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The Cost-Benefit Analysis of Implementing Level3 Automation and two other project for Optimization Consumption energy (Almahdi Hormozal Aluiminium smelter Case Study)

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Abstract: First project sample Standard Level3 Automation implementation for improvement an Aluminum factory and the second project we will present an attempt which was made in order to retrofit a so-called center break cell to point feeder cell. The results show that this project has decreased the energy consumption and anode effect frequency. Furthermore, there has been a significant increase in current efficiency.The purpose of this study is to propose a Plans of Management Energy In the aluminum industry, and explore the possibility of the project is financially. In this study In this paper the construction period of a year, a 16 percent discount rate, net present value and rate of return on plan net Internal. According to the results based on costs and revenues, This plan is quite justified financially.

Keywords: “Aluminium smelter, Optimization Consumption energy, The Cost-Benefit Analysis;”

Introduction

Cost-Benefit Analysis (CBA) estimates and totals up the equivalent money value of the benefits and costs to the community of projects to establish whether they are worthwhile. These projects may be dams and highways or can be training programs and health care systems.

The idea of this economic accounting originated with Jules Dupuit, a French engineer whose 1848 article is still worth reading. The British economist, Alfred Marshall, formulated some of the formal concepts that are at the foundation of CBA. But the practical development of CBA came as a result of the impetus provided by the Federal Navigation Act of 1936. This act required that the U.S. Corps of Engineers carry out projects for the improvement of the waterway system when the total benefits of a project to whomsoever they accrue exceed the costs of that project. Thus, the Corps of Engineers had created systematic methods for measuring such benefits and costs. The engineers of the Corps did this without much, if any, assistance from the economics profession. It wasn't until about twenty years later in the 1950's that economists tried to provide a rigorous, consistent set of methods for measuring benefits and costs and deciding whether a project is worthwhile. Some technical issues of CBA have not been wholly resolved even now but the fundamental presented in the following are well established.

Principles of Cost Benefit Analysis

One of the problems of CBA is that the computation of many components of benefits and costs is intuitively obvious but that there are others for which intuition fails to suggest methods of measurement. Therefore some basic principles are needed as a guide.

There Must Be a Common Unit of Measurement

In order to reach a conclusion as to the desirability of a project all aspects of the project, positive and negative, must be expressed in terms of a common unit; i.e., there must be a "bottom line." The most convenient common unit is money. This means that all benefits and costs of a project should be measured in terms of their equivalent money value. A program may provide benefits which are not directly expressed in terms of dollars but there is some amount of money the recipients of the benefits would consider just as good as the project's benefits. For example, a project may provide for the elderly in an area a free monthly visit to a doctor. The value of that benefit to an elderly recipient is the minimum amount of money that that recipient would take instead of the medical care. This could be less than the market value of the medical care provided. It is assumed that more esoteric benefits such as from preserving open space or historic sites have a finite equivalent money value to the public.

Not only do the benefits and costs of a project have to be expressed in terms of equivalent money value, but they have to be expressed in terms of dollars of a particular time. This is not just due to the differences in the value of dollars at different times because of inflation. A dollar available five years from now is not as good as a dollar available now. This is because a dollar available now can be invested and earn interest for five years and would be worth more than a dollar in five years. If the interest rate is r then a dollar invested for t years will grow to be (1+r)t. Therefore the amount of money that would have to be deposited now so that it would grow to be one dollar t years in the future is (1+r)-t. This called the discounted value or present value of a dollar available t years in the future.

When the dollar value of benefits at some time in the future is multiplied by the discounted value of one dollar at that time in the future the result is discounted present value of that benefit of the project. The same thing applies to costs. The net benefit of the projects is just the sum of the present value of the benefits less the present value of the costs.

The choice of the appropriate interest rate to use for the discounting is a separate issue that will be treated later in this paper. [1]

Experimental Procedure (Model)

The COMFAR III Expert - A Cash Flow Model

The COMFAR system distinguishes cash flows in do-mestic and foreign currencies while allowing for changes in exchange rates. A number of standard func-tions are available to compute net working capital, debt service, annual depreciation of fixed assets and corpo-rate tax. From a variety of financial and efficiency ratios the user may select those needed for project appraisal. Direct costing, the allocation of indirect costs to profit centres (products) and analysis in constant or current prices are also available The COMFAR system distinguishes cash flows in do-mestic and foreign currencies while allowing for changes in exchange rates. A number of standard func-tions are available to compute net working capital, debt service, annual depreciation of fixed assets and corpo-rate tax. From a variety of financial and efficiency ratios the user may select those needed for project appraisal. Direct costing, the allocation of indirect costs to profit centres (products) and analysis in constant or current prices are also available.

