

ECONOMIC EVALUATION OF INVESTMENT PROJECT IN THE AREA OF SHEET METAL PROCESSING

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The article is oriented on the process modelling in selected company. The aim of the process modelling is a possibility to prevent the formation of future risks as a consequence of a wrong decision concerning a capital project. The analysis of actual state in society with the focus on the means of processing the lamination using computer numeric control technology is also a part of article. Based on the analysis mentioned above, the selection and the definition of the capital project have already been carried out. Final section evaluates the capital project using methodology of economic indicators by means of economic indicators of effectiveness and brings a decision whether to accept or refuse given investment.

Key words: economics, net present value, internal rate of return, payback period, profitability index

INTRODUCTION

There is a wide range of methods that deals with evaluation of investment projects. These methods are able to clearly assess the profitability of investments, if it is necessary. The aim of this article is to evaluate the effectiveness of a particular investment project. This project represents an investment purchase of a new high-pressure water jet. This paper is focused on the area of sheet metal processing using computer numeric control technology, specifically laser cutting and water jet cutting.

METHODOLOGY

In the process of evaluation the investment it is necessary to define criterion according to which the investment will be assessed. The basic and most frequently used aspect for classification of specific methods of evaluating investments include time factor. There are two methods that take into account time value of money: Static methods - these methods do not take into account time factor and its impact on the value of money [1, 2].

They are used in cases where the economic life of investment period is short and the discount rate derived from the capital structure of company is low.

The higher is the discount rate, the more marked is the difference between the future and the present value of money. These methods are used for initial preliminary calculations [1]. The most used indicators are: average annual return, average payback period and percentage yield.

Dynamic methods - These methods take into account time factor and a risk factor. Both of these factors are taken into account by a discount rate. They are used mostly in the case of assessment the longer-term investment, because there is no greater distortion of cash flow and capital expenditure due to time factor [1, 2].

The most used indicators are: net present value, internal rate of return and profitability index [3].

The following stage of paper deals with the analysis of current state of selected company, evaluation and selection methods of processing sheet metals by computer numeric control technology.

EXPERIMENTAL WORK

The main objective of company is the enhancement of company capital in the field of mechanical engineering with the available human resources with application of modern business and technological processes [2].

The priority activity of production program in selected company represents sheet metal processing using CNC technology [2].

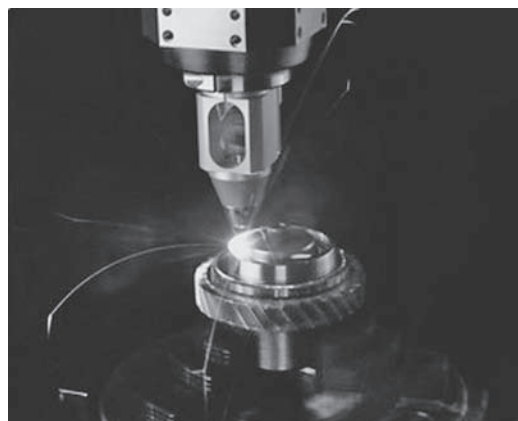


Figure 1 Display of laser beam technology

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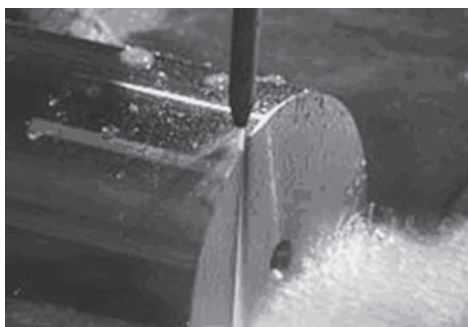


Figure 2 Display of water jet cutting

Two methods of laser beam, is shown in Figure 1 and water jet cutting, is shown in Figure 2, can be used in similar applications. Results from realis, when comparing two similar technologies of indexing material technology, more progressive is the technology of cutting water, because it is more easily and cheaper. Company management decided that for the further expansion of production it is necessary to purchase a new high-pressure water jet, model SMART - JET that should be purchased through a loan. To buy a new high-pressure water jet equipment company needs a € 240 000 loan. The reason why company decided to think about buying a new high-pressure water jet is continually expanding its orders. Company expects that income form investment should reach €910 000, if machine lifetime is 6 years. After the lifetime of high-pressure water jet it will be sold at depreciated price. It is calculated to the value of €24 000. At present, company should invest €240 000 in the expectation that during six years the investment will return in the amount of € 934 000. Company will realize the project and investment in case that the present value of the expected yield €934 000 is higher than investment of €240 000. On

Table 1 Indicators of NPV [€]

