

POSSIBILITIES OF APPLICATION OF STATIC INVESTMENT APPRAISAL METHODS FOR OPTIMIZING PURCHASE UNDER CONDITIONS OF MINE RESCUE SERVICE

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Abstract

The present article focuses on the importance of making investment decisions and its long-term effect on the economy of companies. It presents a specific investment in the recovery of rescue equipment used for interventions in the irrespirable or deleterious environment on an example of the company HBZS, a.s. The objective is to evaluate the effectiveness of the investment project using static methods in relation to setting an optimal price level for leasing the equipment. The optimization of such setting is examined in terms of the economic lifetime of relevant tangible fixed assets.

Key words: investment, efficiency, static methods of appraisal, breathing apparatus

Abstrakt

Předložený článek se zabývá důležitostí investičního rozhodování a jeho dlouhodobým dopadem pro ekonomiku firem. Na příkladě společnosti HBZS, a.s. je představena konkrétní investice do obnovy záchranné techniky pro zásahy v nedýchatelném či zdraví škodlivém prostředí. Cílem je zhodnocení efektivnosti investičního projektu pomocí statických metod ve vazbě na nastavení optimální cenové hladiny pronájmu daných přístrojů. Optimalizace tohoto nastavení je zkoumána z hlediska ekonomické životnosti daného dlouhodobého hmotného majetku.

Key words: investice, efektivnost, statické metody hodnocení, dýchací přístroje

1 INTRODUCTION

Since the beginning of 1994, the Central Mine Rescue Station in Ostrava (Czech abbreviation, HBZS) is a subsidiary of the company OKD, a.s. which is its 100% shareholder. Jurisdiction of this station is established by the Czech Mining Authority throughout the entire territory of the Czech Republic, namely for the organizations conducting mining operations underground. Due to the damping of the deep mining industry in the Czech Republic, the legally imposed contributions of mining organizations to cover the costs of equipment, facility and operation of the main mine rescue station are not able to cover in full the actual costs of equipment, facility and operation of the Central Mine Rescue Station in Ostrava. This fact led to the need for savings in operating costs of the HBZS in Ostrava through optimizing its organizational structure and profiling this station in commercial activities using high-level expertise of mine rescuer at work with special rescue equipment. [1]

One of such optimizing activities is the centralized purchase, administration and maintenance of breathing apparatus used at work which are an essential part of the rescue equipment designed for interventions in the stifling or deleterious environment. That activity is conducted primarily as a recovery investment and, in principle, consists in the centralized purchase of breathing apparatus for the company OKD, HBZS, a.s., in particular in such a number of apparatus to meet the legislative requirement for equipment for both the company OKD, HBZS, a.s. and its subordinate plant mine rescue stations (Czech abbreviation, ZBS). In order to meet the legislative requirement to be equipped with breathing apparatus, the individual ZBS then lease the required number of

apparatus from the company OKD, HBZS, a.s. For mining organizations, the form of lease is effective as the lifetime of the individual mining sites may be shorter than the technical lifetime of the devices.

2 INVESTMENT PARAMETERS

At the end of 2010, the company OKD, HBZS, a.s. purchased a total of 200 units of breathing apparatus Dräger PSS®BG 4 by the German company Drägerwerk AG&Co. KGaA. The purchase was carried out without a tender, because this type of breathing apparatus as the world's only meets the design requirements for the used-at-work insulating regeneration pressure relief device of a closed circuit, supplied with medical oxygen, and meeting the requirements of ČSN EN 145. In terms of Act No. 586/1992 Coll., on Income Tax, as amended, each one self-contained breathing apparatus is considered tangible property, because it is a separate movable thing with a separate technical and economic purpose whose cost is higher than CZK 40,000 and whose operational and technical functions are designed for more than one year. The tangible property in question is in accordance with the aforementioned Act included in the first depreciation group under the item (1-37) and the Standard Industrial Classification (SIC) code 33.10.16. with a depreciation period of at least three years (in case of a straight-line method of depreciation). To finance the investment, the company OKD, HBZS, a.s. used an intercompany loan from the company New World Resources Plc, of which it is part as a 100% subsidiary of the company OKD, a.s. [3]

Since this is an investment project which is in terms of the economic impact on the company classified as a “replacement”, there is no need for special investment analyses, since it is a required replacement of worn out equipment. In the case of purchase of breathing apparatus BG4, it is a recovery investment when the existing fixed assets has been fully depreciated (it concerned the type of breathing apparatus Dräger BG 174), the period of its economic lifetime has expired and hence does not produce any cash income.

