



ROMANIAN ENERGY EFFICIENCY FUND

CASE STUDY: ARC SRL Dorohoi

Project Name	Modernization of Technological Equipment
Sector	Industry
Borrower	Private enterprise "ARC SRL, Dorohoi"
Lender	Romanian Energy Efficiency Fund
Financing Starting Date	May 2006
Project Size/Loan Amount	USD 513,600/400,000

Summary

ARC SRL is a company activating in the glass and porcelain industry. The company operates several technological lines for



glass and porcelain production, requiring important quantities of natural gas. Almost all technological equipment is out-of-date and the modernization aiming the company's competitiveness increase on the market is based on an ambitious multi-component energy efficiency project implying the heating plant, air compressors, reactive power compensation, furnaces rehabilitation, water supply system and heat recovery.

The annual operation costs including energy bills and maintenance and personnel costs were about USD 930,667. By investing USD 513,600 for the implementation of the multi-component energy efficiency project, the company is expected to save about USD 305,789 per year. The electricity consumption is expected to decrease with about 35%, the reactive energy with 100% and the natural gas consumption with 25%.

The project is very profitable with an estimated Simple Payback Period of 1.7 years and an Internal Rate of Return of 60%. The project will also contribute to lower emissions of air pollutants, including green house gases such as CO₂.

FREE has provided a 4-year USD 400,000 loan to ARC Dorohoi with a grace period of 12 months. Mortgage on company's industrial and administrative buildings, pledge on the equipments and promissory notes were accepted as guarantees of the loan. The reimbursement of the loan will be made in quarterly equal installments according to the request of the company and to the cash flow of the project.

Description of the project

Two water wells will be drilled for covering the company water demand. No water will be supplied from the municipal system. Two new screw air compressors operating alternatively in line with the week manufacturing program will be installed. New reactive power compensation equipment fully automated and adapted to the instantaneous reactive power consumption of the company will be installed. A new and fully automated heat plant covering the entire heat demand will be installed in the building. Existing furnaces will be thermally rehabilitated and equipped with new conveyors and temperature regulators, automation systems and new burners,

recirculation exhaust gasses fans. Three new modern furnaces will replace an existing tunnel furnace with conveyor. Finally, a home-designed heat exchanger to recover a part of the heat from the exhaust gasses from furnaces will be installed in order to pre-heat the technological water used within manufacturing processes

Before project implementation, the annual natural gas consumption was about 3,689,640 Nm³, i.e. an equivalent of USD 726,859 and the annual electricity consumption was about 1,392 MWh, i.e. an equivalent of USD 108,603. Annual penalties of about USD 3,705 were paid for the reactive power generation. The annual maintenance and personnel costs were USD 23,500 and USD 68,000, respectively.

Aim of the project

Two water wells have been drilled and the company was decoupled from the municipal system. Two new screw air compressors, and fully automated reactive power compensation equipment were purchased. A fully automated heating plant has been installed. Part of the existing furnaces have been thermally rehabilitated and equipped with new conveyors and temperature regulators, automation systems and new burners, recirculation exhaust gasses fans. Three new modern furnaces have replaced a previous existing tunnel furnace with conveyor. Finally, a home-designed heat



exchanger to recover a part of the heat from the exhaust gasses from furnaces was installed.

The main advantages of the technological modernization are:

- **High energy efficiency:** being under fully automatic control, air compressors, heating plant, reactive power compensation and new and thermally rehabilitated furnaces operation will follow the local requirements of the manufacturing processes, minimizing natural gas and electricity consumptions;
- **Labor:** all equipment operation is totally independent against the human assistance; hence, there is only need to provide unsystematic visual inspection;
- **Maintenance:** no maintenance and other correspondent costs; no major overhauls are expected within the first ten years of operation.

Economic evaluation of the project

The equipment and other related costs are detailed in Table 1.



ROMANIAN ENERGY EFFICIENCY FUND

Savings

The expected financial savings of the project are given below:

- **Electricity:** the technological modernization will improve energy efficiency and will 100% reduce the power reactive generation; electricity savings are estimated at about 35%, i.e. USD 41,571 per year (removed penalties included).
- **Natural gas:** the technological modernization will lead to natural gas savings estimated at 25%, i.e. USD 184,120 per year.
- **Maintenance & Personnel:** total annual financial savings estimated to USD 80,100 per year



Financial evaluation

The analysis of the cash flow for the next 20 years was estimated based on 2006 energy prices. Based on a discount rate of 12% and considering the total investment of USD 513,600 and the annual financial savings of about USD 305,789, the Simple Payback Period is estimated at 1.7 years with an IRR of 60%. The full financial analysis is given in Table 2.

The company's management has decided to invest USD 513,600 for implementation of the ambitious multi-component energy efficiency project. The Romanian Fund for Energy Efficiency finances 78% of the entire investment, i.e. with a credit of USD 400,000, the company assuring the rest of 22%, i.e.



USD 116,300 from its 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

With the new equipment, ARC SRL Dorohoi will be able to manufacture high quality glass and porcelain with reduced natural gas and electricity input. Thus, the company will reduce its natural gas and electricity bills. The total energy savings, coming directly from natural gas savings and indirectly from electricity savings (as the electricity is generated in a fuel fired thermal power plant), will be of about 898 toe/year. The reduction in natural gas and electricity consumption will cause a reduction of around 2,218 tons of CO₂.

Table 1

Item	USD*
Equipment	466,600
Erection works & Engineering	25,500
Transportation	10,000
Other expenses (design, consultancy etc.)	11,500
Total	513,600

* - The costs include import duty, customs storage charges and delivery to site, VAT excluded.

Table 2

Item	Year										
	0	1	2	3	4	5	6	7	...	19	20
	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD
Initial investment	-513.6	-	-	-	-	-	-	-	-	-	-
Cash Flow	-513.6	305.8	305.8	305.8	305.8	305.8	305.8	305.8	...	305.8	305.8
Accumulated Cash Flow	-513.6	-208	98	404	710	1,015	1,321	1,627	...	5,296	5,602
Discount Factor	1	0.89	0.80	0.71	0.64	0.57	0.51	0.45	...	0.12	0.10
Present Value of the Cash Flow	-513.6	-241	3	221	415	589	744	882	...	1,739	1,770
Payback Period	1.7	years									
Discount Payback Period	2.0	years									
Net Present Value	1,770	kUSD									
Internal Rate of Return	60	%									

FREE financing advantages

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