



CASE STUDY: SOMEȘ SA, Dej

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|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Projects Name | Implementing of a monitoring system for energy flows Modernization of steam/condensate system from paper machine |
| Sector | Pulp and paper industry |
| Borrower | Private company, SOMEȘ SA, Dej |
| Lender | Romanian Energy Efficiency Fund |
| Financing Starting Date | October 2005 |
| Project Size/Loan Amount | USD 940,000 / 752,000 |

Summary

SC SOMEȘ SA Dej is a pulp and paper mill that carries on its activity since 1963. The company's object is the production and marketing of bleached and unbleached kraft pulp, bleached and unbleached packing paper and paper for writing and printing.



The company is producing every year 40,000 t of paper and 70.000 t of pulp, out of which 40,000 t are sold to external clients.

The company is operating a cogeneration power plant, equipped with 3 steam turbines, totalizing 15 MW. This facility generated during 2004 about 34,896 MWh of electricity. As the mill is consuming more, the rest of the electricity (about 65,235 MWh) was bought from the national grid. Knowing that about 2,845 MWh were sold to external clients, the overall electricity consumption of the company during 2004 is estimated to about 97,286 MWh.

The mill is also consuming steam on three pressure levels: 40 ata, 13 ata and 4 ata.

The boilers of the CHPP facility are fueled with natural gas, wood waste and black lye. The natural gas consumption of the company is about 31,908,000 Nm³/year (equivalent of 25,688 toe), while the renewable energy consumption (wood waste and black lye) is the equivalent of 43,470 toe.

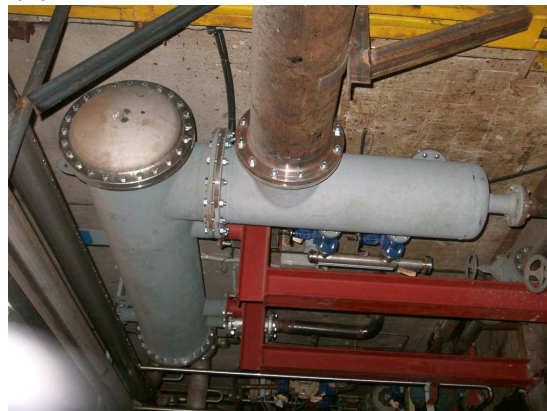
The main steam consumer of the company is the paper machine. The steam is condensed inside 30 cylinders used to dry the paper/pulp. The cylinders are grouped on three levels of pressure/temperature. The condensate resulting from the first group is expanded and the resulting steam is used to heat the second group of cylinders, and so on. The final condensate is collected and transported to "Recovery" Section.

The company's representatives intend to diminish further more the operational costs. Hence, by implementing the two projects, partially financed (80%) by F.R.E.E., the company will undergo important energy savings and will lower its environmental impact, by diminishing GHG emission.

Projects' description

The monitoring system will generate energy savings of at least 0.5% out of the total energy bill of the company. However, one should note that such monitoring systems are expected to generate 3% energy savings. The system will survey and record electricity

consumption, natural gas flows, water flows, steam/condensate flows.



The modernization of the steam/condensate system of the paper machine consists in regrouping the drying cylinders on levels of pressure and temperature. This would ensure a better control of the drying temperature for pulp/paper and a higher quality of the products. The peeling problems of the paper will also be solved and the productivity of the paper machine will increase.

Aim of the projects

The aim of the projects is to diminish the energy bill of the company. The monitoring system will help to identify high energy consumption equipments inside the company. It will also help the operators to increase their awareness to energy savings.

The modernization of the steam/condensate system of the paper machine aims at reducing the steam consumption of the drying cylinders and at increasing its productivity. Other direct consequences of the project are a higher quality of the resulting products and a superior reliability of the above mentioned equipment. The main resulting features of the projects are given hereunder:

- **Natural gas and electricity savings.** The energy savings expected to be encountered after the implementation of the monitoring system are about 0.5%. Moreover, the regrouping of the drying cylinders will generate steam savings, which also means natural gas savings.
- **Water and steam/condensate savings.** The monitoring and the recording of water and steam/condensate flows will increase the awareness of the operators to making such savings. The company will also identify rapidly the equipments that could be optimized to generate supplementary savings.
- **Pollutant emissions reduction.** The reduction of natural gas and electricity consumption will lead to diminishing of CO₂ emissions.

Economic evaluation of the project

The implementation of the monitoring system will be finished before the end of 2005. The modernization of the steam/condensate system of the paper machine will start during December 2005 and will last for about 7 months. The paper machine will be stopped between April 15, 2006 and May 15, 2006, when the annual overhaul is scheduled. The total investment for the two projects is detailed in Table 1.



