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WORLD ENVIRONMENT CENTER

UKRAINE

ENERGY CONSERVATION/WASTE MINIMIZATION DEMONSTRATION PROJECT

AT

DNIPROSHINA TIRE MANUFACTURING PLANT

IN DNIPROPETROVSK

Final Report

USAID/WEC COOPERATIVE AGREEMENT
NO. ANE-0004-A-00-0048-00

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Project Description Reduction of natural gas consumption

Project Type Waste Minimization/Energy Conservation Demonstration Project

Country Ukraine

Industrial Sector Tire Manufacture

Funding Source United States Agency for International Development

Participants Dniproshina Plant and World Environment Center

Project #1 - Improvement in efficiency of Boiler No 2

#2 - Reduction in steam losses in vulcanizing facility due to installation of new steam traps

#3 - Reduction in heat losses at vulcanizing facility due to application of insulation

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I INTRODUCTION

In September 1995, the World Environment Center (WEC) initiated providing technical assistance, training and information dissemination services related to industrial pollution control in Ukraine This activity is performed within the framework of a much broader assistance program to Ukraine funded by the United States Agency for International Development (USAID) and involves a whole spectrum of large-scale issues

WEC s program in Ukraine is implemented in two stages as follows

Stage I – called **Demonstration Program** includes a number of Energy Conservation/Waste Minimization Demonstration Projects (EC/WMDP) implemented at various large industrial plants The main goal of this stage is to *demonstrate* to these enterprises the beneficial aspects of a Waste Minimization/Energy Conservation Program Through the *demonstration projects*, an effort is made to encourage enterprises to incorporate such programs into the permanent policy of plant management The intent is, among other things, to demonstrate that pollution prevention and energy conservation programs are not just additional expenses, but help to improve *production efficiency* and subsequently increase *profitability* of the enterprises A number of demonstration projects were established at selected plants in the Dnipropetrovsk, Donetsk and Lviv regions Some of them are already completed, others are underway

Stage II – of WEC programs in Ukraine is called the **Impact Program** The intent of this stage is to *disseminate to a much wider audience* energy conservation and waste minimization concepts and the benefits resulting therefrom To further the impact of the demonstration phase, seminars and workshops were held for plant manages from major industrial enterprises In addition, study tours were organized in the U S

Under Stage I, one of the plants selected is the Dniproshina Tire Manufacturing Plant located in the city of Dnipropetrovsk Three demonstration projects were selected, equipment purchased by WEC and shipped to the plant The instrumentation was installed and operated satisfactorily Based on the successful operation of these projects, Dniproshina prepared a report (Appendix A) describing the resulting reduction in natural gas consumption and presenting the accompanying benefits, which is described herein

Acknowledgement

At this time, with the three energy conservation projects essentially successfully completed by Dniproshina Plant, WEC wishes to express its sincere appreciation for the excellent cooperation of Mr Vladimir Kovalenko, Technical Director, in rapidly implementing these projects In addition, the excellent support of Mr Kovalenko for the WEC overall program of Energy Conservation and Waste Minimization is hereby recognized

Also the participation and suggestions provided by Mr Boris Shcrebko Chief Power Eng Specialist were extremely valuable in contributing to the successful achievement of the reported benefits His efforts are appreciated and acknowledged

II EXECUTIVE SUMMARY

The WEC team consisting of Dr George Laszkiewicz, WEC project manager, Dr Raymond L Feder, WEC staff consultant, and Dr Vera Zirka, in-country coordinator, visited Dniproshina Tire Manufacturing Plant on April 24, 1998 to review the estimated final benefits for the three Energy Conservation Demonstration Projects funded by USAID and implemented by the Tire Plant

The plant is located in Dnipropetrovsk and has about 7500 employees, including about 1100 in administration It manufactures tires in many sizes from motorcycle tires to large farm tractor tires In 1994, Dniproshina became a modified joint stock company

Previous visits by WEC teams had occurred in February 1997 and in October 1997 Progress Reports No 1 and No 2 were issued in April 1997 and November 1997, following these visits, describing the selected projects in detail, and the equipment provided by WEC

