Increasing Energy Efficiency at a Beauty Products Manufacturer in Slovakia

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Project Title: Minimization of Energy Consumption and Decrease of Air Pollution using Energy Audit, Application of Renewable Energy Sources and Optimization of Critical Energy Flows
Leader: De Miclen, Levice (Slovak Republic)
Partner: Aton Centrum, s.r.o., Zelenec v (Cechach, Czech Republic)
Location: Levice, Slovak Republic
Project Duration: January 2000 – January 2001
EcoLinks Project Investment: Total Project Investment: $72,650; EcoLinks Grant Support: $46,670; Project Team Cost Share Contribution: $25,980.

Best Practice: Transferable Solution

This is a Best Practice because it provides a transferable methodology for developing an effective energy management system. With implementation of the Optimum Energy Management System (OEMS), developed in this project, multiple reductions in energy and water consumption, wastewater production and air emissions could be achieved. The transferability of the methodology is high due to its wide and flexible applicability. The problems in energy management systems that the project addresses are similar across companies, and the model generated can be used for companies that vary in both size and structure.

Project Summary

De Miclen is a producer of beauty products in Levice, Slovak Republic. Energy consumption at De Miclen has been high due to out-of-date production facilities, insufficient information about energy use patterns, and a lack of a comprehensive energy savings strategy. The power distribution networks at De Miclen are too long, and there are high energy losses during the distribution process. De Miclen is likely

to face future increases in energy costs. Slovakian energy prices are becoming more and more comparable to those of the European Union. Energy costs are also expected to continue to rise as CO_2 reduction measures associated with wide spread efforts to minimize global warming trends are implemented. More efficient energy use at De Miclen would help to keep company energy costs down, improve consumer pricing, and minimize air pollution problems and global warming trends due to CO_2 emissions.

With the support of an EcoLinks Challenge Grant, this project provided the capacity to improve energy efficiency at De Miclen through the development of an Optimum Energy Management System (OEMS). An energy audit was conducted to provide a thorough analysis of De Miclen's energy system and to determine critical energy flow consumption. Following the energy audit, technical solutions were generated based on a cost benefit analysis and an environmental assessment.

Several economic and environmental benefits are derived through this project. With the implementation of the Optimum Energy Management System (OEMS), there would be an energy savings of 30%; a decrease in emissions by 30%; a wastewater volume decrease of 85%; and a waste volume decrease of 63%. The company could save 50% of current energy and water costs while decreasing the total volume of environmental burdens (emissions) by 82%.

Project Activities

The project focused on developing an Optimum Energy Management System (OEMS) that included the following eight activities:

1. Conducted a survey of energy use

Action: A survey of the present distribution of energy flows (heat and electricity) was conducted. Overall energy flow, consumption, and losses were identified. Special attention was paid to assessing critical flows and identifying weak sites.

Product(s): 1) Database of historical energy and environmental data 2) Three technical reports on supplementary data required, energy intensive sites in the plant, and energy flows.

2. Conducted a detailed energy audit

Action: Each process unit and utility facility (regarding heat, electricity, water, waste water) was examined. Consumption levels were measured over a determined period.

Product(s): 1) Energy and water flows monitoring report 2) Energy Audit Report.

3. Prepared a list of Low-Cost Immediate Measures (LCIM)

Action: Based on the energy audit, immediate low-cost measures to eliminate or reduce unnecessary energy losses were identified. These included the installation of

thermostatic vents, the insulation of some building roofs, the conversion from steam-based heating to hot water-based heating, the conversion of power frequency, and a reduction in compressed air losses by tightening the system.

Product(s): List of recommended LCIM with physical units savings, financial savings, investment costs and payback periods for each measure.

4. Proposed two alternative solutions

Action: Based on the findings from the energy audit, two variants for improving energy efficiency at the plant (VARIANT I and VARIANT II) were proposed to the management for discussion. Both options included the basic LCIM differentiated by the size of the investment and the benefits gained.

Product(s): Alternative solution study.

5. Developed a comparative costs and benefits study

Action: In reviewing the proposed alternatives, a cost/benefit analysis was conducted to determine the most efficient solution package.

Product(s): Cost/benefit analysis.

6. Conducted an environmental assessment of the two proposed alternatives

Action: The environmental benefits of VARIANT I and VARIANT II were assessed and ranked. The assessment included a quantification of the potential gains of each proposed energy management solution in terms of a reduction in the volume of CO_2 , NOx, and SO_2 and solid waste production (dangerous, special, other).

Product(s): Environmental analysis of VARIANT I and VARIANT II.

