

PD-ABI-874
134 270110



WORLD ENVIRONMENT CENTER

TRIP REPORT #1

TO

ACUMULATORUL S.A.

BUCHAREST, ROMANIA

WASTE MINIMIZATION DEMONSTRATION PROJECT

MAY 10 - 13, 1993

**WORLD ENVIRONMENT CENTER
419 PARK AVENUE SOUTH, SUITE 1800
NEW YORK, NEW YORK 10016**

JULY 1993

REPORT DISTRIBUTION:

Ronald J. Greenberg, Chief, Bureau for Europe, U.S. Agency for International Development

James Taft, Project Officer, Bureau for Europe, U.S. Agency for International Development

Richard J. Hough, U.S. AID Representative, Bucharest, Romania

Patricia A. Swahn, Acquisitions Manager, Document Acquisitions, U.S. Agency for International Development

Liviu Ionescu, WEC Coordinator, Bucharest, Romania

Antony G. Marcil, WEC

Frank T. Wood, WEC

Thomas J. McGrath, WEC

Romuald Michalek, WEC

Bohdan Aftanas, WEC

B. Bhushan Lodh, WEC

Dorothy E. Chuckro, WEC

Raymond L. Feder

Daniel Askin, Esca Tech, Inc.

TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	1
II. Executive Summary	2-3
III. Itinerary	4
IV. Appendix	5
1. Esca Tech, Inc. Interim Report #1 on Waste Minimization Demonstration Project at Acumulatorul S.A.	6
2. Business Cards	7

I. INTRODUCTION

Pursuant to the Technical Assistance Program for Central and Eastern European countries funded by the U.S. Agency for International Development, the World Environment Center (WEC) conducted a reconnaissance trip to a lead and battery manufacturing facility - Acumulatorul S.A. in Bucharest, Romania. A team consisting of Dr. Raymond L. Feder, Staff Consultant of WEC, and Mr. Daniel P. Askin, President of Esca Tech, Inc., visited Acumulatorul S.A. to determine if a Waste Minimization Demonstration Project (WMDP) is feasible at this plant. During this visit, an effort was made to select specific waste minimization projects and to estimate the anticipated degree of pollution reduction with associated cost benefits.

II. EXECUTIVE SUMMARY

WEC first visited Acumulatorul S.A. on March 26, 1993 when Mr. Thomas J. McGrath explained the goals and objectives of the Waste Minimization Program. Mr. McGrath was accompanied by Dr. Raymond L. Feder, Staff Consultant of WEC, and Mr. Liviu Ionescu, WEC Country Coordinator for Romania. Exploratory discussions were held with senior management at Acumulatorul S.A. at that time describing the WEC procedure for implementing Waste Minimization Demonstration Projects and for the necessity of a Memorandum of Understanding concerning the commitments of both parties.

Subsequently, on May 10 - 13, 1993, a WEC team conducted a reconnaissance visit to review plant production processes and procedures in order to identify and select the process for a Waste Minimization Demonstration Project. The results of this visit are presented in the attached report by Esca Tech, Inc.

The WEC team consisted of Dr. Raymond L. Feder, Staff Consultant of WEC, Mr. Daniel P. Askin, President, Esca Tech, Inc., consultant to WEC as a specialist in industrial hygiene and environmental engineering controls for lead processing and Mr. Liviu Ionescu, WEC Country Coordinator. The WEC team held discussions with senior plant personnel including Viasu Nicolae, General Manager, Serban Nicolescu, Technical Manager, Hojbota Floreutiu, Production Manager and Georgete Gates, Environmental Manager.

The WEC team presented the waste minimization program and the advantages that would accrue to the plant following adoption of this concept. The need for organizing a Waste Minimization Committee to facilitate the implementation of these projects at the plant was emphasized. A presentation by Mr. Askin on lead hazard training and introduction to waste minimization to 22 plant managerial personnel was well received as indicated by the extent of questioning during the meeting.

Several in-depth discussions and visits to production facilities resulted in the identification of two possible Waste Minimization Projects which were of significant interest to Acumulatorul S.A. and which met WEC requirements. These projects which are described in detail in the attached Trip Report by Mr. Askin are summarized as follows:

WMDP I

Reduced emissions from lead oxide production and transport systems; with estimated annual reduction of lead oxide pollution by 132 tons/year to the air and environment. This will

result in annual benefits of about \$80,000¹. The benefits from WMDP I will result directly from the equipment to be supplied by WEC. In addition, it is estimated that of the 50 persons who work in this area, the need for medical intervention will be prevented in about 20 people.

