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Environmental Pollution
Prevention Project

A Report of the
Office of Environment and Natural Resources
Bureau for Global Programs
United States Agency for International Development

# FINAL PROJECT REPORT
# EP3/TUNISIA

Final Report

Prepared for

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HBI Reference No TR-96-117
4702-101

Environmental Pollution Prevention Project (EP3)
Project Number 936-5559
Contract Number PCE-5559-C-00-3021-00

April 1996

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**ACKNOWLEDGEMENTS**

The Centre de Production Plus Propre, CP3 wishes to thank and expresses its deep gratitude to all parties and individuals who contributed to the success of the Tunisian EP3 project including EP3 Washington, USEPA, WEF, USAID, the Ministry of Environment and Land Use, the business federation UTICA and IRSIT CP3 wishes to thank in particular Ms. Betsy Marcotte, Mr James Gallup, Mr Barry Hill, Ms Deborah Hanlon and Ms Marlou Tomkinson Church for their illimited support at all stages of the project We also wish to thank all the EP3-Washington team for their professional support of the EP3-Tunisia project The EP3 project proved to be a good and effective model of cooperation and transfer of technology and had the exclusive merit of introducing pollution prevention in Tunisia

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**Annexes**

## CHAPTER 1: INTRODUCTION

This document constitutes the final report for the closing of the Environmental Pollution Prevention Project (EP3) Tunisia program It summarizes the activities and achievements of the project over two years and a half period (from October 1993 through March 1996)

### 1.1 Overview of EP3

EP3 - Tunisia office was established in the fall of 1993 by USAID/Tunisia and the Project in Development and Environment (PRIDE) of USAID's Near East Bureau. The objectives of the project are to

- establish sustainable pollution prevention programs in developing countries;
- transfer urban and industrial pollution prevention expertise and information; and
- support efforts to improve environmental quality

The project was managed by Hagler, Bailly, Inc and the Tunisian office included three professionals and two support staff.

- Rachid Nafti, Office Director and Private Sector Specialist
- Halima Bali M'rad, Information Specialist
- Maher Harmel, Pollution Prevention Engineer
- Leila Abassi, Secretary
- Sadok Ghliou , Driver

Immediately after it became operational, the EP3 Tunisia office signed three memoranda of understanding (MOUs): one with the Ministère de l'Environnement et de l'Aménagement du Territoire (MEAT), one the federation of Tunisian industry (UTICA) and one with the Institut Régional des Sciences Informatiques et des Télécommunications (IRSIT) The MOU with MEAT outlines a framework for cooperation and support to the Government of Tunisia in promoting urban and industrial pollution prevention. The MOU with UTICA outlines a framework for cooperation with industry chambers and private industrial enterprises. The MOU with IRSIT establishes procedures for joint development of the Tunisia Environmental Information System (see Annex 1)

## CHAPTER 2: EP3 TUNISIA ACHIEVEMENTS

This chapter reviews the achievements of EP3 Tunisia in

- outreach and training,
- industrial pollution prevention assessments,
- technical and policy support to government, and
- information dissemination

### 2.1 Outreach and Training

Throughout the life of the project, EP3 Tunisia has undertaken (design and implementation) five outreach seminars and eight training workshops More than 600 participants took part in these outreach and training activities, including more than 250 from industry, 100 from government, and 200 consultants and engineering students In addition, EP3 Tunisia staff have participated in more than 15 national and international conferences and seminars and have met individually with more than 100 representatives of government and industry to promote pollution prevention

#### 2.1.1 Outreach Seminars

EP3 Tunisia conducted five outreach seminars in different parts of the country· Tunis (kick-off seminar), Sfax in the center, Gabès in the south (in association with the Chamber of Commerce and Industry of the South), Jendouba in the northwest and Bizerte in the north (in association with UTICA). The purpose of these one-day seminars was to introduce the EP3 Tunisia program and promote pollution prevention among industry, government, and NGOs A total of 342 participants attended these seminars, including more than 250 from industry and about 100 participants from government (see Annex 2).

#### 2.1.2 Training Workshops

In addition, EP3 Tunisia organized eight technical training workshops focusing on the concept and practice of industrial pollution prevention. A total of 204 participants took part in these workshops, including 28 from industry, 40 from government, 30 consulting engineers, and 91 engineering students (see Annex 3)

Two workshops were targeted exclusively at engineering students from the Ecole Nationale des Ingénieurs de Tunis (ENIT) and the Ecole Nationale des Ingénieurs de Monastir (ENIM) One workshop was organized at MEAT with the employees of MEAT and ANPE All other workshops were attended by a mixture of industry managers, government representatives, university professors, and various professionals. One workshop was organized jointly with the Chambre Syndicale Nationale de la Gestion Industrielle de l'Environnement et du Recyclage (Centre de Formation Continue, Bordj Louzir)

A train-the trainer program was also developed and delivered . this one week training transferred necessary pedagogic and technical tools on pollution prevention to private sector trainers, university professors, and heads of training within the government to enable them to train their target audience in pollution prevention

An other training workshop was organized in collaboration with WEF and the Tunisian Office of Water Sanitation, ONAS and targeted government engineers as well as industrials The main objective of this workshop is how to apply pollution prevention techniques in industrial waste water treatment facilities

### 2 1.3 Participation in Conferences

EP3 Tunisia staff have also participated in more than 22 conferences and seminars organized by other groups in Tunisia and abroad and attended by more than 1,500 participants from Tunisian and international government agencies and NGOs

### 2.1.4 Meetings

In addition to training and outreach activities, EP3 Tunisia staff met with more than 120 government and industry representatives (one-on-one or in groups) to promote the concept and practice of pollution prevention For example, the EP3 Tunisia Office Director made presentations on pollution prevention and the mission of EP3 Tunisia to Board meetings of the following organizations

- Fédération Nationale de Chimie,
- Tunisian American Chamber of Commerce;
- Fédération Nationale de Tourisme; and
- Chambre de Commerce du Sud

## 2.2 Industrial Pollution Prevention Assessments

EP3 Tunisia has conducted pollution prevention assessments at 11 industrial plants (battery manufacturing, oil extraction and soap manufacturing, electroplating, textile dyeing, leather tanning, and printing, sugar beats plant) and two hotels Working with engineers and managers at each facility, these audits have identified a total of 218 pollution prevention measures, including 16 materials substitution, 40 process modification, 102 general good housekeeping, 20 energy conservation, 28 water conservation, 7 in-process recycling and 5 off-site recycling measures (see Annex 4)

Implementation of these pollution prevention measures by the audited facilities is well under way thanks to the commitment of audited facilities and the follow-up assistance services provided by EP3 Tunisia As indicated in the evaluation of EP3 results (Annex 4), the implementation pace was satisfactory given and the enterprises reaped benefits of pollution prevention by reducing their operating costs and took advantage of the short pay back period on their investment In fact the identified pollution prevention measures will

- cost the audited industries about 1 1 million DT to implement, and
- reduce operating costs by about 4.5 million DT annually

Operation and maintenance cost savings are due largely to water and energy savings Indeed, implementation of the recommended pollution prevention measures will conserve, each year, at least.

- 232,000 $m^3$ of water,
- 620,000 kwh of electricity,
- 500,000 $m^3$ of gas, and
- 465,000 liters of fuel oil.

Moreover, the recommended pollution prevention measures will reduce raw materials consumption, waste generation and environmental pollution, decrease wastewater discharge fees and penalties, reduce workers' exposure to hazardous substances, and improve product quality and reduce the frequency of defects

EP3 has provided assistance to the audited facilities as they implement the recommended pollution prevention measures Post-audit support includes identifying equipment vendors, testing and verification, and measuring economic and environmental performance of implemented measures

## 2 3 Technical and Policy Support to Government

EP3 Tunisia has worked with the Government to promote the pollution prevention concept and practice in Tunisia To achieve this objective, EP3 Tunisia and the Ministry of Environment, MEAT signed a Memorandum of Understanding in December 1993

EP3 Tunisia has worked with MEAT and the Tunisian Environmental Protection Agency, ANPE to

- formulate a *pollution prevention policy statement* that would be approved at the ministerial level, and
- develop a *pollution prevention strategy* (objectives) to be followed by a pollution prevention work plan (activities and milestones) to implement the strategy

### 2.3.1 Government Pollution Prevention Strategy

With technical assistance from the USEPA, EP3 Tunisia has drafted a white paper with recommendations for a cleaner production strategy in Tunisia The government was responsive to some of the recommendations of this paper and in the fall of 1995 the Depollution Fund Committee decided to make eligible for government preferential financing all investment in pollution prevention This is a very important step taken by the government to promote the practice of pollution prevention within industry

### 2.3.2 Training of Government Staff

As discussed in Section 2.1, *more than 90 government staff* participated in EP3 Tunisia outreach seminars and training activities. Judging from the evaluation and feedback received, most participants found these outreach seminars and training activities unique, informative, and useful In particular, EP3 Tunisia organized a half-day workshop at MEAT with 12 participants from MEAT and ANPE

Working with the Water Environment Federation, EP3 Tunisia organized a training

workshop to ONAS on pollution prevention and wastewater treatment facilities

### 2.4 Information Dissemination

EP3 Tunisia has become a major source of pollution prevention information in Tunisia EP3 Tunisia's information clearinghouse is built around·

- a library of pollution prevention documentation (hard copies); plus
- the Tunisian Environmental Information System (TEIS), a computer-based data management system accessible via Internet

#### 2.4.1 Library of Pollution Prevention Documentation

EP3 Tunisia's library contains *more than 900 publications and reports* on pollution prevention With support from EP3 Washington, EP3 Tunisia has responded to more than *30 individual requests* for information on pollution prevention (documents, reports, case studies) A sample of requested documentation includes

- technologies to recycle
  - plastics
  - marble and limestone powder
- pollution prevention for
  - oil and gas pipeline projects
  - electroplating industry
- ISO 9000 quality standards
- environmental education materials
- pre-treatment of textile dyeing wastewater

EP3 Tunisia obtained requested documents from EP3 Washington and forwarded them as quickly as possible to the users In the process, EP3 Tunisia was able to augment its pollution prevention library Beneficiaries of these information requests have included ministries and government agencies (e.g., MEAT and ANPE), educational institutions (e.g., Ecole Nationale d'Ingénieurs de Gabès), and industries.

### 2.4.2 Tunisian Environmental Information System (TEIS)

In addition, EP3 Tunisia, working with IRSIT, has designed the Tunisian Environmental Information System (TEIS) IRSIT has built the computer shell of the system, which is now operational The TEIS is the first and so far only pollution prevention information network to be developed by any of the EP3 offices worldwide TEIS has three main components.

(1) InMagic cataloguing system, which constitutes the EP3 Tunisia PP library,

(2) local information system, which provides information on local PP databases developed by EP3 Tunisia (e g , people, industries, requests for PP information, and environmental legislation and regulations),

(3) international information system, which provides information on international PP databases using the Gopher system.

More details on the TEIS are available in Annex 5

### 2.4.3. Publications

In addition to in publication of papers and articles on pollution prevention in the major newspapers and industrial environmental magazines, samples of the articles published in Tunisian newspapers are attached in Annex 6, EP3 Tunisia initiated the preparation for publication in french of manuals on Pollution Prevention for the textile, electro-plating, tannery and hotel industries. These publications will be ready in the course of 1996 as post project activities Several articals on the EP3 Tunisia experience were also published in international pollution prevention and cleaner production magazines namely: UNEP "Industry and Environment Cleaner Production", UNEP "Cleaner production Worldwide " and Ecomed "Cleaner production in the Mediterranean Region". Annex 7 represents some success stories of EP3 Tunisia

## CHAPTER 3: CONCLUSIONS, LESSONS LEARNT AND PROSPECTS

Despite the relatively short period of the project (2 1/2 year), the Tunisian EP3 program made a significant contribution to establish a sustainable pollution prevention program in Tunisia In fact, the understanding of the concept and the practice of pollution prevention techniques within local industry has gone practically from nil to broad acceptance inspite of an environment that favors end of pipe treatment and offers no incentives for the adoption of pollution prevention However the achievements of the project does not mean that all of the objectives stated on the project paper were achieved First the project time frame was too short to achieve such an ambitious goal, and second the project has only the merit to initiate a process, an approach that will ultimately change a behavior, a way of thinking and doing that focusses on an integrated preventive strategy At this point it is appropriate to summarize the lessons learnt from the EP3 pilot project and analyze the prospects of pollution prevention in after the EP3 project era

### Lessons learnt

- The EP3 project played a major and effective catalyst role to introduce pollution prevention concepts and practices in Tunisia through the different programs with industry, government, university and NGOs

- The EP3 project contributed to the building of local capacity that will prove to be critical to the sustainability of pollution prevention in Tunisia

- The EP3 project managed to create a network of local organizations ( chambers of commerce, universities and NGOs) interested in promoting pollution prevention nationwide.

- The EP3 project succeeded to get the government commitment to promote the adoption of pollution prevention, this is measurable by the creation of financial incentives through "the depollution fund" and appointment of a pollution prevention coordinator within the ministry of environment

- EP3 Tunisia is identified and recognized as being the focal point for promoting and implementing pollution prevention in Tunisia which led to the creation of "the Centre de Production Propre, CP3" to carry on pollution prevention activities after the close out of the EP3 project. CP3 is now consulted systematically for activities relating to pollution prevention and cleaner technologies

- The EP3 project has raised awareness for the adoption of pollution prevention but more effort and especially time will be needed to stimulate demand for it by industry Tunisian industry is dominated by Small and Medium Enterprises (accounting for 90%
of all enterprises) which are conservative, resistant to change and innovation and are rather reactive. So far they started to respond to the command and control approach because of the effort of law enforcement by the ministry of environment. It is anticipated that today 's context context will lead SMEs to take more seriously environment management where pollution prevention can be seen as the most viable alternative to reduce pollution and save money

- The EP3 project has been perceived by industry to be narrow in its scope and does not solve all environmental problems facing the enterprises especially if they are required by the environmental authority to install pretreatment plants According to our experience the project would have stimulated demand quicker if it had offered implementation of "Environment Management Systems" including eco-audits, product life cycle analysis, eco-labeling and treatment, in addition to PP audits, whenever required.

- The EP3 program as initially designed proved to be too intensive and extensive at the same time There were too many different activities for implementation ( audits, training, outreach seminars, clearinghouse) that had the local staff in permanent pressure to produce and not having enough time to assess market needs and adjust the potential demand

- The EP3 project strategy was rather horizontal by targeting many different sectors (seven) but had not worked intensively on any one of them It would had been more efficient to allow more time to go in depth in one or two sectors, after having tested several sectors, and develop for each one of them an integrated program including the demonstration audit, specific training , information dissemination and publication

- Even though the EP3 project achieved good results with the government by making it include cleaner production actions among the actions to be financed by the "depollution fund", it did not succeed in including pollution prevention assessments as a requirement by law which is critical for the sustainability of the pollution prevention concept However, changing the regulations would require more time than what was available for the project

- As a demonstration project, the EP3 project did not go in depth into the

implementation of the recommended options It relied on the commitment of the industries to implement However, several of these industries seemed to loose momentum after the assessment

- The approach of EP3/Tunisia project was to conduct as many assessments as possible However, fewer but in depth assessments would have had a better impact on industries to stimulate interest in pollution prevention Moreover, conducting 13 assessments in 2-year time frame put local staff under pressure and handicapped them in the most critical phase of the assessment which is the follow-up

- The horizontal approach of EP3/Tunisia project in dealing with industrial sectors may not be very efficient in building local expertise in one or two sectors, but it showed that pollution prevention can be applied in any sector including the service sector (hotels) As a demonstration project to introduce for the first time the concept of pollution prevention, one needs to spread the concept to different categories of sectors After two years of experience in which the project dealt with seven sectors, one can focus in one or two sectors with the highest potential to implement pollution prevention programs and develop for them an integrated program.