During the most recent visit on April 24, 1998, Dniproshina plant provided the WEC team with a report summarizing the benefits of the three concluded demonstration projects This report is attached as Appendix A and had been prepared following the successful installation and operation of the WEC-supplied equipment funded by the United States Agency for International Development

The Dniproshina report presents the following information

Project #1 - Improvement in Efficiency of Boiler #2

The WEC-supplied oxygen analyzer was installed after the first economizer pass to indicate the oxygen content in the flue gases as close to the furnace as possible As a result of the installation of the gas analyzer, the oxygen content in the exit gases was reduced from 6% to 2%, resulting in a reduction in natural gas consumption on one boiler of **558,000 m^3** annually valued at approximately **$57,000** Based on the equipment cost of $12,000, the payback time is 2 5 months

The WEC consultant calculates the savings for the same oxygen decrease at 5 5% using the temperature at the oxygen analyzer location This calculation shows a saving of 2,560,000 m^3 of natural gas per year and $264,000 per year which is substantially higher than the plant estimate Original projections were for the Boiler #2 to save 5,000,000 m^3 of natural gas per year for a saving of $400,000 per year While it is expected that more precise testing and calculations could improve the savings, the primary result is that installation of the oxygen analyzer does save considerable money and is economic to install

Project #2 – Reduction in Steam Losses at Vulcanizing Facility due to installation of new steam traps

Dniproshina Plant installed WEC-supplied steam traps on one line of 22 vulcanizers replacing the previous traps Steam meters which had been installed prior to installation of steam traps were used to measure steam flow before and after the installation of steam traps

Dniproshina Plant estimates the annual savings resulting from the installation of the new steam traps at approximately 3900 gigacalories valued at **$52,000**, equivalent to **430,000 m^3** natural gas At initiation of the project, the original projection of benefits was a savings in natural gas consumption of 200,000 m^3/year valued at $15,000

Based on equipment costs of $4800, estimated payback time is 1 1 month

Project #3 – Reduction in Heat Losses in Vulcanizing Facility due to application of thermal insulation

Dniproshina applied the WEC-supplied thermal insulation to the same vulcanizers which had been fitted with the new steam traps Using the steam meters installed prior to the application of the insulation, Dniproshina Plant estimates the annual savings at about 1100 gigacalories valued at **$14,600**, equivalent to **144,000 m^3** natural gas

The original projection of benefits as reported in Progress Report #1 was a savings in natural gas consumption of 140,000 m^3/year valued at $12,000/year

Using $6500 for the cost of the insulation, the payback time is estimated at 6 months

Total benefits resulted from demonstration project, as estimated by the plant, are **$123,600/year** and a reduction in natural gas usage of **1,132,000 m^3/year** Total cost of WEC supplied equipment is $23,300

III FINDINGS & CONCLUSIONS

The Dniproshina Tire Manufacturing Plant received the equipment supplied by WEC and installed it as planned The results are shown by tests which Dniproshina conducted on their equipment both before and after installation of the WEC furnished additions or replacements

Project #1 – Improvement in Efficiency of Boiler #2

The oxygen analyzer was installed after the first economizer pass to indicate the oxygen content in the flue gases as close to the furnace as possible The Dniproshina tests showed a reduction in oxygen content from 6% to 2% Dniproshina calculates the savings from this reduction at 557,500 m^3 of natural gas per year and $57,000 per year They show a payback of 2 5 months, which is an attractive return on investment

The WEC consultant calculates higher savings based on the same data by using the flue gas temperature at the same location as the oxygen analyzer This shows a saving of 5 5% or 2,555,000 m^3 of natural gas per year and $263,500 per year for the one boiler This is a payback of 0 5 months Using the same escalation that Dniproshina used for all the boilers, the total savings show 7,670,000 m^3 of natural gas per year and $790,000 per year Original projects described in Progress Report No 1 were for savings of 5,000,000 m^3 of natural gas per year and $400,000 per year It is possible that more precise testing and agreement on calculations could show increased savings The primary objective of the project has been met oxygen analyzers can save considerable money, fuel and reduce emissions

