MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

NATIONAL TECHNICAL UNIVERSITY
«KHARKIV POLYTECHNIC INSTITUTE»

METHODICAL INSTRUCTIONS

for the course project

“Economic evaluation of product manufacturing at the enterprise”

of the academic discipline «Enterprise Economy»

for full-time and part-time students

in the specialty 073 «Management»

Approved by
the editorial and publishing council
of the university,
protocol № 1 from 15.02.2024.

Kharkiv
NTU «KhPI»
2024

Methodical instructions for the course project of the academic discipline «Enterprise Economy» for full-time and part-time students in the specialty 073 «Management»/ authors: Havrys O.O., Havrys M.O., Havrys O.M. Kharkiv: NTU «KhPI», 2024. 34 p.

Authors: O.O. Havrys
M.O. Havrys
O.M. Havrys

Reviewer: docent S.E. Kuchina

Department of business economics and international economic relations

INTRODUCTION

The economic evaluation of production at industrial enterprises is an important task that can be solved by carrying out research, design and technological works. The course project evaluates potential sales markets for products, calculates the cost of production, determines the cost of production assets and the amount of depreciation deductions. The values of labor and salary indicators and indicators of the efficiency of the use of production assets are also calculated. When conducting calculations, potential risks and their impact on the level of economic indicators are assessed. A possible financing strategy is evaluated, credit indicators are calculated. A number of sections of the executive course project are drawn up according to the business plan development method.

In general, the essence of the work consists in the comparison of two products that can potentially be produced at the enterprise (basic product and new product). All the calculations described above are made for both basic and new products. The goal is to determine which product is more expedient to manufacture at the enterprise and why.

The introduction to the course project briefly describes the content of the development and the main tasks to be solved (the student must formulate the content and tasks of his work). Most calculations are done in tables. At the end of the work, there should be a small conclusion in which the results of the calculations are evaluated and the choice of one or another product for production at the enterprise is justified.

In table 1 below, you must enter the data according to your option. The option must be previously agreed with the teacher. The output data for all options must be provided by the teacher.

Prices for different types of materials and different types of equipment needed for production are given further below in Table 1.

Table 1 – Basic data (A=), name of product

Groups of indicators	Unit of measure	Basic product	New product	Indicator number
1. Labor input (labor intensity) of manufacturing of one item, including	norm-hours/item			1
a) Machine-tools works:				
Turning works				2
Milling works				3
Drilling works				4
Other Machine-tools works				5
b) Metalwork-assembly works (cold)				6
c) Harmful and hot works				7
d) Other works (cold)				8
2. The average category of machine-tools works				9
The average category of cold works				10
The average category of harmful and hot works				11
3. The total number of product details				12
4. Number of product part sizes				13
5. Number of sizes of original parts of the product to be mastered in production				14
6. Materials and purchased items, including:				
a) The basic materials, including rate of application of materials by kinds:				
Hire of ferrous metals	Kg/item			15
Electrotechnical steel	Kg/item			16
Nonferrous metals	Kg/item			17
Conducting materials	Kg/item			18
Other materials	Kg/item			19
b) Semi-finished products of own production	Hrn/item			20
c) Purchased components (items) and semi-finished products	Hrn/item			21
7. Net weight of the product by type of material	Kg/item			
Hire of ferrous metals				22
Electrotechnical steel				23
Nonferrous metals				24
Conducting materials				25
8. Operational indicators:				
a) volume of work at the consumer				26
b) rated power				27
c) service life	Years			28
d) efficiency	%			29
9. Duration of a production cycle of an item				30
10. Number of years of issue of an item (project realisation)				31
11. Expenses for repair, modernization, reconstruction, etc. kinds of updating of basic assets of corresponding year.				
1. Year				32
2. Year				33
3. Year				34
4. Year				35
5. Year				36

Groups of indicators	Unit of measure	Basic product	New product	Indicator number
12. Sources of funds (In % From the general value):				
a) bank credit				37
b) own means				38
c) public finance				39
13. Percent for the credit.				40

1. The prices for materials (USD/t)
- Ferrous metals – 800 – 1200;
- Electrotechnical steel – 3000 – 4500;
- Nonferrous metals – 9000 – 14000;
- Conducting materials – 18000 – 20 000;
- Other materials – 2000 – 4 000.

