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**WORLD ENVIRONMENT CENTER**

**FINAL REPORT**

**TO**

**PERION AKKUMULATORGYAR RT.**

**BUDAPEST, HUNGARY**

**WASTE MINIMIZATION DEMONSTRATION PROJECT**

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

**MAY 1995**

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File

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## I. INTRODUCTION

Under the technical assistance program for Central and Eastern European countries funded by the United States Agency for International Development, the World Environment Center (WEC) team conducted a reconnaissance visit to the Perion Akkumulatorgyar Battery Plant in Hungary in August 1993 (Trip #1). The purpose of that visit was to establish the feasibility of a Waste Minimization Demonstration Project (WMDP) and to select the subject for such project. As a result of discussions and mutual consultations during Trip #1, the proposed waste minimization project to reduce process water usage and lead discharge was defined. Subsequently, the necessary monitoring instrument was purchased and delivered to the plant.

During Trip #2 (April 1994), operation of the monitoring equipment was initiated. Plant personnel was trained in its use and maintenance, as well as in waste minimization techniques.

The purpose of Trip #3 (made in February 1995) was to review all collected project data, evaluate final results and conclude the technical part of the WMDP.

The project was formally closed on March 24, 1995.

## II. EXECUTIVE SUMMARY

In pursuing the goal of alleviating existing environmental pollution in Hungary caused by industry, WEC among other various activities, is implementing a program called waste minimization. This program focuses on the potentials of reducing environmental pollution through improvements in production processes resulting in more efficient utilization of natural resources.

To demonstrate the attractiveness of this pollution control strategy in Hungary, three (3) large industrial enterprises were selected at which WEC-sponsored Waste Minimization Demonstration Projects (WMDP) were implemented.

One of these plants was Perion Akkumulatorgyar Rt., the largest producer of lead acid batteries in Hungary.

Following WEC's team visit in August 1993 to initiate the project, as well as a number of meetings and mutual consultations with plant management, the subject for the WMDP was selected. It was decided that the project will focus on reduction of water usage including a decrease of wastewater flow, and on reduction of quantities of lead released into the environment.

To facilitate the project WEC provided the necessary equipment which included automatic wastewater samplers, flowmeters for measuring water flows, a toxic gas detector and dyes for mapping waterflows. The total cost of equipment donated by WEC for this project amounted to \$25,977.

Following installation of the equipment, sources of excessive water usage as well as potential for wastewater re-use were identified and corrective steps were undertaken toward reduction of fresh water consumption. Simultaneously, Perion Co. has introduced and enforced a plant-wide permanent water-saving policy.

The WMDP was very successful, reducing water usage by 38% (annual reduction amounted to over 50,000 m<sup>3</sup>) and reducing lead discharged into the municipal sewer by 40%. Total savings resulting from this project were **\$72,000** per year. The payback period was less than half a year.

Environmental benefits resulting from the project included:

- ° reduced water consumption (better utilization of natural resources);
- ° improved pre-treatment at the plant site;
- ° reduced wastewater load on municipal water pollution control plant;
- ° reduced quantities of lead discharged into the environment; and

- increased awareness by plant personnel of more efficient water use.

In addition to environmental and financial dividends, the WMDP demonstrated to the management of an important and currently profitable enterprise in Hungary (as well as to other companies) the attractiveness of the waste minimization concept in combating environmental pollution. The project was formally closed at the meeting held on March 24, 1995.

For further details of the WMDP, refer to the enclosed Esca Tech, Inc. report.

**III. ESCA TECH, INC. REPORT**

1752 West Silver Spring Drive  
Milwaukee, Wisconsin 53209

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

RE: Perion Akkumulatorgyar Waste Minimization  
Demonstration Project, Visit to Budapest,  
Hungary; February 23, 1995 and March 24-27, 1995

Dear Mr. McGrath:

This is the final report of the accomplishments in Budapest at Perion Akkumulatorgyar, for the Waste Minimization Demonstration Project "Water Use Reduction and Lead Discharge Abatement."

**Results:**

The plant provided data for years 1991 through 1994. Water use at the plant was reduced by 38 % over the two year project, from 1992 through 1994. Total two year water savings was 103,500 m<sup>3</sup> (27,345,000 gallons). Lead discharges to the municipal sewer were reduced by an estimated 40 %. The two year total reduction in lead discharges are estimated at 350 kilograms (770 pounds). The total project cost savings was \$72,040 per year.

The water usage totals and lead in their discharge is tabulated below:

Year	Water Use cubic meters	Lead Discharge kilograms	Discharge Penalties 000 HUF
1991	284,500	3,300 (estimated)	3,167
1992	167,600	500 (estimated)	971
1993	128,700	350	391
1994	103,000	301	337

\*

The plant reported this fine would have been 930,000 HUF higher if the improvements from the project had not occurred.

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The lead content of the waste water discharges for 1991 and 1992 were estimated by the plant and regulatory agency on the basis of grab samples. The automatic waste water samplers provided results that were consistently higher than the grab samples. The lead content of the waste water discharge was revised upwards to make the earlier results agree with the waste water sampler results.