WMDP II

To implement WMDP II will require two stages. The first stage, which will be carried out by WEC, will comprise training and providing instruction to Acumulatorul personnel by the WEC consultant. This training will concern improved ventilation systems in the battery assembly area. The second stage, to implement the recommendations of WEC, will be the responsibility of Acumulatorul management. It is estimated it will cost Acumulatorul \$70,000 - \$100,000 to implement the improved ventilation systems. When the project is completely implemented, in addition to improved worker health and safety conditions, financial benefits from improved production will amount to about \$1.5 mm per year.

In addition, it is estimated that of the 65 persons who work in this area, the need for medical intervention will be prevented in about 30 people.

The attached report by Esca Tech, Inc. provides detailed information on the results from this visit to Acumulatorul S.A.

On May 14, 1993, the WEC team met with the Ministry of Industries, the Ministry of Water, Forestry and Environmental Protection, and the U.S. AID Mission to brief them on the results of the visit to Acumulatorul S.A.

¹Included are additional benefits of \$14,000 from reduced medical payments and decreased water treatment costs.

III. ITINERARY

- May 9, 1993 - Arrival in Bucharest
- May 10 - 13, 1993 - Visit to Acumulatorul S.A.; discussion of program, plant tour; presentation of WMP; identification of selected projects
- May 14, 1993 - Meetings with:
- o Ministry of Water, Forestry and Environmental Protection
 - o Ministry of Industries
 - o U.S. AID
- May 15, 1993 - Return to U.S.A.

IV. APPENDIX

1. ESCA TECH, INC.

INTERIM REPORT #1

ON

WASTE MINIMIZATION DEMONSTRATION PROJECT AT

ACUMULATORUL S.A.

4860 North Hopkins Street
Milwaukee, Wisconsin 53209

July 23, 1993

Page 1 of 11

Mr. Thomas J. McGrath
Vice President - Technical Programs
World Environment Center
419 Park Avenue South
Suite 1800
New York, NY 10016

RE: Accumulatorul Waste Minimization Project
Visit to Bucharest, Romania
May 10 - 13, 1993

Dear Mr. McGrath:

Following is a summary of our observations and recommendations from the trip to the Lead Acid Battery Manufacturing Facility at Accumulatorul in Bucharest, Romania. The purpose of this letter is to document these observations and to define the scope of work for the remainder of the Waste Minimization Project at Accumulatorul.

BACKGROUND

Accumulatorul is the largest producer of lead acid batteries in Romania. The World Environment Center (WEC) has a cooperative Agreement with the US Agency for International Development (US AID) to provide U.S. private sector expertise to transfer technology and skills to Central and Eastern European industry and government representatives. The purposes of the WEC Project would be:

- * more effective pollution reduction
- * improved industrial health and safety practices
- * improved energy conservation and management
- * increased community awareness in environmental and energy related areas

An initial visit was conducted at the facility from May 10 - 13, 1993. The WEC team included Dr. Raymond L. Feder, WEC Consultant, Mr. Daniel P. Askin, specialist in industrial hygiene and environmental engineering controls for lead processing, ESCA Tech, Inc. and Liviu Ionescu, WEC Coordinator for Romania Technical Programs.

The Accumulatorul Plant is listed on the World Bank's Health Problems List, but is not on the Environmental Priority List.

Mr. Thomas J. McGrath
World Environment Center

Page 2 of 11
July 23, 1993

The specific objectives which have been clarified by this visit are:

- * Reduce material losses of lead oxide during its production, transport and processing
- * This will in turn reduce fugitive and stack emissions as well as worker exposure to airborne lead in the work place.
- * Instruct Accumulatorul personnel to properly maintain dust collectors and how to conduct dust collector maintenance in a safe and sanitary manner
- * Instruct Accumulatorul personnel in work place lead exposure control in the cell assembly area. This will include:
 - * production layout and material flow
 - * ergonomic design of work stations with exhaust ventilation
 - * fundamentals of the design and execution of industrial ventilation systems for control of lead exposures at manual work stations