7. Developed an implementation plan for the Optimum Energy Management System (OEMS)

Action: Based on the economic and environmental assessments, an implementation plan was designed.

Product(s): OEMS implementation plan.

8. Developed an educational model case study

Action: An interactive computer based case study for distance learning education and training was developed as a model for solving energy problems. It outlined the strategies used in this project including the screening of critical energy flows and the analysis of the environmental and economic costs and benefits.

Product(s): Educational model “Energy Audit-Case Study”.

Project Benefits

This project provides capacity building benefits and environmental and economic benefits. The collaborative nature of the project, the information database developed in the beginning of the project, and the case study for distance learning all contributed to capacity building. The project provides a framework for achieving important reductions in pollution and waste and for generating cost savings from improved energy efficiency.

Capacity Building Benefits

This project provides several capacity building benefits. It strengthened the project participants' capacity to work collaboratively to address environmental problems. The database and case study include important information that enhances the capacity to address issues of environmental performance at DeMiclen as well as other companies.

This project was a collaborative effort between De Miclen, a Czech consulting firm called Aton Centrum, and two participating entities from the Slovak Republic including the Ecotoxicological Centre and the Academia Istropolitana Nova. This multi-party work effort further strengthened the skills of each participant to collaborate to define and solve environmental problems.

Two of the project products especially contribute to the capacity building benefits. The database of the energy consumption patterns and environmental conditions at De Miclen, developed in the first stages of the project, contributes to the Company's capacity to identify environmental problems and remedies into the future. The model case study, based on the strategies used in this project, provides the basis for a distance learning program to improve the capacity for environmental problem solving at other facilities in the region.

Environmental Benefits

The analysis of the environmental benefits derived upon the implementation of the measures proposed in one of the three alternatives (LCIM, Variant I or Variant II) included the quantification of both "direct emission savings on site" and "avoided emission generation at the national level". The benefits were also quantified in terms of water and wastewater savings and less on-site waste generation.

Upon implementation of the OEMS set forth by this project the following environmental benefits are derived:

- There is an energy savings of 30%: 261,000 kWh and 50,000m^3 of natural gas will be saved annually.

- Pollution emissions (e.g.. CO_2) are decreased by 30% (around 80,000 kg per year).

- Wastewater volume produced by company operations is decreased by 85% (by 12,100 m3/year).

- The volume of solid waste produced is decreased by 63%.

Economic Benefits

The economic benefits of implementing the OEMS include the following:

- The current company energy and water costs are reduced by 50% ($130,000/year).

- The company's competitive position in the beauty products industry is increased through savings generated from the efficient use of energy.

An economic analysis of VARIANT I and VARIANT II was performed. A summary of the data for VARIANT I and VARIANT II (including net present value, internal rate of return, pay back period, and discounted pay back period) is presented below.

	Energy saving measure	Net Present Value	Internal Rate of Return	Pay Back Period
		NPV	IRR	T_s
		Thousands of Sk	%	Years
1	Thermostatic vans installation	145.27	29.55	6.1
2	Adjustable blinds installation	11.12	952	1.4
3	Door insulation	11.95	195.03	1.8
4	Automatic control for electricity users	400.59	213.92	1.5
5	Elimination of air leakage in the compressed air distribution system	420.79	205.54	0.1
6	Workroom and garage roof insulation	345.59	28.63	7.2
7	Conversion from steam to hot-water heating system	171.52	12.85	13.8
8	Replacement of the large. 2.7MW steam boiler with two smaller hot-water boilers 2 x 300kW	1735.72	42.43	22.8
9	Cogeneration unit installation	2156.31	37.25	0
10	Waste heat recovery	338.12	12.98	10.3
11	Roof insulation	1001.47	16.84	19.5
12	Installation of radiation heaters	124.67	25.23	21.8
13	Installatio n of nuvolars	81.7	11.09	13.6
	Variant I	3932.02	19.45	6.1
	Variant II	12057.09	32.63	4
	Variant II with a grant from the Slovak Ministry of Economy	4129.82	38.92	7

According to results of cost/benefit analysis. VARIANT I. is less effective as it has a much longer pay back period than VARIANT II. This illustrates the efficiency of cogeneration unit implementation.

Lessons Learned

Certain lessons were learned during this project. This project provided the opportunity for successful regional cooperation and the transfer of project know-how. This collaborative information sharing setting allowed De Miclen to devise feasible alternatives for improving energy efficiency. An environmental impact assessment and cost/benefits analysis facilitate the selection of the most attractive alternative. Simple, low-cost energy efficiency measures are easy to identify and can bring substantial savings in operational costs.

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