The economic lifetime of Dräger PSS®BG 4 was estimated for ten years. There is an assumption of cost-effective use of the fixed assets during its lifespan. The frequency and conditions of the use of the BG 4 apparatus significantly affect their physical lifetime which, together with changes in economic conditions and obsolescence, may affect the economic lifetime of the property.

The capital expenditure of the project (purchase and partial lease of breathing apparatus BG 4 is summarized in the table below:

Tab. 1 Capital expenditure of investment project [1]

Individual items of capital expenditure of investment project	Price (thousand CZK)
Cost of investment	4,000
Cost of training of mechanics	60
Increase in inventories	500
Total	4,560

During the first six years of the economic lifetime of the investment project, 140 units and over the next four years then 100 units of apparatus will be leased. The basic lease price per unit was set to 100 CZK/day. The gradual increases in price of service material per unit of the breathing apparatus BG 4 is related to the expected sales policy of the apparatus manufacturer which is thus seeking to enforce the rate of replacement of worn-out device type for the new type. The increase in labour costs of maintenance technicians is expected as the increase is at a level of inflation in the company for a long time.

3 STATIC INVESTMENT APPRAISAL METHODS

Static methods monitor the cash flow from investing activities which is then compared with initial expenditure in different ways. Static methods not involving risk are usually used to evaluate minor or risky projects, projects with a low discount factor and short-life investments. The group of static methods include [2]:

Total income from investment as the sum of all cash flows:

$$CP = CF_1 + CF_2 + \dots + CF_n = \sum_{i=1}^n CF_i \quad (1)$$

Where:

CF_i - cash flow in year i .

Net total income from investment is a total income adjusted by initial expenditure:

$$NCP = CP + IN = -IN + \sum_{i=1}^n CF_i \quad (2)$$

Where:

IN - initial capital expenditure, or negative amortization;

CP - total net income.

Average annual cash flow generated by investment:

$$\phi CF = \frac{CP}{n} \quad (3)$$

Where:

CP - total net income

n - number of years of investment's lifetime.

Average annual return, i.e. the percentage of invested amount returned per year on average:

$$\phi r = \frac{\phi CP}{IN} \quad (4)$$

Where:

CP - total net income;

IN - initial capital expenditure.

Average return:

$$\phi doba = \frac{1}{\phi r} \quad (5)$$

Where:

ϕr - average annual return.

Return on investment reflecting the distribution of previous CF:

The method, unlike the previous method does not allow for an average income, but counts the expected revenue in each year according to the following schedule:

Year	Cash flow (thousand CZK)	Cumulative CF (thousand CZK)
0	- CF_0	- CF_0
1	CF_1	- $CF_0 + CF_1$
2	CF_2	- $CF_0 + CF_1 + CF_2$
....
n	CF_n	- $CF_0 + CF_1 + CF_2 + \dots + CF_n$

The chronology also includes the year 0, i.e. the period including primary expenditure associated with the investment itself. Return on the expenditure is achieved with a positive cumulative CF of the investment.

4 INVESTMENT PROJECT APPRAISAL AT BASIC LEASE PRICE OF APPARATUS

The expectations associated with the investment in the purchase and the partial lease of breathing apparatus used at work at a basic lease price per unit set to 100 CZK/day in the period 2011-2020 are shown in Tab. 2.