2. The prices for the equipment (USD/Unit)
- Turning – 5000 – 15 000;
- Milling – 10000 – 30 000;
- Drilling – 4 000 – 10 000;
- Other – 4 000 – 6 000.

1 PRODUCT DESCRIPTION

In this section of the course project a table of the basic parameters of the product is provided (table 1.1).

Table 1.1 – Product parameters (Group of indicators 8)

№	Parameter	Unit of measure	Parameter value

Table 1.1 is compiled according to DSTU, GOST, TU or another type of design documentation (DD) for products that are considered in the CP. It also provides a brief description of the needs that the respective product can satisfy, its features and advantages over similar products of this type. If available, information about patents or certificates of authorship related to the product or its manufacturing technology is provided, and features of its maintenance are outlined. In this case, the necessary literary sources and practical materials for a specific type of product are used.

Short information about your product.

2 EVALUATION OF THE SALES MARKET

In practice, this section is usually the most important part of a business plan. Experience shows that the failure of most commercial projects was associated with poor market research and the reassessment of its capacity. Market research includes: identifying market segments according to industry, functional characteristics and directions of use of products; assessment of the market capacity of products within the country and the capacity of its individual segments; identification of the share of imports in the market capacity of the product; analysis of product and company structure of the market; predicting market conditions for a period of up to two years and market development trends for the long term.

1. The market research methodology generally includes the following

steps.

2. Formulation of the problem and preliminary statement of tasks, the solution of which will solve the whole problem, in a short and clear form, indicating the necessary types of information.

3. Organization of exploratory research, including the collection of data on the main aspects of the problem. The stage ends with the final statement of the tasks.

4. Determination of the necessary initial data, methods for their preparation and types of analysis that need to be performed.

5. Data collection.

6. Analysis of the collected data.

7. Development and implementation of measures for the use of data.

The calculation of market capacity with a small number of consumers is carried out by the method of summing up markets. This allows you to identify all potential consumers of the product in each market. With a sufficiently large number of consumers, market capacity is determined using statistical methods that consider both past trends and promising factors.

The annual market capacity (Mc) for a product for industrial purposes in the general case can be expressed as follows:

$$Mc = A + Bi - E + I + Sc - Ei + Ii, \quad (2.1)$$

where A – the general release of the product (annual output); Bi – inventory balance in warehouses of products (10.5% of A); E – export (7% of A); I – import (8.5% of A); Sc – decrease (increase) in product stocks at the warehouses of consumers (10.5% of A); Ei – indirect export (2.5% of A); Ii – indirect imports (1% of A).

The main questions answered in this section are:

- who will buy the products? (What industries, enterprises, firms);
- why? (For high quality or low prices, etc.);
- when? (Today, tomorrow and the next two years);
- at what price?
- how much?

3 CALCULATION OF FULL COST PRICE AND SELLING PRICE OF ITEM

In this section the accounts of the cost price and price of items by variants are executed, and also, according to normative documents, indicators of adaptability to manufacture, important for an estimation of use of resources, are calculated.

Accounting of the cost price and price of item. According to acting standard documents the full (total) cost price of an item (C_f) includes:

$$C_f = C_{mf} + C_{adm} + C_s, \tag{3.1}$$

where C_{mf} – manufacturing cost price; C_{adm} – administrative expenses; C_s – sales costs. In turn the manufacturing cost price is defined as:

$$C_{mf} = C_m + C_{om} + C_{pa} + C_{fe} + W_b + W_a + SSC_n + C_{mo} + C_w + WL + C_o, \tag{3.2}$$

where C_m – material costs; C_{om} – semi-finished products of own manufacturing; C_{pa} – expenses for purchased components and semi-finished products; C_{fe} – expenses for fuel and energy; W_b – the basic wages; W_a – the additional wages; SSC – single social contribution; C_{mo} – costs for equipment maintenance and operation; C_w – whole-manufacturing expenses; WL – losses from wastes; C_o – other expenses.