PARTICIPANTS AT ACCUMULATORUL ON WASTE MINIMIZATION COMMITTEE MEETINGS

Serban Nicolescu
Viasu Nicolae
Hojbota Floreutiu
Georgete Gates
Grigore Irina
Cernea Petra
Mateescu Alexandru
Lazarescu Iouel
Vasldsan Bela

Technical Manager
General Manager
Production Manager
Environmental Manager
Chemical Engineer
Laboratory Director
Director of Research
Financial Manager
Design Department

Mr. Thomas J. McGrath
World Environment Center

Page 3 of 11
July 23, 1993

PARTICIPANTS IN THE LEAD HAZARD TRAINING & INTRODUCTION TO
WASTE MINIMIZATION PROGRAMS CONDUCTED AT PLANT

The purpose of this meeting was to provide instruction on implementing a blood lead reduction program for the reduction and control of worker lead disease.

The second half of this meeting covered the implementation of a waste minimization program.

The following are all plant production supervisors.

Basea Constantin	Georiescu Constantin
Stan Marin	Zamfir Constantin
Ionita Dumitru	Hozzu Vasile
Irimescu Niculae	Pruteanu Dorinel
Brindus Sorin	Tira Viorica
Dumitrica Melama	Tuta Marius
Popa Nicu	Stanciu Victoria

The following are managers at the factory who attended the training program.

Cernea Petra	Lab Director
Viasu Nicolae	General Manager
Hojbota Floreutiu	Production Manager
Georgete Gates	Environmental Manager
Grigore Irina	Chemical Engineer
Mateescu Alexandru	Director of Research
Lazarescu Iouel	Financial Manager
Vasldsan Bela	Design Department

OVERVIEW OF ACCUMULATORUL

The Accumulatorul complex on the outskirts of Bucharest covers an estimated 35 acres and is a vertically integrated manufacturer of Lead Acid Batteries for starting, lighting, ignition, stand by power, railroad and motive power applications. Plant capacity was treated as confidential.

The plant produces its own lead oxide from ingot, its own PVC battery plate separators and recycles its own plant scrap in reveratory furnaces.

12

Mr. Thomas J. McGrath
World Environment Center

Page 4 of 11
July 23, 1993

The plant site is adjacent to a non-ferrous metal recycling facility, a vacant field, a recreation park with a soccer field and farm fields. Directly across the street is an outdoor cafe. Fugitive emissions from both the battery plant and the metal recycler are high.

Employment at the plant is 1,500 people, with an estimated 600 people in lead exposed jobs. Professional illnesses among this group is quite high, with an estimated 65 % of these 600 persons, (390 people), removed from lead exposure or referred to the hospital for medical intervention in the most recent year with complete data.

A new management team has been installed within the last 8 months, and has begun to address a variety of issues including worker health, quality, productivity and pollution.

A variety of projects that would meet WEC and U. S. AID requirements were reviewed and two were selected for this proposal.

REGULATORY SETTING

The plant at present does not pay any permit fees, fines or assessments to the government for its environmental discharges. They expect this to become the case in the future, but had no indication when this might be implemented.

MEDICAL MONITORING

The plant monitors worker health with respect to lead with urine tests rather than blood tests. They feel that with the current high frequency they need to monitor individuals, that blood lead testing would be too invasive. Blood lead tests are only conducted on people who are referred to the hospital for medical intervention, i.e., chelation therapy. Chelation therapy with EDTA is considered very risky due to high risk of kidney damage.

Mr. Thomas J. McGrath
World Environment Center

Page 5 of 11
July 23, 1993

I have checked with American specialists on urine monitoring and am passing along their recommendations here to Accumulatorul for their urine monitoring program.

- * The Coporphyrin test is a better indicator than urine lead of active blood serum lead levels.
- * Urine specific gravity must be tested on each and every sample to validate the results. Low urine specific gravity invalidates the results of the porphyrin tests.
- * There is no correlation between urine lead levels and active blood serum lead levels.

RECOMMENDATIONS

A. Reduced Pollution Emissions from Lead Oxide Production & Transport Systems (WMDP # 1)

1. Stack Emissions

When lead oxide is produced in the reactors, it is pulled into the product dust collectors. These dust collectors are shaker type baghouses manufactured in the US in the mid to late 70's. These baghouses are estimated to have emission rates of 10 milligrams per cubic meter (mg/m³). This can be reduced by implementing this proposal by about 80 %. This will reduce annual emissions by about 330 kilograms (750 pounds) per year when the recommendations in WMDP # 1 are implemented.

