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Regional Activity Centre for Cleaner Production

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Development of a cogeneration plant at the Osijek Clinical Hospital

Company	Osijek Clinical Hospital.
Industrial sector	Medical facility.
Environmental considerations	Osijek Clinical Hospital is an integrated health care facility with a significant energy demand. The hospital's complex covers an area of approximately 7.5 hectares and includes over thirty separate buildings. The main environmental issue is the high energy demand. In 1999 the Hospital consumed 96,943 gigajoules of heat and 6,105,000 kW/h of electricity which cost $417,000. The Hospital currently relies on the city district heating system and power grid for heat and electricity respectively. A natural gas distribution pipeline—part of the city's gas supply system—is located close to the Hospital. The possibility of installing a combined heat and electric power system to further improve energy cost savings and secure an efficient supply of energy needed to be explored.
Background	The project accomplished several tasks towards improving energy efficiency at Osijek Clinical Hospital. The actions performed were mainly aimed at reducing greenhouse gases emissions and improving energy supply efficiency by introducing a cogeneration system to cover the demand for electricity and heat at the Hospital.
Summary of actions	Process modifications: Low-cost and no-cost saving measures: 1. Optimising the peak power demand by operating high-load heat consumers during off-peak hours. 2. Optimising the reactive power compensation system. 3. Improving the insulation in the existing steam and heating pipes. 4. Installing a recovery unit in the air-conditioning system. 5. Installing a central electricity and heat monitoring and control system. Other measures: 1. Energy management plan. 2. Energy measuring plan. 3. Parameters for a cogeneration plant.

Outline of the process

Balances

Environmental benefits	
Reduction of CO_2 emissions	4,236 t/year
Reduction of SO_2 emissions	152 t/year
Economic benefits	
Annual savings in energy costs	$285,000
Total investment outlays	$1.03 million
Simple pay-back period	3.6 years
IRP	21.2%
NPV	$1.3 million

Conclusions

- A continuous and relatively consistent daily annual demand for electricity and heat is the main factor to be considered prior to undertaking activities related to introducing cogeneration.
- For combining heat and power (CHP) feasibility assessment, the most important factors to be considered are: (1) the ratio of fuel to electricity/heating prices; and (2) the possibility of selling surplus electrical and or thermal energy.
- Under the current prices of electricity, heat and natural gas prices in the region (South and Eastern Europe), natural gas-based cogeneration can be a feasible energy supply alternative, even without selling surplus electrical and/or heat energy to another consumer.
- It is important to analyse the possibility of using the total waste heat generated by a CHP plant (waste heat from exhaust gases as well as plant's oil and water cooling systems) as an energy source.
- The selection of the CHP plant type to be used -gas turbine or gas engine- is determined by a number of factors including: main energy type needed (heat or electricity), which depends upon the average and peak heat and electricity demands, current prices, the availability of alternative sources, the conditions for connecting to the power grid, and the plant's investment and operational costs.

NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.

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