Indicator	1 st year	2 nd year	3 rd year
Sales growth	125 000	140 000	170 000
Cost growth	22 000	25 000	31 000
Depreciation	40 000	40 000	40 000
Gross profit	63 000	75 000	99 000
Income tax	11 970	14 250	18 810
After tax profit	51 030	60 750	80 190
Cash income	91 030	100 750	120 190
Discount (10%)	0,9091	0,8264	0,7513
Discounted cash income (DCI)	82 755	83 260	90 299
Indicator	4 th year	5 th year	6 th year
Sales growth	195 000	150 000	130 000
Cost growth	37 000	31 000	27 000
Depreciation	40 000	40 000	40 000
Gross profit	118 000	79 000	63 000
Income tax	22 420	15 010	11 970
After tax profit	95 580	63 990	51 030
Cash income	135 580	103 990	91 030
Discount (10 %)	0,6830	0,6209	0,5645
DCI	92 601	64 567	51 386

the base of defined economic and financial indicators, company will decide whether the investment is acceptable or the investments must be rejected.

RESULTS AND DISCUSSION

Net present value (NPV) [3]:

For calculation of net present value, it is needed to know following indicators:

- Amortization
240 000 €/ 6 years = 40 000 € attributes to one year
- Gross profit
GP = Sales growth – the growth of expenses – amortization
- Income tax
Calculated as 19 % of gross profit
- After-tax profit (net profit)
After-tax profit = Gross profit – Income tax
- Cash flow (after- tax profit + depreciation)
- Discount for $i = 10\% (0,1)$
- Discounted cash flow (DCF)

$$NPV = \sum DCF - CE \text{ (Capital Expenditure)} \quad (1)$$

$$NPV = 464\ 868 - 240\ 000$$

$$NPV = 224\ 868 \text{ €}$$

Above mentioned results indicate that the NPV is greater than 0 (224 868 > 0). On the base of NPV indicator the investment should be made because it guarantees required rate of return and increases the value of company.

The internal rate of return (IRR) [4]:

When calculating IRR, it is needed to start from the results listed in Table 1. The required return on investment for the company is 10 %. IRR is calculated using following steps:

Any interest rate that discounts the expected cash flows for each year of life of machine will be chosen.

The sum of the discounted cash flows is compared with capital expenditures.

If discounted cash flow will be higher than the capital expenditures for the machine, it is needed to choose another, higher interest rate and the whole calculation will be repeated at a given interest rate. And when the discounted cash flow will be lower than capital expenditure, the calculation with an even lower interest rate will be repeated. The sum of discounted cash income at an interest rate of 50 % is €189 839 (Table 2), which is less than capital expenditure on machinery (€240 000), the same calculation will be repeated with an even low-

Table 2 View of discounted cash income [€] at 50 % interest rate

Indicator	Discount (50 %)	Discounted cash income
1 st year	0,667	60 690
2 nd year	0,445	44 773
3 rd year	0,296	35 612
4 th year	0,198	26 777
5 th year	0,132	13 695
6 th year	0,088	7 992

er interest rate. When counting the net present value, the values calculated at the rate of 10 % will be used.

Calculation of lower and higher Net present value (NPV_l), (NPV_h) [3]:
 Net present value lower NPV_l
 $NPV = \sum DCF - CE$ (2)
 $NPV = 464\,868 - 240\,000$
 $NPV = 224\,868 \text{ €}$
 Net present value higher NPV_h
 $NPV = \sum DCF - CE$
 $NPV = 189\,539 - 240\,000$
 $NPV = -50\,461 \text{ €}$

Calculation of discount:

When calculating an interest rate 50 %, the discount is calculated as follows:

$$\frac{1}{(1 + 0,5)^n}$$
 (3)

n – durability life

Calculation of internal rate of return (IRR):

Using interpolation, the internal rate of return (IRR) will be calculated.

$$IRR = 0,1 + \frac{224\,868}{224\,868 - (-50\,461)} \times (0,5 - 0,1)$$

$$IRR = 0,1 + \frac{224\,868}{275\,392} \times (0,4)$$

$$IRR = 0,4267 = 42,67 \%$$

Required rate of return on investment is defined by company. The calculated IRR is 42,67 %, and therefore is valid that the IRR is greater than the required rate of return on investment i (42,67 % > 10 %). It means, that investment should be made, because it ensures required rate of return and increases the value of company.

The modified internal rate of return (IRR_m) [4]:

The modified IRR calculation requires the following steps [4, 5]:

- The calculation of terminal value of project
- Calculation of modified internal rate of return

When calculating the modified IRR, data listed in Table 3 are used.

