Feasibility Analysis of The Investment Project of Additional High Frequency Machinery in Increasing Production Capacity (Case Study of UD Berkah)

Aldida Dimas Bagus Sajiwa
Program Studi Teknik Industri, Fakultas Teknik,
Universitas 17 Agustus 1945 Surabaya
Jl. Semolowaru No.45, Menur Pumpungan,
Kec. Sukolilo, Kota Surabaya, Jawa Timur,
Indonesia
1411900208@surel.untag-sby.ac.id

Wiwin Widiasih
Program Studi Teknik Industri, Fakultas Teknik,
Universitas 17 Agustus 1945 Surabaya
Jl. Semolowaru No.45, Menur Pumpungan,
Kec. Sukolilo, Kota Surabaya, Jawa Timur,
Indonesia
wiwin_w@untag-sby.ac.id

ABSTRACT

UD Berkah is a small business, that currently produces surface mats for adult slippers and children's slippers. Hot Embossing is one of a series of processes for making the surface of slippers. The Hot Embossing process requires a High Frequency machine to create a pattern on the printed slipper surface. Currently UD Berkah has 3 units of High Frequency machines to meet consumer demand. Due to the large number of requests, not all of them can be done by the company itself, so it requires the services of subcontractors to meet production shortages. Currently, the company plans to purchase High Frequency machines to overcome this problem. So it is necessary to analyze the feasibility of investment projects by considering several aspects with the Straight Line Depreciation method approach, Payback period, Net Present Value, Profitability Index and Internal Rate of Return. This is done to consider whether the investment in adding High Frequency machines is feasible or not for UD Berkah. Research results with an investment value of Rp. 55,000,000 with an economic life of 8 years, the results for a depreciation of Rp. 4,375,000 annually, the value of the declining balance in the final period is Rp. 2,678,492 NPV value of Rp. 399,700,855, the payback period for 8 months, the Profitability Index value is 8,27, the IRR value shows a result of 9.57%. So it can be concluded that the investment in purchasing high frequency machines is feasible.

Keywords: *Hot Embossing, High Frequency, Investment, Net Present Value, Internal Rate of Return.*

Received: 14 Maret 2023; Revised form: 27 Maret 2023; Accepted: 29 April 2023; Online: 30 Mei 2023
2527-9947/ DOI: 10.30996/jem17.v8i1.8664

Published by Fakultas Ekonomi dan Bisnis, Universitas 17 Agustus 1945 Surabaya.

INTRODUCTION

The economy after the Covid-19 pandemic began to show an increasing trend. The Covid-19 pandemic has caused many limitations in all aspects of life including a decrease in people's purchasing power which has affected the amount of production in large and small and medium scale industries. Fulfilling increasingly diverse consumer demands has forced industry players to innovate [1].

Almost all industry players feel the demand, which has started to increase after the pandemic, one of which is the small industry in the field of footwear or slipper. Polymer and Sponge (Ethylene Vinyl Acetate) or what we know as EVA sponge are the main materials for making slipper [2]. Some of the production processes in producing slipper include the process of cutting materials according to shape and size, the process of printing on the surface of the slipper, the process of hot embossing or what is known as the process of stamping on the surface that has been printed, the joining of the top and bottom of the slippers by gluing and finishing processes. UD. Berkah is a type of trading business that sells manufactured goods, namely businesses that sell basic production materials to be made ready-to-sell finished goods. UD. Berkah is a Home Industry supplier of sandal components located on North Wedoro street number. 42, Subdistrict Waru, Sidoarjo, East Java. This company make products which is made according to consumer demand. Currently the company is producing the upper surface of children's slippers to be sent to consumers in Malang, East Java.

Figure 1. The process of screen printing the upper surface of the slippers

In the production of the upper surface of the slippers, it requires an HF (High Frequency) machine to carry out the Hot Embossing process, which is the process of creating screen printing motifs on EVA sponge material. Currently the company has 3 HF Machine Units to meet consumer demand. The

working hours applied at UD. Berkah is 6 working days with normal working time of 10 hours and additional 2 hours of overtime.

Figure 2. Hot Embossing Process

The requests that are higher than the production capacity of HF machines causes companies to use subcontractor services to meet demand. This can be shown in the table below regarding the production capacity that can be achieved and the ability to fulfill it to consumers.

