology.

5.0 Case Study Summary

5.1 Process and Waste Information: The metal finishing industry performs a wide variety of chemical operations. Important among these are metal surface preparation and plating operations. Surface preparation often consists of chemical etching and conversion coating with solutions of chromium salts. The plating operations include both conventional electroplating processes and electroless chemical plating of metal films such as Ni-P, Cu, Co, etc. The testing of a Mg-Al oxide adsorbent-based process which effectively removes toxic metals from metal finishing rinse waters is presented in this case study.

The adsorbent was tested in the laboratory on individual samples from customer's wastewater streams. Two tests were conducted: a powder treatment study and a granular column study. Then pilot scale trials were done to obtain material consumption and economic data. Testing was done on electroless plating rinses, hexavalent chromium rinses, and cyanide plating rinses.

5.2 Scale of Operation: The scale of operation of the plants from which the water was tested was not described.

5.3 Stage of Development: This treatment method has been laboratory tested and pilot field tested. The adsorbent is fully developed.

5.4 Level of Commercialization: The new adsorbent is trademarked as Alcoa SORBPLUS Adsorbent.

5.5 Material/Energy Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:		
rinsewater	N/A	

This study tested the effectiveness of various adsorbent doses by determining the associated element concentrations in the laboratory and in pilot field tests. Therefore, a material balance within a specific facility is not possible. The study provides the concentrations associated with different adsorbent doses.

6.0 Economics*

6.1 Investment Costs: not provided

6.2 Operational & Maintenance Costs: not provided

6.3 Payback Time: not provided

7.0 Cleaner Production Benefits The Mg-Al oxide adsorbent is a non-toxic, non-corrosive inorganic chemical. The key benefit of the adsorbent is the selective adsorption of toxic stream contaminants. The adsorbent is highly effective at removing chelated nickel, copper or cobalt from electroless plating baths or rinses; hexavalent chromium from chrome plating or chromate conversion coating rinsewaters; and metal complexed cyanides from cyanide plating rinsewaters.

This treatment technology requires very low capital investment and low maintenance (figures not provided). Furthermore, it is feasible to recycle the treated rinse water which can actually improve the overall system performance.

8.0 Obstacles, Problems, and/or Known Constraints Spent adsorbent will have to pass the Toxic Characteristic Leaching Procedure (TCLP) before being disposed of in a landfill.

9.0 Date Case Study Was Performed
not provided

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry; January, 1991; pp. 257-268.

10.3 Level of Detail of the Source Material: Additional detail is provided on the results of each rinse tested, including the adsorbent doses, the concentrations of chemicals in the rinsewater before and after introducing the adsorbent.

10.4 Industry/Program Contact and Address: not provided

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600 Leesburg Pike, Falls Church, VA 22043.

11.0 Keywords

11.1 Waste type: rinsewater, plating baths

11.2 Process type/waste source: electroplating, surface finishing, SIC Code 3471

11.3 Waste reduction technique: wastewater treatment, adsorption

11.4 Other keywords:

12.0 Assumptions
Although ALCOA is listed above in Section 3.0 as the facility, the laboratory testing was conducted on rinsewaters from customer companies. It was not stated where the pilot field testing was conducted.

13.0 Peer Review
Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: rinsewater, plating baths, electroplating, surface finishing, SIC Code 3471, wastewater treatment, adsorption

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Displaying item number 89

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Document No.: 222-003-001

1.0 Headline A Metal Finishing Plant Tested Silver Reduction Process To Replace The Existing Treatment Plant and Also Tested On-site Silver Reclamation To Replace Off-site Reclamation.

2.0 SIC Code: 3471, electroplating, surface finishing

3.0 Name & Location of Company
not specified

4.0 Clean Technology Category; The clean technologies initiated in the case study consisted of the modification of air-knives, electrolytic recovery cells and flow restrictors to reduce silver drag-out and the installation of reverse osmosis units as in-line reuse systems.

5.0 Case Study Summary

5.1 Process and Waste Information: Two examples of waste minimization at a metal finishing plant are presented in this case study. In the first example, the rinse-wastewater treatment plant was frequently violating the discharge standard for silver. The major sources of the silver were rinses following silver-cyanide plating in the reel-to-reel lines. The plant evaluated whether or not to modify the treatment system or introduce waste minimization in the production line. A strategy to reduce silver drag-out was initiated, including: efficient air-knives installed at the rinse tanks, more efficient electrolytic recovery cells installed on the dead rinses following the silver plating baths, and flow restrictors installed on all rinses.

In the second example, to replace off-site silver reclamation, on-site silver reclamation was initiated to reclaim silver from the silver dead rinses. This in-line reuse system consisted of 6 reverse osmosis units. The installation would involve conversion of the dead rinse and DI-Water rinse stations to a two-stage counter flow rinse, conductivity control of DI Water supply, and recirculation pumps for rinsing to reduce the flow rate.

5.2 Scale of Operation: Information not provided.

5.3 Stage of Development: The clean technologies are fully developed.

5.4 Level of Commercialization: The clean technologies are fully commercialized.

5.5 Material/Energy Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:		
silver drag-out reduction:		
rinse-wastewater	240,000 gpd	155,000 gpd
silver concentration in influent	5 mg/l	0.5 mg/l
silver concentrations in effluent	N/A	below 0.15 mg/l

6.0 Economics*

6.1 Investment Costs: In the first example, the capital investment for the silver drag-out reduction was $12,000.

The capital cost to install the reverse osmosis units was estimated at $525,000.

