PANEL 3

14:45 – 16:00

ENERGY AND RESOURCE EFFICIENCY IN THE SUGAR INDUSTRY AS A KEY FACTOR FOR SUSTAINABILITY

Speaker: **IGOR RYLIK**

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IMPROVING RESOURCE EFFICIENCY OF PRIMARY PRODUCTION AND PROCESSING OF THE SUGAR SECTOR

BASIC PRINCIPLES OF ENERGY AND RESOURCE EFFICIENCY IN THE SUGAR INDUSTRY

- Improving the technological quality of raw materials
- Using fuel and heat as secondary resources
- Minimizing the water flow to the technology
- Saving electrical energy
- Reducing the use of limestone and coke

INVESTMENT AMOUNT

Investments of **USD 10.5 million** will lead to significant operational savings of **USD 3 million** per season/campaign. Proposed investments/reconstruction can be implemented in two stages over two years.

Preliminary analysis shows that these investments will lead to a net present value of **USD 5.07 million** and 23% internal rate of return over a 10-year period at 10% discount rate.

MAIN RESULTS OF THE RECONSTRUCTION

- Improving overall fuel efficiency and reducing fuel consumption by **44 – 47%.**

- Decreasing fuel consumption will reduce operational expenses by **USD 2.3 million** per season;

- Reducing sugar losses by at least 1020 tons of sugar per season will lead to additional revenue of over **USD 0.65 million per year**;

- Reducing limestone, coke and fresh water use.

RESULTS OF IMPLEMENTED PROJECTS IN UKRAINE

Factor	Measurement units	Beginning of realization	End of realization	Specific improvement	% improvement
Gas consumption	m3/t. beet	54	28	26	48
Electrical energy consumption	kWth/t. beets	34	25	9	26
Limestone consumption	Kg/t. beets	85	46	39	46
Coal consumption	Kg/t. beets	7,7	3,2	4,5	58
Fresh water consumption	m3/t. beets	200	60	140	70

COOPERATION WITH BEET FARMERS

- To purchase a laboratory to test soils planted with beets and to support beet farmers through providing advice in the area of agricultural cultivation (e.g. assistance in selecting appropriate seeds, fertilizers, plant protection, irrigation techniques, etc.). This can lead to direct economic benefits for farmers and their crop and for the factory in turn.

- Implementation of price differentiation for raw materials purchased from sugar beet farmers depending on beet quality (not only based on digestion and level of contamination, but also based on the content of potassium, sodium and alpha-amine nitrogen) is reasonable as well.

- Price differentiation will motivate the farmers to improve the technological quality of raw materials.

IMPROVING THE TECHNOLOGICAL QUALITY OF BEET

- **REDUCES FUEL CONSUMPTION**:

- Each percent increase in the purity of the diffusion juice reduces the natural gas consumption by **0,6 m3** per ton of beet processed.

- **INCREASES SUGAR VOLUME PRODUCED**:

- Each percent increase in the purity of the diffusion juice leads to 0.22% increase of the sugar volume produced (an increase equivalent to **1320 tons** of sugar per campaign for a factory with processing capacity of 6000 tons/day).

IMPROVING THE QUALITY OF RAW MATERIAL

- **Increasing the sucrose content by 1%** will increase the factory's sugar production by 4800 tons of sugar per season, which makes **USD 3.1 million** of additional revenue per year.

- Increasing the sucrose content can be achieved by improving agricultural techniques and technologies used in the growing and harvesting of beets.

CALCULATED POTENTIAL RESULTS

Parameter	Current value	Potential change with proposed reconstruction (reduction/increase per unit)	Improved value (per unit) with proposed reconstruction	Potential savings (in units) per season/year	Savings in USD per season/year
NATURAL GAS consumption (m3/t of beet)	47-50	decrease by 22	25-28	13,200,000 n.m3	**2,310,000**
LIMESTONE consumption (% to mass of beet)	7	decrease by 3.8	3.2	22800 t	depending on the price of limestone
COKE consumption (% to mass of beet)	0.5	decrease by 0.28	0.22	1680 t	depending on the price of coke
ELECTRICITY consumption (kW*h/t of beet)	40	decrease by 13	27	872 200 n.m3	**153,000**
SUGAR CONTENT in beet (% to beet mass)	16-17	increase by 1	17-18	4800 t sugar	**3,115,200**
SUGAR LOSSES (% to beet mass)	could not be estimated	decrease by 0.17	could not be estimated	1020 t sugar	**652,800**

SECONDARY USE OF HEAT

Utilizing heat from the condensates, massecuite vapour and barometric water in order to heat the extraction feeding water, products (juice, syrup, molasses) and air in sugar drying heat exchangers.

Increasing the use of vapor from the last bodies of the evaporator, which will increase sugar concentration in the syrup.

FUEL SAVINGS

TECHNOLOGY OPTIMIZATION

Extraction (draft and purity), heating scheme, crystallizing department

EQUIPMENT UPGRADE

Modern efficient equipment: filter presses, vacuum pans with mechanical stirrers and continuous type, centrifugals, pumps.

WATER USE REDUCTION

Flow meters and staff motivation, optimizing extraction, antiscaling chemicals, “Hydroflow” techn.

ELECTRICAL ENERGY CONSUMPTION

Changes to the technology, minimizing the water flow lead to a reduction of the volumes of technological streams, hence lowering the energy used for pumping.

Regulating electrical engines through frequency controllers.

Installing modern equipment with lower energy consumption.

Reactive energy compensation.

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