Tab. Expectations at basic lease price in 2011-2020

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Non-leased equipment (units/year)	60	60	60	60	60	60	100	100	100	100
Leased equipment (units/year)	140	140	140	140	140	140	100	100	100	100
Lease income per unit (thousand CZK/year)	36.5	36.6	36.5	36.5	36.5	36.6	36.5	36.5	36.5	36.6
Service material per unit (thousand CZK)	5	5	5	5.3	5.3	5.3	5.5	5.5	5.5	6.1
Wages of service mechanics (thousand CZK/month)	70	70	70	73.5	73.5	73.5	77.2	77.2	77.2	81

The planned income statement of the investment plan in question at a basic lease price per unit set to 100 CZK/day, including depreciation, is expressed in Tab. 3. From the income statement, a tax saving in company-wide economy is obvious which arose due to the negative gross profit in the first three years of the economic lifetime of the project. The loss from the assessed investment must be compensated by the overall positive economic result of the company.

Tab. 3 Planned income statement at basic lease price

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Non-leased equipment (units/year)	60.0	60.0	60.0	60.0	60.0	60.0	100.0	100.0	100.0	100.0
Leased equipment (units/year)	140.0	140.0	140.0	140.0	140.0	140.0	100.0	100.0	100.0	100.0
Lease income per unit (thousand CZK/year)	36.5	36.6	36.5	36.5	36.5	36.6	36.5	36.5	36.5	36.6
Service material per unit (thousand CZK/year)	5.0	5.0	5.0	5.3	5.3	5.3	5.5	5.5	5.5	6.1
Wages of service mechanics	70.0	70.0	70.0	73.5	73.5	73.5	77.2	77.2	77.2	81.0

(thousand CZK/month)										
Sales (thousand CZK/year)	5,110.0	5,124.0	5,110.0	5,100.0	5,100.0	5,124.0	3,650.0	3,650.0	3,650.0	3,660.0
Consumption of material (thousand CZK/year)	1,000.0	1,000.0	1,000.0	1,050.0	1,050.0	1,050.0	1,102.5	1,102.5	1,102.5	1,215.5
Labour costs (thousand CZK/year)	840.0	840.0	840.0	882.0	882.0	882.0	926.1	926.1	926.1	972.4
Depreciation (thousand CZK/year)	8,000.0	16,000.0	16,000.0	-	-	-	-	-	-	-
Operating profit (thousand CZK/year)	-4,730.0	-12,716.0	-12,730.0	3,178.0	3,178.0	3,192.0	1,621.4	1,621.4	1,621.4	1,472.1
Tax 19% (thousand CZK/year)	-898.7	-2,416.0	-2,418.7	603.8	603.8	606.5	308.1	308.1	308.1	279.7
Net profit (thousand CZK/year)	-3831.3	-10,300.0	-10,311.3	2,574.2	2,574.2	2,585.5	1,313.3	1,313.3	1,313.3	1,192.4

The planned funds expressed through the cash flow (CF) of the investment (indirect method of calculation) at a basic lease price per unit set to 100 CZK/day are given in Tab. 4, and show a consistently positive CF throughout the economic lifetime of the investment (the data in the first three columns refer to the period of property depreciation). The last row of the table summarizes the cash income and expenditure in the years following the purchase of breathing apparatus BG 4 and their partial lease at a basic lease price per unit set to 100 CZK/day.

Tab. 4 Planned cash flow at basic lease price (thousand CZK/year)

Item	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Net profit	-	-3,831	-10,300	-10,311	2,574	2,574	2,586	1,313	1,313	1,313	1,192
Depreciation	-	8,000	1,6000	1,6000	-	-	-	-	-	-	-
Increase in inventory	-	-500	-	-	-	-	-	-	-	-	-
Increase in receivables	-	-	-	-	-	-	-	-	-	-	-
Increase in current liabilities	-	-	-	-	-	-	-	-	-	-	-
Cash flow	-40,060	3,669	5,700	5,689	2,574	2,574	2,586	1,313	1,313	1,313	1,192

Appraisal by static methods:

Total income from investments according to formula (1):

$$CP = CF_1 + CF_2 + \dots + CF_n = \sum_{i=1}^n CF_i = 58,010.65 \text{ thousand CZK}$$