Table 1. Recap Production Capacity of UD. Berkah

Kapasitas Produksi Mesin HF (*High Frequency*) 2022						
Tanggal		**Keterangan**	**Jumlah Permintaan**	**Pemenuhan**	**Subkontraktor**	**Persentase Kekurangan**
Minggu ke 1	5/9-10/9	Sablon Motif Anak	1000 Kodi	777	223	22.3%
Minggu ke 2	12/9-17/9		1000 Kodi	777	223	22.3%
Minggu ke 3	19/9-24/9		1000 Kodi	777	223	22.3%
Minggu ke 4	26/9-01/10		1000 Kodi	648	352	35.2%
Minggu ke 1	3/10-8/10	Sablon Motif Anak	1000 Kodi	777	223	22.3%
Minggu ke 2	10/10-15/10		1000 Kodi	648	352	35.2%
Minggu ke 3	17/10-22/10		1000 Kodi	777	223	22.3%
Minggu ke 4	24/10-29/10		1000 Kodi	777	223	22.3%
Minggu ke 1	31/10-5/11	Sablon Motif Anak	1000 Kodi	777	223	22.3%
Minggu ke 2	7/11-12/11		1000 Kodi	777	223	22.3%
Minggu ke 3	14/11-19/11		1000 Kodi	777	223	22.3%
Minggu ke 4	21/11-26/11		1000 Kodi	648	352	35.2%
TRIAL 7 HARI KERJA						
Minggu ke 1	28/11-04/12	Sablon Motif Anak	1000 Kodi	907	93	9.3%
Minggu ke 2	5/12-11/12		1000 Kodi	907	93	9.3%
Minggu ke 3	12/12-18/12		1000 Kodi	648	352	35.2%
Minggu ke 4	19/12-25/12		1000 Kodi	756	244	24.4%

The problem is that the company is not able to process all requests within the company so it uses the services of a subcontractor to work on the shortage of production requests. Requests that cannot be fulfilled independently will be carried out by subcontractors at a price of IDR 8,500/Kodi. While the cost to do it independently is only IDR. 5,740/Kodi. The cost of using subcontractors to meet demand adds to the burden of production costs for UD. Berkah. If the company is able to work on all production requests, it will cut costs more.

Business owners consider the benefits of using subcontractors to be very small and add to the company's expenses so that the company does not get the maximum profit from this production. The company seeks to increase production by increasing working days to 7 days in order to increase revenue by reducing the use of subcontractor services. However, this was not effective because when the experiment was conducted in December, the machine worked continuously. The machine experienced downtime and caused defects such as: Motives did not appear, Motives appeared uneven and wrinkled, and damage to several machine components. Maintenance policies need to be implemented to support smooth running. production activities due to production machines that have stopped due to damage [3].

Table 2. Damages to High Frequency Machine

Components	Damage
Nipple	Broken nipple due to excessive working duration of the machine. Causing the pattern to appear uneven
Contactor	The contactor does not work because the heat from the electricity that flows exceeds capacity.
Dinamo	The dynamo does not work so that the High frequency machine does not have electricity

The decision to add working days has an impact on machine damage and product defects. Business owners wish to buy machines to increase production capacity. By purchasing a High Frequency machine, it can increase production capacity and enable lower production costs. The investment that must be spent to purchase a High Frequency machine is IDR. 55,000,000. The specifications of the machine are with a hydraulic press mechanism and the required electrical power consumption is at least 5000 watts.

LITERATURE REVIEW

Production

Production is the process of changing inputs that consist of physical and non-physical components. This increases the added value (added value) of the processed inputs. Added value can be considered from the perspective of functional added value and economic added value [4].

The relationships between inputs and outputs, as well as interactions between "processes" and other components, make up a production system. One of the many financial systems is a manufacturing system in the form of input, process and output, which are three types of production system components [5].

Cost

According to Giatman in a book entitled “Ekonomi Teknik” there are things that must be considered [6], namely as follows:

1. What is meant by cost here is all the sacrifices needed to achieve the goal whose measurement is carried out in currency values.
2. Cost, referred to as expenset generally because of its association with the amount of money that must be spent to make payments to get a desired result.

From the two things above, it can be concluded that cost has a far more complete and in-depth understanding than expenses. Whereas, Mulyadi defines costs in a broader sense "Cost is the sacrifice of economic resources measured in units of money, which has occurred or is likely to occur for a particular purpose" [7].