The full cost price is the sum of expenses for manufacturing and sales of a unit of production of the given type. When calculating costs at enterprises, as a rule, the following calculations are made:

3.1 Calculations of expenses for the basic materials and semi-finished (half-finished) products of own manufacturing

Expenses for the basic materials (C_m) and semi-finished products of own manufacturing (C_{om}) are defined under the formulas:

$$C_m = K_T \cdot \sum_{i=1}^{i=m} N_{ai} \cdot P_i - RW, \tag{3.3}$$

$$C_{om} = \sum_{i=1}^{i=m} N_{ahi} \cdot C_{npi}, \tag{3.4}$$

where K_m – factor considering transport and loading-unloading costs for

materials (K_m=1,05-1,1); N_{ai} – norm of application of a material (material consumption rate) of *i*-th kind per unit of production (in the accepted units of measure); P_i – the price of unit of i-th kind of a material, hrn.; RW – cost of a returnable wastes, hrn. (equal to 1-2% from the sum of expenses for the basic materials, including transport costs); m – quantity of kinds of the basic materials; N_{phi} – norm of application of semi-finished products of own manufacturing of *i*-th kind per unit of production; C_{npi} – the manufacturing cost price of a unit of *i*-th kind of semi-finished products of own manufacturing, hrn.; m – quantity of kinds of semi-finished products of own manufacturing.

3.2 Calculations of expenses for purchased components and semi-finished products

Calculations of these expenses is executed under the formula:

$$K_{pa} = P_T \cdot \sum_{j=1}^{j=n} N_{n.j} \cdot \quad _{n.j}, \qquad (3.5)$$

where K_T – the factor considering transport costs for purchased components (K_m = 1,05-1,1); P_{nj} – unit price of *j*-th kind of the the purchased components, hrn.; N_{nj} – quantity of the purchased components of *j*-th kind for unit of production; n – quantity of kinds of purchased components for unit of production

Table 3.1 – Calculations of expenses for the basic materials, semi-finished products and purchased components

Kind of costs	Unit of measure	Price, hrn./kg	1 variant		2 variant	
			quantity	sum, hrn/item	quantity	sum, hrn/item
1. Basic materials:						
a) Hire of ferrous metals	Kg					
b) Electrotechnical steel	Kg					
c) Nonferrous metals	Kg					
d) Conducting materials	Kg					
i) Other materials	Kg					
Total cost of basic materials						
Total cost of basic materials, including shipping costs, excluding waste						
2 Semi-finished products of own manufacturing	hrn					

3 Purchased components, semi-finished products with transport costs	hrn					

3.3 Calculations of the basic wages (*Wb*)

The basic wages are defined as:

$$W_b = W_d + A, \tag{3.6}$$

where W_d – direct wages of basic industrial workers, hrn.; A – afterpayments to direct wages, hrn. (accepted by agreement with the teacher 25-30% W_d).

The direct wages for one product is calculated by the formula:

$$W_d = \sum_{i=1}^{i=m} Th_1 \cdot TF_I \cdot t_i \,, \tag{3.7}$$

where Th_I – hour tariff of the first category, hrn/h.; TF_I – tariff factor of average category of i-th kind of works; t_i – labor input of i-th kind of works for a unit of production; m – number of kinds of works.

According to acting standard documents in machine-building three significances of hour tariffs are established:

1) For competent workers of auxiliary manufacture, performing especially difficult and unique works, machine operators of the unique equipment;

2) For workers of the basic and auxiliary manufacture;

3) For the workers engaged on other works, directly not connected with the basic activity of the enterprise.

For works with the difficult and harmful working conditions the increase in annual tariffs by 4, 8, 12, 16, 20 and 24% is provided.

The payment is made according to the tariff grid given in table 3.2.