- Even though the project dealt with different sectors that required different types of expertise, it allowed local office staff to become "experts" in pollution prevention

- The EP3 approach focussed on no cost-low cost pollution prevention options and gave little attention to high cost ones This approach had the advantage to show quick results but the high cost investment would have allowed the introduction of new and clean technologies that will reinforce the competitiveness and export capacity of Tunisian enterprises which is now hindered by the obsolete and non environmental friendly technologies used by the industry Therefore it is more appropriate for Tunisian industry to consider both cheaper and higher cost options as way of "upgrading" the enterprise both at the environmental and technological levels.

- Although the concept of sustainability is listed in the project objective, there has been no clear strategy to follow or benchmark for monitoring the progress toward this goal. In fact the first year was spent testing the pollution prevention approach in Tunisia through the various project activities by adopting a supply driven approach We recognize that this stage was necessary to make sure that the project responded to real needs and offered viable environmental alternatives for

pollution control solutions that were costly and not all the time effective. The sustainability issue became critical as the project draught to its end and a lot of effort and concentration were made to move toward sustainability It is only at this point where a market approach has been taken by EP3 project in order to achieve sustainability At this point also, we realized that the timeframe (2years) of the project was too short to have a sustainable program and a transition period was required to minimize the risk of failure and strengthen the capacity of the local organization and especially allow enough time for the pollution prevention market in Tunisia to develop

- Regarding policy dialogue, the EP3 project achieved a good result by making the government take concrete measures (financial incentives for industry and a public recognition of the preferred preventive approach). This was done in a smooth manner, since the change occurred as soon as the results of the EP3 project became known through the outreach seminars and the case studies In other words, the change occurred as the result of conviction based on the EP3 experience and less due to political will The EP3 project contributed to the acceptance of pollution prevention by the government and we anticipate that the government will play a proactive role for promoting pollution prevention in the future

- The EP3 Tunisia participation and presence in major international cleaner production events has payed off. It was the extra effort invested in networking and sharing its experience with other countries that brought the attention of other international cleaner production programs such as the NCPC UNEP/UNIDO to the EP3 Tunisia office and recognition of the value of the Tunisian experience in PP and support of AID Washington lead UNIDO to deciding to provide technical assistance to CP3 to carry on the pollution prevention and cleaner production activities.

**Prospects**

The after EP3 project will be a transition period where CP3 in collaboration with UNIDO will continue providing pollution prevention services to the Tunisian industry, assisting stakeholders from government, university and NGOs to integrate pollution prevention in their programs. Besides CP3 will adopt a market approach in providing its various environmental services with a particular emphasis on pollution prevention which is the cutting edge of the organization CP3 will keep close links with US providers of environmentally sound

technologies. It is anticipated that total sustainability can be achieved in one to two years pending the integration of CP3 in the national program of industrial enterprises restructuring as a provider of pollution prevention and environmental management services that will be integrated in the restructuring program of about four thousand enterprises over the next ten years. The program has started and is supported by the government and the European commission. Therefore the EP3 Tunisia staff remains fully optimistic for the sustainability of the organization as well as the concept and practices of pollution prevention in Tunisia.

**Annex 1**

# MEMORANDA OF UNDERSTANDING WITH
# MEAT
# UTICA
# IRSIT

UNITED STATES OF AMERICA

Mission Speciale Americaine
de Cooperation Economique
et Technique en Tunisie

Special Mission for Economic
and Technical Cooperation
28, Rue Suffex - Notre Dame
Tunis, Tunisia

البعثة الامريكية الخاصة للتعاون
الاقتصادي والفني
تونس

USAID

نسخة مطابقة للاصل
تونس في : 1993
رئيس مركز الامن الوطني بنهج كولونيا
الطاهر الزين

Mr. Ahmed Ounaies
Directeur General des Affaires Politiques
Economiques et de Cooperation pour les
pays d'Amerique et d'Asie
Ministere des Affaires Etrangeres
34 Rue d'Iran, Tunis

Tunis, Decembre 9 1993

SUBJECT: Memorandum of Understanding Relative to the Pollution Prevention Project(EP3).
AID Project No. 398-0365

Dear Mr. Ounaies,

This letter constitutes the Memorandum of understanding between the United States Agency For International Development ("AID") and the Government of Tunisia acting through the Ministry of Foreign Affairs for the implementation of the the EP3 project in Tunisia:

1 The Program·

The EP3 program provides technical assistance , training and information services in industrial pollution prevention to private sector industries in order to help these industries become more competitive. The EP3 program will establish an office in Tunisia which will have two primary functions:

(A) To promote interest and demand for the adoption of pollution prevention approaches in Tunisian firms;

(B) To facilitate transfer of pollution prevention methodologies and technologies to Tunisian firms.

The EP3 office in Tunisia will include provision for long and short-term technical assistance, limited travel, in-country and external training, workshops, seminars, pollution prevention audits/assessments , and regional information/technology demonstration fairs.

The program is further described in Annex A "Amplified Project Description", which is attached hereto and incorporated herein by reference.



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2 Implementation.

This activity will be implemented by the United States EP3 Prime Contractor, RCG/Hagler, Bailly Inc., through the EP3 local office opened in Tunisia. Project workplans will be developed by EP3 and provided for review by the Ministry of Environment and Land Use (MEAT).

3.Responsibilities

a EP3 Tunisia office agrees to

1 Keep the MEAT informed of its activities through quarterly activity reports and on going communication with designated MEAT officials Activity reports shall include names of industries that are participating in EP3 diagnostic studies, lists of training programs, and other planned activities

2.coordinate environmental activities with MEAT so as to target those industrial categories, geographical areas or priority polluters that are of concern to MEAT

3 share information with MEAT on results of demonstration projects implemented by EP3

4 assist MEAT in obtaining information and documents through the EPI Information Clearinghouse in Washington,DC.

5 assist MEAT including its agencies such as ONAS and ANPE by providing technical assistance, conducting selected workshops and training sessions as identified by MEAT.

b The MEAT agrees to:

1.designate responsible persons as EP3 contacts within MEAT, including one from ONAS and one from ANPE. These contacts will communicate and coordinate with EP3 Office in Tunisia and will assist in the development of in house and external training courses and technical assistance programs.

2.Share non-confidential environmental information with the EP3 Office in Tunisia so as not to duplicate efforts and to assist EP3 in targetting its efforts.

3.The MEAT agrees, in general, to provide advice and support to carry out the project effectively and in a timely manner. Specifically, the Ministry agrees to name a Ministry employee who will serve to assist in coordinating activities between MEAT and the EP3 project in Tunisia

4.Financing

The EP3 project is centrally funded by the United States Agency for International Development, for a total cost of U.S.Dollars 1 2 million, for a two year period expiring August 25, 1995.

5 Project grant:

All terms and conditions of the bilateral agreement for economic, technical and related assistance dated march 26, 1957 between the Governments of Tunisia and the United States of America shall apply with force and effect to this project.

Please indicate your agreement with the above by signing below and returning one copy of this Memorandum of understanding to us. This Memorandum of Understanding shall come into full force and effect as of the dates affixed below.

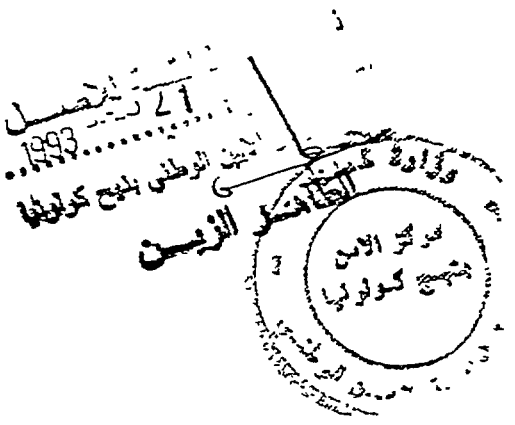
**FOR THE MINISTRY OF FOREIGN AFFAIRS**

Signature: _____

Name :Ahmed Ounaies

Title .Directeur General des Pays D'Amerique et D'Asie

Date 12/21/93



**FOR USAID/TUNISIA**

Signature : _____

Name :James A Graham

Title :Director,USAID/Tunisia

Date : 12/21/93

CONCURRENCE:

**MINISTRY OF ENVIRONMENT AND LAND USE:**

Signature : _____

Name :Faiez Aved

Title :Chef de Cabinet

Date : 12/15/93

Attachment Annex A : Amplified Project Description.



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UNITED STATES OF AMERICA

Mission Speciale Americaine
de Cooperation Economique
et Technique en Tunisie

Special Mission for Economic
and Technical Cooperation
28, Rue Suffex - Notre Dame
Tunis, Tunisia

البعثة الامريكية الخاصة للتعاون
الاقتصادي والفني
تونس

Mr. Hédi Jilani
Président de l'UTICA
Avenue de la Liberté
Tunis

January 18, 1994

SUBJECT: Memorandum of Understanding Relative to the Pollution Prevention Project(EP3). AID Project No 938-0365

Dear Mr. Jilani,

This letter constitutes the Memorandum of understanding between the United States Agency For International Development ("AID") and Union Tunisienne pur l'Industrie,le Commerce et l'Artisanat ("UTICA") for the implementation of the the EP3 project in Tunisia.

1 The Program

The EP3 program provides technical assistance , training and information services in industrial pollution prevention to private sector industries in order to help these industries become more competitive. The EP3 program will establish an office in Tunisia which will have two primary functions:

(A) To promote interest and demand for the adoptions of pollution prevention approaches in Tunisian firms;

(B) To facilitate transfer of pollution prevention methodologies and technologies to Tunisian firms.

The EP3 office in Tunisia will include provision for long and short-term technical assistance, limited travel, in-country and external training, workshops, seminars, pollution prevention audits/assessments , and regional information/technology demonstration fairs.

The program is further described in Annex A "Amplified Project Description", which is attached hereto and incorporated herein by reference



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2 Implementation

This activity will be implemented by the United States EP3 Prime Contractor RCG/Hagler, Bailly Inc through the EP3 local office opened in Tunisia. The project workplans will be regularly provided for review by UTICA.

3 Financing:

The EP3 project is centrally funded by the United States Agency for International Development, for a total cost of U.S Dollars 1.2 million, for a two year period expiring August 1995.

4 Responsibilities

a EP3 Tunisia office agrees to.

1.Keep UTICA informed of its activities through quarterly activity reports and on going communication with designated UTICA officials Activity reports shall include names of industries that are participating in EP3 diagnostic studies, lists of training programs, and other planned activities.

2.coordinate environmental activities with UTICA so as to target those industrial categories, geographical areas or priority polluters that are of concern to UTICA.

3 share information with UTICA on results of demonstration projects implemented by EP3.

4.assist UTICA in obtaining information and documents through the EP3 Information Clearinghouse in Washington,DC.

5.assist UTICA by conducting selected workshops and training sessions as identified by UTICA.

b UTICA agrees to:

1.designate responsible persons as EP3 contacts within UTICA. These contacts will communicate and coordinate with EP3 Office in Tunisia and will assist in the development of criteria for selection of industries for the implementation of pollution prevention projects

2 Share industry specefic information with the EP3 Office in Tunisia so as to assist EP3 in targetting its efforts in

selecting priority industries

3.UTICA agrees, in general, to provide advice and support to carry out the project effectively and in a timely manner.

Please indicate your agreement with the above by signing below and returning one copy of this Memorandum of understanding to us. This Memorandum of Understanding shall come into full force and effect as of the dates affixed below.

FOR UTICA:

Signature _____

Name :Hedi Jilani

Title :President

Date :01 FEV. 1994

FOR USAID/TUNISIA

Signature :_____

Name :James A. Graham

Title :Director,USAID/Tunisia

Date :01 FEV. 1994

FOR EP3 TUNISIE:

Signature :_____

Name :Rachid Nafti

Title :Office Director

Date :01 FEV. 1994

Attachment: Annex A : Amplified Project Description.

UNITED STATES OF AMERICA

Mission Spéciale Americaine
de Cooperation Economique
et Technique en Tunisie

Special Mission for Economic
and Technical Cooperation
23, Rue Suffex - Notre Dame
Tunis, Tunisia

البعثة الامريكية الخاصة للتعاون
الاقتصادى والفنى
تونس

Mr Noureddine Ellouze
Président Directeur Général
IRSIT
Tunis

Tunis, Decembre 9, 1993

SUBJECT Memorandum of Understanding Relative to the
Environmental Pollution Prevention Project (EP3)
AID Project No 398-0365

Dear Sir,

This letter constitutes the Memorandum of Understanding between the Environmental Pollution Prevention Office of Tunisia (EP3) and IRSIT

1 The EP3 and EIS Programs

a The EP3 program provides technical assistance , training and information services in industrial pollution prevention to private sector industries in order to help these industries become more competitive The EP3 program will establish an office in Tunisia which will have two primary functions

(a 1)To promote interest and demand for the adoption of pollution prevention approaches in Tunisian firms,

(a.2)To facilitate transfer of pollution prevention methodologies and technologies to Tunisian firms

The EP3 office in Tunisia will include provision for long-term and short-term technical assistance, limited travel, in-country training, workshops, seminars, pollution prevention audits/assessments, and regional information/technology demonstration fairs

The program is further described in Annex A Amplified Project Description, which is attached hereto and incorporated herein by reference



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b The EIS program consists of developing an Environment Information System that will electronically link the EP3 office in Tunisia to the EP3 office in the U S as well as to similar information systems in the US (EPA's PPIC/PIES, UNEP's ICPIC, etc.. ) The EIS will also establish several data bases to support the information dissemination activities of the EP3 Tunisia office The EIS will also provide other communication facilities (Email) to help local Tunisian companies establish contact with US suppliers of clean technology products

2 Implementation

The EP3 activity will be implemented by the United States EP3 Prime Contractor RCG/Hagler, Bailly Inc through the EP3 local office opened in Tunisia. Project workplans will be developed by EP3 and provided for review by IRSIT

The EIS activity will be implemented by IRSIT according to the following work plan

1/ IRSIT will first develop several electronic data bases to support the outreach and information dissemination activities of the EP3 office in Tunisia

2/ IRSIT will then assist the EP3 office in Tunisia to access electronically the data bases maintained in the EP3 Washington office as well as the UNEP ICPIC

3/ IRSIT will install the EIS main node at IRSIT and to test the EIS access to local Tunisian organizations, such as Chambers of Commerce or other economic operators This will allow calibration and fine tuning of the proposed system

4/ IIRSIT will make the EIS accessible to 10 pilot clients in Tunisia These pilot sites will allow IRSIT to test the performance of the EIS and will eventually lead to an overall assesment of the quality of services rendered by the EIS This second step will also allow IRSIT to make recommendation on how to expand the EIS access to other NE countries in the future

In order to successfully accomplish this proposed action plan, IRSIT will provide

(a) Engineering and software expertise to develop the EIS database. Most of the work involved after testing all hardware and software would be to find relevant data from databases in the U S , feed this data to the local database and develop a user friendly interface to the proposed system This requires custom database application development to be done at an early stage of the project.

