



RESOURCE EFFICIENT AND CLEANER PRODUCTION CENTRE

We strive for green industries in Ukraine

Case Study

FOOD PROCESSING SECTOR: SUGAR PLANT

COMPANY DESCRIPTION

This company is specialized in sugar production. The annual production is 10'800 tons of sugar. The company also produces heat energy, electricity, lime carbonate, treacle and pulp. The company employs 150-200 persons, processed 2'016 tons/day of sugar beets, produced 2'668 MWh of electricity and consumed 43'728 MWh of gas and 228'600 m³ of water (225'300 m³ for technical purposes, i.e. for beet washing, diffusion and juice evaporation) in 2013.

PROCESS DESCRIPTION

The enterprise has steam capacity from two 16 tons/h and one 20 tons/h gas-fired-boilers (2 MPa maximum pressure, 380 °C maximum temperature) and owns a combined cycle gas turbine power plant with two 1'500 kW gas-turbine generators for electricity production.



The used production system is outdated but was widely used in FSU Regions and all over the world up to the 80s of the past century. However progress in development of thermal and technological equipment allowed reducing fuel consumption by 2.2% to process the beets.

GOALS of the RECP PROJECT

A modernization of the cycle arrangements at the enterprise could reduce the specific flow of steam significantly, however to reach best practice levels a complex and expensive modernization of the factory would be necessary.

To improve the plant's efficiency the following main objectives for the analyzed processes were identified with the management:

- Modernization of steam-pipelines;
- Reduction of water losses;
- Reduction of energy losses.



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra



*IMAGES references:
<http://labcowelding.com>,
<http://www.pdssheetmetal.co.uk>

OPTIONS AND IMPROVEMENTS

Table 1 summarizes the key financial and environmental performance parameters of the proposed improvement options.

Table 1: COSTS AND BENEFITS OF PROPOSED MEASURES

MEASURES	FINANCIAL			ENVIRONMENTAL	
	Investments [€]	Savings [€/y]	Payback [y]	Energy [MWh/y]	Material [Units/y]
1. Insulation of condensate return piping after 1st and 2nd evaporation plants	3'900	3'700	1.06	95.47	9'547 m ³ of gas
2. Pressed pulps water return	30'000	63'370	0.5	1'646	164'600 m ³ of gas
3. Biomass fired boiler installation options:					
3.1 pulp-fired	385'000	163'150	2.36	-1'284 ¹	708'000 m ³ of gas
3.2 fuel pellets-fired	191'650	272'000	0.7	-1'284	989'800 m ³ of gas
TOTALS					
1. with pulp fired option	418'900	230'220	1.82	457.5	See above
2. with pellets fired option	225'550	338'840	0.67	457.5	

¹ Positive environmental benefits indicate savings compared to the current situation, negative signs indicate additional energy or materials are needed compared to the current situation.

Low cost measures:

1. Heat insulation of condensate return piping after 1st and 2nd evaporation plants.
2. Pressed pulps water return: it reduces the juice pump age at the normative losses of sugar on a diffusive aggregate and reduces the expense of feed water on diffusion. The juice pumpage reduction allows cutting down steam usage for juice evaporation.

Investing required measures:

3. Use a biomass (pulp- or pellets- fired) boiler installation for steam production. A major part of energy needs could be covered by the use of alternative types of bio-fuels through the biomass boiler with a capacity of 20 tons/h. The potential is defined by the limited power of transformers, by the required independence from the external electricity grid, and by the inherent inertance of biomass boilers. Basic advantage of pulp as fuel is its availability at the enterprise and the resulting independency however the required initial investments would be higher. In the offered calculations the cost of pellets delivery and potential price volatility was not taken into account.

FINANCING

For larger investments third party loans are needed. The company seeks external funding of 200'000 € from financial institutions for the projects.

FOR MORE INFORMATION

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