6.2 Operational & Maintenance Costs: Information not provided.

6.3 Payback Time: Without expanding the capacity of the plant, the payback period for installing the capacity of the plant, the payback period for installing waste minimization in the production line was projected to be less than one month.

The marginal payback period for the in-line reuse system as compared to the existing off-site reclamation was projected as 5 months.

7.0 Cleaner Production Benefits: For the first example, the operating savings of silver drag-out reduction versus treatment is $470,000 per year. For the first six months after implementation of the reduction process, all discharge standards were being met.

In the second example, the net savings of the in-line reuse system versus the off-site reclamation were estimated at $825,000. According to laboratory tests, more than 90% recovery is feasible with the reverse osmosis units.

8.0 Obstacles, Problems, and/or Known Constraints There are

fiscal and organizational limits to implementation of waste minimization for these processes. The silver drag-out reduction program required considerable attention from production Q/A personnel. Despite initial improvements from waste discharge standards, by the end of a year, silver violations had returned to their former level. This was due to significant changes in production and inadequate new treatment plant and not continue with the waste minimization efforts.
Due to the large capital cost needed for the in-line reuse system, the facility also decided not to adopt the in-line system.

9.0 Date Case Study Was Performed

Information not provided.

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry"; January, 1991; pp. 59-69.

10.3 Level of Detail of the Source Material: Further detail is provided on the silver drag-out reduction strategy and additional cost data is provided.

10.4 Industry/Program Contact and Address: John Rosenblum, Rosenblum Environmental Engineering, 3502 Thorn Road, Sebastopol, CA 95472. Mazen J. Naser, Plating and Waste Management Consulting, 96 Lycett Circle, Daly City, CA 94015.

10.5 Abstractor Name and Address: Maria Leet, SAIC 7600 Leesburg Pike, Falls Church, VA 22043.

11.0 Keywords

11.1 Waste type: rinsewater, wastewater

11.2 Process type/waste source: electroplating, SIC Code 3471, electroplating baths

11.3 Waste reduction technique: reuse, reclamation, reverse osmosis, electrolytic recovery, process modification, silver recovery drag-out reduction.

11.4 Other keywords: economics, payback period, economic evaluation, return on investment

12.0 Assumptions

None

13.0 Peer Review

Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: rinsewater, wastewater, electroplating, SIC Code 3471, electroplating baths, reuse, reclamation, reverse osmosis, electrolytic recovery, process modification, silver recovery drag-out reduction, economics, payback period, economic evaluation, re

Displaying item number 90

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Document No.: 222-003-001

1.0 Headline Use of Simple Material Balances Solves Problems in A Circuit Board Manufacturer's Waste Water Treatment Plant.

2.0 SIC Code: 3672, printed circuit board manufacturing, 3471, electroplating, surface finishing

3.0 Name & Location of Company

Teradyne Connection Systems
4 Pittsburgh Avenue
Nashua, NH 03062

4.0 Clean Technology Category

After conducting a material balance, the company implemented technologies including process modification, equipment redesign, and water conservation. Recycling, incineration, minimizing landfilling, equipment modification, on-site treatment, ion exchange, neutralization, electrolytic recovery were also used as clean technologies.

5.0 Case Study Summary

5.1 Process and Waste Information: This circuit board manufacturing facility used conventional precipitation for waste treatment. After monitoring the compliance data from the waste treatment effluent with respect to copper concentration, it became evident that the system was incapable of providing repeatable results. There were copper spikes in the effluent that were apparently caused by non-settleable particles in the clarification process.

A water material balance was conducted to verify the flow rates from the process area and the flow rates into the waste treatment area. To reduce the hydraulic loading on the waste water treatment system, non-contact cooling water and scrubbing water were eliminated by installing closed loop systems. Equipment washdowns were also reduced 80% by installing automatic shut offs on the washdown hoses and devising and implementing strict water conservation specifications. In addition, to reduce the water flow rate supplying the process equipment, rinsing specifications were determined and flow restrictors were installed. Electronic controls were also installed to shut down the water flow to production equipment when unattended.

A material balance of hazardous waste was also used to attempt to understand the type and amount of waste material that was being disposed of from the waste treatment process. Strategic plans for waste management were then made, including: recycling, incinerating all organic material, and minimizing or eliminating materials that are landfilled. Therefore, two changes were made in waste handling at the facility: (1) a sludge dehydrator was installed to increase the solids content of the F006 metal hydroxide sludge and reduce the amount of material that is disposed of at hazardous waste landfills and (2) the copper pyrophosphate material was to be treated in-house and not shipped off-site for disposal.

To minimize hazardous waste generation, ion exchange can be coupled with electrolytic recovery. A material balance was used to investigate the feasibility of such a system. Depending on the concentration of the process waste water entering the collection system, either conventional treatment (precipitation), or neutralization should be used. It was discovered that one line entering the collection system, which has a flow rate of 15.5 gpm, would benefit from an ion exchange/electrolytic recovery system.