(b) Software development expertise to operate the system Athough IRSIT provides some similar services currently, IRSIT will adjust to much larger user needs from a much larger user community This will be accomplished by hiring and training additional technical staff to operate the system in order to guarantee a reliable service and provide adequate support to end users

(c) Engineering and software assistance to install necessary hardware and/or software at the EIS user sites As indicated earlier, 10 pilot sites will initially access the system In addition a special access point needs to be installed at the EP3 office in Tunisia

(d) Maintenance services to guarantee smooth system operation Assuring reliable service quality and providing users with adequate support are two essential factors to guarantee the usage of the proposed EIS by end users

The implementation of the proposed EIS will be conducted in following phases These phases will lead to the following benchmarks

Benchmark 1

Establish contact with the EP3 clearing house in the US and the EP3 office in Tunisia to prepare an action plan The upgrade of IRSIT technical capabilities by installing additional hardware and software will be also conducted in this initial phase

Benchmark 2

Start developing the EIS at IRSIT This phase will first focus on the development of the EIS "engine" as well establishing the electronic links between the EIS and the EP3 clearing houses in Tunisia and Washington and with the UNEP ICPIC

Benchmark 3

Identify key end users in Tunisia and start to establish links between these users and the EIS This will involve the setup of electronic connection between the users and IRSIT as well as the installation of the EIS user interface Training the users will be also conducted in this phase

Benchmark 4

Promote the EIS within the user community in conjunction with the EP3 office in Tunisia This phase will also involve making recommendations on how to expand the EIS both in Tunisia and in the Near East Countries

Benchmark 5

Depending on the overall success of the EIS and the ability to link a critical number of end users, IRSIT will identify a strategy to start a fully private incubator company which will run the EIS as a private company that operates based on the principle "fee for service"



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3 Responsibilities

a EP3 Tunisia office and IRSIT agree to

1 IRSIT will finalize the Environmental Information System (EIS) workplan in conjunction with EP3 Tunisia Office and will coordinate activities to reflect EP3 workplan

2 IRSIT general role is system and software development of the Environment Information System and establishing the telecommunication links

a) IRSIT will be responsible for bringing relevant data from databases in the U S and from UNEP (the EP3 office in Washington will assist IRSIT in accessing these systems), feed this data to the local database and develop a user friendly interface to the proposed system

b) IRSIT will provide overall technical assistance to the the EP3 office staff in Tunisia to promote EIS

c) IRSIT will set up telecommunication infrastructure for the EP3 office in Tunisia

3 In cojunction with the EP3 office in Tunisia, IRSIT will develop specialized databases to assist the EP3 office in the implementation of activities The EP3 Office will primarily be responsible for the collecting information and will maintain several of the databases

4 In conjuction with the EP3 office in Tunisia, IRSIT will make the EIS accessible to EP3 pilot clients IRSIT role will only involve technical assistance, mainly, to establish the EIS link and access information EP3 office in Tunisia will handle actions pertaining to obtaining relevant information from the EIS

5 IRSIT and EP3 office in Tunisia will share information on activities through continuing contact, quarterly summary reports and bi-annual progress meetings.

6. During the grant period, neither EP3 Office in Tunisia or IRSIT will charge each other for information or services or shall expect each other to do anything outside of the approved scopes of work.

7 At the end of the two year grant, IRSIT will transfer to the EP3 Office in Tunisia the software developped to run the EIS system, software, data and source codes It is EP3 office in Tunisia's responsibility to provide the hardware required to run the system. At this time IRSIT may also keep those portions of the EIS which they desire

Please indicate your agreement with the above by signing below and returning one copy of this Memorandum of understanding to us This Memorandum of Understanding shall come into full force and effect as of the dates affixed below

**FOR IRSIT**

Signature _____

Name Noureddine Ellouze

Title Président Directeur Général

Date December 13, 1993

**FOR EP3/TUNISIA**

Signature _____

Name Rachid Nafti

Title Director / EP3 Office Tunisia

Date December 14, 1993

**FOR USAID/TUNISIA**

Signature : James A. Graham

Name James A Graham

Title Director USAID/ Tunisia

Date : Dec 15, 1993



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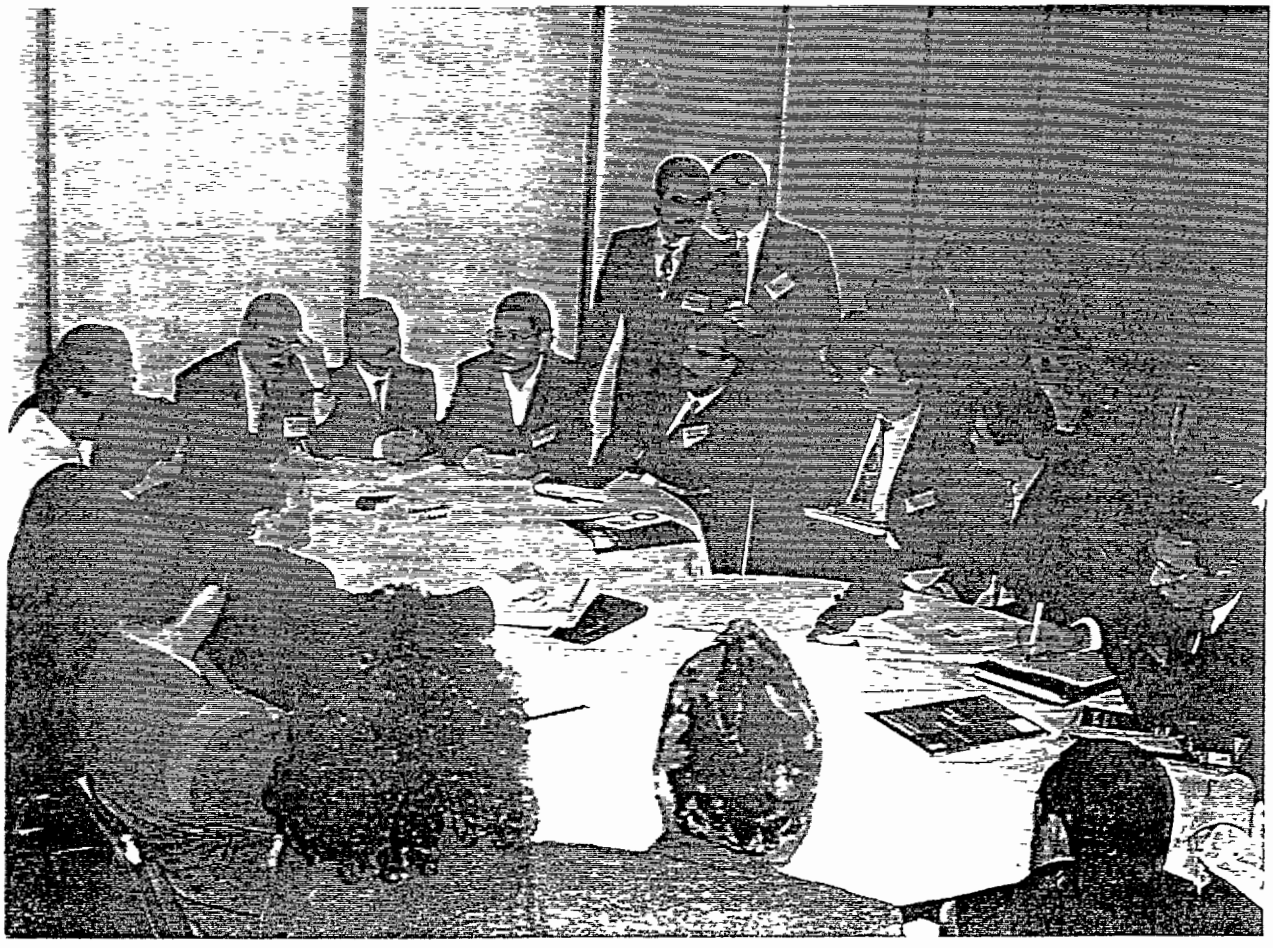
**Annex 2**

## OUTREACH SEMINARS
## SUMMARY TABLE

## PROFILE OF PARTICIPANTS IN EP3 TUNISIA'S OUTREACH SEMINARS

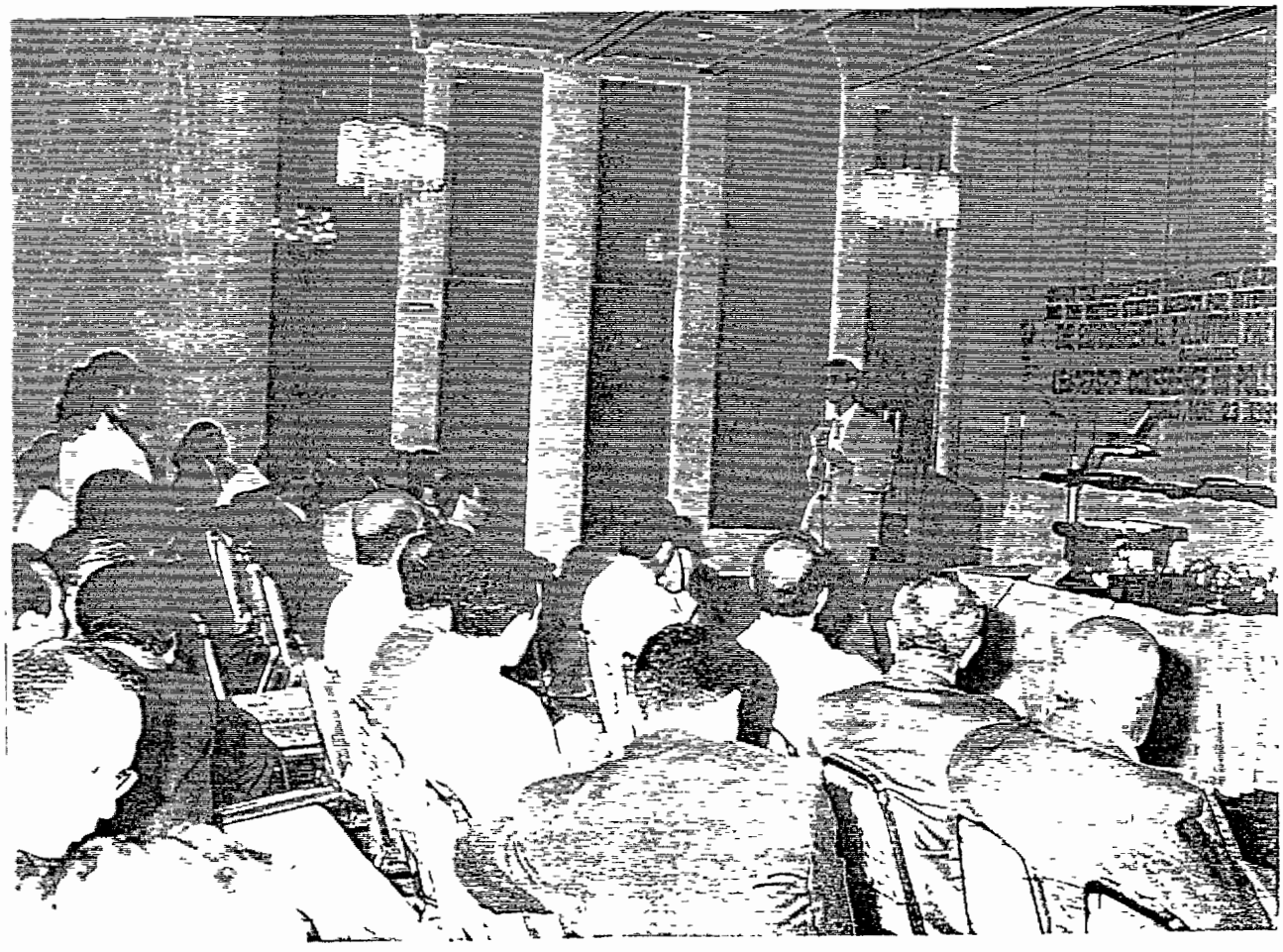
| Training Activity | Number of Participants | | | | |
|---|---|---|---|---|---|
| | Industry | Consultants a/ | Government | Other | Total |
| **Outreach Seminars** | | | | | |
| 1 Tunis 12/3/93 | 48 | 34 | 18 | 12 | 112 |
| 2 Sfax 1/12/94 | 54 | 8 | 14 | 4 | 80 |
| 3 Gabès 1/13/94 | 36 | 4 | 6 | 4 | 50 |
| 4 Jendouba 4/19/94 | 38 | 6 | 5 | 1 | 50 |
| 5 Bizerte 6/30/94 | 27 | 7 | 6 | | 40 |
| 6 Leadership Conference 5/23/96 | 63 | 10 | 22 | 20 | 115 |
| **Subtotal** | 266 | 69 | 71 | 41 | 447 |

a/ Includes university professors
b/ Engineering students form the "other" participants category



EP3 Kick Off Seminar


EP3 Leadership Conference



EP3 Leadership Conference


Leadership Conference chaired by the Tunisian Minister of Environment
and the US Ambassador in Tunisia