2. Product loss and air pollution emissions during transport:

The lead oxide is discharged through rotary air locks into screw conveyors. The screws discharge to silos, then to weigh hoppers and finally into the paste mixers. The screw conveyor assemblies have tremendous leaks. The plant estimates the loss at 24 metric tons per reactor per year for a material loss value of US\$ 26,000 per year.

Mr. Thomas J. McGrath
World Environment Center

Page 6 of 11
July 23, 1993

3. Summary of Cost & Benefits:

A. Reduced emissions from lead oxide production & transport

We are proposing to reduce the product loss and air emissions in building 100 and 150. Building 100 has two reactors. One of the reactors (rotary mill) is not included in this project because the mill is not expected to be operated much longer. Building 150 has three additional reactors. The project includes a HEPA Vacuum Cleaner (High Efficiency Particulate Arresting) to place spilled material into steel drums, and to clean out the dust collectors. New filter bags and clamps for the dust collectors, leak test equipment to verify proper filter bag installation, personal protective equipment to protect workers during clean up and dust collector maintenance and silicone adhesive to seal the screw conveyors.

4. Equipment Required:

Description:

Cost:

- a. HEPA Filtered Vacuum Cleaner: Will be used to clean up spills from the screw conveyors and to clean out the deposited leaks in the clean air chamber of the baghouses, so that workers can stay cleaner.

Quote, FOB, Malvern, PA.

\$8,950.00

Description:

Cost:

- b. 90 filter bags & clamps for the one Balox Oxide Mill Dust Collector,

Quoted Cost

\$1,600.00

- c. 288 bags & clamps for the three Linklater Oxide Mill Dust Collectors,

Quoted Cost:

\$6,150.00

Mr. Thomas J. McGrath
World Environment Center

Page 7 of 11
July 23, 1993

- d. Twenty (20) pounds fluorescent dye powder,
one black light and one spare bulb.

Quoted cost: \$380.00

- e. Powered Air Purifying Respirators for personnel cleaning
up spills and changing filter bags.

Four (4) with spare batteries, filters & parts:

Quoted Cost: \$2,900.00

- f. Silicone Adhesive to seal screw conveyor lids, 4 cases
of 12, 10.3 oz tubes & caulk guns.

Quoted Cost: \$300.00

Estimated Total: \$20,280.00

Contingency (12 %): \$2,030.00

Inland Freight, plus overseas freight,
insurance and forwarding: \$2,665.00

Preliminary Budget: \$24,975.00

TRAINING REQUIRED

One (1) week of Mr. Askin's time is estimated in Romania to
train workers on the cleanup required and the proper
installation of filter bags and testing of the installation.

The cost benefits are listed in the attached letter from the
Accumulatorul plant.

ESTIMATED BENEFITS per YEAR

1. Savings of lead oxide, 2 ton/month, per reactor:	US\$ 48,000.00
2. Reduced losses of in process materials to the environment, 3 tons/month:	US\$ 18,000.00
3. Reduced medical payments, @ 70 %:	US\$ 2,000.00
4. Savings for material & labor:	US\$ <u>2,000.00</u>
Total plant estimate:	US\$ 70,000.00

16

Mr. Thomas J. McGrath
World Environment Center

Page 8 of 11
July 23, 1993

Fifty persons work in the areas of oxide production and pasting. Implementation of WMDP # 1 is estimated to prevent the need for medical intervention on behalf of 23 persons in the first year

Additional anticipated benefits, resulting from implementation of WMDP # 1 in the plant are estimated at:

1. Cleanup of conveyor spills with vacuum rather than the pressure washer and acetic acid, results in 1 ton per month recycled through the furnaces.

Lead Material Recovery	US\$ 6,000.00
Reduced load to waste water treatment plant and reduced operating costs	US\$ 4,000.00
Total Savings:	US\$ 80,000.00

RECOMMENDATIONS

B. Improved Ventilation in Battery Assembly (WMDP # 2)

In the assembly department, the incidence of lead poisoning has increased this year. It is necessary to revise the production layout, material flow and ventilation to reduce the number of people required and to reduce the exposure to lead in air for the workers.