Savings

After the implementation of the two projects the estimated savings are presented below:

- **Electricity.** The monitoring system will generate electricity savings of about 486.4 MWh/year, i.e. 36,500 USD/year.
- **Natural gas.** In 2004 the company consumed about 69,200 toe as fuel. The natural gas savings generated by implementation of the monitoring system have been estimated at 346 toe/year, being an equivalent of 429,650 Nm³/year, i.e. 76,900 USD/year. Modernization of the steam/condensate system of the paper machine generate saturated steam at 4 bar savings of about 1.5 t/h. Every year it will be an equivalent of 974,000 Nm³/year of natural gas savings. Including all production costs the total financial savings will reach 238,100 USD/year.
- **Increased productivity.** Increasing the efficiency of the paper machine will also lead to a supplementary production of about 2,100 t/year, i.e. equivalent of 75,100 USD/year.
- **Reduction of treated water consumption.** More efficient condensate collection will lead to diminishing of water treatment costs with about 71,000 USD/year.
- **Maintenance, works.** Modernization of the paper machine leads to diminishing of the maintenance costs by increasing its reliability. The savings have been estimated at about 62,000 USD/year.

Financial evaluation

The feasibility evaluation of the projects has been performed using the following criteria: the simple payback period, internal rate of return and net present value calculated for an actualization rate of 12% and a study period of 20 years. Tables 2 and 3 present a synthesis of the financial analysis.

The company's management has decided to invest USD 940,000 for implementation of the two energy efficiency projects. The Romanian Fund for Energy Efficiency finances 80% of the entire investment, i.e. with a credit of USD 752,000, the company assuring the rest of 20%, i.e. USD 188,000 from the own sources. The FREE credit is for 4 years having a grace period of 12 months. Credit disbursement will be made every 3 months using equal installments, as the company has requested.

Expected Impact

The annual natural gas savings, generated by the two projects, have been estimated at 1,403,650 (equivalent of 1,130 toe). Electricity savings have been estimated at about 486.4 MWh/year, i.e. equivalent of 140 toe. After the projects implementation the CO₂ emissions will decrease with about 2,800 t/year.

Table 1

| Item | USD* |
|-------------------------------------------------------------|----------------|
| Monitoring system for energy flows | 400,000 |
| Modernization of steam/condensate system from paper machine | 540,000 |
| Total projects | 940,000 |

* - The figures are VAT excluded.

Table 2

| | Year | | | | | | | | | | |
|--------------------------------|------|--------|--------|-------|-------|-------|-------|-------|------|---------|---------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | ... | 19 | 20 |
| | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD |
| Initial investment | -400 | - | - | - | - | - | - | - | - | - | - |
| Cash Flow | -400 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | ... | 113.4 | 113.4 |
| Accumulated Cash Flow | -400 | -286.6 | -173.2 | -59.8 | 53.6 | 167.0 | 280.4 | 393.8 | ... | 1,641.2 | 1,754.6 |
| Discount Factor | 1.00 | 0.89 | 0.80 | 0.71 | 0.64 | 0.57 | 0.51 | 0.45 | ... | 0.10 | 0.09 |
| Present Value of the Cash Flow | -400 | -299 | -208 | -128 | -56 | 9 | 66 | 118 | ... | 435 | 447 |
| Payback Period | 3.5 | years | | | | | | | | | |
| Discount Payback Period | 4.9 | years | | | | | | | | | |
| Net Present Value | 447 | kUSD | | | | | | | | | |
| Internal Rate of Return | 28 | % | | | | | | | | | |

Table 3

| | Year | | | | | | | | | | |
|--------------------------------|-------|-------|-------|-------|---------|---------|---------|---------|------|---------|---------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | ... | 19 | 20 |
| | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD | kUSD |
| Initial investment | -540 | - | - | - | - | - | - | - | - | - | - |
| Cash Flow | -540 | 446.2 | 446.2 | 446.2 | 446.2 | 446.2 | 446.2 | 446.2 | ... | 446.2 | 446.2 |
| Accumulated Cash Flow | -540 | -93.8 | 352.4 | 798.6 | 1,244.8 | 1,691.0 | 2,137.2 | 2,583.4 | ... | 7,491.6 | 7,937.8 |
| Discount Factor | 1.00 | 0.89 | 0.80 | 0.71 | 0.64 | 0.57 | 0.51 | 0.45 | ... | 0.10 | 0.09 |
| Present Value of the Cash Flow | -540 | -142 | 214 | 532 | 815 | 1,068 | 1,295 | 1,496 | ... | 2,747 | 2,793 |
| Payback Period | 1.2 | years | | | | | | | | | |
| Discount Payback Period | 1.4 | years | | | | | | | | | |
| Net Present Value | 2,793 | kUSD | | | | | | | | | |
| Internal Rate of Return | 83 | % | | | | | | | | | |

FREE financing advantages

- FREE is a unique Romanian financier in energy efficiency field;
- FREE is actively supporting the companies during the energy efficiency project analysis;
- FREE offers flexible and attractive ways to guarantee the loans;
- FREE facilitates the access of the companies for financing feasibility studies, energy audits, etc.;
- FREE offers low cost financing for companies;
- FREE offers technical assistance.