5.2 Scale of Operation: There are 275 employees. Water usage at the facility is 100,000 gpd.

5.3 Stage of Development: The technology is fully developed.

5.4 Level of Commercialization: Information not provided.

5.5 Material/Energy Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:		
copper pyrophosphate	2,764 lbs	2,500 lbs (see 12.0
Assumptions below)		
metal hydroxide sludge	410,000 lbs 25% solids	101,675 lbs 95% solids
Feedstock Use:	N/A	N/A

Material Category	Quantity Before	Quantity After
Water Usage:		
Process rinsewater	176 gpm	106 gpm
Mechanical scrubber water	118 gpm	-0-
Non-contact cooling water	42 gpm	-0-
Equipment washdowns	10 gpm	-0-
Energy Use:	N/A	N/A

6.0 Economics*

6.1 Investment Costs: Information not provided

6.2 Operational & Maintenance Costs: Information not provided

6.3 Payback Time: Information not provided

7.0 Cleaner Production Benefits

Process water flow rates were reduced approximately 40%. The results of the flow rate reduction proved effective in increasing the repeatability of the effluent stream and resulted in a treatment confidence level of 99.45%.

The installation and operation of the sludge dehydrator increased the solids content of the F006 sludge from 25 to 95% and decreased the volume by 75% which reduced disposal by 308,325 pounds per year. In addition, by drying the sludge, the leaching capability and thus the toxicity is reduced.

The process to treat the copper pyrophosphate was designed and installed in-house. This reduced the outside waste disposal by approximately 2700 lbs per year.

Subsequent to a materials balance of the hazardous waste, for a relatively small capital investment, a significant portion of the metal hydroxide sludge generation could be shifted to the production of non-hazardous metal products.

8.0 Obstacles, Problems, and/or Known Constraints

Information not provided

9.0 Date Case Study Was Performed

The date was not provided, however, the case study was published in a January 1991 document.

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry"; January, 1991; pp. 113-129.

10.3 Level of Detail of the Source Material: No further details were provided on material balances, and flow charts of the plant processes.

10.4 Industry/Program Contact and Address: David A. Wood, P.T., Teradyne Connection Systems, 4 Pittsburgh Avenue, Nashua, NH 03062.

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600-A Leesburg Pike, McLean, VA 22043-4317.

11.0 Keywords

11.1 Waste type: waste water, sludge, metals, copper

11.2 Process type/waste source: SIC Code 3672, printed circuit board manufacturing, SIC Code 3471, electroplating, surface finishing

11.3 Waste reduction technique: ion exchange, electrolytic recovery, process modification, equipment redesign

11.4 Other keywords: wastewater reduction, materials balance

12.0 Assumptions

13.0 Peer Review

Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: waste water, sludge, metals, copper, SIC Code 3672, printed circuit board manufacturing, SIC Code 3471, electroplating, surface finishing, ion exchange, electrolytic recovery, process modification, equipment redesign, wastewater reduction, mater

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Document No.: 222-003-001

1.0 Headline The Removal of Certain Metals Can Be Accurately Monitored with Oxidation Reduction Potential (ORP) Probes in The Metal Plating Industry

2.0 SIC Code: 3471, electroplating, surface finishing

3.0 Name & Location of Company

Nalco Chemical Company
Naperville, Illinois

4.0 Clean Technology Category

The clean technology used in these metal plating plants is precipitation. This case study evaluated Oxidation

Reduction Potential (ORP) probes to measure metals removal.

5.0 Case Study Summary

5.1 Process and Waste Information: A research study was done to evaluate Oxidation Reduction Potential (ORP) probes as sensors in metal ion precipitation at Nalco Chemical Company. Wastewater samples were tested using this method from four plants including, two printed circuit board plants, a zinc plating plant and a brass plating plant.

5.2 Scale of Operation: Information not provided

5.3 Stage of Development: The use of ORP probes as process sensors in ion precipitation is still in the testing phase.

5.4 Level of Commercialization: ORP probes are fully commercialized as they are commonly used in the plating industry to automate control of cyanide destruction and chromium (VI) reduction processes.

5.5 Material/Energy Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:		
Feedstock Use:	N/A	
Water Use:		
Energy Use:		

6.0 Economics*

6.1 Investment Costs: Information not provided.

6.2 Operational & Maintenance Costs: Information not provided

6.3 Payback Time: Information not provided

7.0 Cleaner Production Benefits

Removal of certain metals can be accurately monitored with ORP probes. In laboratory studies, marked response of ORP was seen at the equivalence point (dosage corresponding to metal ion disappearance) for a copper-bearing wastewater, a synthetic copper-nickel wastewater, and a copper-zinc wastewater. ORP responds to the disappearance of certain metal ions such as copper and nickel, that are active at the electrode.

8.0 Obstacles, Problems, and/or Known Constraints

In one sample of circuit board plating wastewater, the presence of an interference predicted severe product overfeed and under ORP control. The need for waste stream equalization or removal of the suspect stream from the continuous process was suggested.

9.0 Date Case Study Was Performed Information not provided

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry"; January, 1991; pp. 309-316.

10.3 Level of Detail of the Source Material: Specific details of the experimental procedure and the responses of the ORP probe to metals removal are provided.

10.4 Industry/Program Contact and Address: Kristine S. Siefert and Kerstin Lampert, Nalco Chemical Company, Naperville, Illinois.