Interest

According to Giatman, interest is the money you earn from using money you previously borrowed. Interest forfeiture basically compensates for the depreciation of money over the life of the loan, with the amount of interest proportional to the depreciation of the money. Therefore, a person who earns interest on his money when the value of the money falls (inflation) does not profit economically from that money, and the value of the assets involved is relatively fixed and stable [6].

Interest of Rate

According to Giatman, The interest rate is the ratio between the interest charged per period of time and the amount of money borrowed at the beginning of the period multiplied by 100% [6], or :

$$Rate\ of\ Interest = \frac{Interest\ is\ paid\ per\ unit\ time}{Initial\ loan\ amount} \times 100\%$$

Simple Interest

Simple interest is an interest calculation system based solely on the size of the original loan, and the previous period's interest paid does not include the interest multiplier factor. Interest calculation method can be done with a simple formula, Example: Mrs. Hanna borrowed money from her brother 4

years ago in the amount of IDR.200,000 with the obligation to pay interest at 5%/year using the simple interest method, the interest calculation is as follows.

Table 3. Simple Interest Calculation

Year	Initial Loan	Interest (i=5%)	End of Period Loan
1	IDR. 200.000	5% x IDR. 200.000 = IDR. 10.000	IDR. 200.000 + IDR. 10.000 = IDR. 210.000
2	IDR. 200.000	5% x IDR. 200.000 = IDR. 10.000	IDR. 210.000 + IDR. 10.000 = IDR. 220.000
3	IDR. 200.000	5% x IDR. 200.000 = IDR. 10.000	IDR. 220.000 + IDR. 10.000 = IDR. 230.000
4	IDR. 200.000	5% x IDR. 200.000 = IDR. 10.000	IDR. 230.000 + IDR. 10.000 = IDR. 240.000
Total Interest = IDR. 40.000			

The formula for a simple interest system can be calculated as follows:

$$Bunga = i \times P \times n$$

Where: i = interest rate

P = re-loan

n = periods

Example: If Mrs. Hanna has 7.5 million rupiah in savings at the bank for 8 months with an interest rate of 2.5%/month. How much interest does Mrs. Hanna get, if the interest system is simple? Answer:

Simple Interest Amount: $Interest = i \times P \times n$

$$Interest = 2{,}5\% \times 7{,}5\ Million \times 8$$

$$Interest = 1{,}5\ Million$$

Compound Interest

According to Giatman, The compound interest system is an interest calculation system in which interest is not only calculated on the amount of the initial loan, but calculations are based on the amount of debt at the beginning of the period in question, in other words interest is compounded. If the example above, Mrs. Hanna borrowed money from her brother 4 years ago in the amount of Rp. 200,000 with the obligation to pay interest at 5%/year using the compound interest method [6], the interest calculation is as follows:

Table 4. Compound Interest Calculation

Year	Initial Loan	Interest (i=5%)	End of Period Loan
1	IDR. 200.000	5% x IDR. 200.000 = IDR. 10.000	IDR. 200.000 + IDR. 10.000 = IDR. 210.000
2	IDR. 210.000	5% x IDR. 210.000 = IDR. 10.500	IDR. 210.000 + IDR. 10.500 = IDR. 220.500
3	IDR. 220.500	5% x IDR. 250.500 = IDR. 11.025	IDR. 220.500 + IDR. 11.025 = IDR. 231.525
4	IDR. 231.525	5% x IDR. 231.525 = IDR. 11.576	IDR 231.525 + IDR. 11.576 = IDR. 243.101
Total Interest = IDR. 43.101			

It can be seen that the amount of interest that must be paid with a compound interest system will be greater than a simple interest system for the same loan. In current economic practice, the simple interest system is rarely applied, almost all national and international financial institutions/banks apply a compound interest system.

Investment

According to Pujawan, To increase the profit of creating goods and services available in the economy, investment is issued from the company's capital to buy capital goods and production equipment to increase its capacity in a business. In other words, investment is a spending activity that increases the output capability of an economy or company [8].