Table 3.2 – Distribution of wage rates in mechanical engineering according to the tariff grid

The wage category	1	2	3	4	5	6	7	8
Tariff factor, *TF*	1	1,12	1,35	1,56	1,71	2,0	2,2	2,4

Work of the workers engaged into various works (machine-tools, cold, hot and harmful) is usually paid differently. Therefore, accounting by these kinds of works is

conducted separately, and the direct wages by the unit of production are defined as the sum of corresponding significances. If the average category of works is not an integer, its tariff factor is defined by the method of interpolation.

$$TF_{ij} = TF_i + j \cdot (TF_{i+1} - TF_i), \quad (3.8)$$

where j – fractional part of the digit.

So, for example, the tariff factor of average category 4,6 is defined as:

$TF_{4,6} = TF_4 + 0,6 \cdot (TF_5 - TF_4) = 1,56 + 0,6 \cdot (1,71 - 1,56) = 1,65$.

Here K_{T4} and K_{T5} – tariff factors of 4th and 5th categories.

Wages accounting per unit of production is reduced into table 3.3.

Table 3.3 – Calculations of the basic wages on one item

Kind of works	1 variant				2 variant			
	Labor-intensity (labor input), n-h	Average category of work	hour tariff rate, hrn.	The sum of wages, hrn.	Labor-intensity (labor input), n-h	Average category of work	hour tariff rate, hrn.	The sum of wages, hrn.
Machine-tools								
Metalwork-assembly (cold)								
Hot and harmful								
Total direct wages								
Afterpayments to a direct wages								
Total basic wage for the unit of production								

3.4 Additional wages (W_a)

The additional wages of manufacturing workers are taken proportionally to the sum of the basic wages (12-19 %).

3.5 Single social contribution (*SSC*)

The single social contribution is a consolidated insurance contribution in Ukraine, which is collected in the system of compulsory state insurance on a mandatory basis and on a regular basis.

A single social contribution is payable to the Pension Fund of Ukraine. He replaced four earlier (until 2011) existing mandatory state social taxes: to the Pension

Fund, to the Social Insurance Fund for Unemployment, to the Social Insurance Fund for Temporary Disability and to the Social Insurance Fund for Accident. From 01.01.2016, the rate of the single social contribution has been reduced to 22% (for all categories of payers) to Article 7 of Law No. 2464-VI of the base for calculating the single contribution. In this work, as the base of accrual should be taken the cost of labor, that is, the amount of the basic (W_b) and additional (W_a) wages.

3.6 Costs for the equipment maintenance and operation (C_{mo})

Are distributed on the cost price proportionally the basic wage (100 %).

3.7 Wholemanufacturing expenses (C_w)

Are distributed on the cost price proportionally the basic wage (120 %).

3.8 Wastes losses (*WL*)

Losses from production wastes can be accepted as 1,5% from the sum of all previous items of expenses.

3.9 Other costs (*Co*)

Other costs can be accepted as 1,0% from the sum of all previous items of expenses.

3.10 Administrative expenses (C_{adm})

Administrative expenses are defined proportionally to the manufacturing cost price (6%).

3.11 Expenses for sales (*Cs*)

Expenses for sales are defined proportionally to the manufacturing cost price (3,5%).

Also, defined the wholesale price, *VAT* and the retail price of a unit of production. All accounts are reduced in tab. 3.4.

The wholesale price is defined as:

$$P_w = C_f + P_{rof}, \tag{3.9}$$

C_f – full cost price, P_{rof} – profit (15% C_f).

The value-added tax according to the legislation of Ukraine is defined as:

$$VAT=20\% \cdot P_w, \tag{3.10}$$

The selling price:

$$P_r = P_w + VAT = C_f + P_{rof} + VAT\,, \qquad (3.11)$$

All calculations are summarized into table 3.4.