The high lead exposure levels create a situation where skilled workers are medically removed from these jobs for treatment of lead disease. Training time for new workers in these positions average 8 weeks before they can do the jobs with the same level of quality and productivity as the workers removed for medical treatment. In addition, new workers will generate more lead dust than skilled workers, until they learn the jobs, due to the handling of the lead plates individually. It is during this training period when the highest exposures and lead absorption occur. The new layout and ventilation will enable the skilled workers to stay at their jobs.

17

Mr. Thomas J. McGrath
World Environment Center

Page 9 of 11
July 23, 1993

This proposal covers air monitoring equipment to assess current exposure levels and to measure the improvements resulting from the new production layout and ventilation.

RECOMMENDATIONS

The specific objective of WMDP # 2 is:

- * Reduce airborne lead levels and the incidence of medical removal of workers for treatment of lead disease

In order to realize these benefits, instruction in the following areas is required:

- * production layout and material flow
- * ergonomic design of work stations with exhaust ventilation
- * fundamentals of the design and execution of industrial ventilation systems for control of lead exposures at manual work stations

This training will assist Accumulatorul in developing designs and to subsequently install improved work flow and ventilation in the cell assembly area. This will result in reduced lead exposures, reduced medical removal expenses and increased quality and production.

As an additional result of implementing this program, they would be able to apply these same design principles to other production areas to achieve the above benefits in these other areas of the plant.

Equipment Required:

a) Six (6) Personal Air Sample Pumps	\$3,000.00
b) One (1) Calibrated Rotameter (to calibrate air flows on the air sample pumps).	\$225.00
c) Four (4) boxes of 50 air sample filter cassettes, 37 mm, mixed cellulose ester	\$300.00
SUBTOTAL:	\$3,525.00
Inland Freight, plus overseas freight, insurance and forwarding:	<u>\$300.00</u>
Preliminary Budget:	\$3,825.00

Mr. Thomas J. McGrath
World Environment Center

Page 10 of 11
July 23, 1993

This work would be started during the first visit, and completed during the return visit to follow up on the reduction of emissions from the first project. A final follow up visit after they have implemented these changes in Spring of 1994 is recommended.

All of the other materials required are available in Romania, or can be made in the plant's fabrication shop.

ESTIMATED BENEFITS per YEAR

The plant estimates the actual annual losses in the battery assembly department as follows:

1. Production losses due to lead illness, 90 batteries/shift, US\$1,860,000.00
2. Losses due to medical payments US\$2,000.00

The plant estimates the annual benefits at:

1. Production will increase 80 batteries per shift, US\$1,560,000.00
 2. Number of workers reduced, saving salaries of: US\$6,000.00
 3. Savings in medical payments: \$2,000.00
- Total: US\$1,568,000.00

Sixty five persons work in cell assembly. Implementation of WMDP # 2 is estimated to prevent the need for medical intervention on behalf of 30 persons in the first year.

SUMMARY

A total of three (3) more trips to Romania are estimated. The next trip will include follow up on the blood lead reduction program training already provided and to supervise clean up of the oxide mills and installation of the filter bags. During this trip, the preliminary training on battery assembly layout and ventilation will be started.

The second trip would be used to estimate the actual benefits of the oxide mill project and complete the training in battery assembly.

Mr. Thomas J. McGrath
World Environment Center

Page 11 of 11
July 23, 1993

A third trip is to estimate the benefits of the completed battery assembly project.

Interim field reports, (three are anticipated) and a final summary report will be submitted to WEC. We expect to complete our involvement by April 30, 1994.

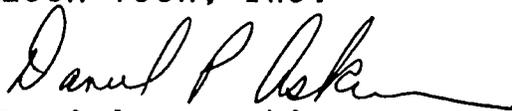
Dr. Feder and Mr. Askin wish to strongly recommend continued improvement in the personal hygiene of the workers at the plant. They agreed they needed to improve their locker rooms and shower rooms. This is considered necessary for the plant to begin to realize the benefits of their blood lead reduction program started on the first visit.

These needed improvements include:

- * No accumulations of lead oxide on the floors of the locker room and the lockers to be free of dust.
- * Supply shower nozzles and warm water in the shower room
- * Hand washing sinks with warm water and soap and a means to dry your hands provided.