The need for investment is a capital requirement that will later be used in the operations of a business sector or a project. The term capital refers to resources in the form of money or goods that can be used to generate profit or profits [1]. The goal of investing is to reap future rewards, be it financial, non-financial, or both [8]

Investment Feasibility Analysis

Investment feasibility analysis is a research conducted on a project (generally an investment project) whether it can be implemented or not to determine the value of feasibility or success [9]. The understanding of this success can be seen from two sides, in a broader or more limited way. Success for the company, especially making a profit, is a more limited definition, while success outside the company's operations, such as success for society, such as absorbing labor is a more expansive thing [10].

Investment Analysis Steps

Measuring an investment requires a method of doing so to find out whether an investment is feasible or not. In making an assessment requires consideration of several aspects or certain considerations are necessary to decide the feasibility of an investment [11]. The following steps need to be taken for decision making:

1. Set Value of MARR (Minimum Attractive Rate of Return). Basic reference in determining alternative is MARR (Minimum Attractive Rate of Return) minimum value or how many obligations must be met.
2. Comparing investment alternatives. In making an assessment requires consideration of several aspects and certain considerations are necessary to decide the feasibility of an investment. Some of the methods below are used to analyze the feasibility of an investment, including:
    a. Payback Period

    According to Pujawan, The payback period is the payback period calculated based on annual cash flow and residual value, which is basically the period (years) required to amortize (cover) the initial investment cost at a given rate of return [8]. To get a certain payback period, the following formula model is used:

$$0 = -P + \sum_{t=1}^{N^1} A_t\left(\frac{P}{F}, i\%, t\right)$$

    Where at is known as the cash flow that occurs in period t and N' is the payback period to be calculated. If At is the same from one period to another (uniform series), then the above equation can be expressed based on the P/A factor as follows:

$$0 = -P + \sum_{t=1}^{N^1} A_t\left(\frac{P}{A}, i\%, t\right)$$

    If an alternative has an economic useful life greater than the payback period (N') then the alternative is acceptable. Conversely, if (N') is greater than the estimated useful life of a tool or the age of an investment, then the investment or tool is not worth accepting because there will not be enough time to return the capital used as the initial cost of the investment. In practice, industry circles often calculate the value of N^' by ignoring the monetary value of time, or by assuming that i = 0%. With this assumption it will turn out to be:

$$0 = -P + \sum_{t=1}^{N^1} A_t$$

If the cash flow is in the form of a uniform series, then (N') can be obtained by the formula:

$$N' = \frac{P}{A_t}$$

Where at of this equation is a uniform cash flow series. Assuming i = 0%, this method has 2 weaknesses, namely:

i. Ignore the concept of money value of time.
ii. All cash flows occurring after N^' are ignored.

b. Net Present Value

According to Pujawan, In this method all cash flows are converted to present value (P) and summed up so that the P obtained reflects the net value of all cash flows that occur during the planning horizon [8]. The interest rate used in this method is MARR. Mathematically the present value of a cash flow can be expressed as follows:

$$P(i) = \sum_{t=0}^{N} \frac{A_t}{(1+i)^t} \qquad \text{or} \qquad P(i) = \sum_{t=0}^{N} A_t \left(\frac{P}{F}, i\%, t\right)$$

Where:
P(i) = Present value of all cash flows at interest rate i %
A_t = Cash flow at the end of period t
I = MARR
N = Planning horizon (period)

c. Internal Rate of Return

According to Giatman, The IRR method is related to the level of cash flow ability to recover the investment and how many obligations must be fulfilled, which are explained in the form of a percentage/time period [6]. How to find IRR by using the following formula [12]:

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} \; x \; (i_1 - i_2)$$

Where: i_1 = Interest rate 1 (discount rate that produces NPV1)
i_2 = Interest rate 2 (discount rate that produces NPV2)
NPV1 = Net Present Value 1
NPV2 = Net Present Value 2
Conclusion:

i. If the IRR is greater (>) than the loan interest, it is accepted
ii. If the IRR is smaller (<) than the loan interest, then it is rejected

d. Profitability Index

According to I Made Adnyana, The profit index method (Profitability Index/PI) is a technique that compares or uses the ratio between the initial investment of the project and the total value of the current cash flows during the project [13]. Initial outlay is excluded from the total present value of cash flows over the economic life, which only takes into account cash flows from the first year to the last year. The formula for finding the profitability index value is as follows [12]:

$$PI = \frac{\sum PV\ Net\ Cash}{\sum PV\ \ Investment}\ x\ 100\%$$

The assessment criteria using the profitability index method to determine an investment are as follows:

i. If the profitability index > than 1 then the investment will be accepted.