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600-A Leesburg Pike, McLean, VA 22043-4317.

11.0 Keywords

11.1 Waste type: wastewater

11.2 Process type/waste source: electroplating, plating, SIC Code 3471, printed circuit board manufacturing, zinc plating, brass plating

11.3 Waste reduction technique: metal ion precipitation, metal recovery

11.4 Other keywords: oxidation reduction potential (ORP) probes

12.0 Assumptions
None

13.0 Peer Review
Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors.

KEYWORDS: wastewater, electroplating, plating, SIC Code 3471, printed circuit board manufacturing, zinc plating, brass plating, metal ion precipitation, metal recovery, oxidation reduction potential (ORP) probes

Displaying item number 92

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Document No.: 222-003-001

1.0 Headline: Metal Recovery Systems Installed in an Electroplating Facility Reduces Waste Generation, and Disposal Costs, and the Potential for Wastewater Treatment Upsets

2.0 SIC Code: 3471, electroplating, surface finishing

3.0 Name & Location of Company: Von Duprin, Incorporated, Indianapolis, Indiana.

4.0 Clean Technology Category

The metal recovery systems involve spray rinses, a reciprocating bed ion-exchange system, atmospheric evaporation, a stagnant rinse, and reverse osmosis.

5.0 Case Study Summary

5.1 Process and Waste Information: Von Duprin conducts automated hoist rack plating of copper cyanide, satin and bright nickel, decorative chromium, brass cyanide and barrel plating of alkaline non-cyanide zinc.

Previously implemented waste reduction measures include the following: modifying rack designs to minimize cupping; adjusting automatic hoist parameters to include extended drip times; using two-stage and three-stage counterflow rinses; using stagnant baths for recovery of dragout from bright nickel and chrome baths; using alkaline non-cyanide zinc bath to minimize use of cyanides; and eliminating vapor degreasing.

New technically and economically optimal processes selected for the facility include five metal recovery system:

(1) Cyanide copper - The chosen technology includes a combination of spray rinses to minimize dragout and atmospheric evaporation to allow space in the bath for added water. These technologies result in maximum recovery of solution with minimal capital and operating costs. They also result in less operator and maintenance attention than other minimization options. However, because of the use of the atmospheric evaporator on a cyanide bath, there is an increased rate of buildup of potassium carbonate in the bath.

(2) Nickel - Installation of a reciprocating bed ion-exchange system for recovery and reuse of a nickel chloride/nickel sulfate mix was recommended. Nickel can be recovered from both the satin and bright nickel baths without fear of bath contamination associated with recovery of bath brighteners. The reciprocating bed design offers the direct ability to reuse recovered solution without further processing to remove excess water. Although the system has a relatively high capital cost, the payback period on the capital investment was less than two years.

(3) Chrome - A combination of spray rinsing, atmospheric evaporation and a stagnant rinse to minimize dragout and recover solution captured in the first rinse was selected. This system greatly improved recovery with a minimal capital investment. The system is also applicable to atrivalent chrome processing. The system, however, causes the buildup of impurities from reuse of the dragout. The ability of the existing tank steam coils to handle the heat loss from the evaporator was also found to be a problem after the system was installed.

(4) Brass - Reverse osmosis to capture dragout and return to clean water for rinsing was selected. This

system allows for closed-loop rinsing which eliminates cyanide discharges. This does have a high capital and operating costs. Buildup of carbonates is also a concern, but this has not been observed at the plant.

(5) Non-cyanide alkaline zinc: Reverse osmosis captures dragout from this barrel line and atmospheric evaporators make room in the bath for reuse of all of the recovered solution. This allows for a closed-loop system thus eliminating zinc discharge. Reverse osmosis also allows for recovery and reuse of the zinc, unlike ion exchange systems, which were designed to recover a zinc metal which would be shipped off-site. The main disadvantage was the lack of vendor in-plant experience with the system.

In addition to the five processes described above, process water for bath makeup and rinsing in the plating area was upgraded through the installation of a reverse osmosis water treatment system. In addition, water use was achieved through reactive rinsing. Rinsewater from acid activation steps was pumped to rinse parts after alkaline steps.

5.2 Scale of Operation: Information not provided

5.3 Stage of Development: While all systems are not fully operational on a continual basis, some reduction in sludge volumes has been seen. Metal usage in the third quarter of 1990 was less than half of that in the first quarter of 1990.

5.4 Level of Commercialization: The clean technologies are fully commercialized.

5.5 Material/Energy Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:	N/A	N/A
Feedstock Use:	N/A	N/A
Water Use:	N/A	N/A
Energy Use:	N/A	N/A

6.0 Economics*

6.1 Investment Costs: Costs were not provided although costs were considered in their evaluation of selecting waste reduction processes. For example, it was stated that the reciprocating bed design has a "relatively high capital cost".

6.2 Operational & Maintenance Costs: Costs were not provided although costs were considered in the selection of waste reduction processes.

6.3 Payback Time: The reciprocating bed ion-exchange system for recovery and reuse of a nickel chloride/nickel sulfate mix has a payback period of under two years.

7.0 Cleaner Production Benefits

The systems provide a cost-effective means to reduce waste generation and disposal costs, enhance community and customer relations, and reduce the potential for wastewater treatment upsets. Significant reductions in metals and cyanides are expected to result and metal usage by the plant is already decreased over 50%. Drastic reductions in sludge volume are expected when the zinc recovery system operates consistently and bath dumping is minimized.