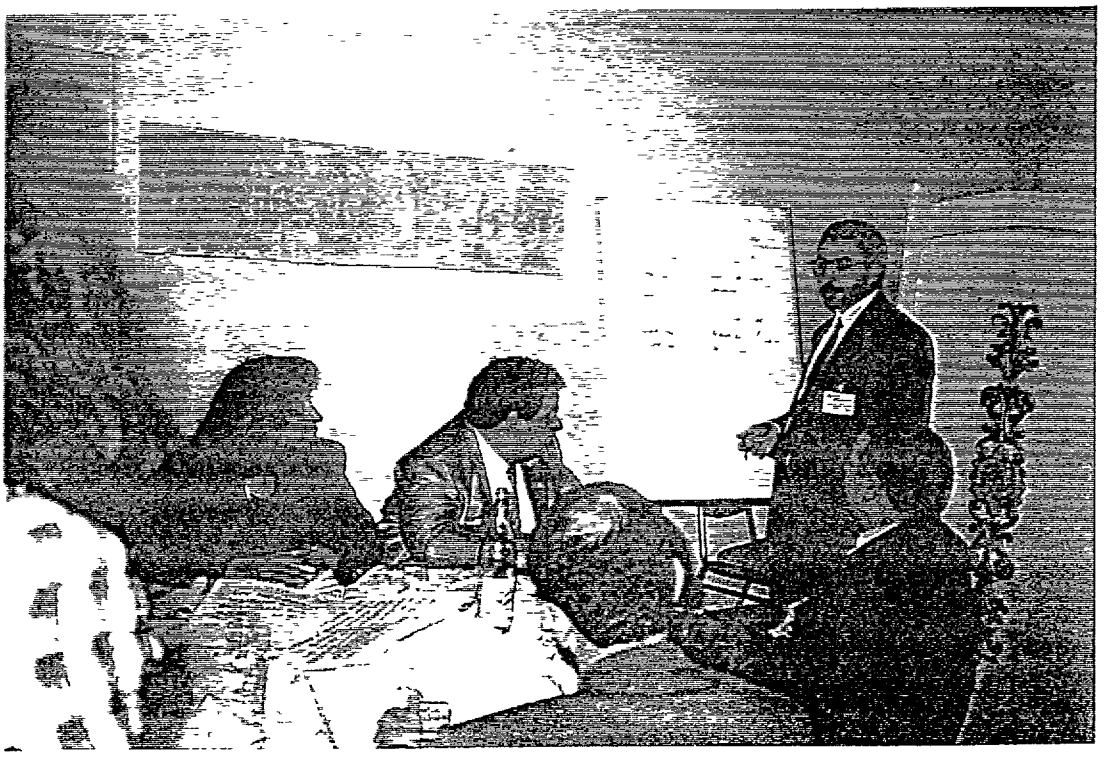
Annex 3

# Training Workshops
## Summary Table

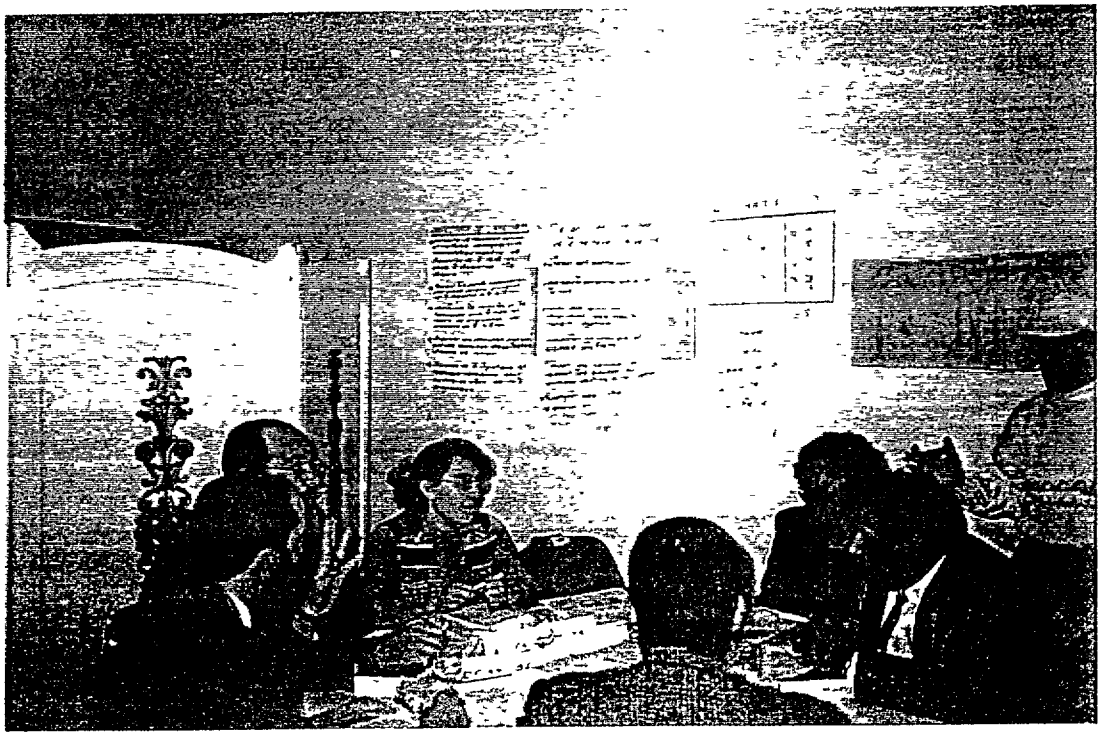
## PROFILE OF PARTICIPANTS IN EP3 TUNISIA'S TRAINING WORKSHOPS

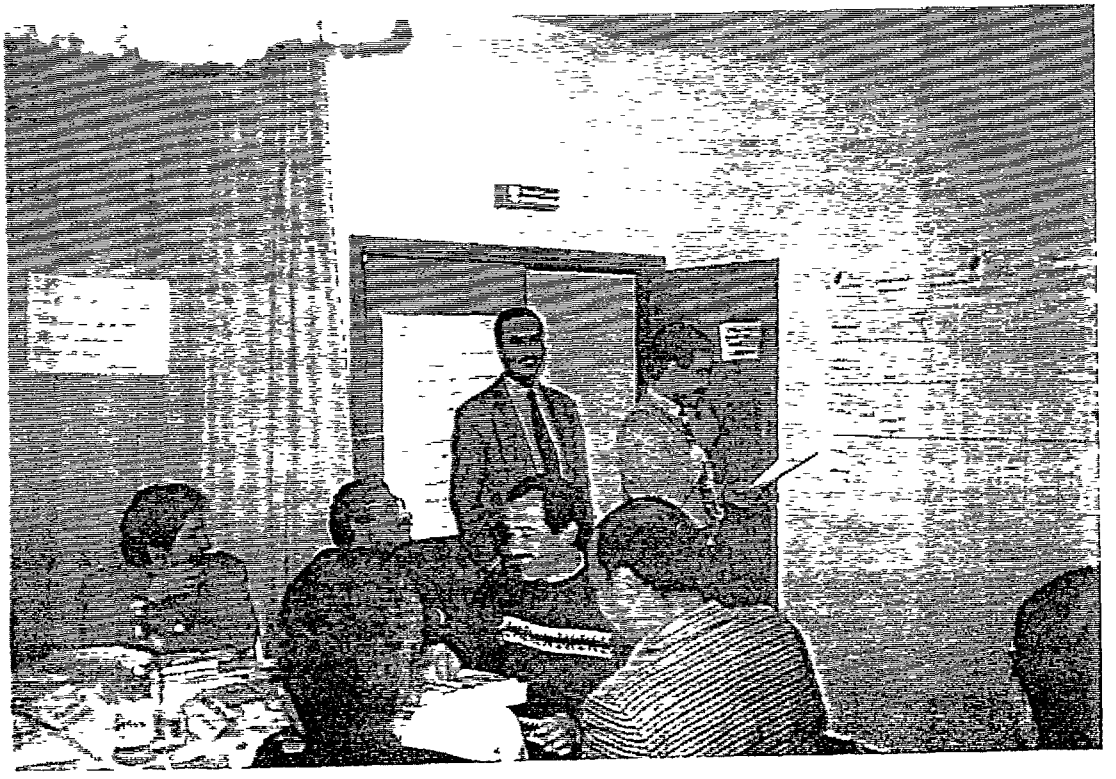
| Training Activity | Number of Participants | | | | |
|---|---|---|---|---|---|
| | Industry | Consultants a/ | Government | Other | Total |
| **Training Workshops** | | | | | |
| 1 Tunis 4/28/94 | 8 | 6 | 4 | 2 | 20 |
| 2 Bordj Louzir 6/28/94 | 6 | 5 | 5 | 6 | 22 |
| 3 ENIM b/ 9/94 | | | | 30 | 30 |
| 4 EP3 Office 11/30/94 | 5 | 6 | 3 | | 14 |
| 5 ENIT b/ 12/15/94 | | 4 | | 46 | 50 |
| 6 Tunis 1/24-26/95 | 4 | 9 | 6 | 7 | 26 |
| 7 MEAT 10/25/94 | | | 12 | | 12 |
| 8 ONAS 6/20-22/95 | 4 | | 14 | | 18 |
| 9 USIS 4/26/95 | | | | 25 | 25 |
| **Subtotal** | 27 00 | 30 00 | 44 00 | 116 00 | 217 |

a/ Includes university professors
b/ Engineering students form the "other" participants category