ii. If the profitability index is < than 1 then the investment will be rejected.

e. Depreciation Stright Line

According to Pujawan, The straight-line depreciation approach is based on the idea that the diminishing value of an asset is linear (proportional) with its time or age. Because of the simplicity of the calculations, this method is very popular [8]. The amount of depreciation each year using the SL method is calculated based on:

$$D_t = \frac{P-S}{N}$$

Where:

D_t = The amount of depreciation in the t-year

P = Initial cost of the asset in question

S = residual value of the asset

N = the useful life (age) of the asset expressed in years.

Because assets are depreciated by the same amount each year, these assets are reduced by the amount of annual depreciation multiplied by t, or:

$$BV_t = P - tD_t$$
$$= P - \left[\frac{P-S}{N}\right] t$$

The rate of depreciation, d, is the part of P-S that is depreciated each year. For the SL method, the depreciation rate is:

$$d = \frac{1}{N}$$

RESULTS

Net Profit

Company net profit data for a period of 5 years, starting from 2018 to 2022. Can be seen in the following table:

Table 5. Net Profit UD Berkah

No	Year	Net Profit (Rupiah)
1	2018	IDR. 122.213.000
2	2019	IDR. 105.826.000
3	2020	IDR. 98.280.000
4	2021	IDR. 119.305.000
5	2022	IDR. 135.666.000

MARR

The MARR value is generally determined subjectively with a consideration of certain aspects of the investment. Where the considerations in question are:

1. Investment Interest Rate (i)
2. Other costs that must be incurred to obtain investment (Cc)
3. Investment risk factor (α)

$MARR = i + Cc +$ ± if Cc and ± not yet or zero, so $MARR = i$ (interest), and MAR≥ 1

Where: i = Bank's average loan interest rate Quarter 1 of 2023= 9,38%

a = Investment risk factor = 0%

Then the MARR value obtained is equal to:

$$i + Cc + a$$

$$= 9{,}38\% + 0 + \%$$

$$= 9{,}38\%$$

The calculation results above show that the Minimum Attractive rate of Return or MARR is 9.38%. The MARR value above is used as a basic reference for evaluating and comparing with other alternatives.

Depreciation

1. The initial investment value for the High Frequency machine is P = IDR. 55.000.000
2. The service life of the machine or N = 8 years
3. The remaining value of the machine at the end of the period = IDR. 20.000.000
4. The amount of depreciation expense every year

$$D_t = \frac{P-S}{N}$$

$$= \frac{IDR.55.000.000 - IDR.20.000.000}{8\ year}$$

$$= IDR.\ 4.375.000$$

Table 6. Machine Depreciation and Value Every Year

Year	Depreciation Every Year (Rupiah)	Value *High Frequency* Machine (Rupiah)
0	0	IDR. 55.000.000
1	IDR. 7.000.000	IDR. 48.000.000
2	IDR. 7.000.000	IDR. 41.000.000
3	IDR. 7.000.000	IDR. 34.000.000
4	IDR. 7.000.000	IDR. 27.000.000
5	IDR. 7.000.000	IDR. 20.000.000