Net total income according to formula (2):

$$NCP = CP + IN = -IN + \sum_{i=1}^n CF_i = 17,950.65 \text{ thousand CZK}$$

Average annual cash flow according to formula (3):

$$\bar{CF} = \frac{CP}{n} = 5,801.06 \text{ thousand CZK}$$

Average annual return according to formula (4):

$$\bar{r} = \frac{\bar{CF}}{IN} = 14.48 \%$$

Average return according to formula (5):

$$\bar{r} = \frac{1}{\bar{r}} = 6.91 \text{ years}$$

Return on investment:

It results from the negative values of cumulative CF in all monitored years (see Tab. 5) that the return on the investment will not happen during its economic lifetime.

Tab. 5 Return at basic lease price - cumulative CF (thousand CZK/year)

Item	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cash flow	- 40,060	3,669	5,700	5,689	2,574	2,574	2,586	1,313	1,313	1,313	1,192
Cumulative CF	- 40,060	- 36,391	- 30,691	- 25,003	- 22,428	- 19,854	- 17,269	- 15,955	- 14,642	- 13,329	- 12,136

The summary appraisal of the investment project - the purchase and partial lease of breathing apparatus used at work using static methods at a basic lease price per unit set to 100 CZK/day - is presented by the data given in Tab. 6. The appraisal shows that the basic lease price is low and needs to be corrected.

Tab. 6 Summary appraisal of investment project at set basic price

Method name	Value	Acceptance criterion	Desirable	Appraisal
CP (total income in thousand CZK)	27,924	CP>IN (40,060 thousand CZK)	maximum	unsatisfactory
NCP (net total income in thousand CZK)	-12,136	NCP>0	maximum	unsatisfactory
\bar{CF} (annual average CF in thousand CZK)	2,792	$\bar{CF}>IN/n>4,006$ thousand CZK	maximum	unsatisfactory
\bar{r} (average annual return in %)	6.97	-	maximum	-
\bar{t} (average return in years)	14.35	return<economic lifetime (<10)	minimum	unsatisfactory
Return (in nth year)	>10	return<economic lifetime (<10)	minimum	unsatisfactory

5 INVESTMENT PROJECT APPRAISAL AT CORRECTED LEASE PRICE OF APPARATUS

The expectations associated with the investment in the purchase and partial lease of breathing apparatus used at work after correcting the basic price of lease per unit are summarized in Tab. 7, wherein the corrected price is set to 182 CZK/day. The corrected price results from the break-even point analysis, thus from finding the equilibrium point between costs and revenues of the investment project in question when an iterative step of the conversion of costs and revenues from the basic lease price to the corrected lease price per unit was 1 CZK.

Tab. Expectations at corrected lease price

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Non-leased equipment (units/year)	60	60	60	60	60	60	100	100	100	100
Leased equipment (units/year)	140	140	140	140	140	140	100	100	100	100
Lease income per unit (thousand CZK)	66.4	66.6	66.4	66.4	66.4	66.6	66.4	66.4	66.4	66.6
Service material per unit (thousand CZK)	5	5	5	5.3	5.3	5.3	5.5	5.5	5.5	6.1
Wages of service mechanics (thousand CZK/month)	70	70	70	73.5	73.5	73.5	77.2	77.2	77.2	81.0

The planned income statement of the investment plan in question at a corrected lease price per unit set to 182 CZK/day, including depreciation, is expressed in Tab. 8. It is obvious from the income statement that even after correcting the lease price per unit, a tax saving in the company-wide economy will be reported, which arose due to the negative gross profit in the first three years of the economic lifetime of the project. The impact of the fact on the company economy has already been described above.