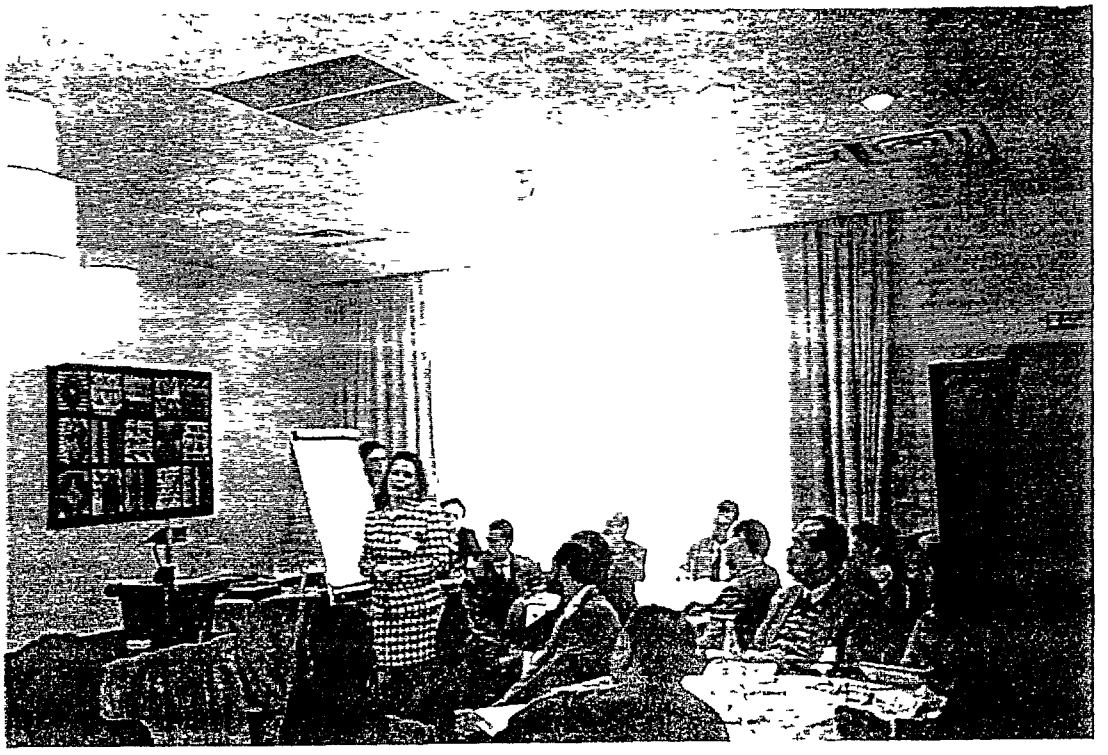


Training Workshop





Training Workshop



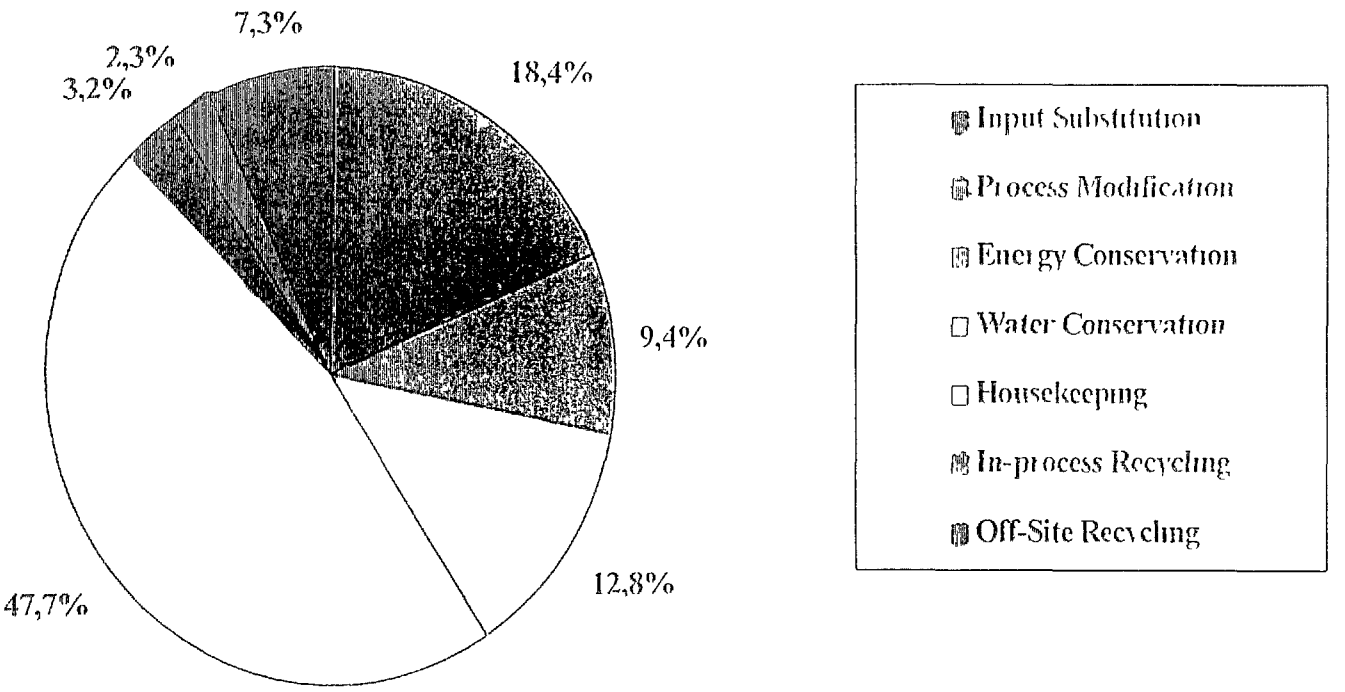

Training Certificates for completing
Train the Trainer Workshop

Annex 4

# Pollution Prevention Assessments
## Summary Tables of PP options and savings

# POLLUTION PREVENTION OPTIONS SUMMARY

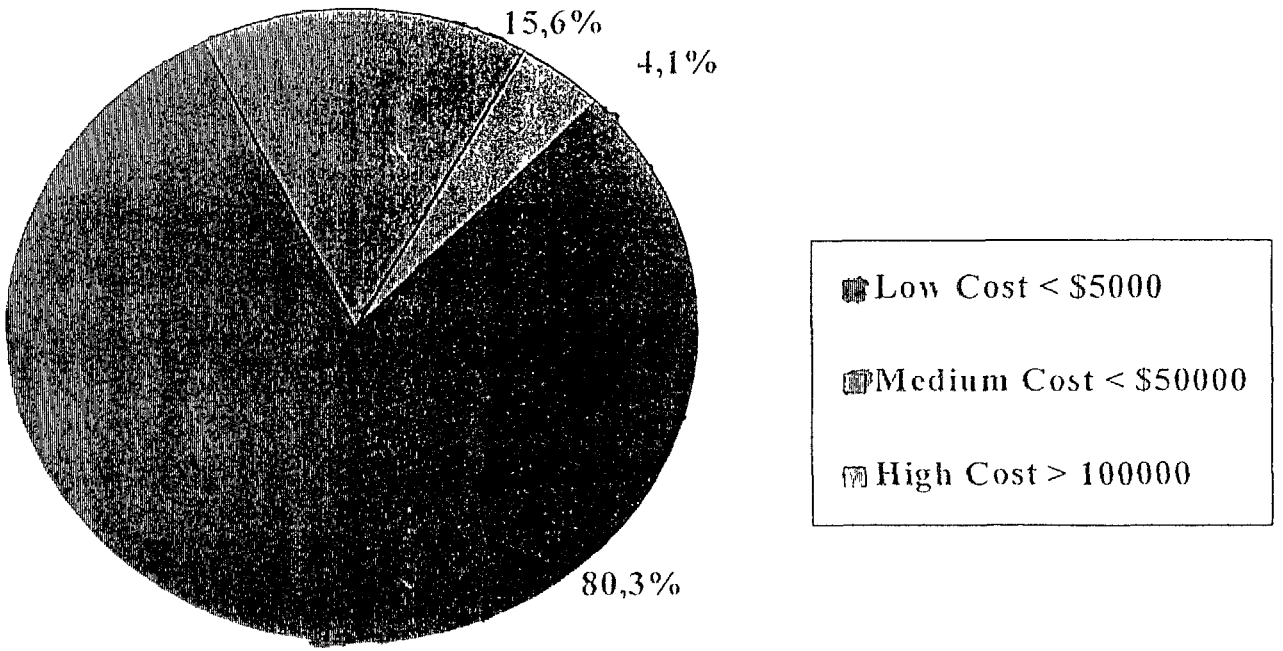
## (1) REPARTITION BY CATEGORY




CP3

# POLLUTION PREVENTION OPTIONS SUMMARY

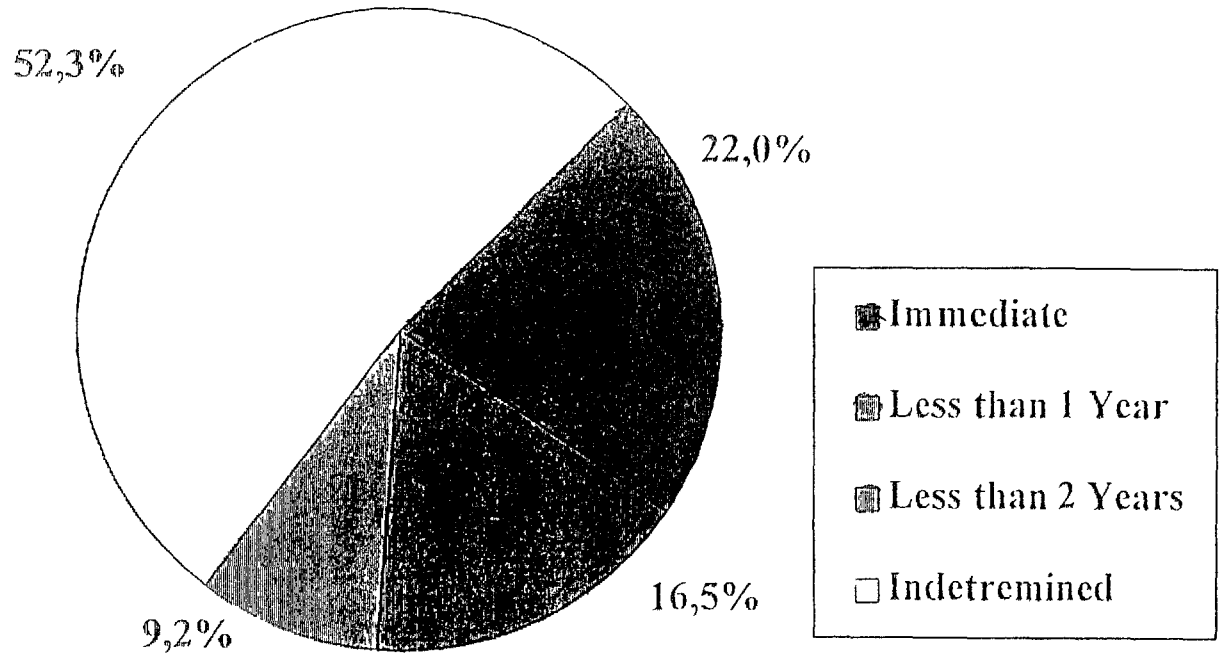
## (2) REPARTITION BY COST




CP3

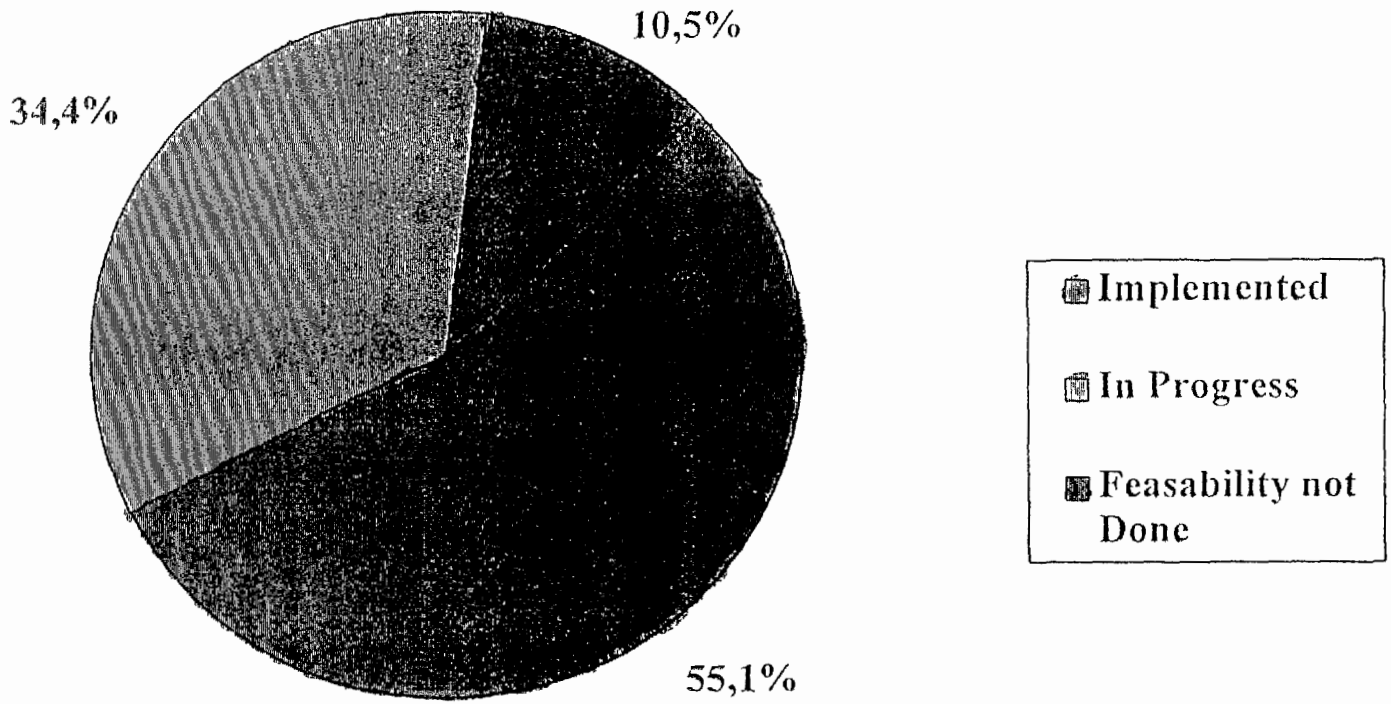
# POLLUTION PREVENTION OPTIONS SUMMARY

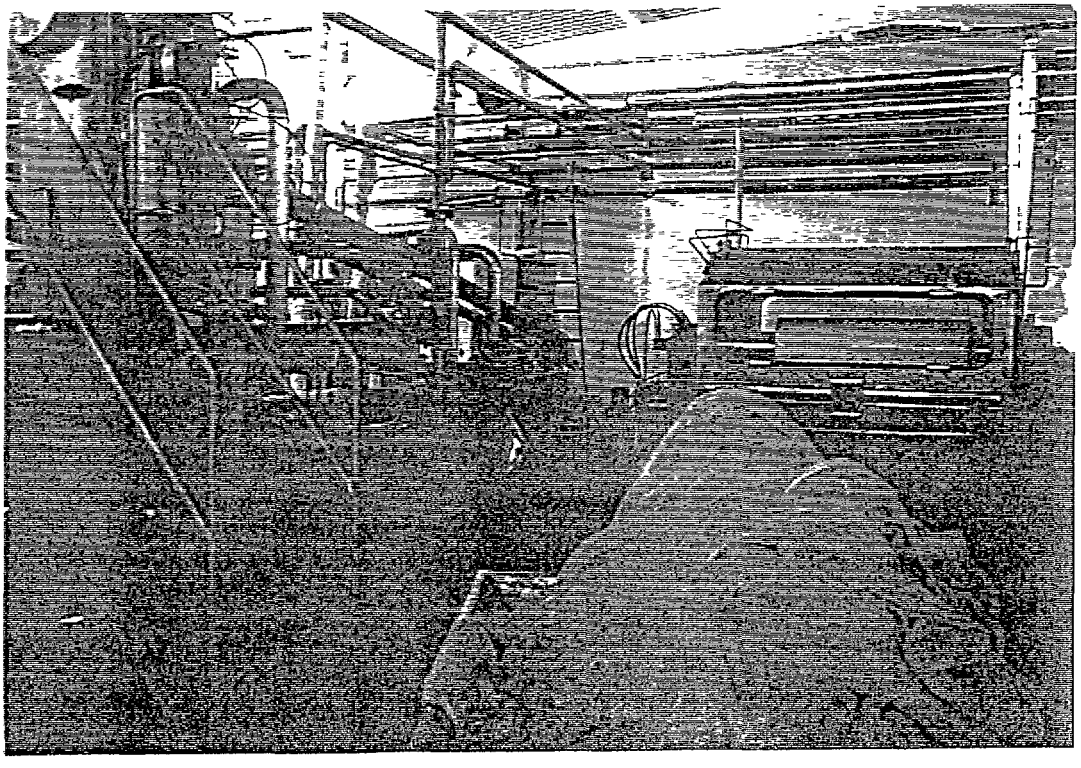
## (3) REPARTITION BY PAY-BACK PERIOD



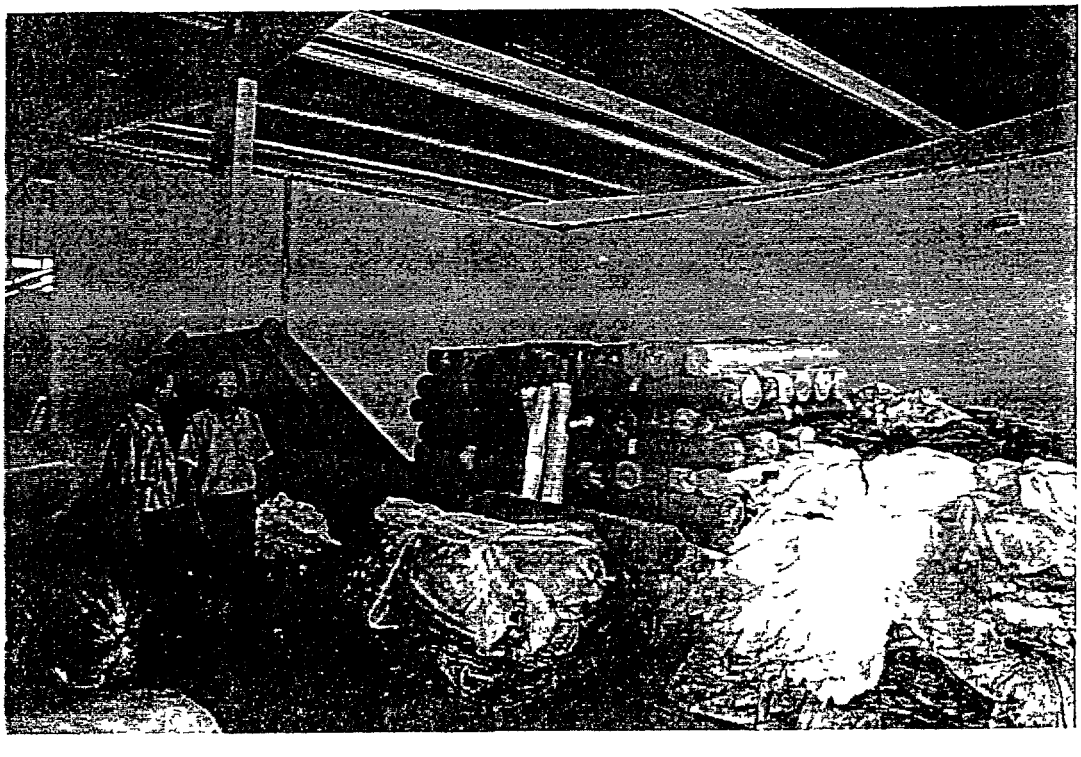
# POLLUTION PREVENTION OPTIONS SUMMARY

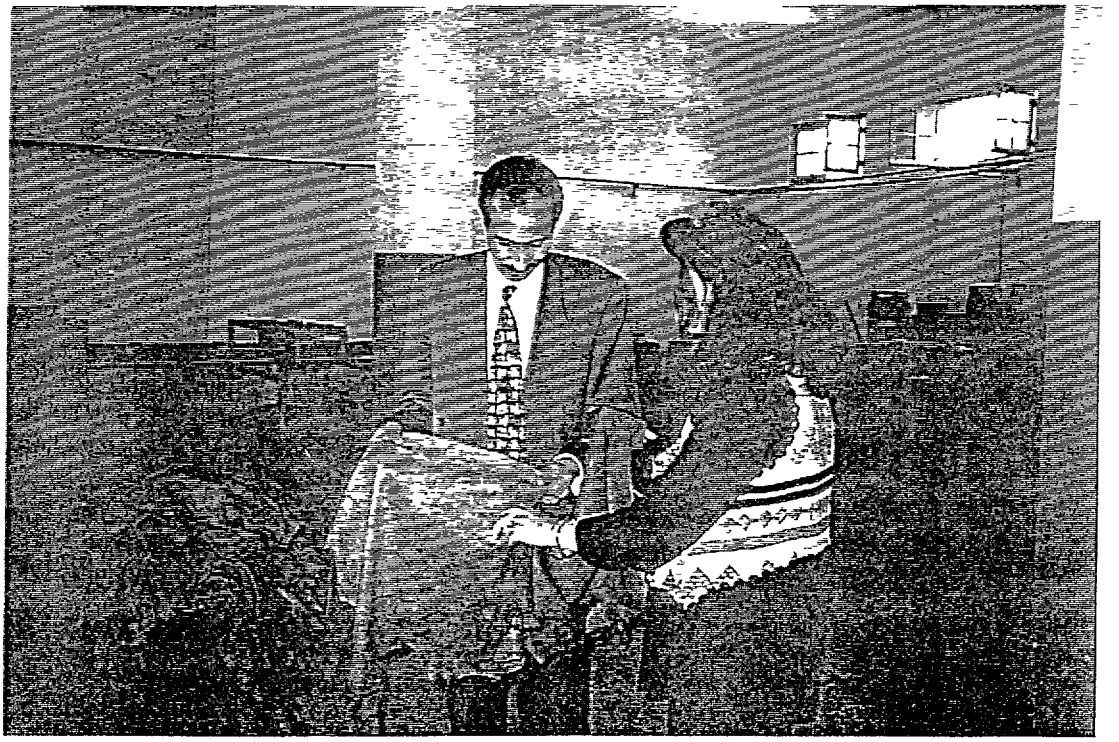
## (4) REPARTITION BY IMPLEMENTATION



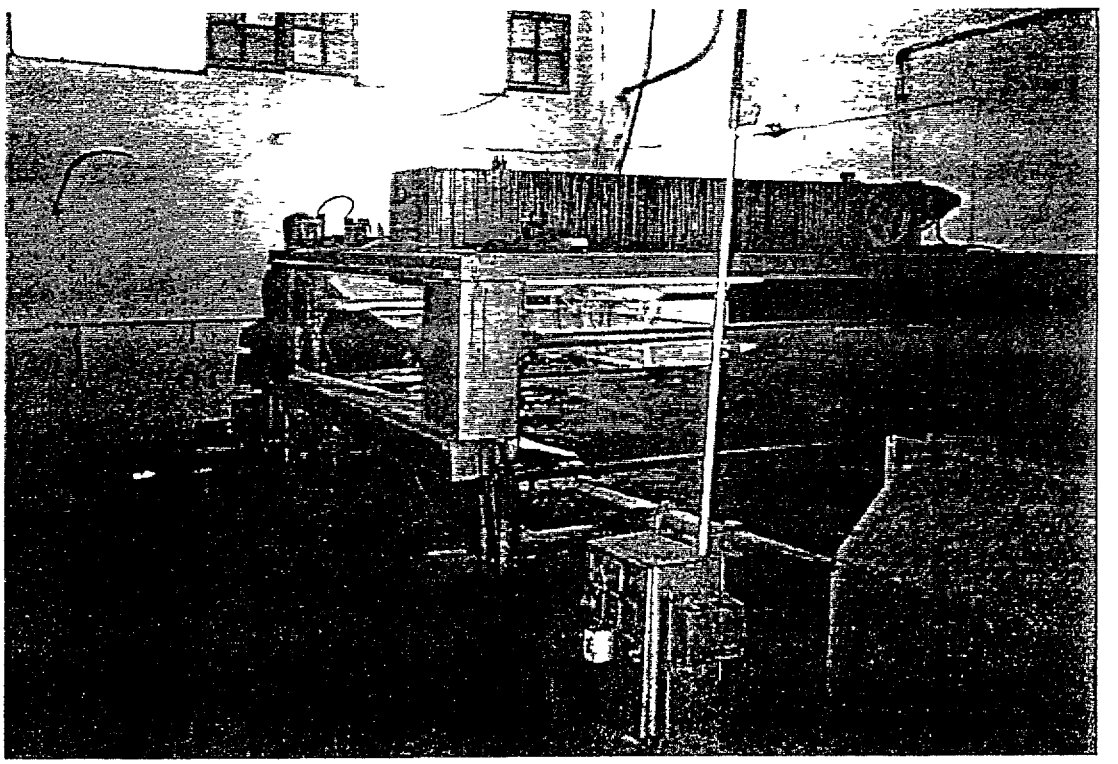


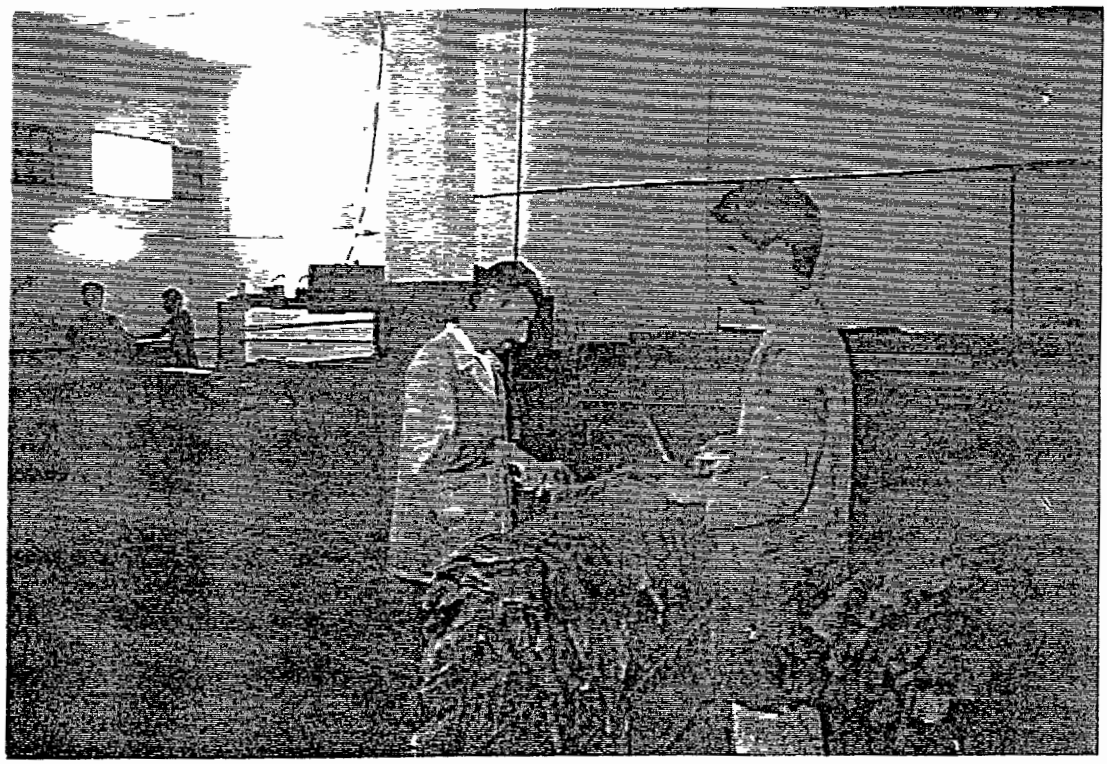
Textile Pollution Prevention Assessment



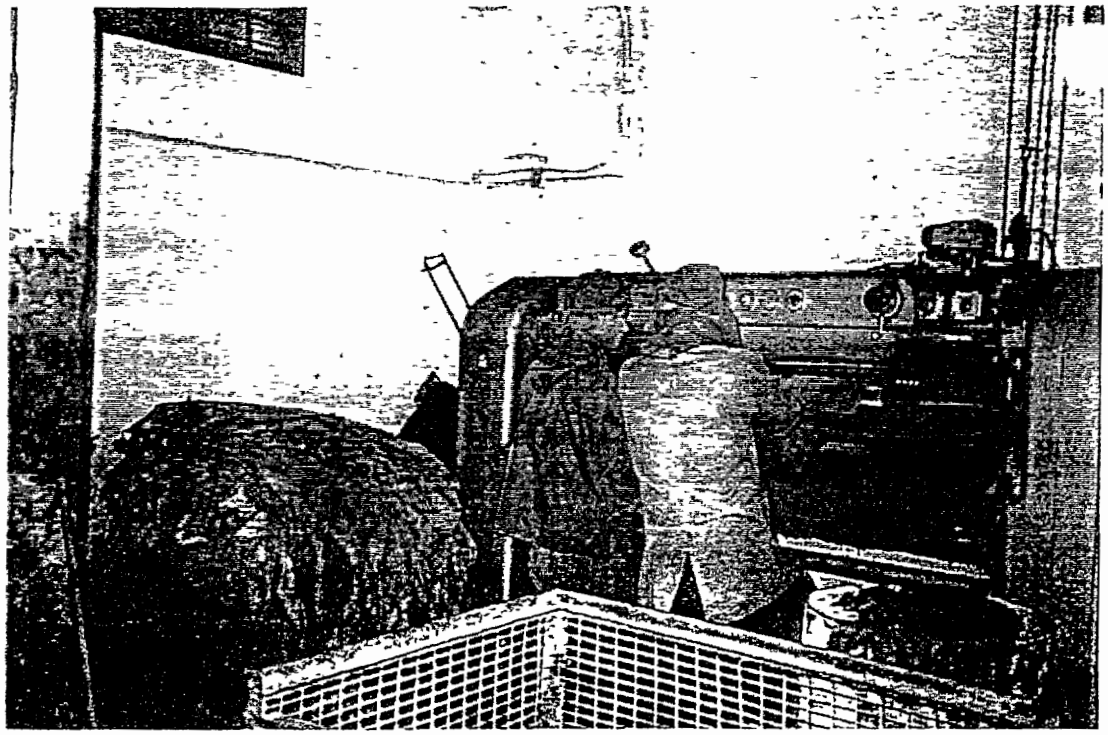


Tannery Pollution Prevention Assessment

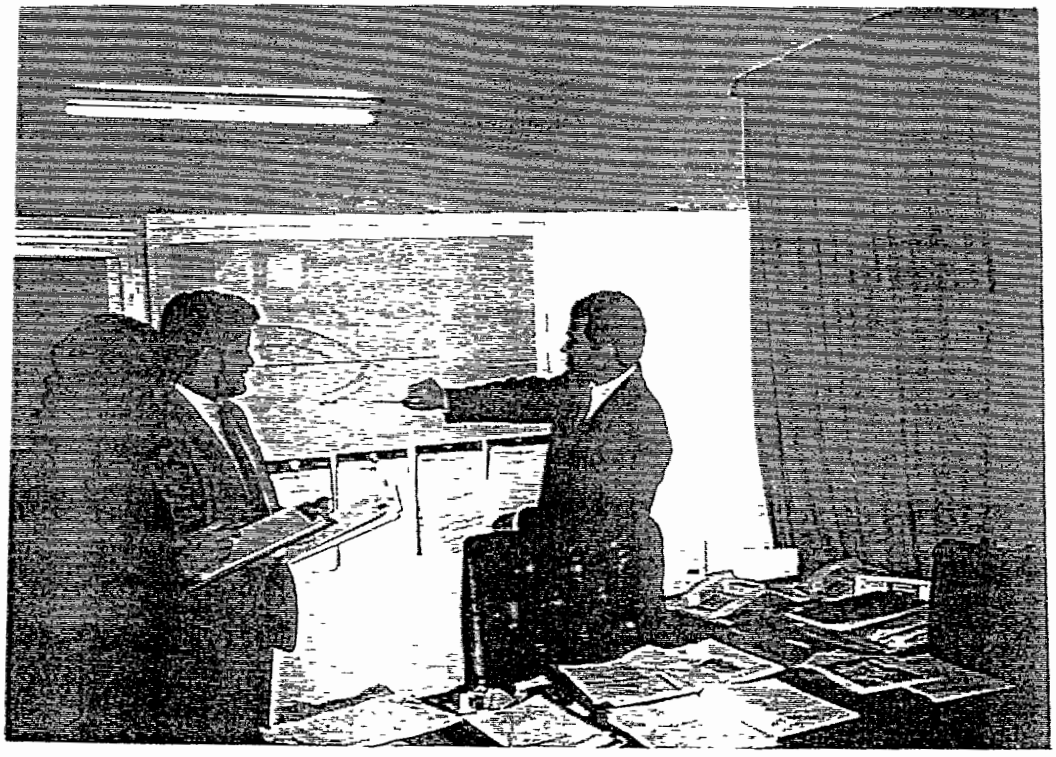


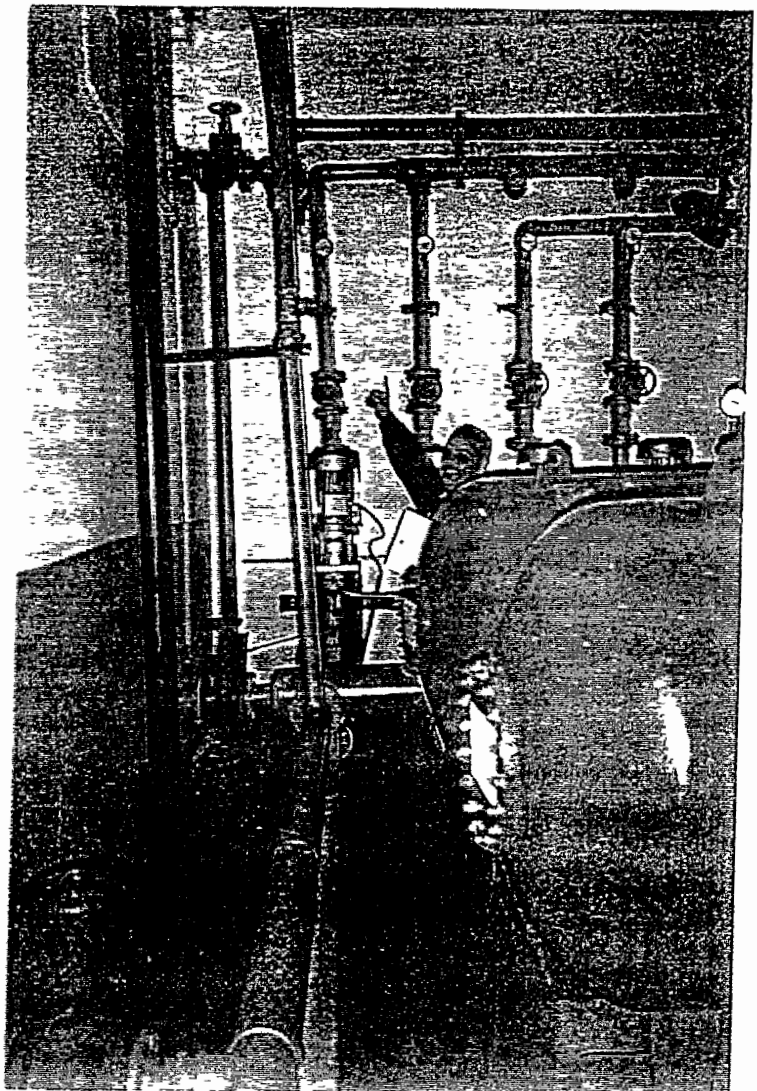


Tannery Pollution Prevention Assessment



Car Battery Plant Pollution Prevention Assessment





Annex 5

# TUNISIAN ENVIRONMENTAL INFORMATION SYSTEM

EP3 - Tunisia Clearinghouse
Demonstration for the Tunisian Minister of Environment (Mr Mehdi Mlika)
and the US Ambassador in Tunisia (Ms Mary Casey)

May 1995

# ACCESSING AND PROVIDING INFORMATION ON CLEAN TECHNOLOGIES TO INDUSTRY

HALIMA BALI M'RAD
Environmental Pollution Prevention Project, Tunisia

## 1. WHY POLLUTION PREVENTION

Rapid industrialization and urbanization in developing countries have led to severe pollution water that is unfit for drinking or bathing, extreme levels of air contamination, and growing quantities of municipal and hazardous wastes that are disposed of improperly. Efforts to manage urban and industrial pollution have concentrated on "end-of-pipe" treatment which, in many cases is not only costly but ultimately unsustainable This is especially true in developing countries where additional pollution treatment diverts scarce resources from economic development

Experience in the United States and other countries has demonstrated that in the long run, pollution prevention through waste minimization and cleaner production is more cost-effective and environmentally sound than traditional pollution control methods Pollution prevention techniques apply to any manufacturing process, and range from relatively easy operational changes and good housekeeping practices to more extensive changes such as the installation of state-of-the-art recovery equipment Pollution prevention can improve plant efficiency, enhance the quality and quantity of natural resources for production, and make it possible to invest more financial resources in expanding production capacity

The Environmental Pollution Prevention Project (EP3) is a five-year program sponsored by the United States Agency for International Development (USAID) to address urban and industrial pollution and environmental quality in developing countries The objectives of the EP3 program are

- to establish sustainable programs in developing countries,
- to transfer urban and industrial pollution prevention expertise and information, and
- to support efforts to improve environmental quality

As one of the first EP3 programs, the Tunisia EP3 office has become a leader in the field of pollution prevention and clean production technology in the Middle East. The EP3 Tunisia office was established by USAID/Tunisia and the Project in Development and Environment (PRIDE) of USAID's Near East Bureau and is well into its second and final year of operation It has used marketing and training to develop awareness and interest in pollution prevention

EP3/Tunisia houses a pollution prevention clearinghouse In addition to the clearinghouse holdings, which includes various technical and industrial publications and

training materials, the Tunisia office has established linkages with the headquarters' clearinghouse in Washington, D C. and various other sources of clean technology information such as the U S EPA, state information centers in the U.S., and UNEP.

## 2. The Demand and Supply of Pollution Prevention Information

### 2.1 Need for Information: Demand

There are several needs fueling the demand for pollution prevention information At the core is the basic need to educate people about the concept of pollution prevention, what it is and what it is not. Two different groups that could reap the most benefit from pollution prevention education are community groups and industry Furthermore, it is extremely important that the difference between pollution prevention and pollution control be made clear to both groups Plant managers knowledgeable about pollution control may think that pollution prevention is the same thing and might therefore miss out on the benefits of a pollution prevention program They need to know that pollution prevention is a new and innovative way of approaching pollution problems and what its benefits are Communities/community groups need to know about the difference between pollution prevention and pollution control so that they can be fully aware of the different environmental ramifications and impacts of the two