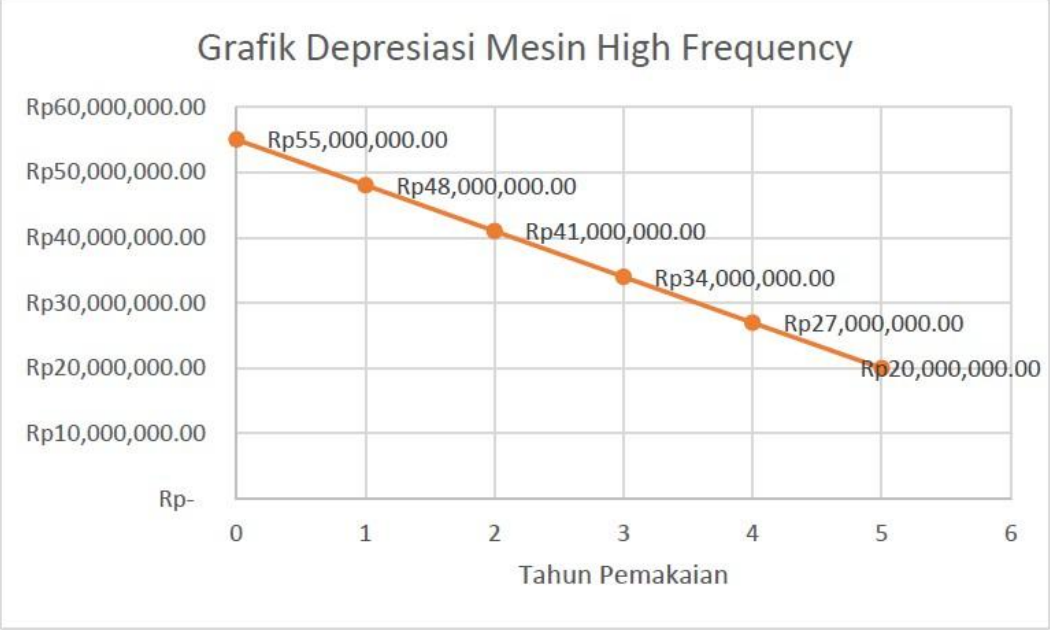

Figure 3. Depreciation Stright Line Chart

Table 7. Depreciatin Declining Balance

Years	Depreciation Last Years	Book Value Last Years
0	0	Rp. 55.000.000
1	1/9 X Rp. 55.000.000 = Rp. 6.111.111	Rp. 48.888.888
2	1/9 X Rp. 48.888.888 = Rp. 5.432.098	Rp. 43.456.790
3	1/9 X Rp. 43.456.790 = Rp. 4.828.532	Rp. 38.628.257
4	1/9 X Rp. 38.628.257 = Rp. 4.292.028	Rp, 34.336.229
5	1/9 X Rp, 34.336.229 = Rp. 3.815.136	Rp. 30.521.092
6	1/9 X Rp. 30.521.092 = Rp. 3.391.232	Rp. 27.129.860
7	1/9 X Rp. 27.129.860 = Rp. 3.014.428	Rp. 24.115.431
8	1/9 X Rp. 24.115.431 = Rp. 2.678.492	Rp. 21.435.938

Net Present Value

Determine the present value (p) adjusted for cash flow by adding up each period, then the cash value can reflect the net value of the entire cash flow in the coming period. So, NPV is the ratio of the difference between the present value of cash inflows and the present value of cash outflows over a certain period of time to test whether an investment made will generate profits in the future.

Table 8. Present Worth Value

No	Year	EAIT (Rp)	Depreciation (IDR)	*Net Profit Proceed* (IDR)	Cost (Rp)	*Discount Factor* (10%)	PV Net Cash (IDR)
0	2017	-	-	-	IDR. 55.000.000	-	-
1	2018	Rp. 122.213.000	Rp. 4.375.000	Rp. 126.588.000	-	0.9091	Rp 115.081.150
2	2019	Rp. 105.826.000	Rp. 4.375.000	Rp. 110.201.000	-	0.8264	Rp 91.070.106
3	2020	Rp. 98.280.000	Rp. 4.375.000	Rp. 102.655.000	-	0.7513	Rp 77.124.701
4	2021	Rp. 119.305.000	Rp. 4.375.000	Rp. 123.680.000	-	0.6830	Rp 84.473.440
5	2022	Rp. 135.666.000	Rp. 4.375.000	Rp. 140.041.000	-	0.6209	Rp 86.951.456
	Total PV Net Profit						Rp 454.700.855

Net Cash PV value obtained from (Net Profit × Discount Factor) The amount of the Discount factor is obtained from the discrete compounding interest table ($P/F \times i\% \times n$) If the Net Present Value is positive, the investment made will be profitable. Calculations to determine the feasibility of investment with the NPV method are:

NPV = PW Benefit – PW Cost

= IDR. 454.700.855 – IDR. 55.000.000

= IDR. 399.700.855

NPV calculation above is known that the results are positive, namely Rp. 399.700.855 is greater than zero so it is a feasible and profitable investment to do.