Tab. 8 Planned income statement at corrected lease price

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Non-leased equipment (units/year)	60.0	60.0	60.0	60.0	60.0	60.0	100.0	100.0	100.0	100.0
Leased equipment (units/year)	140.0	140.0	140.0	140.0	140.0	140.0	100.0	100.0	100.0	100.0
Lease income per unit (thousand CZK)	66.4	66.6	66.4	66.4	66.4	66.6	66.4	66.4	66.4	66.6
Service material per unit (thousand CZK/year)	5.0	5.0	5.0	5.3	5.3	5.3	5.5	5.5	5.5	6.1
Wages of service mechanics (thousand CZK/month)	70.0	70.0	70.0	73.5	73.5	73.5	77.2	77.2	77.2	81.0
Sales (thousand CZK/year)	9,300.2	9,325.7	9,300.2	9,300.2	9,300.2	9,325.7	6,643.0	6,643.0	6,643.0	6,661.2
Consumption of material (thousand CZK/year)	1,000.0	1,000.0	1,000.0	1,050.0	1,050.0	1,050.0	1,102.5	1,102.5	1,102.5	1,215.5
Labour costs	840.0	840.0	840.0	882.0	882.0	882.0	926.1	926.1	926.1	972.4

(thousand CZK/year)										
Depreciation (thousand CZK/year)	8,000.0	16,000.0	16,000.0	-	-	-	-	-	-	-
Operating profit (thousand CZK/year)	-539.8	-8,514.3	-8,539.8	7,368.2	7,368.2	7,393.7	4,614.4	4,614.4	4,614.4	4,473.3
Tax 19% (thousand CZK/year)	-102.6	-1,617.7	-1,622.6	1,400.0	1,400.0	1,404.8	876.7	876.7	876.7	849.9
Net profit (thousand CZK/year)	-437.2	-6896.6	-6917.2	5,968.2	5,968.2	5,988.9	3,737.7	3,737.7	3,737.7	3,623.4

The planned funds expressed by the CF of the investment (indirect method of calculation) at a corrected lease price per unit set to 182 CZK/day are given in Tab. 9 and show a consistently positive CF throughout the economic lifetime of the investment. The resulting cash income and expenditure in the years following the purchase of breathing apparatus BG 4 and their partial lease are listed in the last row of the table:

Tab. 9 Planned cash flow at corrected lease price (thousand CZK/year)

Item	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Net profit	-	-437	-6,897	-6,917	5,968	5,968	5,989	3,738	3,738	3,738	3,623
Depreciation	-	8,000	16,000	16,000	-	-	-	-	-	-	-
Increase in inventory	-	-500	-	-	-	-	-	-	-	-	-
Increase in receivables	-	-	-	-	-	-	-	-	-	-	-
Increase in current liabilities	-	-	-	-	-	-	-	-	-	-	-
Cash flow	-40,060	7,063	9,103	9,083	5,968	5,968	5,989	3,738	3,738	3,738	3,623

Appraisal by static methods:

Total income from investment according to formula (1):

$$CP = CF_1 + CF_2 + \dots + CF_n = \sum_{i=1}^n CF_i = \mathbf{58,010.65 \text{ thousand CZK}}$$

Net total income according to formula (2):

$$NCP = CP + IN = -IN + \sum_{i=1}^n CF_i = \mathbf{17,950.65 \text{ thousand CZK}}$$

Average annual cash flow according to formula (3):

$$\emptyset CF = \frac{CP}{n} = \mathbf{5,801.06 \text{ thousand CZK}}$$

Average annual return according to formula (4):

$$\emptyset r = \frac{\emptyset CP}{IN} = \mathbf{14.48 \%}$$

Average return according to formula (5):

$$\emptyset \text{ return} = \frac{1}{\emptyset r} = \mathbf{6.91 \text{ years}}$$

Return on investment (see table below):

Tab. 10 Return at corrected lease price - cumulative CF (thousand CZK/year)

Item	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cash flow	- 40,060	7,063	9,103	9,083	5,968	5,968	5,989	3,738	3,738	3,738	3,623
Cumulative CF	- 40,060	- 32,997	- 23,894	- 14,811	- 8,843	- 2,875	3,114	6,852	10,590	14,327	17,951

The values of cumulative CF in the table show that the return on investment will happen in the sixth year of its economic lifetime.