Industry is an important target for pollution prevention education and programs for obvious reasons Implementing pollution prevention programs can lead to reductions in pollution, which directly benefits the environment However, there are no regulatory incentives for industry to adopt pollution prevention measures Current laws either favor end-of-pipe pollution control technology choices or do not exist at all, and where regulations do exist, they are poorly enforced Therefore, alternative ways of convincing industry to implement pollution prevention programs must be found One way to achieve this is to show industry the financial benefits that result from practicing pollution prevention The dual benefits of meeting environmental regulations and standards while increasing production efficiency and saving money should prove to be an attractive result of pollution prevention programs In addition, worker safety and health conditions are often improved by the implementation of pollution prevention measures, hazardous substance use and exposure are reduced as well as hazardous waste production and handling

Pollution prevention education is also important at the community level Increasing levels of information and education increases the likelihood of community activism The more a group, individual, or organization knows about pollution prevention, the more likely they are to demand the adoption of measures that reduce waste rather than treat it Providing community groups information also empowers them by giving them/allowing them to make educated decisions with regards to their environmental activities With facts to support their claims, community groups can be regarded as credible and serious players in the

environmental arena and better equipped to influence the outcome of environmental decisions.

### 2.2 Dissemination of information: Supply

Pollution prevention information is available from a variety of sources. In the United state, material is available from industry, industry associations, vendors, and state pollution prevention offices For example, 3M is one of several companies that has implemented successful pollution prevention programs and produces literature/material sharing its lessons learned etc There are many international organizations that produce pollution prevention material, like UNEP and UNIDO, that can be accessed by interested parties. Other international sources of information include NGOs, environmental organizations, and various donor organizations as well as counterparts to U S industry associations Because there are so many organizations/companies/people that could be contacted for information, the process of accessing the "right" information can be overwhelming It was with this in mind that the EP3 clearinghouses were created/designed The clearinghouses are meant to provide "one-stop-shopping" for industries and other users in developing countries seeking information on pollution prevention Rather than contacting twenty different entities about a specific topic, often resulting in redundant material, one can request information through the clearinghouse

The EP3 headquarters' clearinghouse, has developed a core collection of pollution prevention materials from many sources that are available for distribution to EP3 country offices Also included in this packet are EP3 training materials, newsletters, and case studies EP3's own publications are designed to show that pollution prevention can work in developing countries as well as in the U S and Europe In addition, the EP3 clearinghouse maintains working relationships with many of the above mentioned organizations and can easily access those respective libraries

## 3. TOOLS TO MAINTAIN THE DEMAND AND SUPPLY OF INFORMATION: "DEVELOPMENT OF THE EP3 TUNISIA CLEARINGHOUSE"

### 3.1 Develop EP3 Tunisia Library

The development of the EP3 Tunisia library has been based on a demand driven criteria. In addition to some fundamental information that was required to start the library (general information on pollution prevention, some technical catalogues and books on techniques of implementing pollution prevention and some training and promotional material to promote pollution prevention and clean technologies), all of the library holdings have been collected in response to a demand for information Currently, the library includes information on the Tunisian Environmental profile and on pollution prevention The clearinghouse has been collecting data on the Tunisian environmental network including

institutional information, legislation and regulations, industry and training material The clearinghouse has also been compiling different catalogues and publications on industry:

- specific information regarding processes, raw material, wastes and applications of pollution prevention techniques and cleaner production technologies;

- information on the use and effectiveness of pollution prevention and clean technology; and

- standard procedures and EP3 Tunisia training materials on pollution prevention.