8.0 Obstacles, Problems, and/or Known Constraints

Some of the problems related to each process are discussed above in Section 5.1.

During the installation of the equipment, there were some problems, including a lack of constant adequate water pressure to feed the reverse osmosis unit, resulting in system shutdowns. During the installation of the nickel recovery ion-exchange system, piping contractors inappropriately mounted several transfer pumps outside of the diked area provided for the equipment. The major problems associated with the ion-exchange system included the control logic, which had to be modified to allow smooth operation, and the variations rinse conductivities, which was resolved by reducing the acid amounts and adjusting the conductivity control loop.

To install the brass and zinc reverse osmosis systems, substantial time was spent cleaning rinse tanks to remove hardness salts which could foul the reverse osmosis membranes.

Extra costs were incurred to provide additional electrical noise isolation to protect system components.

Several problems were found in the first few months of operation of the reverse osmosis systems. A diatomaceous earth (DE) prefilter included in the zinc system repeatedly became plugged with a hard deposit that also clogged the piping to the DE filter. This clogging caused several failed prefilter pumps. It was determined that it was a result of calcium carbonate in the system, coming from the use of insufficient quality water before installation of softeners and reverse osmosis membranes on the water supply. The calcium carbonate also apparently passed through the DE filter, plugging one set of reverse osmosis membranes.

9.0 Date Case Study Was Performed

The case study was conducted in 1989-1990. Dates of installation of technologies was not provided.

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry; January, 1991; pp. 51-57.

10.3 Level of Detail of the Source Material: Additional information is available concerning the equipment and its operation.

10.4 Industry/Program Contact and Address: James Smith and Michael Bayman, Von Duprin, Inc., Indianapolis, IN. Daniel Reinke, Capsule Environmental Engineering, Inc.

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600-A Leesburg Pike, Falls Church, VA 22043.

11.0 Keywords

11.1 Waste type: wastewater, rinsewater

11.2 Process type/waste source: electroplating, SIC Code 3471, plating baths

11.3 Waste reduction technique: evaporation, ion-exchange, metals recovery, drag-out recovery, reverse osmosis, closed-loop recycling, rinsing techniques

11.4 Other keywords: wastewater reduction

12.0 Assumptions

None

13.0 Peer Review: Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors

KEYWORDS: wastewater, rinsewater, electroplating, SIC Code 3471, plating baths, evaporation, ion-exchange, metals recovery, drag-out recovery, reverse osmosis, closed-loop recycling, rinsing techniques, wastewater reduction

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Displaying item number 93

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Document No.: 222-003-001

1.0 Headline
Closed-loop Recycling Reduces Metal Finishing Wastewater Discharges

2.0 SIC Code: 3471, electroplating, surface finishing

3.0 Name & Location of Company

Pratt & Whitney Aircraft, North Haven, CT

4.0 Clean Technology Category

Striving toward zero discharge, a closed-loop recycling system using good operating practices has been installed.

5.0 Case Study Summary

5.1 Process and Waste Information: This facility produces major metal-finished rotating parts such as discs, hubs, and shafts. In 1987, they were discharging approximately 1,000,000 GPD of treated wastewater, 400,000 of which was generated by metal-finishing operations. Implementation of a "zero discharge" program involved 6 phases.

In Phase One good operating practices were defined. These include defining minimum water quality standards; using countercurrent rinses to reduce water usage; using continuous process purification versus batch purification to maintain consistent process quality (i.e., dummy plating and carbon and particulate filtration); using on-line process monitors to control solution additions; optimizing process solutions to control dragout; optimizing preplate rinsing to control dragin of contaminants; installing automatic level controls on all heated processes; training operators to understand proper rinsing and work transfer techniques to reduce dragout and dragin; and treating small concentrated batches as opposed to high volume dilute wastestreams.

Phase Two is to implement Phase One. Phase Three is designed to verify closed-loop technology on a single process. This was conducted on an existing nickel plating process encompassing a Woods nickel strike and four sulfamate nickel plating tanks.

Phase Four incorporates good operating practices and closed-loop technologies in the design of planned and appropriated new plating lines. New plating lines, encompassing (1) nickel and chromium plating, (2) cadmium, chromium, and nickel stripping, and (3) titanium descaling were already on the drawing boards. Initial plans were revised to incorporate countercurrent rinses, ion exchange (nickel strike, nickel strip, cadmium strip, and chromium strip); atmospheric evaporation (hard chromium, and sulfamate nickel); and deionized water in all critical rinses and softened water in all noncritical rinses and noncritical evaporation makeup.

Phase Five was to install the plating lines. Phase Six involved renovating remaining existing processes, including cadmium cyanide plating and chromating.

5.2 Scale of Operation: The facility encompasses 1,000,000 square feet. It was discharging 1,000,000 GPD of treated wastewater, 400,000 GPD of which was generated from metal finishing operations.

5.3 Stage of Development: Implementation of Phase Three is fully developed and was completed in August, 1989. The plating lines (Phase Five) are also completely developed and were installed by October, 1990.