Payback Period

Payback Period is a formula to find out how long the payback period is. In the previous method, namely the Net Present Value method, the information on net cash owned by the company is different each year, then the Payback Period method is calculated with the following settlement:

Investment = IDR. 55.000.000
Cash Year 1 = IDR. 126. 588.000 -
= IDR. – 71.588.000

Because the remainder cannot be reduced by the second year's net cash, the first year's net remaining cash is divided by the second year's net cash.

$$PP = \frac{IDR.71.588.000}{IDR.\ 110.201.000} \times 12\ month\ = 7{,}7 = 8\ month$$

Payback Payback Period results is 8 months and these results are shorter than the economic life of the machine, which is 8 years. From these results, the investment is declared feasible.

Profitability Index

The profitability index method basically calculates the ratio between the present value of net cash receipts in the future and the present value of the investment.

$$PI = \frac{\sum PV\ Net\ Profit}{\sum PV\ Investment} \times 100\%$$

$$PI = \frac{\text{IDR. } 454.700.855}{\text{IDR. } 55.000.000} \times 100\%$$

$$PI = 8{,}27$$

Profitability Index calculation is known the result is 8,27. Where the value is more than one. then the investment to purchase a High Frequency machine is acceptable or feasible.

Internal Rate of Return

Internal Rate of Return, which is a method for calculating the value of an investment that is used to determine the interest rate that equates the present value of expected cash flows in the future or cash receipts with the initial investment outlay. IRR is a formula to show what percentage of return on investment is made [14].

Table 9. Calculation of IRR with i = 9%

No	Year	Net Cash	Discount factor (9%)	PV Net Cash
1	2018	Rp 126.588.000.00	0.9174	Rp. 116.131.831.20
2	2019	Rp 110.201.000.00	0.8417	Rp. 92.756.181.70
3	2020	Rp 102.655.000.00	0.7722	Rp. 79.270.191.00
4	2021	Rp 123.680.000.00	0.7084	Rp. 87.614.912.00
5	2022	Rp 140.041.000.00	0.6499	Rp. 91.012.645.90
Total PV Net Cash				Rp. 466.785.761.80
Investment				Rp. 55.000.000
		NPV	C1	Rp. 411.785.761

Table 10. Calculation of IRR with i = 10%

No	Year	Net Cash	Discount factor (10%)	PV Net Cash
1	2018	Rp 126.588.000.00	0.9091	Rp. 115.081.150.80
2	2019	Rp 110.201.000.00	0.8264	Rp. 91.070.106.40
3	2020	Rp 102.655.000.00	0.7513	Rp. 77.124.701.50
4	2021	Rp 123.680.000.00	0.6830	Rp. 84.473.440.00
5	2022	Rp 140.041.000.00	0.6209	Rp. 86.951.456.90
Total PV Net Cash				Rp. 454.700.855.60
Investment				Rp. 55.000.000
		NPV	C2	Rp. 399.700.855.60

$$IRR = I_1 + \frac{NPV_1}{NPV_1 + NPV_2}(I_2 - I_1)$$

Dimana:

I_1 = 9%

I_2 = 10%

NPV_1 = Rp. 411.785.761

NPV_2 = Rp. 399.700.855

$$IRR = 9 + \frac{\text{Rp.411.785.761}}{\text{Rp.411.785.761} - \text{Rp.399.700.855}}(10 - 9)$$

$$IRR = 9 + \frac{\text{Rp.411.785.761}}{Rp.811.486.906}(1)$$

$$IRR = 9 + 507 = 9{,}57\%$$

Internal calculation of the rate of return on investment in purchasing high frequency machines the result is 9.57%. Internal Rate of Return is greater than the minimum attractive rate of return of 9.38%.

CONCLUSION

Based on the results of data processing and analysis of calculations that have been carried out, conclusions can be drawn and at the same time answer the problem formulation of the topic of this final project. The conclusions from this high frequency machine investment project are:

1. Investment in the purchase of the company's high frequency machines is feasible
2. Some calculations to see the rate of return can be seen in the results below:
    a. Calculation of depreciation using the Straight Line Depreciation method results in the amount of depreciation each year amounting to Rp. 4,375,000 for 8 years with a machine residual value of Rp. 20,000,000, and the residual value at the end of the period is Rp. 21,435,938 with a Declining Balance in the final period of Rp. 2,678,492.
    b. The results of the calculation of the Net Present Value show a figure of Rp. 399.700.855 or it can be said to be greater than zero so that the investment is said to be profitable to realize.
    c. Payback Period method to find out the length of time to pay back capital, the results are 8 months and declared worthy of investment.
    d. Profitability Index to compare the present value with future net cash receipts, the results obtained are 8,27, the results are positive so that the investment is feasible to be realized.

e. Internal Rate of Return method to show what percentage of return on investments made, shows a yield of 9,57% and the result is greater than the minimum attractive rate of return of 9,38%.