**Savings:**

The plant reported the following savings for the two year project. Savings are reported in HUF x 1,000, with 1992 as the base year and are calculated in current costs, to account for inflation.

Savings resulted from reduced expenditures to purchase fresh water, lower civil penalties for excess lead in the discharge water and reduced costs to purchase chemicals to treat the waste water and lower energy costs to operate the waste water system.

<b>Category:</b>	<b>Targeted Savings</b>	<b>Savings Achieved 1993</b>	<b>1994</b>
Fresh Water Use	1,833	1,867	3,100
Civil Penalties	700	4,464	4,518
Treatment Chemicals & Energy Cost	658	575	575
<b>Totals:</b>	<b>3,191</b>	<b>6,907</b>	<b>8,193</b>
<b>Dollar Savings:</b>		<b>\$69,000</b>	<b>\$78,000</b>

Total savings over the two year project for 1993 and 1994 combined were:

Water costs:	4,968,000 HUF
Water treatment chemicals & energy:	1,150,000 HUF
Reduced discharge penalties:	8,982,000 HUF

**Total:** 15,100,000 HUF

\$143,800 USD

Average savings per year: \$71,900 USD

The plant considers this a very successful start to the project and will be continuing on their own to reduce water consumption and discharges of lead in their waste water further.

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Additional savings were projected but not realized in the following areas:

**1. Reduced sludge volume, disposal, handling and transportation costs.**

Waste water treatment sludge volume was not reduced as expected. As they evaluated each source of waste water, some water streams that did not require treatment (e.g. cooling waters) were diverted from the waste water treatment system, and other waters that were previously untreated replaced the volume (e.g. shower and sink water, laundry and laboratory waste water). The result was the same volume of water is treated, the same quantity of sludge is generated but the metal content of the the waste water leaving the factory has been reduced.

**2. Energy savings were less than expected.**

Savings in the energy needed to pump the reduced water volumes was offset by additional pumps used to recirculate water.

**3. Savings in the use of water treatment chemicals was less than expected.**

The instrumentation provided allowed them better control of the rate treatment chemicals were added, but the volume of water treated remained essentially constant.

**Continuing Work:**

They plan the following work to continue this project on their own.

1. Build a third "Lamella" settling chamber. This will allow them to always have two settling chambers on line while they clean one. At present they take both settling chambers off line each week for 24 hours to clean them. During these two days they do not have sufficient settling capacity to effectively remove the solids.

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2. They plan to install a polishing filter. Test results from their pilot tests were:

Water discharged form "Lamella" settling chambers:

Time:	8:00	11:00	13:00
	mg/l	mg/l	mg/l
Dissolved lead:	0.29	0.20	0.30
Total lead:	0.76	0.74	0.94

After running this material through the water filter:

Dissolved lead:	0.17	0.21	0.20
Total lead:	0.23	0.21	0.22

Installation of this equipment will reduce the lead discharges by an additional 61 kilograms per year.

I feel the Perion plant truly embraced the Waste Minimization approach on this project. They involved people in every department of the plant from the beginning with training to identify where excess water was used and in identifying how it could be reduced. The involvement even extended to the weekend security guards who closed the water valve on Friday afternoon and could only turn the water on for pre-approved weekend projects.

The project began with an initial visit to the facility from August 2 - 5, 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 Ms. Zsuzsanna Dorko, WEC Coordinator for Hungarian Technical Programs.

Perion's Waste Minimization Project team was trained on the equipment supplied by Mr. Carl Schwing and Daniel P. Askin. Perion's project team consisted of:

Laszlo Solti	Manager Environment, Health & Safety
Jozsef Ipaes	Process Engineer, Water Systems
Miklos Nagy	Electrical Engineer, Automation Designer
Agnes Horvath	Chemical Engineer, Leader of International Group
Sandor Kovacs	Engineer, Energy & Water Systems
Ferenc Csajka	Chemical Engineer
Dr. Jozsef Keri	General Manager
Zsuzsanna Dorko	WEC Technical Coordinator, Hungary

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**Closing Ceremonies:**

The closing ceremony was March 24, 1995 at the offices of Perion in Budapest and the project was completed on March 27, 1995 with final training on implementing the Permanent Waste Minimization Program.

On March 27, 1995, a seminar on Implementation of the Waste Minimization Program was presented by Daniel P. Askin to the following members of Perion's staff.

Dr. Maraz	Finance Manager
F. Csajha	Laboratory Chief
P. Kovacs	Maintenance Manager
J. Lontai	Deputy Mgr of Nickel Cadmium and Dry Cell Factory
E. Szlanka	Quality Control
V. Hencici	Production Manager
S. Ken	Mgr Lead Acid Battery Plant
S. Kovacs	Mgr Energy Supplies
F. Spaes	Engineer for Waste Water

Also in attendance were Zsuzsanna Dorko, WEC Coordinator for Technical Programs and Zsuzsanna Pirkner Director of the Hungarian Pollution Prevention Center.

I wish to thank the people of Perion 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