Project #2 – Reduction in Steam Losses at Vulcanizing Facility due to installation of new steam traps

The Dniproshina Tire Manufacturing Plant installed the WEC furnished steam traps on a 22 unit line of vulcanizers They conducted a series of tests using meters to measure the steam to the vulcanizing line to indicate performance Their tests showed a savings of approximately 3900 Gigacalories (Gc) equivalent to 430,000 m^3 of natural gas per year and $52,000 per year The original projection in Progress Report No 1 was a savings in natural gas of 200,000 m^3 per year and $15,000

Project #3 – Reduction in Heat Losses in Vulcanizing Facility due to application of thermal insulation

Dniproshina applied the insulation materials that WEC supplied to 22 vulcanizers in the large tire section, on the same vulcanizers that received the new steam traps The same steam traps were used for the testing The results showed a saving of about 1100 GC representing 144,000 m^3 of natural gas and $14,600 per year Payback period is 6 months

IV CHRONOLOGY OF PROJECT

February 1997	-	WEC Team visited plant and identified 3 projects
July 1997	-	WEC issued purchase orders for instrumentation
November 1997	-	Arrival of equipment at Dniproshina Tire Manufacturing Plant
February 1998	-	Instrumentation installed and collection of operating data initiated
April 1998	-	Dniproshina Tire Manufacturing Plant prepared report summarizing estimated benefits resulting from three projects

V APPENDIX A

(Report Prepared by Dniproshina on Estimated Benefits)

INFORMATION
ON CARRYING OUT MEAASURES FOR ENERGY SAVING
AT THE BOILING SHOP

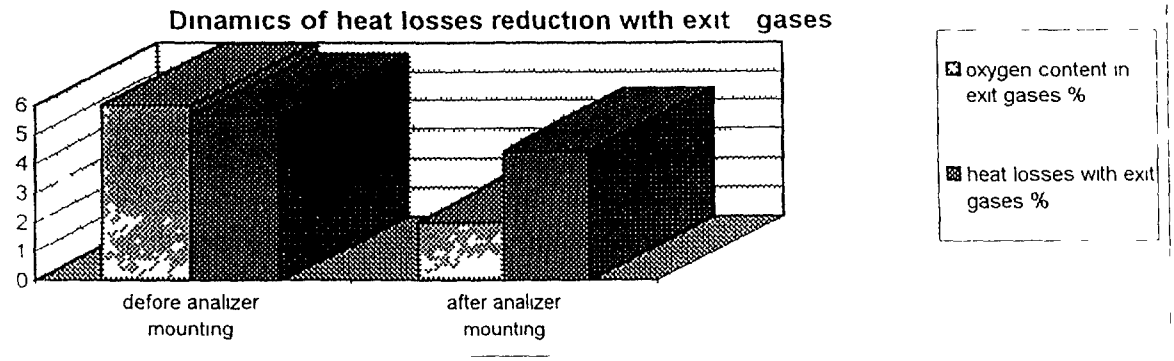
According to the project at the boiling shop of 'DNIEPROSHINA' JSC on the boiler 2 BKZ 75 oxygen analyzer WORLD CLASS 3000 with transmitter IFT 3000, measuring oxygen content in exit gases Initial analizer transformer is installed between water economizer and air-heater of the 2-nd stage Display is installed on the panel of the boiler smoke-sucker and ventilator control

The temperature of the exit gases at the site of transformer installation doesn t exceed 400 C Oxygen content control in exit gases is performed on the basis of analyzer readings in manual regime

As the gas consumption measurement is performed at the common gas pipe-line for the boiling shop - gas consumption reduction as a result of oxygen content reduction in exit gases was determined by calculation method with usage of the results of the measurements necessary for calculation of parameters and results of adjustment of the boiler Calculation is attached