Table 3.4 – Calculations of full cost price and price of the item

Cost items	Amount of expenses under articles, hrn.	
	Base product	New product
1. Basic materials (C_m)		
2. Half-finished products of own manufacturing (C_{om})		
3. Purchased components and semi-finished products (C_{pa})		
4. Basic wages (W_b)		
5. Additional wages (W_a)		
6. Single social contribution (SSC)		
7. Costs for equipment maintenance and operation (C_{mo})		
8. Whole-manufacturing expenses (C_w)		
9. losses from wastes (WL)		
10. Other expenses (C_o)		
Manufacturing cost price (C_{mf})		
11. Administrative expenses (C_{adm})		
12. Sales costs (C_s)		
Full cost price (C_f)		
Profit		
Wholesale price (P_w)		
Value-added tax (VAT)		
Selling price (P_r)		

4 DETERMINING THE VALUE OF PRODUCTION ASSETS AND DEPRECIATION CHARGE

4.1 Calculations the value of production assets

Production assets are the means of production, expressed in the monetary form.

Means of production – set of means of labor (cars, equipment, etc.) and subjects of labor (raw materials, basic materials, etc.).

Means of labor make the material contents of the fixed production assets (fixed assets), and subjects of labor – circulating (working) capital.

Thus, production assets represent set of the fixed (basic) production assets and working capital, to be exact - fixed assets and rationed working capital (figure 4.1).

Structure of production assets is different in different branches. In mechanical engineering the fixed assets makes 60-65 % of production assets cost, working capital – 35-40 %.

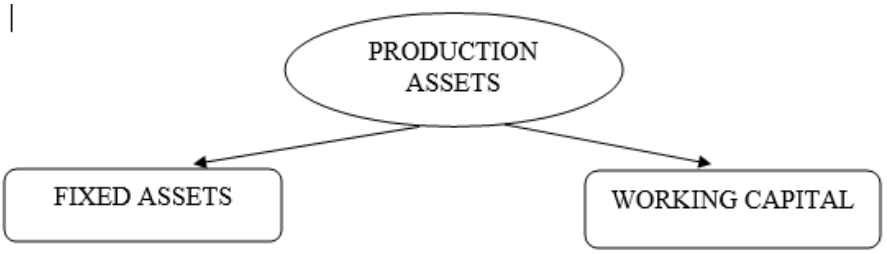

Figure 4.1 – Production assets

4.1.1 Next, you need to calculate the cost of fixed assets and working capital of the enterprise. *The calculations of fixed assets* are carried out in the following sequence:

1) the actual annual fund of the operating time of a unit of equipment is determined;

2) the number of units of machine equipment is calculated;

3) the cost of fixed production assets is calculated.

The actual annual fund of an operating time of unit of equipment (F_{act}) is defined as:

$$F_{act} = F_{reg} \cdot \left(1 - \frac{L_t}{100}\right), \tag{4.1}$$

where F_{reg} – regime fund of an operating time of a unit of equipment, hours; L_t – percent of losses of time for maintenance service and repairs (3-6 %).

F_{reg} is defined as:

$$F_{reg} = d_{wa} \cdot l \cdot t_{shift.}, \tag{4.2}$$

where d_{wa} – quantity of the working days during the year (determined according to the calendar except weekends and holidays); l – number of shifts per day (2 shifts); t_{shift} – duration of one shift in hours (8 hours).

Definition of quantity of calculated units of machine tools equipment (Q_{mt}) is

executed by the groups (turning, drilling, etc.):

$$Q_{mt} = \frac{A_a \cdot t_i}{F_{act} \cdot F_f}, \tag{4.3}$$

where A_a – annual amount of production in units; t_i – labor input (intensity) of unit of production processed on the given group of the equipment in norm-hours; F_f – the planned factor of fulfillment of norms (1.1).

The accepted (actually necessary) quantity of units of equipment (Q_{act}) is calculated, considering that the actual factor (coefficient) of equipment loading (K_{el}) should not exceed the value 0,85.

$$K_{el} = \frac{Q_{mt}}{Q_{act}} \le 0{,}85. \tag{4.4}$$

So, the accepted quantity of units of equipment (defined with rounding to an integer):

$$Q_{act} = \frac{Q_{mt}}{0{,}85}. \tag{4.5}$$

Quantity of equipment by groups as a whole is defined for two variants of a designed item in tab. 4.1.

