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WORLD ENVIRONMENT CENTER

**CLOSE OUT
OF
WASTE MINIMIZATION DEMONSTRATION PROJECT**

**AT
ACUMULATORUL S.A.
BUCHAREST, ROMANIA**

MARCH 30, 1995

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

JUNE 1995

REPORT DISTRIBUTION

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File

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Note: This Trip Report summarizes all previous reports detailing the progress on this Waste Minimization Demonstration Project (WMDP) - from March 26, 1993 to the final report of Daniel P. Askin, Consultant to WEC and the close out ceremony on March 30, 1995.

EXECUTIVE SUMMARY

First Visit - March 26, 1993

WEC team: Mr. Thomas J. McGrath - WEC Vice President, Dr. Raymond L. Feder - Staff Consultant, WEC and Mr. Liviu Ionescu - WEC In-Country Coordinator for Romania.

Acumulatorul S.A. Representatives - Messrs. Nicolae Viasu - General Manager, Serban Nicolescu - Technical Manager, Hojbota Floreutiu - Production Manager and Ms. Georgeta Gate - Environmental Manager.

The WEC team visited Acumulatorul's plant to explain the goals and objectives of the Waste Minimization Program. At that time exploratory discussions were held with Acumulatorul management describing the WEC procedure for implementing a Waste Minimization Demonstration Project and discussing the necessity of developing a memorandum of understanding regarding the responsibilities of both parties.

Second Visit - May 10 - 13, 1993

WEC team: Dr. Raymond L. Feder - Staff Consultant, WEC, Mr. Daniel P. Askin - Consultant to WEC (specialist in industrial hygiene and environmental engineering controls for lead processing) and Mr. Liviu Ionescu - WEC In-Country Coordinator for Romania.

Acumulatorul S.A. representatives: Messrs. Nicolae Viasu - General Manager, Serban Nicolescu - Technical Manager, Hojbota Floreutiu - Production Manager and Ms. Georgeta Gate - Environmental Manager.

The WEC team presented the Waste Minimization Program and the advantages to the plant following adoption of this concept. The need for organizing a waste minimization committee to facilitate the implementation of waste minimization projects at the plant was emphasized. A presentation by Mr. Askin on lead hazard training and an introduction to waste minimization were made to 22 plant managerial personnel.

After several in-depth discussions and visits to production facilities, the following two possible waste minimization projects of significant interest to Acumulatorul, and which met WEC requirements, are summarized as follows:

EXECUTIVE SUMMARY (CONTINUED)

No. 1: 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 savings of approximately \$80,000/year. The benefits from this project will be a direct result from the equipment to be supplied by WEC. In addition, it is estimated that of the 50 workers in this area, the need for medical intervention will be prevented in about 20 of them.

No. 2: The implementation of this project will require two stages. The first stage, to be carried out by WEC, will consist of providing training and instruction to Acumulatorul personnel by the WEC Consultant. This training will involve improving the 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 between \$70,000 and \$100,000 to improve the ventilation systems. When the project is complete, in addition to improved worker health and safety conditions, financial benefits from improved production will be approximately \$1.5 million/year.

In addition, it is estimated that of the 65 workers in this area, the need for medical intervention will be prevented in about 30 employees.

Third Visit - March 22 - 31, 1994

WEC team: Dr. Raymond L. Feder - Staff Consultant, WEC. Mr. Daniel P. Askin - Consultant to WEC and Mr. Liviu Ionescu - WEC In-Country Coordinator for Romania.

Acumulatorul S.A. representatives: Mr. Bela Vasloban - Technical Manager, Ms. Ion Petrica - Production Manager, Ms. Petra Cernea - Head of Worker Safety & Environmental Department and Ms. Georgeta Gate - Environmental Manager.

A visit was made to inventory the equipment supplied by WEC and to provide training on its implementation.

It was noted that the project is only about 50% complete, but management has already been able to observe quite impressive results concerning workers' health and safety. The plant has reported that the number of lost work days due to illness in Department 100 (responsible for handling lead oxide) has decreased by about 50%.

EXECUTIVE SUMMARY (CONTINUED)

Total Annual Savings Resulting From WMDP:

Assuming World Lead Price:	\$1,335,000
Assuming Romanian Lead Price:	\$794,000

CLOSE OUT OF WMDP AT ACUMULATORUL S.A.