The information collected is maintained in the library and is being used by EP3 Tunisia staff to research specific problems or issues raised by outside users. Outside users also have direct access to the library and can get specific requested documents or training material in order to encourage them to practice and promote pollution prevention and clean technologies techniques. The users may also request information that could be processed in other international libraries (in case the information required does not exist in the local Tunisian library) Thanks to the permanent link that exists electronically between EP3 Tunisia office and EP3 Washington, a Tunisian information request can be answered by any international library of documents The EP3 Tunisia clearinghouse has received, and responded to numerous requests for information that ranged from general information on pollution prevention, educational material on protecting the environment by applying pollution prevention techniques, and a list of suppliers of recycling equipment, raw material, or new process equipment

### 3.2 Design and development of Tunisia Environmental Information System (TEIS)

The TEIS is the electronic information system of the EP3 Tunisia clearinghouse It has four components

1) Local Information which holds all the information databases related to EP3 Tunisia office,

2) Electronic Library that includes a catalogue of all hard copy documents of pollution prevention in the EP3 clearinghouses and international vendors of clean technologies,

3) External Gopher server that permits access and exchange of information with international pollution prevention and clean technology information sources, and

4) Local gopher that grants access to local users

At this stage, the TEIS has been fully designed and is being maintained as part of the EP3 Tunisia clearinghouse Each of the four components is described in greater detail below

### 3.3 Maintain Local Information Databases

In order to develop a local network for promoting pollution prevention and clean technologies, the EP3 Tunisia clearinghouse has developed, and is currently maintaining, a set of local information databases that enables staff to quickly locate items in response to requests This component includes.

- Contact directory which includes all of EP3's clients As of March 1995, several hundred representatives from Industry, Government institutions, trade associations, chambers of commerce, NGOs and Associations are listed in this database.

- Industry database that registers the EP3-to-Industry technical assistance services, and summarizes the EP3 Tunisia case studies. This database describes the pollution prevention problems and opportunities applied to each specific sector assessed by EP3/Tunisia This database is currently being developed and will contain specific pollution prevention information on leather tanning, printing, textiles, battery formulation, hotels, oil extraction and electroplating

- Statistical/tracking system that allows the EP3 office to keep track of the number of requests for technical assistance/information, number and type of activities organized, number of people participating, etc,

- Legislation database which maintains information about the environmental laws and regulations applied by the Tunisian government Following an environmental Tunisian profile study conducted by the EP3/Tunisia office, most environmental laws have been fed into the system

### 3.4 Electronic Library

To be compatible with international pollution prevention and clean technology libraries, the Tunisia clearinghouse acquired "Inmagic" software for cataloguing the holdings of its library and maintaining the pollution prevention database of vendors of clean technologies This enables staff to quickly locate items in response to requests, and access current listings of suppliers of clean technologies The electronic library consists of

- Inmagic cataloguing of EP3 Washington and Tunisia library holdings. This is maintained and updated as books are received from different sources The Tunisia database currently contains about 1020 publications on pollution prevention and related environmental topics

- Pollution prevention vendor database, Vendinfo includes a list of more than 10,000 technical references, services, manufacturers and distributors of cleaner production technologies and products in order to help promote pollution prevention and cleaner production. This database is maintained by the Solid & Hazardous Waste Education center at the University of Wisconsin and updated versions are sent on a regular basis to the EP3 Tunisia office.

### 3.5 External Gopher

An External Gopher Server that permits the Tunisia EP3 Clearinghouse to access international information systems such as the Pollution Prevention Information Clearinghouse of the U S Environmental Protection Agency (PPIC/EPA) and the International Clean Product Information Center of the United Nations Environmental Project (ICPIC/UNEP) This international link allows the office to electronically access a very broad set of information sources on pollution prevention and clean technologies and download any information that is relevant to the implementation and promotion of pollution prevention in Tunisia The information loaded in the Tunisian international gopher server is in response to requests for information made by professional users, this access is granted to the EP3 Tunisia office through an internet connection to the IRSIT international gopher server This gopher server can also be accessed by other international environmental gopher servers that can get information on EP3 Tunisia and leave electronic requests for information that can be answered by the Tunisian clearinghouse

### 3.6 Local Gopher

A Local Gopher Server has also been designed to provide access to some Tunisian professional organizations through ten additional internet links The organizations include private and public agencies such as the National Environmental Protection Agency, the Union of Industry Federations, chambers of industry and commerce, and selected firms from EP3 Tunisia pilot demonstration projects This TEIS connection will grant the users access to the EP3 Tunisia clearinghouse which has access to most international pollution prevention and clean technologies information By using the local Gopher Server a Tunisian user can research and deposit an information request that can be replied by the EP3 Tunisia clearinghouse

## 4. PROMOTING THE CLEARINGHOUSE SERVICES

The EP3 Tunisia office has been using outreach and training to build an educated demand for the clearinghouse resources and services The EP3 Tunisia office developed specific outreach tools tailored to the needs of industries and government in Tunisia The tools to promote the clearinghouse services and initiate demand include

- Preparation and distribution of promotional material on the EP3 Tunisia clearinghouse;

- Mailing to the professional organizations that constitute the Tunisian Environmental network,

- Electronic connections to the TEIS will be used as marketing and dissemination tools for the EP3 Tunisia clearinghouse,

- Offering the clearinghouse services and resources to companies selected for pollution prevention industrial assessments,

- Newsletters and press articals regarding EP3 information resources, and

- Advertizing the clearinghouse services in the professional newsletters and journals of industrial organizations

In addition to the above mentioned ways of promoting its clearinghouse, the EP3 Tunisia office plans to

- Issue a quarterly newsletter,

- Develop and disseminate case studies of the assessments conducted by the office, and

- Develop success stories highlighting the results achieved at specific plants

## 5. Lessons Learned from Being an Information Provider

### 5.1 Transfer from Being a User of Information to a Supplier of Information

The design and development of the clearinghouse has been a challenging and long process for several reasons The first is that, at the design level, having no experience in developing environmental information systems, a major effort was put on defining the components of the system This was achieved by looking at other countries' experience in the area of developing information systems and defining the requirements of the EP3 office as a local Tunisian user The second reason is that, as is the case for introducing any new concept or technique, raising the demand for pollution prevention information has been time consuming So far all the requests that the EP3 Tunisia office has received are from users who had direct or indirect contact with the EP3 office The role of the clearinghouse has been first to raise the demand and then to provide the supply, and since the development of the clearinghouse is based on a demand-driven criteria it is taking time to progress Third,

processing information requests requires significant effort to find out what the user actually expects and needs in order to provide accurate and appropriate information.

Finally, supplying and maintaining an information system requires dedicated people who are patient and believe in the importance of the information they are providing so they can overcome the difficulties of raising the demand as well as providing the supply.

## 5.2 Steps Towards Sustainability

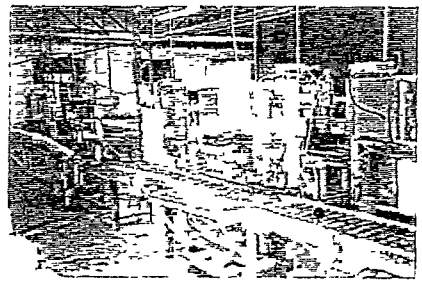
During its one and a half year of implementation, the strategy of the EP3 Tunisia project has been to contribute to in-country capacity building on pollution prevention and clean technology in order to achieve sustainability and develop a permanent network that could serve as valuable resource An information and communication network is a vital part of the system and allows those who wish to establish pollution prevention and cleaner production programs, implement clean production industrial options, or use clean technology equipment, to benefit the experience, progress and knowledge of the EP3 pilot project in Tunisia. By exploring the EP3 Tunisia clearinghouse, local industrial organizations, NGOs and universities can access the information required, communicate with each other, and promote pollution prevention to achieve a multiplier effect and sustainability. It is the objective of the EP3 TEIS to become the main environmental gopher for Tunisia at the national level

In terms of the regional cooperation, the TEIS offers a unique opportunity for close developing countries to avoid past mistakes of similar countries and to help them achieve sustainable development in cleaner production for good EP3 Tunisia plans to promote pollution prevention and clean technologies through information exchange and technology transfer with neighboring countries that wish to implement pollution prevention To that end, EP3 TEIS can serve as the main environmental focal point under the United Nations Sustainable Development Network (SDN), which consists of providing real time information to NGOs and Government agencies in Tunisia The SDN is now being established in the Middle Eastern countries, and Tunisia will be responsible for a portion of this network that will provide information in different areas, including the environment Tunisia TEIS is the only existing electronic network that can be operational under the SDN as soon as tomorrow

## Annex 6

# SELECTED SUCCESS STORIES

# Process improvements in lead battery manufacture



## Background

La Societe Tunisienne de l Accumulateur NOUR manufactures starting lighting and ignition (SLI) batteries The plant has six main unit operations and uses the dry charge *(tank formation)* process for 60 per cent of the production and the wet charge *(container formation )* process for the remaining 40 per cent

The company was the subject of a pollution prevention diagnostic assessment carried out by the United States Agency for International Developments (USAID) Environmental Pollution Prevention Project (EP3)

## Cleaner production

Recommendations were made for all six unit operations For example smelting has been improved by covering the large piles of slag dross and baghouse dust that present major environmental problems and risks to workers through exposure to lead

During the pasting operation the lead rich waste is shovelled back into the hopper for reuse The moisture content of the paste recipes (both positive and negative) is increased so that the panels enter the drying oven at between 14–15 per cent moisture

## Enabling technology

Temperature measuring instruments, accurate in the range of 1000–1300°C, hel to ensure that the kiln temperature stays close to 1150°C so that organic materials are burned off and maximum effectiveness achieved An improved design of casting molds eliminates the oversized lugs and unnecessary rigid connectors (feet) betwee the two grids that make up a panel, reducing waste energy lead and paste usage and material handling, and eliminate the dusty high-scrap plate cutting operatior

To convert virgin lead into lead oxide an appropriately sized mill makes the lead oxid in large spherical particles, using air to atomise and oxidise the molten lead The particles provide greater interstitial spaces and hold more moisture – critical to improving the curing process Later the interstitial space holds more sulphuric acid giving the battery more cold cranking power , an important measure of battery value and quality

Water flow to the wetting roller on the pasting machine is reduced and de-ionised water is used reducing water use and generation of lead sulphate-contaminated water A simple moisture analysis oven is used for each batch of paste, and plates are sampled before entering and after leaving the drying oven This saves energy and gives a more complete conversion of the elemental lead to lead oxide

During curing, vertical racks accommodate the larger batch sizes that are possible to produce because of the higher moisture in the plates A higher residual moisture content allows a longer wait until more

# Less Toxic Wastes in a Leather Tanning Process

## Background

The sheepskin tanning process includes the following steps

- Soaking skins for 48 hours in ambient temperature fresh water to remove blood manure and dirt from the hides,
- Dewooling by painting the hides with lime and sodium sulfate solution, curing for 7 hours and removing the wool using a mechanical hair-pulling machine,
- Liming for 24 hours to dissolve the epidermis, any remaining hair and any other remaining undesirable compounds in or on the hides,
- Fleshing by pressing by a roller and shaving by a blade adjacent to the roller,
- Neutralizing with a solution of fresh water, ammonium salts, enzymes and organic salts,
- Preparing for pickling by addition of emulsifiers, non-solvent degreasing agents, salt, formic acid and sulfuric acid to lower the pH to the 2 8 - 3 0 range,
- Tanning by adding chromium sulfate salts and sodium bicarbonate sequentially and mixing for 2 hours and 4 hours, respectively,
- Post-tanning by aging for 24 hours and rinsing and degreasing,
- Dyeing and conditioning using fat liquoring agents to give the leather its supple feel, and
- Finishing by trimming stretching out and pinning onto a light metal grill and drying to the desired final moisture Depending on the final use of the hides, an automatic system sprays pigments, resin binders and waxes onto the grain side of the hides The finished hides are shaved, ironed, inspected and hand-trimmed to their final size

Currently the plant suffers from a number of pollution problems including

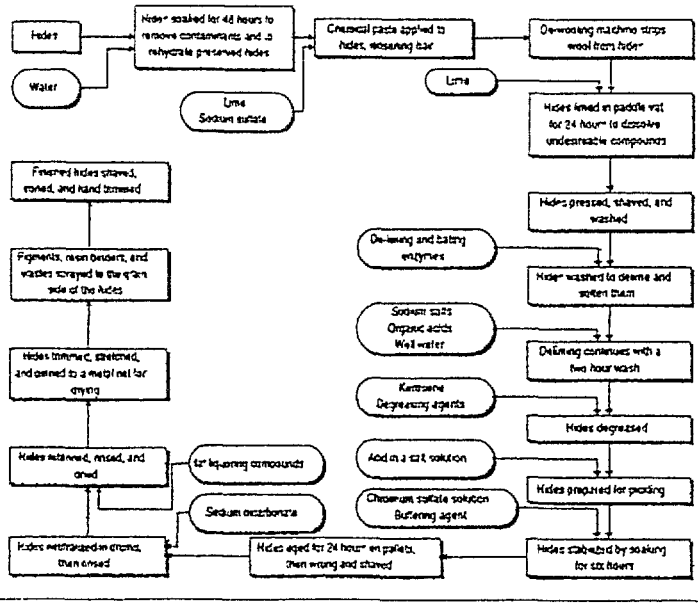
- sulfide generation,
- excessive chromium discharge,
- excessive effluent volume,
- inefficient chromium fixation, and
- inefficient use of dye chemicals

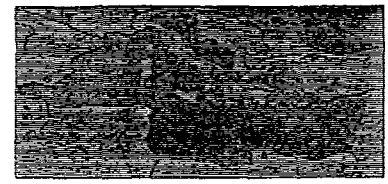
## Cleaner Production Application

Four pollution prevention opportunities that could address these problems were identified

- segregate the liming and washing wastewaters to eliminate sulfide generation,
- increase temperature and control

Figure 1 Overview of Facility's Sheepskin Tanning Process





the pH of the tanning baths to increase chromium fixation on the hides,

- recycle used chromium effluent with addition of 1/3 of initial requirements to reduce chromium discharge to the wastewater, and

- recycle used black dye solution with addition of 1/2 of initial requirements to reduce the dye discharge into the wastewaters

## Enabling Technologies

- Construct a sump that can intercept wastewater from the liming and washing operations and oxidize the sulfides before mixing with acidic waste streams

- Repair boiler to reheat the tanning bath, install continuous, digital temperature and pH probes for each bath

## Advantages

- Zero production of sulfides and foul smells,

- Consumption of chromium sulfate is reduced to 1/4 original consumption, and

- Consumption of black dye is reduced to 3/4 the original consumption

## Economic Benefits

| Cost Saving | US Dollars/year |
|---|---|
| Chromium recycling | 40,000 |
| Dye Recycling | 10,000 |
| TOTAL | 50,000 |
| Investment | 20,000 |
| Payback period | 5 months |

## Country

Tunisia

## Industry

Leather Tanning

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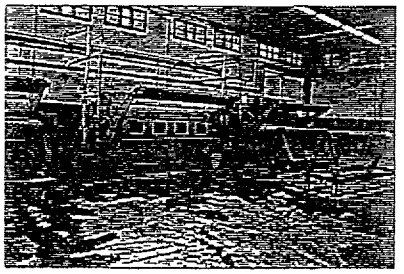
# Conserving Resources in a Textile Dyeing Facility



## Background

This facility treats woven and knitted fabrics of polyester, polyester/cellulosic blends, and cotton blends The majority of dyes used are disperse and reactive types, with some direct and sulfur dyes which are used on cellulosic fibers, and acid dyes for other fibers

Fabrics undergo a variety of processes in the machines depending on consumer requirements scouring, bleaching, dying, and rinsing Not all processes are carried out on all fabrics

- Scouring is carried out with detergent and sodium carbonate at 80°C, followed by 2 rinses Caustic soda treatment is carried out when required after scouring with caustic soda at 120°C The treatment is finished with cooling, overflow rinsing, and a neutralization

- Bleaching of cellulosic fibers and polyester cellulose blends is carried out with hydrogen peroxide and appropriate stabilizers and other auxiliaries at 95°C After cooling, the fabric is hot and cold rinsed

- Dyeing of polyester is conducted with dispersing and anti-foaming agents at 130°C After dying a hot rinse is followed by overflow rinsing Dyeing of cotton is carried out at 69°C Salt and sodium carbonate are the auxiliary used A hot rinse, a soaping, and overflow rinsing complete the treatment. Polyester/cellulosic blends are dyed with a two-bath, two-step process, with the polyester component dyed first, and an overflow rinsing between the two steps

- Centrifuging fabric extracts water from the fabrics

- Depending on the clients the fabrics may be finished by passing them through a Buckner tenter frame Fabrics may also be dried and heat set, or finished with softeners and/or hand builders A second, loop dryer and finishing applicator is used for 100% cotton in a relaxed state The finished fabrics are inspected and wrapped and stored for shipment.