5.4 Level of Commercialization: The new processes are fully commercialized.

5.5 Material/Energy Balances and Substitutions:

Material Category	Qty. Before	Qty. After
Waste generation:	N/A	N/A
Feedstock Use:	N/A	N/A
Water Use:	Shown in process schematics	
Energy Use:	N/A	N/A

6.0 Economics*

6.1 Investment Costs: Information not provided

6.2 Operational & Maintenance Costs: Information not provided

6.3 Payback Time: The anticipated payback time is less than two years.

7.0 Cleaner Production Benefits

The metal finishing contribution to the total wastestream volume has been reduced from 40% to 5%.

Raw material costs have been reduced by approximately 90%. Transportation and disposal costs and associated liabilities have also been reduced by the same order of magnitude due to the decreased sludge production and decreased shipments of concentrated solution wastes to a treatment facility. Product quality has also improved and operator acceptance has been very good despite initial skepticism.

8.0 Obstacles, Problems, and/or Known Constraints

None mentioned

9.0 Date Case Study Was Performed

The date the case study was not provided, however, the initial conception for the zero-discharge plan began in 1987.

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry; January, 1991; pp. 75-89.

10.3 Level of Detail of the Source Material: Additional details on the process description, nickel concentration, conductivity, workload and water usage are provided in graphs.

10.4 Industry/Program Contact and Address: Industry contact not provided.

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600-A Leesburg Pike, Falls Church, VA 22043.

11.0 Keywords

11.1 Waste type: wastewater, metal finishing wastes, rinsewater

11.2 Process type/waste source: electroplating, SIC Code 3471

11.3 Waste reduction technique: closed-loop recycling, counter-current rinsing, ion exchange, evaporation, housekeeping

11.4 Other keywords: wastewater reduction

12.0 Assumptions

None

13.0 Peer Review
Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors

KEYWORDS: wastewater, metal finishing wastes, rinsewater, electroplating, SIC Code 3471, closed-loop recycling, counter-current rinsing, ion exchange, evaporation, housekeeping, wastewater reduction

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Displaying item number 94

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Document No.: 222-003-001

1.0 Headline
Printed Circuit Board Manufacturer Reduces Air Emissions, Wastewater Discharge, Sludge, and Chemical Wastes through Process Changes, Equipment Modifications, and Recycling

2.0 SIC Code: 3672, printed circuit board manufacturing; 3471, electroplating, surface finishing

3.0 Name & Location of Company

Bull HN Information Systems Inc., Brighton, MA.

4.0 Clean Technology Category

The technologies include: changing from solvent-based to aqueous-based processes; recycling through ion exchange; installing filter presses into the effluent waste treatment process to reduce sludge volume; and recycling of waste chemicals.

5.0 Case Study Summary

5.1 Process and Waste Information: This printed circuit board manufacturer produces four types of waste: air emissions, wastewater discharge, sludge, and chemical disposals. The company is attempting to reduce and recycle these emissions.

Air emissions: The facility previously used 1,1,1-trichloroethane and methylene chloride as stripping and cleaning agents. The solvent-based stripping process was converted to an aqueous base stripping process by substituting aqueous materials for the chlorinated solvents.

Wastewater discharge: The wastewater treatment system installed in the 1970's consisted of one giant tank for neutralizing wastewater. Several problems arose with this system because the system could not satisfactorily remove all insoluble contaminants due to equipment corrosion. The equipment began to malfunction due to age.

A new industrial wastewater treatment system was installed consisting of three parts: segregated rinse waters (allowing recycling through ion exchange), combined rinse waters (treated through a large ion exchange system and discharged directly to the sewer), and effluent treatment systems which concentrate metal bearing solution streams from ion exchange backwash. Regenerant wastes combined with metered bath dumps are also treated through two identical conventional effluent treatment systems.

Sludge disposal: In the 1970's, the by-product of the effluent waste treatment process was the precipitation of metal hydroxides or "sludges." The old system produced a large volume of sludge which was difficult to dewater and had to be manually collected. After the installation of several plate and frame filter presses in the new effluent treatment system and the use of coagulation and flocculation, the operation improved considerably and the sludge volume was significantly reduced.

Chemical Disposal: Previously, chemical wastes were transported, treated, and disposed of off-site. Most of the waste is now either treated on site or returned to the manufacturer who in turn recycles the chemical.

5.2 Scale of Operation: The industrial wastewater treatment system can process nearly 250,000 gallons of combined treated rinse and wastewater per day.

5.3 Stage of Development: Conversion to aqueous-based stripping was completed in 1987. The installation of the wastewater treatment system was completed in 1984.

5.4 Level of Commercialization: The processes are fully commercialized.

5.5 Material/Energy Balances and Substitutions:

Material Category	Qty. Before	Qty. After
Waste generation:	N/A	N/A
Feedstock Use:	N/A	N/A
Water Use:	N/A	N/A
Energy Use:	N/A	N/A

6.0 Economics*

6.1 Investment Costs: Conversion to the aqueous-based stripping process cost $1.8 million (1987 dollars). The cost of installing the wastewater treatment system was greater than $2.5 million.

6.2 Operational & Maintenance Costs: Information not provided.

6.3 Payback Time: Information not provided.

7.0 Cleaner Production Benefits

Greater than 20% of the company's industrial waste water is recycled. The sludge volume was "significantly" reduced. Chemical recycling reduced trucking-out of wastes by 90%.