Table 3 **Reinvested cash flow of the terminal value of project**

Indicator	Coefficient	Cash flow [€]	Reinvested cash flow [€]
1 st year	1,61	91 030	146 605
2 nd year	1,46	100 750	147 508
3 rd year	1,33	120 190	159 973
4 th year	1,21	135 580	164 052
5 th year	1,1	103 990	114 389
6 th year	1,0	91 030	91 030

Coefficient

Coefficient is calculated by using the equation:

$(1 + 0,1)^{n-t}$, where

n – durability life,

t – individual years of durability life

Terminal value of project = $\sum 823\,557 \text{ €}$

The calculation of modified internal rate of return

$$IRR_m = \sqrt[6]{\frac{823\,557}{240\,000}} - 1$$

$$IRR_m = 0,3281 = 32,81 \%$$

If the IRR exceeds the required return, the modified IRR is within the limits of required return (i = 10 %) and IRR.

Payback period:

The procedure for calculating the payback period of investment project:

Identify annual after-tax profit and depreciation.

Calculation of total cash flow [5]:

Total cash flow = depreciation + after-tax profit

Calculation of cumulative cash flow (CF):

is set by mutual summation of individual cash flows in particular year (Table 4).

Table 4 **Calculation of cumulative CF**

Indicator	Cash Flow [€]	Cumulative CF [€]
1 st year	91 030	91 030
2 nd year	100 750	191 780
3 rd year	120 190	311 970
4 th year	135 580	447 550
5 th year	103 990	551 540
6 th year	91 030	642 570

Determination of the payback period of investment project [6, 7]:

$$PBP = \frac{(CAPEX) - \text{cumulative CF}}{CF} + t$$
 (4)

Where:

CAPEX – capital expenditure,

CF – cash flow

t - the year in which CF is the closest to the cost of acquisition, but does not exceed it

$$PBP = \frac{(240\,000) - 191\,780}{120\,190} + 2 = 2,4 \text{ year}$$

Investment of €240 000 will return to the company, so the payback period of the investment project is 2,4 year (Figure 3).

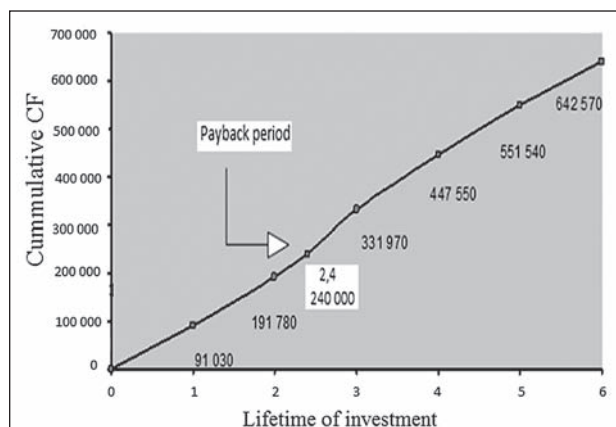


Figure 3 Illustration of payback period

Profitability Index:

When calculating the profitability index, the data from Table 5 are used. Also the cash flow, discount (10 %) and discounted cash flow is taking into account.

Calculation of Profitability Index:

$$PI = \frac{464\,868}{240\,000}$$

$$PI = 1,94$$

Table 5 The calculation of depreciation and profit after tax to determine payback period [€]

Indicator	Gross profit	Income tax	After-tax profit
1 st year	63 000	11 970	51 030
2 nd year	75 000	14 250	60 750
3 rd year	99 000	18 810	80 190
4 th year	118 000	22 420	95 580
5 th year	79 000	15 010	63 990
6 th year	63 000	11 970	51 030

Gross profit = sales growth – cost growth – depreciation (calculation is based on data in Table 1)

Income tax = 19 % of gross profit

After tax profit = gross profit – income tax

Calculation shows that the profitability index is 1,94, and it means that profitability index is greater than 1 (1.94 > 1). Company should make an investment (purchase of a new high-pressure water jet), because it ensures the required rate of return and increases the value of company.

CONCLUSIONS

Invested project advantageous for high-pressure water jet (Model SMART Board - JET). The investment was evaluated by using static and dynamic methods of evaluation of investment, specifically: net present value of the

investment, internal rate of return, modified internal rate of return, payback period and profitability index.

The results show that the investment is profitable and the company is recommended to make the investment because it guarantees required rate of return, increasing the value of company and there is a presumption that the investment will be economically profitable and successful.

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Note: The translator responsible for English language is Andrea Petriková, Technical University of Košice, Košice, Slovakia