Financial analysis (enterprise level)

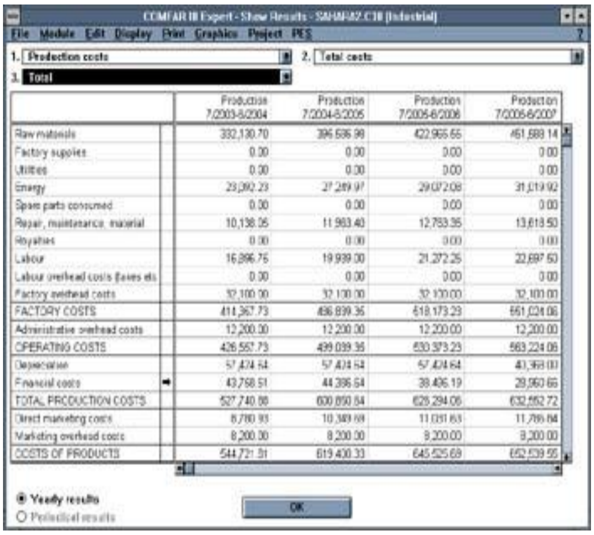
For the financial analysis COMFAR III Expert produces, based on the corresponding input data, the following result schedules: SUMMARY SHEET, INVESTMENT COSTS, PRODUCTION COSTS, PRODUCTION AND SALES PROGRAMME, SOURCES OF FINANCE AND DEBT SERVICE, BUSINESS RESULTS, comprising: Financial cash flow, Discounted cash flow,Income statement, Balance sheet (with ratios), data on direct costing, product profitability, FINANCIAL AND EFFICIENCY RATIOS, and BREAK-EVEN CONDITIONS.

Economic analysis (macro level)

The Economic Analysis option allows the user to intro-duce shadow prices (to express project inputs and outputs in terms of economic prices) and to compute economic rates of return, value added, foreign ex-change effects and so on, including or excluding exter-nal economic effects.

Sensitivity analysis

With the help of sensitivity analysis it is possible to show how net cash returns, or the profitability of an investment alter, with different values assigned to the variables needed for the computation (sales prices, unit costs, sales volumes etc.). COMFAR *III Expert* facilitates the assessment of alternative project scenarios and the determination of the critical variables. A variety of graphical charts is available to analyse the structures of project inputs and outputs, e.g. the structure of the annual production and sales programmes, or the vari-able and operational margins and break-even sales volumes. [2]



	Production 7/2003-6/2004	Production 7/2004-6/2005	Production 7/2005-6/2006	Production 7/2006-6/2007
Raw materials	332,130.70	396,536.98	422,965.55	461,588.14
Factory supplies	0.00	0.00	0.00	0.00
Utilities	0.00	0.00	0.00	0.00
Energy	23,092.23	27,249.97	29,072.08	31,019.92
Spare parts consumed	0.00	0.00	0.00	0.00
Repair, maintenance, material	10,138.06	11,983.40	12,783.35	13,618.50
Royalties	0.00	0.00	0.00	0.00
Labour	16,896.76	19,939.00	21,272.25	22,697.50
Labour overhead costs (taxes etc	0.00	0.00	0.00	0.00
Factory overhead costs	32,100.00	32,100.00	32,100.00	32,100.00
FACTORY COSTS	414,367.73	486,839.36	518,173.23	551,024.06
Administrative overhead costs	12,200.00	12,200.00	12,200.00	12,200.00
OPERATING COSTS	426,567.73	499,039.36	530,373.23	563,224.06
Depreciation	57,474.64	57,474.64	57,474.64	40,368.00
Financial costs	43,758.51	44,396.64	38,496.19	28,960.66
TOTAL PRODUCTION COSTS	527,740.88	600,850.64	626,294.06	632,552.72
Direct marketing costs	8,780.93	10,349.69	11,031.63	11,786.84
Marketing overhead costs	8,200.00	8,200.00	8,200.00	8,200.00
COSTS OF PRODUCTS	544,721.81	619,400.33	645,525.69	652,539.55

Fig1- Financial analysis (enterprise level)