The facility faced several pollution problems including

- excessive use of water
- inefficient use of energy,
- no condensate water recycling, and
- excessive use of chemicals increasing the risk of worker exposure

## Cleaner Production Application

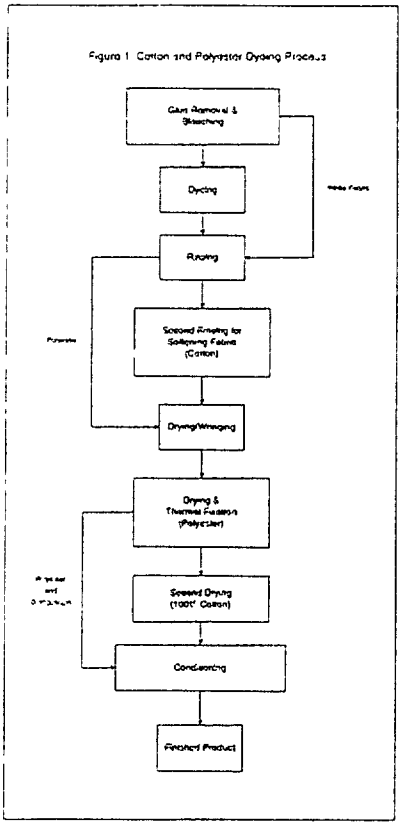
Six cleaner production opportunities were identified

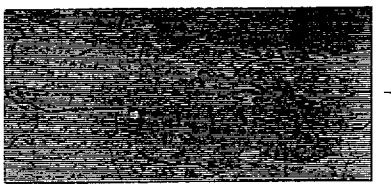
- Maintenance Fix all leaks in steam lines, condensate return lines process/cooling water supply lines and cooling water return lines This includes fixing all associated values gauges traps fittings, and connections, redesigning the piping system to include isolation valves replacing existing lines and hardware with higher grade material, repairing the broken dryer vent fan, and replacing filler with appropriate covering

- Laboratory analysis On an ongoing basis, analyze cooling water return to verify that it is usable as process make-up water, and analyze condensate return to verify that it is usable as boiler-feed water, analyze public water supply for direct use in less critical processes

- Water recycling Purchase and install tank and plumbing to collect hot return cooling water, use hot return cooling water as separate hot bath make-up, and reuse final rinse water from certain baths as feed for appropriate scouring and/or dyeing steps

- Reduce energy consumption





Purchase and install heat exchanger to recover energy from hot discharged dye baths and a vacuum slot de-watering machine for the inlet to dryer, and optimize dryer operations by temperature and/or moisture monitoring

- Space reorganization Acquire additional off-site floor space for grey fabric storage and possibly finished goods inspection and storage and construct an appropriate drug room in the vacated portion of the former shipping and receiving area

- Process optimization and quality control program institution Minimize chemical use, verify the accuracy of dye and chemical dispensing, empty and wash all plastic chemical containers and use these chemicals in process baths, examine one-bath processes for polyester-cotton blend dyeing, eliminate unnecessary rinsing and re-evaluate softened water requirements and process water quantities

## Enabling Technologies

Almost all of the recommendations deal with good house-keeping practices and process optimization with existing technology and equipment The only recommendation that requires new technology is the heat recovery with the introduction of a heat exchanger

## Advantages

- Improved worker safety by reducing their exposure to chemicals, dyes and live steam and minimizing electric shock potential,

- Reduced water consumption, COD and pH of effluent as well as the capital cost for waste water pre-treatment station

- Eliminated corrosion products from condensate and cooling water return lines

- Increased heating efficiency, thus reducing on-site energy consumption,

- Reduced chemical consumption,

- Improved quality and increased quantity of the products

## Economic Benefits

| Cost Saving | $/year |
|---|---|
| Water consumption reduction | 65,000 |
| Energy consumption reduction | 30,000 |
| Chemical consumption reduction | 10,000 |
| TOTAL | 105,000 |
| Investment | 95,000 |
| Payback period | 11 months |

## Country

Tunisia

## Industry

Textile

## Contact

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# Cleaner Production in an Electroplating Facility

## Background

The facility is an electroplater that performs zinc, nickel, brass and chrome plating The facility operations can be divided into five main steps

1) Polishing Manual polishing takes place in a separated room Two to three workers sit at electric polishing machines that look like stationary belt sanders and polish bars and other large pieces before they are plated They use a red polishing paste to apply abrasives to the belts The paste comes in brick form and consists of aluminum and silica and fatty acids that act as binders The fatty acids that must be removed in the cleaning process Dust generated by the polishing process is collected using vacuums connected to each machine

2) Cleaning Prior to electroplating many parts are cleaned in a vapor degreaser that uses trichloroethylene (TCE) to remove grease and other impurities Parts are removed from the degreaser, dried with paper towels and tied to racks before being placed in a queue for plating The degreaser is heated so that TCE vapors rather than the liquid remove the grease However, the degreaser does not currently function in this manner, and parts are placed in baskets, dipped in the liquid and removed There is considerable drag-out from this operation, and worker exposure to TCE is quite high

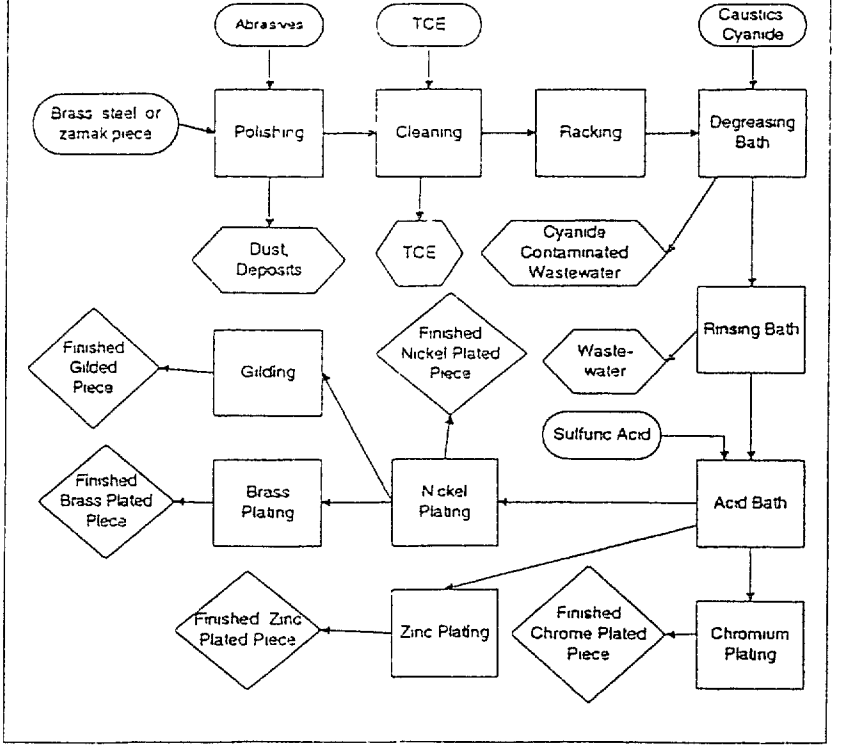
3) Racking The facility electroplates any different kinds of parts Many small pieces are plated in baskets that are placed directly in the solutions Other parts are hung on special racks that are specifically constructed After plating, the racks are dismantled, and the copper wire and excess plating solution that forms on the metal rack and wire are removed and collected for resale

4) Electroplating The facility electroplates three different metals, approximately 60 percent of its substrate is brass, 30 percent is steel, and 10 percent is zamak. The electroplating line consists of washing tanks, rinsing tanks, and nickel and chrome plating baths and recuperation baths A copper cyanide bath is located across from the line and is used to plate the zamak before it is plated with nickel and chrome

All plating is manual Times are not exact, and there is considerable variation in soaking times among parts and workers Workers generally place the parts first in a degreasing bath that contains caustic and cyanide in a heated solution Parts are then rinsed in a continuous rinsing tank and placed in a stripping/pickling bath Workers quickly rinse the part in a static rinse bath, place the part in an acid ($H_2SO_4$) bath, dip it in a continuous rinse tank, and then place it in an electrolytic washing tank that contains caustic and cyanide They dip the part in a second continuous rinse tank, a second acid bath, and a final rinsing bath before plating For plating the parts are placed first in the nickel bath and then rinsed in a recuperative bath, dipped in a continuous rinse tank, and placed in a chrome bath

Following chrome plating, parts are dipped in a recuperative bath and then another continuous rinse bath Sometimes, depending on how the piece looks, workers dip the part in a second rinsing bath before placing the part on a rack for drying

Figure 1 Overview of Facility's Electroplating Process



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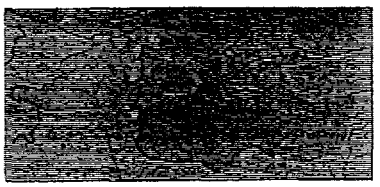

**Economic Benefits**

| Cost Saving | US Dollars/year |
|---|---|
| Raw material consumption reduction | 20,000 |
| Water consumption reduction | 2,000 |
| TOTAL | 22,000 |
| Investment | 1,500 |
| Payback period | 1 months |

5) Gilding Gilding takes place in a separate room Parts were rinsed in special rinse baths before gilding Gilded parts are plated with nickel before gilding

The facility faced several pollution problems including

- polishing debris,
- use of organic solvents for degreasing,
- acid dip contamination,
- inefficient cyanide electroplating,
- unnecessary chrome and nickel waste, and
- excessive water use

## Cleaner Production Application

Cleaner production recommendations were identified for six unit operations

- Polishing Reduce time between buffing and cleaning, replace polishing compound with one that is compatible with aqueous alkaline cleaners, improve operator practice by purchasing fixtures and jigs, and reduce compound and wheel use through proper operator practice and training
- Solvent degreaser Replace this process step with alkaline cleaner
- Alkaline cleaner Eliminate cyanide use and improve process solution monitoring
- Acid dip Isolate acids for steel and brass, eliminate the process of depassivation of nickel, replace the process of mixed acid stripper with solutions in small tanks and practice segregation and recovery as well as improve process solution monitoring and control
- Plating Capture and return 100% of drag-out to process solutions clean baths less frequently and improve process solution monitoring and control
- Rinsing Add agitation and sprays control water use by turning off water while not used

## Enabling technologies

Most of the recommendations deal with good housekeeping practices and process control and optimization with existing technology and equipment. However, one recommendation introduces a new technology for more effective rinsing with less water A simple sparging arrangement could be installed at the bottom of each rinse bath to disperse the incoming flow over several points and create a "rolling boil" of water which is especially effective at rinsing racked parts Air agitation is generally even more effective, but requires a pump that can generate clean air

## Advantages

- Reduced toxic emissions and worker exposure to toxic chemicals,
- Reduced water and raw material consumption as well as process optimization,
- Reduced acid and heavy metals contaminated waste water, and
- Improved product quality

## Country

Tunisia

## Industry

Electroplating

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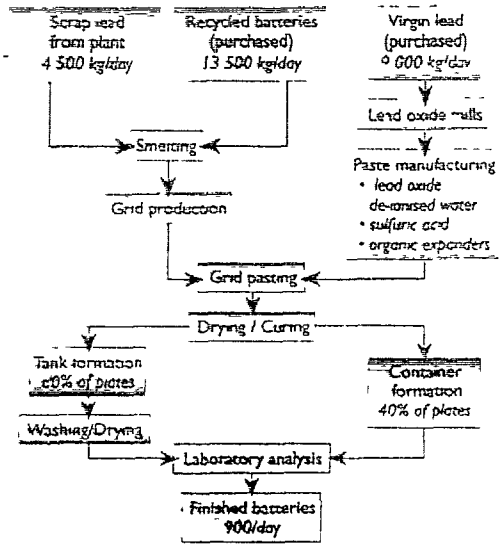
plates are available for curing More heat is generated during the curing of larger batch sizes because the formation of lead oxide also generates heat Higher temperature and saturation humidity transforms the elemental lead into a tetrabasic lead oxide, thus improving the mechanical bond, the cold cranking power, and the reserve capacity of the battery

The container formation process has been improved by applying a low current as soon as possible after the batteries are filled with acid Temperatures of about 50°C improve the performance of the negative plate, and help to convert residual lead sulphate and oxide into lead peroxide

Finally tank formation is eliminated so the cured panels now go directly to battery assembly eliminating the washing and drying needed after tank formation This significantly reduces worker exposure to sulphuric acid and lead dust saves energy and reduces the volume of contaminated water from the plant




## Advantages

The new process reduces

- employee exposure to lead dust
- toxic emissions slag and waste
- energy and water use
- the amount of lead needed
- lead acid contaminated waste water

Product quality is also improved by the increase in service life

## Economic benefits

The 19 pollution prevention options could produce savings of over US $2.1 million in the first two years for an investment of $396 416. Capital investment cost for end-of-pipe equipment will be reduced by at least 35%, and treatment chemical costs by at least 66%. The following table shows just some of the savings achieved by the 19 options being implemented.

| Operation | Cost US $ | Savings US $ | Payback period |
|---|---|---|---|
| *Smelting:* • *cover slag and dust piles, clean smelting from smelting room* | 500 | 10 000 | 3 weeks |
| • *temperature monitoring instrument* | 1 000 | 1 000 | 1 year |
| *Cutting: eliminate the cutting process* | 100 000 | 401 712 | < 3 months |
| *Container formation: apply charge to batteries immediately after filling* | 0 | 70 000 | Immediate |
| *Tank formation:* • *eliminate the process* | 300 000 | 669 000 | < 6 months |
| • *stop washing plates* | 0 | 125 000 | Immediate |

## Country

Tunisia

## Industry

Lead acid battery manufacture

## Company

La Societe Tunisienne de l'Accumulateur NOUR s battery manufacturing operation began in the 1950s NOUR is a privately owned Tunisian enterprise that occupies a prominent position in the SLI battery market The company faces increased competition, however, as a result of the Tunisian import liberalisation programme

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