The summary appraisal of the investment project of the purchase and partial lease of breathing apparatus used at work at a corrected lease price per unit set to 182 CZK/day is presented through the data in Tab. 11. It follows from the appraisal that the corrected price is the minimum lease price at which the project is still acceptable.

Tab. 11 Summary appraisal of investment project at corrected price

Method name	Value	Acceptance criterion	Desirable	Appraisal
CP (total income in thousand CZK)	58,011	CP>IN (40,060 thousand CZK)	maximum	satisfactory
NCP (net total income in thousand CZK)	17,951	NCP>0	maximum	satisfactory
Ø CF (annual average CF in thousand CZK)	5,801	ØCF>IN/n>4,006 thousand CZK	maximum	satisfactory
Ø r (average annual return in %)	14.48	-	maximum	-
Ø return (average return in years)	6.91	return<economic lifetime (<10)	minimum	satisfactory
Return (in nth year)	6.00	return<economic lifetime (<10)	minimum	satisfactory

As indicated in the introduction, the financing of the investment project of the purchase and partial lease of breathing apparatus is provided by a combination of debt and equity.

The loan capital is represented by an intercompany loan from the company New World Resources Plc, of which it is part as a 100% subsidiary of the company OKD, a.s.

The equity enters the financing as a stabilizing element of the negative cumulative cash flow in the first five years of the economic lifetime of the project. Since in the appraisal of investment in the purchase and partial lease breathing apparatus, the future cash flows were taken into account, the influence of inflation environment on the investment was thus eliminated.

6 CONCLUSIONS

The article focuses on the importance of making investment decisions and its impact on the economy of a chosen company in the future. It analyses the specific investment project of the purchase and partial lease of 200 units of the breathing apparatus Dräger BG 4 used at work in the company OKD, HBZS, a.s.

The aim was to find the “break even point” when setting the price of daily lease per unit, in particular under the given conditions resulting from the purchase price of the apparatus, the proportion of leased and non-leased equipment and service costs. Since the economic lifetime of the breathing apparatus was set to 10 years, the investment should be seen as active, i.e. the investment project during its economic lifetime will be interfered with management decisions concerning mainly adjusting the prices of daily lease per unit.

In the application and verification parts, static methods of investment efficiency appraisal were used that monitor the cash flow from the investment which is then compared with its initial expenditure in different ways. The methods like “Total investment income”, “Net total income”, “Average annual CF”, “Average annual return”, “Average return” and “Return” were applied. These methods can be used for appraisal of minor projects, or the projects with a low discount factor. It was found out that the investment project concerning the purchase and the partial lease of 200 units of breathing apparatus is viable provided that the ratio of leased and non-leased breathing apparatus in each year of the economic lifetime of the project is met, while the price of leasing one unit of breathing apparatus is set to at least 182 CZK/day.

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RESUME

Předložený článek se zabývá významem investic a jejich optimalizací s dlouhodobým dopadem pro ekonomiku firem. Na konkrétním příkladě společnosti HBZS, a.s. je představena investice do obnovy záchranné techniky pro zásahy v nedýchatelném či zdraví škodlivém prostředí. Cílem je zhodnocení efektivnosti investičního projektu pomocí statických metod ve vazbě na nastavení optimální cenové hladiny pronájmu daných přístrojů. Optimalizace tohoto nastavení je zkoumána z hlediska ekonomické životnosti daného dlouhodobého hmotného majetku. Pro aplikačně-ověřovací část bylo použito statických metod hodnocení efektivnosti investic, které monitorují cash flow z dané investice, a ta následně různými způsoby komparují se vstupními výdaji. Bylo zjištěno, že investiční projekt týkající se nákupu a částečného pronájmu 200 kusů pracovních dýchacích přístrojů je životaschopný v případě, že bude dodržen vzájemný poměr pronajímaných a nepronajímaných dýchacích přístrojů v jednotlivých letech ekonomické životnosti projektu a současně bude nastavena cena pronájmu jednoho dýchacího přístroje minimálně na 182,- Kč/den.

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