



ROMANIAN ENERGY EFFICIENCY FUND

CASE STUDY: UNIO Satu – Mare (I)

Project Name	Replacement of air compressors in machine-building industry
Sector	Industry
Borrower	Private enterprise "UNIO SA, Satu-Mare"
Lender	Romanian Energy Efficiency Fund
Financing Starting Date	October 2004
Project Size/Loan Amount	USD 290,000/130,000

Summary

UNIO Satu-Mare is one of the most important Romanian companies in the machine building industry, requiring important quantities of compressed air. The 50 years old reciprocating compressors have a very low efficiency of about 10%. The annual operation cost for old compressors was about USD 310,000. By investing USD 290,000 for new, more energy-efficient screw compressors with lower maintenance costs, the company is expected to save about USD 110,000 per year. The power consumption is expected to decrease with about 34%.

The project is very profitable with an estimated Simple Payback Period of 2.6 years and an Internal Rate of Return of 37%. The project will also contribute to lower emissions of air pollutants, including green house gases such as CO₂.

FREE has provided a 3-year USD 130,000 loan to Unio Satu-Mare with a grace period of 6 months. Pledge on the screw compressors and some auxiliary equipment 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

A central compressor station provides compressed air for all parts of the factory where it is used for control actuators and cleaning operations. Before project implementation, the annual electricity consumption of the plant was about 4,464 MWh, i.e. an equivalent



of USD 294,600.

Previously, the station was equipped with three water cooled, two-cylinder reciprocating compressors (3V45 Reșița), installed in the '60s and driven by 300 kW electrical motors. The overall operating efficiency is estimated at 10%. Moreover, the maintenance costs were high and spare parts were difficult to find on the market. In average, the compressed air was supplied 200 h/month using three compressors and 300 h/month by two compressors. In both cases, compressors were running at full load. The previous annual operating costs are presented in table 1.

Aim of the project

Four new Ingersoll screw compressors (three SSR-ML 160 and one IRN-90K-CC) have been purchased and installed in the existing

compressor station. Three of them are driven by 160 kW asynchronous electrical motors. The fourth compressor was specially designed to increase efficiency when running at partial loads and to diminish the starting current. It is driven by a variable speed 90 kW electrical motor powered via a frequency changer. This new configuration for the compressed air station would optimize the company's electricity consumption.



The main advantages of screw compressors are:

- **High energy efficiency:** operating under fully automatic control, the three screw compressors operation will follow the compressed air requirements of the site, minimizing energy consumption; in addition, the variable speed electrical motor minimizes energy consumption at part load;
- **Labor:** the compressors operation are fully automated; hence, there is no need to provide continuous human assistance to compressors;
- **Maintenance:** the compressors have low maintenance requirements and costs; no major overhauls are expected within the first ten years of operation; moreover, important reduction of oil consumption will occur after project implementation; one should also note that the used oil is biodegradable.

Economic evaluation of the project

The compressor and estimated installation costs are detailed in Table 2.

Savings

The expected financial savings of the project are given below:

- **Energy:** the new compressors offer improved energy efficiency and prevent excessive pressure build-up avoiding increased power consumption and air leakages; energy savings are estimated at about 34%, i.e. USD 102,000 per year.
- **Maintenance & other:** regular repairs of the compressors are expected to be eliminated for the first years of operation; regular necessary maintenance involving replacing air and oil filters and changing the lubricating oil, as well as significantly fewer spare parts will reduce costs; moreover, less human assistance is needed during operation; the overall annual maintenance savings would be USD 9,000.



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The savings are summarized in Table 3.

Financial evaluation

The analysis of the cash flow for the next 10 years was estimated based on 2004/2005 energy prices. The evaluation of the feasibility of this project was performed taking into consideration the following criteria: Payback Period, Internal Rate of Return (IRR), and Net Present Value (NPV), based on a discount rate of 12%. The full financial analysis is given in Table 4.

Considering the total financial investment of USD 290,000 and the annual financial savings of about USD 111,000, the Simple Payback Period is estimated at 2.6 years with an IRR of 38%.

Financing

Financing of the investment program has been a major issue for the management of the company. Beginning with 2000, after its privatization, the management has been working on a sustained technological modernization program, reducing costs and improving quality. Implementation of updated technologies has been realized in the following sections of the factory: cutting, mechanical machining, welding, teething, heat treatment, surface protection and control.

Being aware of the large energy consumption in their manufacturing process and confronted with sharp increases of energy prices, the

initial aim of the companies' activities was to reduce costs, mainly by replacing old, energy consuming machinery by modern, highly energy efficient equipment.

Following the development objectives, the management decided to invest USD 290,000 in air compressor station modernization. Considered as an investment project in energy efficiency increase, the management has applied to the only dedicated energy efficiency lending facility in Romania -- the Romanian Energy Efficiency Fund -- for a loan of USD 130,000 (45%), in addition to the company contribution of USD 160,000 (55%).

Expected Impact

With the new equipment, UNIO SA Satu Mare will be able to produce the same output with reduced electricity input. Thus, the company will reduce its electricity bill. This will directly lead to fuel savings in power plants of about 440 tep/year. Moreover, the power supply equipment is provided with reactive energy compensation, diminishing even more the electricity bill of the company.

The reduction in electricity consumption will cause a reduction in pollutant emissions (CO₂, SO₂, NO_x, dust particles). For instance, considering that the electricity is produced by heavy oil combustion, this reduction would be around 1,530 tons of CO₂ or 27 tons of SO₂.

One should also note that the lubricating oil is biodegradable.

Table 1

Item	USD
Energy	294,600
Maintenance, labor	14,760
Total	309,360

Table 2

Item	USD*
Compressors and Controls	156,000
Civil Works	30,000
Electricity Supply and Connection	39,588
Other expenses	64,412
Total	290,000

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

Table 3

Item	USD
Energy	102,000
Maintenance & other	9,000
Total	111,000

Table 4

Item	Year										
	0	1	2	3	4	5	6	7	8	9	10
	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD	kUSD
Initial investment	-290	-	-	-	-	-	-	-	-	-	-
Cash Flow	-290	111	111	111	111	111	111	111	111	111	111
Accumulated Cash Flow	-290	-179	-68	43	154	265	376	487	598	709	820
Discount Factor	1	0.89	0.80	0.71	0.64	0.57	0.51	0.45	0.40	0.36	0.32
Present Value of the Cash Flow	-290	-191	-102	-23	47	110	166	217	261	301	337
Payback Period	2.6	years									
Discount Payback Period	3.3	years									
Net Present Value	337	kUSD									
Internal Rate of Return	38	%									

Main advantages of the FREE financing are:

- 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 offers low cost financing for companies;
- FREE offers technical assistance.