We look forward to continuing this project. Please feel free to give me a call with any questions.

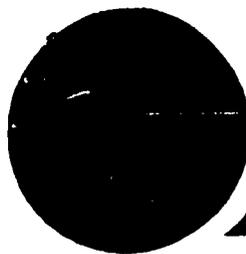
Sincerely,
ESCA Tech, Inc.



Daniel P. Askin
President

Attachment: Two pages from Accumulatorul, S.A., Waste
Minimization Projects

2



Cumulatorul S.A.

B-dul Biruintei nr. 98, sect. 2, Bucuresti

TEL: 272080
275480
TLX: X-10653
FAX: 286621
: 312812;
J40/390/1991

Către

WASTE MINIMIZATION PROJECTS

A. Reduced emissions from lead oxide production and transport

When lead oxide is made in the reactors it is drawn into the product dust collector; Domestic filter bags are inefficient and require frequent removal for extra cleaning. Removal contaminates the entire area.

The lead oxide is discharged from the dust collector to screw conveyors to transport the oxide to each machine. The screw conveyors travel above a work area with 30 workers and up to 2 tons/month of oxide leaks falls on these workers.

A.1. Equipment required

1. Vacuum cleaning system for removal of spilled lead oxide prior to maintenance.
2. Protective equipment for maintenance workers
3. Sensors to detect blocked material in screw conveyors to minimize lead oxide spills.
4. New replacement filter bags for product dust collector.
5. Sealant for improved conveyor performance.
6. Air test equipment to measure emission reduction.
7. Bag leak test equipment to minimize stack emissions and improve product recovery.

A.2. Estimated benefits

1. Saving of lead oxide
2 to/month

21

1000 £/month

2. Reducing of production losses

1500 £/ month

3. 70% saving of medical payments

140 £/month

4. Saving for materials and labour needed for maintenance;

labour: 40£/month

materials: 240 £/month

B. Improve ventilation in battery assembly

In the assembly department the number of workers who are hand stacking groups, with professional illness, is increased

It is necessary to decrease the number of workers exposed to lead poison by avoiding the direct contact with the pollution source.

For this reason, it is necessary to improve the ventilationsystem in the battery assembly area.

B.1. Actual losses

1. Production losses due to professional illness

90 batteries/shift

155000 £/month

2. Losses due to medical payments

90 days/month

180 £/month

B.2. Estimation of benefits

1. The production will increase with;

80 batteries/shift

150000 £/month

2. The number of workers will decrease

Saving in salary payment

480 £/month

3. Saving of medical payment

150 £/month

BUSINESS CARDS OF CONTACTS

BEST AVAILABLE COPY

BEST AVAILABLE COPY

Ray Feder
212-683-5053

MINISTRY OF INDUSTRIES
General Directorate for Research,
Development and Ecology

dipl. eng. PAUL BLAER
General Director

Calea Victoriei nr 152
70179 Bucharest
ROMANIA

Phone: +40.1.659.51.40
Telex: 10.640

1993 JUL 23 PM 2: 06

MINISTERUL INDUSTRIILOR
Directia Generala
Cercetare - Dezvoltare - Ecologie

Dr. ing. Alexandru GEORGESCU
Director

Calea Victoriei 152
70179 BUCURESTI

Tel. 659 41 91
Telex 10640



World Environment Center

LIVIU IONESCU
COORDINATOR FOR ROMANIA
TECHNICAL PROGRAMS

BUSINESS
TEL. 781-6050
781-6345
FAX 812 3810
812-5727

PRIVATE
P.O. BOX 10000 NR 300
BULEZARDI APT. 100
BUCURESTI
ROMANIA
TEL 6 872-004



Richard J. Haugh
Representative to Romania
United States Agency for International Development

Bld. N. Băcescu, No. 22
Fifth Floor, Etaj V

Tel. 312-5565
Fax. 312-0308



UNITED STATES AGENCY
FOR INTERNATIONAL DEVELOPMENT

GIANINA MONCEA
Project Management Assistant

Bld. N. Băcescu, No. 26
Fifth Floor
Bucharest

Tel. (40-1) 312-55-68
312-55-68
312-55-84
Fax. (40-1) 312-05-08

RECEIVED AUG 20 1993