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Jávorszky Ödön Hospital
Vac, Hungary
Energy Efficiency Demonstration Project Evaluation
Final Report

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and

JOVK Hospital
Vac, Hungary

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1. Project Background

The proposed project at Javorszky Odon Varosi Korhaz (JOVK) Hospital in Vac, Hungary was selected based on three considerations:

1. The site selected (a municipally-owned hospital) is one of the type of facilities identified in the Hungary Project Work Plan as being seriously in need of energy efficiency improvements;
2. The technologies involved in the demonstration project appear to be very cost-effective, and are also very replicable throughout Hungary;
3. The municipality and hospital involved are financially stable and highly motivated to reduce energy consumption and related costs.

Electrotek's work with JOVK Hospital followed on the previous USAID hospital partnership programs in Hungary. At the request of USAID-Budapest, Electrotek Concepts, Inc. worked with EGI Contracting/Engineering to assess the energy savings options at JOVK Hospital. EGI conducted an energy audit under its subcontract to Electrotek and found very promising potential energy efficiency projects, leading to the design of this demonstration project.

The USAID-funded energy efficiency project at Vac hospital was actually part of a much larger project being undertaken. The hospital also rehabilitated its entire boilerhouse and steam supply system. This larger project was funded using moneys from the German Coal Fund. The USAID project was an important first step in the hospital's overall energy efficiency strategy, and enabled the hospital to meet the 20% cofinancing requirement of the German Coal Fund. USAID also provided technical assistance to Vac hospital to help them prepare the specific project-related loan documents required by the German Coal Fund. The rehabilitation project was completed in December 1998.

2. Description of Project

There were two energy efficiency measures that were installed:

- New feed water pumps and boiler level switches; and
- New automatic controls, enabling blowdown of the two boilers.

These specific measures were chosen for the USAID portion of this larger project in large part because they could be installed independently of the boilerhouse and steam supply system rehabilitation. This large project was very ambitious and experienced many delays throughout 1997 and 1998. The selection of these two measures provided some assurance that these measures would be installed even if the implementation of the larger project was delayed past the date of Hungary's graduation from USAID, scheduled for June 1999.

Short descriptions of the two measures to be implemented follow.

Feed water pump replacement and new boiler level controls. Three new feed water pumps were installed. The existing feedwater pumps were oversized and 22 years old, and therefore the efficiency of the pumps was less than 30%. Within this project, three properly sized pumps were installed, two for normal

operations, and one standby pump. The pumps were equipped with an automatic control system. The boilers were equipped with electronic water level controls. Prior to this project, the control valve for the boilers had a pressure drop of five bars at nominal load.

Automatic control of the blowdown of the two boilers. The two HOK 7/12 boilers had manual blowdown before the project and the level controls were considerably undersized. Due to the manual blowdown, the quantity of blowdown water depended on the operator only, and several signs indicated that it exceeded the necessary amount. In the course of the project, the boilers were equipped with an automatic blowdown system and an electronic device replaced the mechanical level control. The pressure drop of the new level controls is considerably lower than that of the old devices. This further reduces the energy use of the feedwater pumps.

3. Installation of Proposed Measures

The hospital was responsible for the installation of all of these measures. Despite the many delays that were experienced in negotiating the scope of the project and what USAID's contribution to the project would be, there were no such delays with the installation of USAID-funded equipment. Once the equipment arrived and cleared customs, it was installed relatively quickly. Installation took place during June-July 1998.

4. Quantitative Evaluation of Energy Savings and Project Payback

Methodology Used to Compute Energy Savings

Computing the energy savings for this project was very challenging since very little baseline data was available that pertained to the USAID-funded measures. It was necessary to derive energy savings using a combination of engineering calculations and spot metering. These calculations were done for both the baseline situation (i.e., before the new equipment was installed) and after installation of the new equipment.

The specific methods used to estimate the energy savings for the two types of installed measures were as follows.

Replacement of Feedwater Pumps

Baseline situation

Engineering calculations were used to compute the electricity usage of the feedwater pumps. Spot metering was used to confirm the values assumed for some of the variables, such as electric load and hours of operation. The following table describes the characteristics and electricity use of the feedwater pumps installed previously.

	Summer	Winter
Number of boilers in operation	1	2
Annual hours of operation (h)	4680	3966
Feed water flow tons (t)/h	6	12
Head, bar	22	20
Pump efficiency %	25	35
Electric load kW	17.3	22.4
Annual electricity consumption kWh	81	89

After intervention

After the new pumps were installed, engineering calculations were again done to compute the electricity use of the new pumps. And again, spot metering was used to check and confirm the levels of some of the variables. The following table reports the characteristics and energy use of the new feedwater pumps.

	Summer	Winter
Number of boilers in operation	1	2
Annual hours of operation (h)	4680	3966
Feed water flow tons (t)/h	6	12
Head, bar	12	12
Pump efficiency %	72	72
Electric load kW	3.2	6.3
Annual electricity consumption kWh	15	25

Thus, the annual energy consumption of the new pumps is 40 MWh and the electricity savings is 130 MWh per year.

Automatic Blowdown System and New Level Controls

Baseline situation

The 2 HOK 7/12 boilers had manual blowdown and the level controls were significantly undersized.

Absent continuous metering, it is quite difficult to estimate the quantity of blowdown water from the boiler. According to the operator's manual, 3-5% blowdown is required. In 1990, a detailed study was carried out in the water treatment facility within the boilerhouse. Metering was installed in order to measure the blowdown quantity and length of underwater blowdown periods. The blowdown quantity was found to be 3.9%. However, given the quality of the treated water and the boiler requirements, only 1.6% blowdown was required. Therefore, the amount of blowdown water that exceeds this 1.6% level and associated heat content are considered as losses.

After intervention

The automatic blowdown equipment reduced the blowdown rate to 1.6%. Therefore, the rate was reduced by 2.3%. The specific assumptions that were used to compute the energy and cost savings associated with the 2.3% reduction are as follows:

Annual steam production	34,000 tons/year
Expected make-up savings (34,000 * .02)	680 m^3/year
Heat content of water (10 bar saturated)	678 MJ/ m^3/year
Plant efficiency	85%
Specific fuel savings	789 MJ/ m^3
Annual heat savings	542 GJ
Annual fuel (gas) savings	16,000 m^3

Summary of Energy Savings and Simple Payback for Each of the Installed Measures

No	Measure	Energy or Water Savings/yr.	Energy Bill Savings in KFt./yr.	Measure Cost in KFt.	Simple Payback (years)
1	Feedwater pump replacement	130 MWh	1879 KFt.	2545 kFt.	1.4
2	Automatic blowdown system and new level controls	540 GJ (heat) 16000 m^3 gas	1800 KFt.	5404 KFt.	3