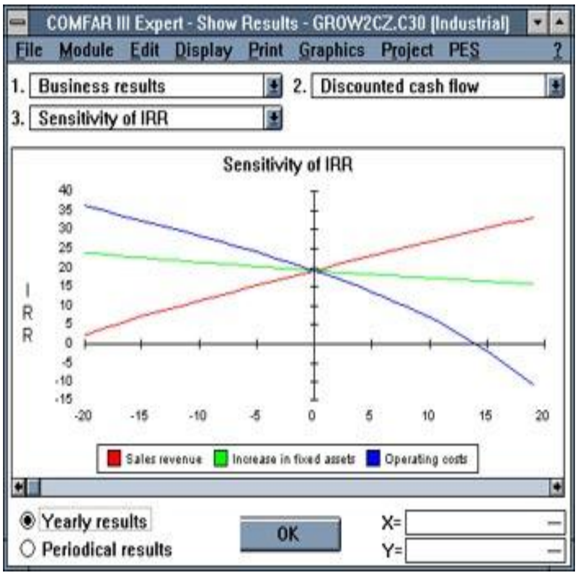


Fig2-- Sensitivity analysis

Results and Discussions

First Project Summary

Aluminum reduction cells have benefited from point feeding technology for a long time, but there are still smelters which are using the old technology of center break and center feed system. Due to several factors this system is no longer approved and there have been a few attempts worldwide to upgrade these cells so as to implement the newer technology by applying mechanical and automation changes. In this paper we will present an attempt which was made in order to retrofit a so-called center break cell to point feeder cell. The results show that this project has decreased the energy consumption and anode effect frequency. Furthermore, there has been a significant increase in current efficiency. [3-4]

Fig3- Report in level of Supervisors and Middle managers

Second Project Summary

Aluminum reduction cells have benefited from point feeding technology for a long time, but there are still smelters which are using the old technology of center break and center feed system. Due to several factors this system is no longer approved and there have been a few attempts worldwide to upgrade these cells so as to implement the newer technology by applying mechanical and automation changes. In this paper we will present an attempt which was made in order to retrofit a so-called center break cell to point feeder cell. The results show that this project has decreased the energy consumption and anode effect frequency. Furthermore, there has been a significant increase in current efficiency. [5-9]

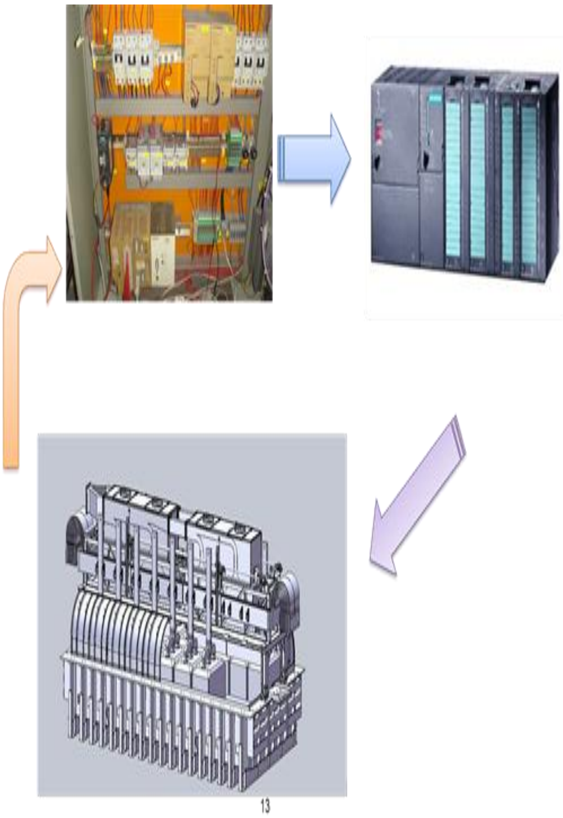


Fig4- Programming and Upgrade $PLCs_5$ to $PLCs_7$

Result

COMFAR III Expert — TARBIAT MODARRES UNIVERSITY,

SUMMARY SHEET

Project title: pakage2 (5,6,7,8)
Date and time:

Project classification: New project

Construction phase: 1/01 - 12/01
Length: 1 years
Production phase: 1/02 - 12/16
Length: 15 years

Accounting currency: rial (LC)
Units: Absolute
Local currency: rial (LC)

