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Fejér Megyei Szent György Kórház Hospital Szekesferhervar, Hungary Energy Efficiency Demonstration Project Evaluation

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and

Fejér Megyei Szent György Kórház Hospital
Szekesferhervar, Hungary

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1. PROJECT BACKGROUND

The proposed project 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.

This project was the outcome of the Energy Managers Contest conducted by EGI Contracting Engineering Co., Ltd. and the Hungarian Chamber of Engineers under Electrotek Concepts Inc.'s USAID contract. The technical staff of Szent György Hospital, Székesfehérvár entered the energy manager contest. The high quality of their application, which included cost and payback analysis and cash-flow calculations, lead to negotiations between Electrotek/EGI and the hospital to conduct a demonstration project.

The Székesfehérvár Hospital consists of 40 buildings and 1914 beds. Five boilers in the main section of the hospital feed the steam heat supply system. The system supplies the entire hospital campus, which includes the main section, two new, more modern buildings, and several outer buildings that are located across the street from the main hospital and fed by two substations. The pipes connecting the outer section are old and extremely leaky. The main heating system is also in very poor condition – over 200 steam traps are broken and flash steam and condensate build-up are serious problems. The system efficiency is very low in the summer months when only hot water is generated.

2. DESCRIPTION OF PROJECT

The project included the following components:

- Separation of the remote buildings from the steam heat supply system and the installation of two local boilers to provide hot water heating; and
- Installation of 200 steam traps, insulation, and new valves in the old system.

Short descriptions of the two measures to be implemented follow.

Separation of the outer buildings and installation of two local boilers. As explained above, the outer buildings were disconnected from the main heat supply system and two boilers were installed in local substations.

Installation of 200 Steam Traps, and system upgrade. 200 steam traps were installed throughout the existing main steam system to reduce losses and problems from flash steam and condensate build-up. Pipes were insulated and leaky valves replaced.

Székesfehérvár Hospital also obtained additional funding from the German Coal Fund to undertake most of these improvements. Due to the timing of the project and the delays experienced, the project was implemented in two parts. USAID provided the majority of funding for the steam traps

and local boilers, and this component of the project was implemented first, during September 1998. The second portion of the project began after final approval of the German Coal Fund loan was obtained. The loan money is being used to complete the larger project, which involves:

- Reconstruction of 2 boiler houses
- Replacement of 182,000 meters of piping

The total cost of this project (excluding the USAID-funded portion) is 32 million Ft. ($152,000). These improvements will be completed by July 1999 and tested during August and September 1999.

The USAID-funded portion constitutes the hospital's 20 percent contribution that was required to obtain funding for the larger project through the German Coal Fund. Therefore, the USAID contribution has allowed the hospital to undertake a much larger energy efficiency project that would not have been feasible otherwise.

3. QUANTITATIVE EVALUATION OF ENERGY SAVINGS AND PROJECT PAYBACK

Methodology Used to Compute Energy Savings

To compute the energy savings for this project, direct observations (using data collected through spot metering) were used. The following describes the method used to estimate the energy savings for the installed measures.

Steam traps

The baseline situation was assessed using the same method as was used for the laundry improvements for the Veszprém hospital project. Under this approach, a large sample of the steam traps was tested using an ULTRAPROBE 500-steam trap tester before the intervention. The steam loss was calculated using a calibration chart for this device. Due to the large number of traps, only one-third of all traps was tested. Total loss was calculated by multiplying the measured steam losses by the steam load of the equipment. The total loss for the entire system was calculated as follows:

Purpose of equipment served by the traps	Average loss/trap, kg/h	Number of traps	Annual working hours	Annual loss Tons of steam
Drainage	2.7	32	8600	743
Heat exchangers	6.1	63	4500	1729
Total				2472

If the steam traps work properly, all the loss can be avoided. Therefore it was agreed that the monitoring would be based on the regular checking of the operation of the steam traps. To facilitate the checks, the project also provided an ULTRAPROBE 100 steam trap tester for the hospital.

The hospital technical staff regularly carries out the checks. In addition, during a site visit by the project team (25/11/98), the ULTRAPROBE 100 device was used to test a representative sample of the steam traps. All of the tested traps were found in good working condition, no sound of blow-though steam was detected.

Also, the hospital technical staff that regularly checks this equipment confirmed the good working condition of the traps. Thus, it can be safely assumed that all of the estimated savings have been achieved.

To further verify the magnitude of savings, the following calculation was also made. The steam savings amount to 2500 t/year, which corresponds to 6.8 t/day. If steam is lost, it must be replaced by make-up water whose quantity is measured. Based on these assumptions, data for one sample month (before the project) and the same month one-year later (after the project) were collected and compared. The same calculation was made for a longer period. The results are shown below:

Before the project	**09/97**	**11/97-04/98**
Total feedwater used by the boilers	2512 t	25198.7 t
Make-up water quantity	957 t	7559.6 t
Percentage of make-up	38 %	30%
After the project	**09/98**	**11/98-04/99**
Total feedwater used by the boilers	2922 t	24018.8 t
Make-up water quantity	946 t	5764.5 t
Percentage of make-up	32.3 %	24%

For the longer period, assuming the percentage of make-up water remains the same, as before the project, the 24018.8 tons of feedwater would have required 7205.6 tons of make-up water. Thus, the savings over five winter months are around 1441 t, which equals to 9.4 t/day. If the same calculation is made for September, when heating was not likely to be necessary, the result is 5.4 t/day. The average over the year should be around 7.5 t/day. From these figures, it can be concluded that the actual savings are rather close or are somewhat higher than the calculated value.

Based on this logic, it was assumed that the entire 2472 tons of steam lost annually with the previous equipment was avoided. The value of this avoided steam loss is 2200 Ft./ton ($10.50) or 5.5 million Ft. in total ($26,000).

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	Steam Trap Replacement	2472 tons (Steam	5500 KFt.	5366 KFt.	1.0