Below you will see the data characterizing efficiency of performed work

Content of oxygen in exit gases before analyzer installation	- 6 %
Content of oxygen in exit gases after analizer installation	- 2 %
Heat losses reduction with exit gases	- 1,20 %
Consumption of natural gas/ per hour	- 72,6 c m
Natural gas saving/ per year on one boiler	- 557500 c m
Expected annual saving on one boiler BKZ -75	- 107000 grv
Expected NOx ejection reduction per year by one boiler	- 0 53 t



EXPENCES FOR ANALYZER INSTALLATION ON THE BOILER BKZ-75

Purchazing of the analyzer	- 12000 grivna
Installation of the analyzer	- 500 grivna
Other expences	- 1000 grivna
TOTAL	13500 rivna

Expected benefit after analyzer installation on 4 boilers

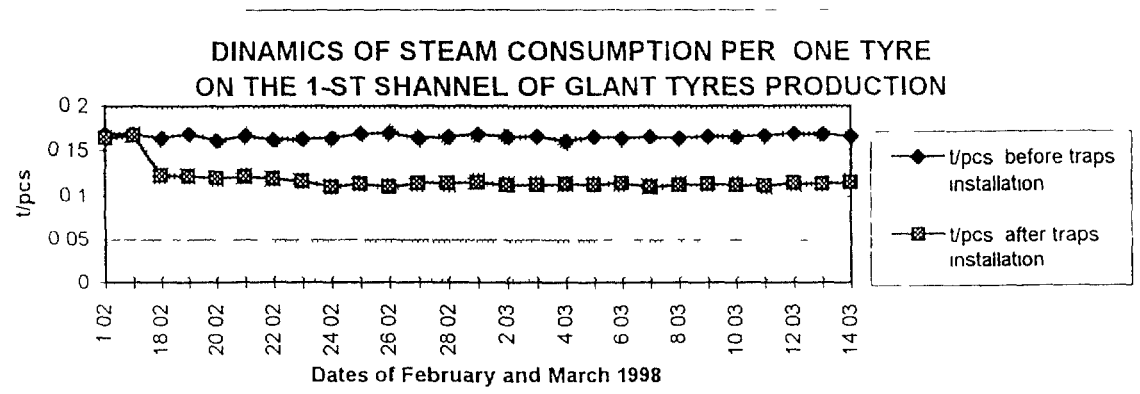
Natural gas saving/ year	- 1673000 c m
Funds saving for the account of natural gas saving	- 321000 grivna
Reduction of NOx ejections as a result of natural gas consumption reduction	- 1,6 t
Expences for analyzers installation on 4 boilers BKZ-75	- 54000 grivna

INFORMATION
ON CARRYING OUT MEASURES FOR ENERGY SAVING ON 1-ST CHANNEL (GIANT TYRES PRODUCTION)

According to the project steam traps were installed on the 1-st channel of giant tyres production in February 1998 on 22 vulcanizers and steam pipe 0 8 Mpa, as well as vulcanizers insulation was performed

Below you will find basic data characterizing efficiency of performed work with P-0 95

Steam consumption before traps installation and insulation with one vulcanizer	- (0 133+0 005)t/h
Steam consumption after performing the measures with one vulcanizer	- (0,090 +0,005) t/h
Steam consumption reduction per hour	- 32 %
as a result of traps installation	- 25 %
as result of vulcanizers insulation	- 7 %
Expected annual saving of heat energy for 1-st channel	- 5038 Gcal
Expected annual saving of funds on the 1-st channel taking into no account expences for traps installation and vulcanizers insulation	- 125000 grivna
Reduction of harmful substances ejections as a result of reduction of gas burning per year NOx	0 679 t



Expences for performing measures on the 1-st channel	- 9740 grivna
Including	
Purchasing of steam traps	- 5980 grivna
Carrying out of mount-dismount works	- 2000 grivna
Thermo-insulation of vulcanizers	- 1760 grivna

Expected benefit as a result of performing measures for energy saving on 8 channels

Annual savings of heat energy, not less	- 40000 Gcal
Funds savings for the account of heat energy savings per year, not less	- 1000000 grivna
Reduction of annual ejections of harmful substances NOx, as a result of gas burning reduction not less	- 5 4 t
Expected expences for performing of measures for energy savings, not less	- 100000 grivna