8.0 Obstacles, Problems, and/or Known Constraints

Information not provided.

9.0 Date Case Study Was Performed Information not provided.

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry;" January, 1991; pp. 91-99.

10.3 Level of Detail of the Source Material: Additional information is provided on equipment and future steps to be taken by the facility.

10.4 Industry/Program Contact and Address: Solomon Roditi, Bull HN Information Systems, Inc., Brighton, MA.

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600-A Leesburg Pike, Falls Church, VA 22043.

11.0 Keywords

11.1 Waste type: sludge, organic chemicals, volatile organic compounds, wastewater

11.2 Process type/waste source: printed circuit board manufacturing, SIC Code 3672, electroplating, SIC Code 3471

11.3 Waste reduction technique: process redesign, equipment modification, recycling, ion exchange,

11.4 Other keywords: sludge, volume reduction

12.0 Assumptions

None

13.0 Peer Review: Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors

KEYWORDS: sludge, organic chemicals, volatile organic compounds, wastewater, printed circuit board manufacturing, SIC Code 3672, electroplating, SIC Code 3471, process redesign, equipment modification, recycling, ion exchange, sludge, volume reduction

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Displaying item number 95

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Document No.: 222-003-001

1.0 Headline: Treatability and Pilot Tests have Successfully Reduced Effluent Toxicity from a Metal Finishing Facility

2.0 SIC Code: 3471, electroplating, surface finishing

3.0 Name & Location of Company

Har-Conn Chrome Company
603 New Park Avenue
West Hartford, CT 06110

4.0 Clean Technology Category

The company initiated a toxicity reduction program including a pilot study that incorporated pH adjustment (to pH 11) for metals precipitation, followed by filtration and final pH adjustment. In addition, as part of a waste minimization program, water conservation efforts have begun and pollution prevention techniques, including evaporation, ion exchange, electrowinning, and recovery of metals, are being or will be installed to enhance the reduction of toxic effluents from the facility.

5.0 Case Study Summary

5.1 Process and Waste Information:

Har-Conn conducts the following metal finishing operations: cleaning (acid and alkaline), electroplating (chromium, nickel, copper, cadmium, tin and silver), electroless plating (silver), anodizing (titanium and aluminum), phosphating (zinc and manganese), and chormating. Rinsewater from these operations are discharged to a treatment system which consists of cyanide destruction, chrome reduction, pH adjustment, equalization and pressure filtration.

A toxicity reduction program was initiated in August 1989 and was continuing at the time this case study was prepared. A successful pilot study was conducted that incorporated elevated pH adjustment for metals precipitation, filtration and final pH adjustment. Microfiltration is currently being evaluated as a means of upgrading the current pressure filtration system.

Har-Conn is also undertaking the first phase of a comprehensive waste minimization program. The purpose of this program is to identify, evaluate and implement applicable techniques for the conservation and/or recovery of process chemicals and water. The first phase consists primarily of water conservation efforts. As an initial step, the company has installed flow restrictors on all running rinses. In addition, conductivity controllers were being installed at various areas of the plant to reduce rinsewater discharge rates. To further reduce flow rates, a portion of the final effluent will be recycled for use in non-critical rinsing applications.

This will be done after an upgraded treatment system is installed.

A second phase of waste minimization is planned to reduce releases of toxic metals. The company plans to implement (1) process techniques to reduce chemical drag-out and (2) evaporation, ion exchange and electrowining technologies for point source treatment and recovery of chemicals. Based on results of toxicity evaluation procedures, source reduction efforts will initially concentrate on cadmium and copper. Nickel, although relatively less toxic than these metals, will also be included in these efforts due to its high contribution of the total metals load and potential for economic recovery of nickel salts.

5.2 Scale of Operation:

Approximately 60,000 gallons per day of effluent are discharged from the facility.

5.3 Stage of Development:

The pilot study for metals precipitation and filtration has been completed. Under the waste minimization program, flow restrictors have been installed and conductivity controllers were being installed at the time of the case study report. The evaporation, ion exchange and electrowinning technologies have not yet been implemented.

5.4 Level of Commercialization: Information not provided.

5.5 Material/Energy Balances and Substitutions:

Material Category	Quantity Before	Quantity After
Waste Generation:	90,000 gpd rinsewater (Aug, 1990)	60,000 gpd rinsewater (Sept, 1990)
Feedstock Use:	N/A	N/A
Water Use:	N/A	N/A
Energy Use:	N/A	N/A

6.0 Economics*

6.1 Investment Costs: Information not provided.

6.2 Operational & Maintenance Costs: Information not provided.

6.3 Payback Time: Information not provided.

7.0 Cleaner Production Benefits

Toxicity has been reduced through the treatability of rinsewater by pH adjustment and filtration. The installation of flow restrictors on running rinses has reduced water use at the facility by 33%. In addition, conductivity controllers which were being installed at the time of the case study, are expected to reduce the rinsewater discharge rate from 60,000 to 45,000 gpd. Recycling of rinse waters should reduce effluent flow to less than 30,000 gpd. Finally, there is the potential for economic recovery of nickel salts.

8.0 Obstacles, Problems, and/or Known Constraints

To achieve compliance with the chronic toxicity limits, flow reduction and waste minimization efforts aimed at point source reduction of specific toxic metals will be required.