ACKNOWLEDGEMENT

We would like to thank Mrs. Sri Handayani for her support and we also want to thank Mrs. Wiwin Widiasih for the fruitful discussion as well as her support and suggestions. Once again I thank my "For Palestine" association partners for their kindness and support. This research was conducted for the requirements of obtaining a bachelor's degree in industrial engineering at University of 17 Agustus 1945 Surabaya.

REFERENCES

[1] Prihastono, E., & Hayati, E. (2015). Analisis Kelayakan Investasi Mesin untuk Meningkatkan Kapasitas Produksi (Studi Kasus di CV Djarum Mulia Embroidery Semarang). Jurnal Dinamika Teknik, 9(2), 47–60.

[2] Suharianto, S. (2013). Rancang Bangun Mesin Hot Embossing Sandal Dengan Sistem Elektro Pneumatik. Journal of Chemical Information and Modeling, 53(9), 1689–1699.

[3] Asmoro, N. D. A. & Widiasih, W. (2022). Analisis Keandalan Mesin untuk Meningkatkan Kinerja pada Mesin Extruder di PT Rapindo Plastama. Journal of Industrial View, 4(2), 11–21.

[4] Wignjosoebroto, S. (2003). Pengantar Teknik & Manajemen Industri. Editor by I Ketut Gunarta. 1st edition. Jakarta: Prima Printing.

[5] Jacobs, F. R. & Chase, R. B. (2015). Manajemen Operasi dan Rantai Pasok. Editor by M. Masykur. 14th edition. Jakarta: Salemba Empat.

[6] Giatman, M. (2006). Ekonomi Teknik. Editor by A. Aliludin. 3rd edition. Jakarta: PT Raja Grafindo Persada.

[7] Mulyadi, M. (2015). Akuntansi Biaya. 5th edition. Yogyakarta: Sekolah Tinggi Ilmu Manajemen YKPN.

[8] Pujawan, I. N. (2012). Ekonomi Teknik. 2nd edition. Surabaya: Guna Widya.

[9] Setiadi, D. & Surianti, S. (2018). Peranan Metoda Disconted Payback dan Net Present Value Dalam Keputusan Investasi Mesin Pada CV X. Journal of Materials Processing Technology, 3(1), 1–8.

[10] Amelia, G. P. S. Meitha, R. & Sugiharto, S. (2017). Panen Tembakau Di Bojonegoro. Calyptra: Jurnal Ilmiah Mahasiswa Universitas Surabaya, 1(1), 1–9.

[11] Diniaty, D. & Nova, K. I. G. (2016). Analisis Kelayakan Investasi Penambahan Mesin Oven Pada Industri Pengolahan Kayu CV Riau Pallet. Seminar Nasional Teknologi Informasi, Komunikasi dan Industri (SNTIKI) 8, 397–407.

[12] Kasmir, K. & Jakfar, J. (2017). Studi Kelayakan Bisnis. Edisi Revisi. Editor by W. Endang. Depok: Kencana.

[13] Adnyana, I. M. (2020). Studi Kelayakan Bisnis I. In Melati (Ed.), Lembaga Penerbitan Universitas Nasional (LPU-UNAS) (1st ed.). Lembaga Penerbitan Universitas Nasional (LPU-UNAS).

[14] Oktaviyani, E. (2013). Analisa penggantian mesin produksi PT Wahanamas Panca Jaya Kudus: Suatu analisis Kualitatif dan kuantitatif.

[15] Dewi, S. R. (2019). Akuntansi Biaya (S. R. Dewi (ed.); 1st ed.). UMSIDA Press.

[16] Iriyanto, T. T. (2019). ANALISA KELAYAKAN INVESTASI PENGADAAN MESIN PEMOTONG PLASTIK ISI RAPORT OTOMATIS (STUDY KASUS UMKM BERKAH MEDIA JAYA)

[17] Teguh Tri Iriyanto Program . Studi . Teknik , Industri ,. Universitas / 17 . Agustus . 1945 . Surabaya ABSTRACT Umkm berkah media jaya. Kelayakan Investasi.