INVESTMENT COSTS

	Total construction	Total production	Total investment
Total fixed investment costs	1,740,500,000.00	959,128,087.68	2,699,628,087.68
Total pre-production expenditures	0.00	0.00	0.00
Pre-production expenditures (net of interest)	*0.00*	*0.00*	*0.00*
Interest	*0.00*	*0.00*	*0.00*
Increase in net working capital	0.00	125,144,713.06	125,144,713.06
TOTAL INVESTMENT COSTS	1,740,500,000.00	1,084,272,800.74	2,824,772,800.74

SOURCES OF FINANCE

	Total construction	Total production	Total inflow
Total equity capital	1,740,500,000.00	323,678,453.80	2,064,178,453.80
Foreign	*0.00*	*0.00*	*0.00*
Local	*1,740,500,000.00*	*323,678,453.80*	*2,064,178,453.80*
Total long-term loans	0.00	0.00	0.00
Foreign	*0.00*	*0.00*	*0.00*
Local	*0.00*	*0.00*	*0.00*
Total short-term loans	0.00	0.00	0.00
Foreign	*0.00*	*0.00*	*0.00*
Local	*0.00*	*0.00*	*0.00*
Accounts payable	0.00	41,750,938.43	41,750,938.43
TOTAL SOURCES OF FINANCE	1,740,500,000.00	365,429,392.23	2,105,929,392.23

INCOME AND COSTS, OPERATIONS

	First year 2	Reference year 2	Last year 16
SALES REVENUE	124,748,688,000.00	124,748,688,000.00	124,748,688,000.00
Factory costs	14,290,016,000.00	14,290,016,000.00	15,017,365,567.32
Administrative overhead costs	0.00	0.00	0.00
OPERATING COSTS	14,290,016,000.00	14,290,016,000.00	15,017,365,567.32
Depreciation	210,050,000.00	210,050,000.00	83,298,228.79
Financial costs	0.00	0.00	0.00
TOTAL PRODUCTION COSTS	14,500,066,000.00	14,500,066,000.00	15,100,663,796.11
Marketing costs	0.00	0.00	0.00
COSTS OF PRODUCTS	14,500,066,000.00	14,500,066,000.00	15,100,663,796.11
Interest on short-term deposits	0.00	0.00	0.00
GROSS PROFIT FROM OPERATIONS	110,248,622,000.00	110,248,622,000.00	109,648,024,203.89
Extraordinary income	0.00	0.00	0.00
Extraordinary loss	0.00	0.00	0.00
Depreciation allowances	0.00	0.00	0.00
GROSS PROFIT	110,248,622,000.00	110,248,622,000.00	109,648,024,203.89
Investment allowances	0.00	0.00	0.00
TAXABLE PROFIT	110,248,622,000.00	110,248,622,000.00	109,648,024,203.89
Income (corporate) tax	0.00	0.00	0.00
NET PROFIT	110,248,622,000.00	110,248,622,000.00	109,648,024,203.89

RATIOS

Net Present Value of Total Capital Invested	at 16.00%	612,838,139,758.45
Internal rate of return on investment (IRR)	6,335.97%	
Modified IRR on investment	6,336.07%	
Net Present Value of Total Equity Capital Invested	at 16.00%	612,838,139,758.45
Internal rate of return on equity (IRRE)	6,335.97%	
Modified IRRE on equity	6,336.07%	
Net present values discounted to	12/01	

Fig6- result of Financial analysis (enterprise level) by comfar3

Third Project Summary

Due to the need to collect daily data from pots, the design and construction of Vm (and

Assumptions designs

1-The discount rate used in the central bank's buying rate In 2011, 16 percent were considered.

2-Operation period of 15 years in accordance with the usual practice in most industrial designs are considered.

3-InThis project is not intended as tax payments.

4-The price of electricity in all the designs 420 rials is considered.

5- Construction period is one year on all projects.

6- alMahdi Aluminum Complex to Foster and365 days worked.

7- Analysis of design criteria,

8-In the More designs in machinery depreciation rate of 10% has been considered.

9- In all projects, it is assumed that the cost of financing projects and all Cash payment by almadi aluiminim smelter is down.

Conclusion

1-According to the analysis made clear that Allowing significant savings in energy There is an integrated aluminum industry.
2-Regarding the implementation of targeted subsidies and the imposition of price Almost double the electricity to the aluminum industry, this industry is inevitable that the

implementation of such plans, Because in the long run, if not, save projects and reduce production coststhis industry is bankrupt and is forced to shut down.

3-According to the financial analysis of the proposed scheme in the complex in order to save power consumption Suggested. It is clear that the implementation of all proposed projects are financially It is affordable and economical.

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