9.0 Date Case Study Was Performed: Information was not provided. The case study was presented at a Conference in January 1991.

10. Contacts and Citation

10.1 Type of Source Material: EPA Conference Proceedings

10.2 Citation: American Electroplaters and Surface Finishers Society, Inc., and the Environmental Protection Agency; "12th AESF/EPA Conference on Environmental Control for the Surface Finishing Industry;" January, 1991; pp. 101-111.

10.3 Level of Detail of the Source Material: Additional toxicity data are provided.

10.4 Industry/Program Contact and Address: Scott Backus, Vice President, Har-Conn Chrome Co., 603 NewPark Avenue, West Hartford, CT 06110; Bill Willams, P.E., Vice President, Paul Schaffman, Project Engineer, Consulting Environmental Engineers, Inc., 100 Shield Street, West Hartford, CT 06110.

10.5 Abstractor Name and Address: Maria Leet, SAIC, 7600-A Leesburg Pike, Falls Church, VA 22043.

11.0 Keywords

11.1 Waste type: rinsewater, metals,

11.2 Process type/waste source: electroplating, metal finishing, SIC Code 3471

11.3 Waste reduction technique: toxics reduction, filtration, ion exchange, precipitation, source reduction, water conservation, evaporation

11.4 Other keywords: wastewater reduction

12.0 Assumptions

13.0 Peer Review
Unknown

(*) - Disclaimer: Economic data will vary due to economic climate, varying governmental regulations and other factors

KEYWORDS: rinsewater, metals, electroplating, metal finishing, SIC Code 3471, toxics reduction, filtration, ion exchange, precipitation, source reduction, water conservation, evaporation, wastewater reduction

Displaying item number 96

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Document No. 453-001-A-000

1.0 Headline: Recovery and Use of Methane From Sugar Beet Processing Effluent

2.0 SIC Code: 2063, Beet Sugar

3.0 Name and Location of Company

British Sugar plc
Oundle Road
Peterborough PE2 9QU, England

4.0 Clean Technology Category

This technology uses an anaerobic stage to recover methane from sugar beet effluent for use as a process fuel.

5.0 Case Study Summary

5.1 Process and Waste Information: The facility processes sugar beets generating a wastewater effluent with a high chemical oxygen demand. Traditionally, this effluent was dealt with aerobically by a water treatment plant and its organic content wasted. The clean technology was to add an anaerobic stage to the water treatment section to convert the organic content of the effluent to usable methane. The fermentation takes place in the digestion vessel, the off-gas consists largely of methane with some carbon dioxide. Key features of the process are the pre-heating of the incoming stream using low-grade heat, careful control of the pH and the recirculation of sludge. The methane provides process heat to dry the pulp for use as an animal feed.

5.2 Scale of Operation: British Sugar operates 12 beet factories and employs 3,000 people. The Peterborough facility produces 100,000 tons of sugar per year.

5.3 Stage of Development: The technology is fully implemented.

5.4 Level of Commercialization: No information provided.

5.5 Material/Energy Balances and Substitutions: No information provided.

6.0 Economics*

6.1 Investment Costs: The capital cost of the technology is 750,000 English Pounds.

6.2 Operational and Maintenance Costs: Annual savings in lower sewage charges are 26,000 English Pounds and 8,000 English Pounds in electricity cost savings. The value of recovered gas is 25,000 English Pounds.

6.3 Payback Time: Payback time is 12 years.

7.0 Cleaner Production Benefits

The technology resulted in reduced chemical oxygen demand in the wastewater effluent. Recovery and use of methane from organic matter in the waste water effluent were achieved. Lower operating costs and energy conservation were added benefits of the technology.

8.0 Obstacles, Problems and/or Known Constraints

None were identified.

9.0 Date Case Study Was Performed

Unknown.

10.0 Contacts and Citation

10.1 Type of Source Material: Government Publication.

10.2 Citation: Clean Technology, Environmental Protection Technology Scheme, Department of the Environment, 2 Marsham Street, London SW1P 3EB, 1989, p. 21.

10.3 Level of Detail of the Source Material: No additional detail is provided.

10.4 Industry/Program Contact and Address: Mr. J.N. Smith, Chief Safety and Environment Officer, British Sugar plc, Oundle Road, Peterborough PE2 9QU, England, Telephone (0733) 63171.

10.5 Abstractor Name and Address: John Houlahan, Science Applications International Corporation, 7600-A Leesburg Pike, Falls Church Virginia 22043.

11.0 Keywords

11.1 Waste type: chemical oxygen demand, wastewater effluent, sugar beet processing effluent

11.2 Process type/waste source: sugar products, agricultural processing

11.3 Waste reduction technique: anaerobic digestion

11.4 Other keywords: methane, United Kingdom, SIC 2063

12.0 Assumptions

It is assumed that the economics cited in the source document are on a per plant basis and not the total of all 12 British Sugar plants.

13.0 Peer Review

Unknown.

(*) - Disclaimer: Economic data will vary due to

economic climate, varying governmental
regulations and other factors.

KEYWORDS: chemical oxygen demand, wastewater effluent, sugar beet processing effluent, sugar products, agricultural processing, anaerobic digestion, methane, United Kingdom, SIC 2063
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