Table 4.1 – The quantity of equipment by groups

Indicators by variants	Designations of indicators	Groups of equipment				Total
		turning	milling	drilling	other	
1 variant						
Labor intensity of an item, norm-hours	t_i					-
Labor intensity of the program, norm-hours	$A_a \cdot t_i$					-
Labor intensity of the program, machine-hours	$(A_a \cdot t_i)/F_f$					-
Quantity of machine tools calculated	Q_{mt}					-
Quantity of machine tools actual	Q_{act}					
Actual factor of loading	K_{el}					-
2 variant (the same calculations are executed)						

Calculation of the value of fixed production assets is executed in the table 4.2 by the results calculation of quantity of machine tools equipment (tab. 4.1). Equipment value is defined as:

$$V_{eq} = \sum_{1}^{m} P_{ue} \cdot Q_{act}, \quad (4.6)$$

where P_{ue} – average price of *i*-th kind of equipment, hrn. (prices for the equipment are indicated in the appendix); *m* – quantity of kinds of the equipment.

Capital value for the equipment (V_{ec}) includes also the costs of it transportation, installation and adjustment (10 %).

$$V_{ec} = V_{eq} \cdot 1.1 = V_{eq} \cdot 0.1 + V_{eq}$$

Table 4.2 – Calculation of the value of fixed production assets

Indicator	The price, hrn/pc	Designations	1 variant		2 variant	
			quantity	sum, hrn.	quantity	sum, hrn.
Value of equipment						
turning	140000		Table 4.1			
milling						
drilling						
other						
Total:		V_{eq}				
Equipment value including transportations, installation and adjustment costs		V_{ec}				
Value of other items of fixed assets (according to appendix 1)						
Value of the fixed assets (total)		V_{fa}	App 1 total			
Value of production assets		$V_{pa}=V_{fa}+V_{wc}$				

The cost of other components of fixed assets is calculated based on their structure according to Appendix 1 and the calculated absolute values of the cost of the equipment. The cost of other components of fixed assets is calculated according to the proportion:

V_{ec} – 39,3%

X – 36,3%

$X = V_{ec} \cdot 36,3 / 39,3$

If the obtained value of the cost of the production area does not coincide with the one calculated above, then for further calculation we accept the value determined by the structure.

4.1.2 The value of working capital is calculated on the basis of the previously determined values of basic materials and purchased components (table 3.1 or 3.4) and the indicative structure of working capital, which is given in app. 2.

When calculating the value of working capital (similar to the calculation of the value of fixed assets) consider the number of turnovers of working capital, which is calculated as follows:

$$F_{it} = T / D_t = 360 / (D_{cycle} + 10), \quad (4.7)$$

where T – planning period, here it is a year, which is 360 days; D_t – duration of one turnover of the working capital; D_{cycle} – duration of a production cycle of an item (part 9 of the initial data + (10-15) days).

So, the total cost of materials is calculated by the formula:

$$C_{m\Sigma} = ((C_m + C_{pa}) \cdot A_a): F_{it}, \quad (4.8)$$

where $(C_m + C_{pa})$ – the cost of materials and purchased components and semi-finished products (Table 3.1 or 3.4). According to appendix 2, is 43.5% of the total value of working capital.

The value of other components of working capital (assets) is determined according to the structure given in app. 2.

The calculation of the value of working capital is given in table. 4.3.

Table 4.3 – Calculation of the value of working capital

Elements of working capital	Value by variants	
	1 variant	2 variant
(Elements of working capital according to appendix 2)		
Total value of working capital		

4.2 Calculation of the value of intangible assets

Along with the basic assets, concept of “intangible assets” is considered. They include so-called imperceptible assets, which can produce profit during several years (patents, licenses, complete sets of design and technological documentation, technological secrets (know how), trademarks, software, the lease rights, “goodwill” (reflection of accompanying advantages of assets – a convenient location, qualified personnel, wide experience of work, traditions, etc.).