Total WEC Supplied Equipment and Shipping Costs:

Vacuum System	\$14,514.00
Filter Bags	5,087.00
Air Sampling Equipment	2,665.00
Air Purifying Respirators	2,348.00
Silicone	467.00
Air Sample Filters	282.00
Florescent Dyes	156.00
Vasolite Kit	172.00
Manuals	90.00
Freight Forwarder	3,187.00
Consolidator	955.00
Deliver Vacuum	<u>249.00</u>
TOTAL:	\$30,172.00

CONSULTANT'S REPORT

MR. DANIEL P. ASKIN, ESCA TECH, INC.

1752 West Silver Spring Drive
Milwaukee, Wisconsin 53209

May 16, 1995

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

RE: Acumulatorul Waste Minimization Project, Visit
Bucharest, Romania, February 27 - 28, 1995 and
Closing Ceremony March 30, 1995

Dear Mr. McGrath:

The Waste Minimization Demonstration Project "Reduced Pollution Emissions from Lead Oxide Production and Transport", (WMDP #1) and "Improved Ventilation in Battery Assembly", (WMDP # 2) at Acumulatorul in Bucharest, Romania is complete.

Annual savings for WMDP 1 & 2 combined: \$794,000
based on the Romanian price for lead.

Annual savings for WMDP 1 & 2 combined \$1,335,000
based on the world price for lead.

ANNUAL SAVINGS from: "Reduced Pollution Emissions"

Acumulatorul has four (4) reactors that convert lead metal into lead oxide. Three were made by Linklater and the fourth by Balox. The lead oxide is used to make the active material in battery plates. When the lead oxide is produced it is collected in dust collectors called baghouses. Each reactor produces 300 kg/hour and is typically operated 500 hours per month.

The WEC provided American made filter bags and materials to test the baghouses for filter leaks and the materials to seal leaks. They also provided powered respirators for the workers servicing the dust collectors and a powerful vacuum cleaner to clean equipment, work areas and recover spills.

The plant used our recommendations to rebuild and seal the dust collectors to eliminate filter bypass leaks. They installed the American made filter bags provided by the WEC.

May 16, 1995

The efficiency of the dust collectors was tested before and after this work. Efficiency on Linklater baghouse number one was 84.3 %. After the changes the efficiency was 99.2 %.

Similar results were obtained from the two other Linklater systems and better results were obtained for the Balox system. The preliminary results for the 6 month period the replacement bags were in service are tabulated here. The cost of lead in Romania is 964 lei/kg. (\$0.23/lb). The world price for lead is \$0.44/lb. This table is calculated at the Romanian price they paid for lead during this time.

System	Reduced Pollution Product Recovered Long tons	Annual Savings
Linklater 1	268.2	\$148,100
Linklater 2	268.2	\$148,100
Linklater 3	268.2	\$148,100
Balox 1	491.7	\$271,200
Totals:	1,296,000 kg	\$715,500

If they had been paying the world price for lead, \$ 0.97/kg, the annual savings would have increased to: \$1,257,000

The additional product recovery was equivalent to increasing the yield of the reactors by 15 %, operating time and energy consumption were reduced by 15 %. Exposures to lead in air were reduced in the oxide production areas 50 %.

Reduction in lost work days due to high lead absorption by workers in the oxide production areas was calculated by the plant. The actual data on lost days due to lead exposure is confidential. The total savings in sick pay increased production and improved quality was reported as:

1994 savings in sick pay:	\$600
1994 added productivity & improved quality:	\$43,600
<u>Total savings realized:</u>	\$760,000
<u>Total savings at World Price for Lead</u>	\$1,300,000

May 16, 1995

Other Savings:

The plant was able to identify other areas of costs savings from this project, but could not assess the cost savings for them. These included:

1. Production increase of 15 %.
2. Energy savings of 15 % for the department.
3. Elimination of lead oxide spills and wasted product.
4. Reduced water consumption for spill cleanup. Spills have been reduced to a level consistent with USA practices.
5. Reduced waste water and sludge treatment costs.
6. Improved quality of battery plates.
7. Exposure to airborne lead reduced by 50 % in the oxide department.
8. Eliminating leaks in the oxide transport system reduced worker exposures to airborne lead in the plate manufacturing departments by 25 %.
9. Improved Community Relations due to the significant reduction in lead oxide emissions.
10. Reduced exposures and sick days due to lead exposure resulted in one highly skilled oxide mill operator being able to postpone his retirement.

Project Continuation by Acumulatorul

The WEC supplied bags were in use for six months. They clogged due to inefficiencies in the bag filter cleaning system. They replaced the bags with Romanian made filter bags, using the technology they observed used in the American bags. Efficiency tests on the new bags were done on March 2, 1995, but analytical errors voided these results.

They rescheduled these tests for April 1, and promised to forward these results to us. As of today, despite repeated requests these results were not forwarded to us. From these tests it was hoped to see how much long term improvement they will gain from the locally produced bags. It would be to Acumulatorul's advantage to complete these tests to document for themselves how much long term savings they can achieve from this project.

May 16, 1995

In order to monitor efficiency over time, and effect repairs quickly when the filters develop leaks, they will use a quick Colorimetric efficiency test on a daily basis as recommended by the WEC. This test will detect leaks for repair before significant emission increases and product loss occur.

RESULTS: Improved Ventilation - Battery Assembly"
WMDP 2

The battery assembly process at Accumulatorul is labor intensive, with every battery plate handled many times before the battery assembly process is completed.

The WEC provided training on improving work methods and personal hygiene and industrial hygiene methods. The WEC also provided air sample pumps to accurately measure lead in air levels and to measure the improvements from the changes made.

To date, improvements in personal hygiene, work practices and material handling methods have resulted in a decrease of lead in air exposures in battery assembly operations and significant reductions in work days lost due to high worker lead levels.

Contributing to the reduction in lost work days was improved working conditions in battery assembly. The WEC provided training, air sample pumps and the plant instituted many of the recommended changes in the battery assembly operations. No new equipment was installed but changes in worker training and procedures were used to reduce worker exposures.

Average exposures to workers in these areas of the plant have been reduced 26 %.

When a worker's lead absorption exceeds a threshold level, they are removed from work (at full pay) and given a short (3 week) vacation. For workers with higher lead levels, they are removed from work and medical intervention is prescribed.

May 16, 1995

The exact number of lost work days is confidential company information, but the improvement is reported as follows:

With 1992 as the base year, lost sick days declined 8 % in 1993 and an additional 20 % between 1993 and 1994. The total improvement from 1992 to 1994 was a 26 % reduction in lost work days due to high lead absorption.

2 year savings in labor costs: \$7,300.

The reduction in lost work days resulted in production increases. The 2 year value of added production from the reduction in sick days was:

2 year earnings from higher production: \$60,000

Total annual savings, from WMDP # 2: \$34,000

The plant considers this a very successful start to the project. Phase II of this project is now beginning and they will be installing new Romanian made ventilation equipment. These projects are expected to dramatically reduce worker exposures and increase productivity.

To further improve working conditions with respect to air exposure levels they have retained the services of a local industrial ventilation engineering firm to design, specify and install the following projects during the summer shutdown.

1. New, ventilated hand stacking stations for assembly of battery cells to reduce exposures and emissions and improve material handling efficiencies.
2. Ventilation of battery formation to control sulfuric acid mist exposures and emissions.
3. Splitting the assembly department into small work cells to reduce exposures by isolating workers from other exposure sources, improve quality and improve material handling efficiencies.
4. Install dust collectors on the lead reclamation furnaces.
5. They will also install an automatic neutralization system to improve control of lead in their waste water discharge.

May 16, 1995

They have assigned a full time staff engineer to be their in-house specialist in ventilation systems, and request continued WEC assistance on these projects.

I feel the Acumulatorul plant truly embraced the Waste Minimization approach on this project. They involved people in each department where the project work was done from the beginning with training.

The project began with an initial visit to the facility from May 10 - 13, 1993. The WEC team included Dr. Raymond L. Feder, WEC Consultant, Mr. Daniel P. Askin, of ESCA Tech, Inc.; a specialist in industrial hygiene and environmental engineering controls for processors of lead, arsenic, nickel and cadmium and Mr. Liviu Ionescu, WEC Coordinator for Romanian Technical Programs.

Acumulatorul's Waste Minimization Project team was trained on the equipment supplied by Dr. Raymond L. Feder and Daniel P. Askin.

Acumulatorul's project team consisted of:

Mr. Vasloban Bela	Technical Director
Mr. Mateescu Alexandru	Chief of Research & Design
Ms. Cernea Petra	Chief of Environmental Department
Ms. Gate Georgeta	Environmental Manager
Mr. Irimescu Nicolae	Director of Oxide Production & Plate Manufacturing
Ms. Petrica Ion	Production Manager

The project was completed March 29, 1995 and the closing ceremony was held March 30, 1995 at the offices of Acumulatorul in Bucharest. A brief 2 hour training program on implementing a Waste Minimization Program was provided the afternoon of March 30, 1995 after the closing ceremony.

I wish to thank the people of Acumulatorul for the excellent cooperation we have received on this project. I also wish to state what a pleasure it is to work with them.

If you have any questions, please call me.

Sincerely,
ESCA Tech, Inc.



Daniel P. Askin

RESUME OF CONSULTANT

MR. DANIEL P. ASKIN

PROFESSIONAL BACKGROUND OF WEC CONSULTANT

- CONSULTANT** Daniel P. Askin, President, ESCA Tech, Inc.
- EXPERTISE** Industrial hygiene and pollution control in manufacturing processes using lead, arsenic, cadmium and nickel.
- EDUCATION** St. John Fisher College, Rochester, NY, B.S. in Chemistry - 1975.
Harvard School of Public Health, Cambridge, MA, Certification in the In-Place Testing of HEPA Filters - 1980.
University of Wisconsin, Milwaukee, Additional Courses in Industrial Hygiene and Pollution Control - 1991.
- EXPERIENCE SUMMARY** Have provided, or continue to provide, environmental consulting services to the following companies: Battery Builders, Inc., BRK Electronics, Corp., Eagle Picher Industries, Eveready Battery Co., Exide Battery (General Battery Co.), General Company for Batteries (Egypt), Hammond Lead Products, Johnson Controls - Battery Division (Globe Union), Trojan Battery Co., Wirtz Manufacturing Co., Yuria-Exide Battery Co.
- Have designed complete facilities required for:
- Conversion of a manganese dry cell battery plant to production of dry charge battery plates.
 - A sealed lead acid battery project, from lab to pilot plant through construction and start-up.
 - Plate making and battery assembly plant.
- Have designed and implemented following projects/programs: lead in air control programs, ventilation/recirculation of exhaust air systems, blood lead control programs, respiratory protection systems, zero air emission programs, exhaust hoods and dust collection systems, cadmium control programs, hazardous material/waste programs and industrial hygiene programs.
- PROFESSIONAL ASSOCIATIONS** Battery Council International
Industrial Health Committee
Environmental Health Committee
Independent Battery Manufacturers Association

WASTE MINIMIZATION DEMONSTRATION PROJECT
CLOSE OUT CEREMONY

1. Mr. Francis J. Szymborski, WEC Project Manager, introduced the WEC team and USAID representatives and gave a brief history of the project from WEC's first visit to Acumulatorul in March, 1993.
2. Mr. Richard J. Hough, USAID Representative to Romania, congratulated Acumulatorul for their efforts in successfully completing the WMDP.
3. Mr. Daniel P. Askin, President of ESCA Tech, Inc. presented the final report with pertinent charts.
4. Mr. Nicolae Viasu, Acumulatorul General Manager, expressed his personal appreciation for USAID's and WEC's contribution in helping Acumulatorul make a significant dent in reducing environmental pollution as well as in making their plant a better and safer workplace - while at the same time increasing production and plant efficiency.
5. Mr. Richard Hough officially transferred the WEC supplied equipment to Acumulatorul.
6. The WEC team, USAID representatives and Acumulatorul management answered all pertinent questions from the audience and in particular answered all the questions presented by the *Romania Libera* reporter, Ion Marcovici, who asked most of the questions. See clipping, enclosed in this report, of Marcovici's article on the Acumulatorul project and the Waste Minimization Program. The article resulted from WEC's answers to his questions.
7. Mr. Francis J. Szymborski closed out the ceremony by presenting a plaque as a certificate of recognition to Nicolae Viasu and extending WEC's compliments for completing a successful Waste Minimization Demonstration Project.

CLOSE OUT CEREMONY - LIST OF ATTENDEES

The WEC team included:

Francis J. Szymborski	WEC - Project Manager
Liviu Ionescu	WEC - In-Country Coordinator for Romania
Daniel P. Askin	WEC - Consultant - President, ESCA Tech, Inc.

USAID was represented by:

Richard Hough	Representative to Romania
Gianina Moncea	Project Manager - Environmental Projects

Acumulatorul representatives included:

Nicolae Viasu	General Manager
Bela Vasloban	Technical Manager
Georgeta Gate	Head of Environmental Dept.
Petra Cernea	Head of Logistics & Environmental Dept.

Additional Attendees:

Bucharest EPA:

Adrian Corda	Director
Ioana Suteu	Inspector

General Worker Health Inspectorate:

Ioan Abur	Director
Silviu Mitrea	Inspector

Certex S.A. (supplier of filter bag material):

Georgeta Anghel	Researcher
Gheorghe Nicula	Researcher
Gabriela Schiopu	Researcher

Electro Project S.A. (environmental consulting company):

Vasile Suci	Director
Gheorghe Dobrescu	Engineer
Alexandru Ivan	Engineer

Additional Attendees (continued):

Neferal (adjacent smelter):

Dan Brinzei

Head of Environmental Dept.

Rombat S.A. (Romanian battery manufacturer):

Elena Fortuncanu

Head of Environmental Dept.

Romania Libera (second leading newspaper in Romania)

Ion Marcovici

Reporter

TRANSLATION OF ARTICLE IN NEWSPAPER *ROMANIA LIBERA*

Article by Ion Marcovici, printed April 6, 1995

**"Acumulatorul S.A. / Waste minimization program
291,728 \$ saved in six months**

WEC, financed by the USAID launched at Acumulatorul the (technological) Waste minimization project.

The American initiative acts in two ways : reduce waste and, implicitly, reduce environmental pollution. WEC, financed by the USAID, has installed at Acumulatorul 25,000 \$ worth process equipment , including a set of filter bags for the lead (oxyde) mills ; an industrial vacuum-cleaner, used to clean the bag-house and totally recover the lead; a complete respirator, used to penetrate the bag-house; air sampling equipment; leak-detection equipment. The economic effects are significant : less lead spilled (291,728 \$ in six months). Improved working conditions led to 5.5 million lei additional production, by lower sick leave days level. Mr. Frank Szymborski - the WEC Project Manager and Mr. Dan Askin- President, Esca Tech, Inc, demonstrated that the environment may be protected by minimizing the waste of useful materials. In the US, this principle has been applied for more than 30 years and is based on the principle that it is more convenient to minimize waste than to create waste and dispose of it."

**ACUMULATORUL SA / Program de minimizare
a pierderilor**

Economie, în șase luni: 291.728\$

Centrul Mondial de Protecția Mediului - WEC (World Environment Center) finanțată de "USAID" - United States Agency for International Development (Agenția Internațională pentru Dezvoltare a SUA) a lansat, la "Acumulatorul" București, Programul de minimizare a pierderilor (tehnologice).

"Acțiunea americană" vizează în principal două direcții: diminuarea pierderilor tehnologice și, (împlicit) protecția mediului ambiant. WEC finanțat de USAID a montat la "Acumulatorul" o serie de echipamente tehnologice în valoare de 25.000\$ între care un set de saci filtrați pentru echiparea morilor de plumb; un aspirator industrial pentru curățarea camerei filtrelor și recuperarea în totalitate a plumbului; un echipament complex individual (mască etanșă cu ventilator de suprapresiune internă) pentru pătrunderea în interiorul filtrelor de plumb; echipamente de prelevare a probelor de aer la locul de

muncă; aparate și dispozitive pentru identificarea și remedierea neetanșității în zona prafului de plumb. Efectele economice sunt considerabile - economie de oxid de plumb (într-o perioadă de șase luni) de 291.728\$. Higienizarea mediului a condus la un spor de producție de 5,5 milioane lei (pe șase luni) prin scăderea concediilor de boală. Demonstrația pe care au făcut-o agenții WEC (dr. Francis J. Szymborski - managerul proiectului) și Mr. Dan Askin, președinte la Esca Tech, Inc - este evidentă: protejarea mediului prin măsuri tehnologice de minimizarea pierderilor de materii prime. În SUA, acest concept, împământat încă de acum 30 de ani pornește de la premisa că deșeurile rezultate din tehnologii nu pot niciodată să protejeze mediul prin depozitare, mult mai eficientă fiind aplicarea unor tehnologii pentru minimizarea pierderilor.

Ion Marcovici