So, the objects of intangible assets include the manufacturing and intellectual property, and also other rights, recognized as objects of the property right (patents, licenses, complete sets of the design and technological documentation, new technologies, "know-how", trademarks, rights of lease, etc.). In practice their value is defined by direct accounting. According to the Tax Code of Ukraine, there are 6 groups of intangible assets subject to depreciation (table 4.4).

Table 4.4 – Classification of groups of intangible assets

Groups	Term of right to use
Group 1 — the right to use natural resources (subsoil license, the right to use other natural resources, geological and other environmental information)	Subject to title document
Group 2 — the right to use property (the right to use land plot except for the right to permanent use of land plot under the legislation, the right to use building, the right to rent facilities etc.)	Subject to title document
Group 3 — the rights for trade names (the rights to trademarks (marks for goods and services), commercial (business) names etc.) except for those the expenses for acquisition of which are recognized as royalty	Subject to title document
Group 4 — the rights for industrial property items (the right to inventions, useful models, industrial patterns, plant varieties, animal breeds, semiconductor topography rights, trade secrets, including know-how, protection against unfair competition) except for those the expenses for acquisition of which are recognized as royalty	Subject to title document but at least 5 years
Group 5 — copyright and allied rights (right to literary works, pieces of art, musical pieces, computer programs, software for electronic computing devices, database compilations, phonograms, videograms, broadcasting programs etc.) except for those the expenses for acquisition of which are recognised as royalty	Subject to title document but at least 2 years

Group 6 — other intangible assets (the right to carry out activity, use of economic and other benefits etc.)	Subject to title document

In course project intangible assets may be taken as part of fixed (basic) manufacturing assets (5%).

4.3 Calculation of depreciation charge

Fixed (basic) assets are divided into active and passive parts. Active part includes funds, which directly participate in processes of production manufacturing. These are the working machinery and equipment, measuring and adjusting devices and systems, power equipment. Other funds are included into the passive part. There are organizational and technical measures for production efficiency increase. They are taken to increase a share of an active part of the basic assets. They consist in reduction of a building part of funds (for example, at the expense of application of columnless buildings design, using of the modern and highly effective technical equipment, etc.). In the tax accounting, since January 1st, 2011 in the process of determination of funds depreciation (amortization) groups of fixed assets are used (table 4.5).

For the accounting of depreciation charge of fixed (basic) assets from tab. 4.2 should be distributed on to the indicated 16 groups.

In practice, in tax accounting, depreciation reports are submitted quarterly and the depreciation amount is calculated as a three-month deduction; in book keeping – depreciation is accrued on a monthly basis and reports are submitted on a monthly basis. In CP, to simplify calculations, we calculate depreciation for 4 quarters of one year and only for certain groups of fixed assets.

Norms of depreciation deductions by groups are defined proceeding from term of use of object of basic assets. In the course project it is necessary to take the minimum terms established by the legislation and resulted in table 4.5. For the intangible assets the term of depreciation should be accepted at a rate of 10 years.

Depreciation charges are carried out according to the rates of depreciation (R_d).

R_d is a percent of quarterly or monthly assignments from original cost or residual value of the basic assets at the manufactured production.

The depreciation rate (R_d) indicates what percentage of the value of a fixed asset should be depreciated in a quarter.

Table 4.5 – Classification of groups of fixed assets and the minimal terms of their depreciation

Group	Contents	Minimal term of depreciation
Group 1	Land plots	-
Group 2	Capital expenses for land improvement that are not related to construction	15
Group 3	- building - structures - transmission devices	20 15 10
Group 4	Machinery and equipment including: computers and other machines for automatic processing of information, connected with them, means or reading and printing of information, related computer software (other than software acquisition costs are recognized as royalty and / or programs that are recognized as intangible assets), and other information systems, switches, routers, modules, modems, uninterruptible power supplies and means for connection to telecommunication networks, telephones (including cellular), microphones and radios, which value is higher than 2500 hrn.	5 2
Group 5	Transport means	5
Group 6	Instruments, equipment, inventory (furniture)	4
Group 7	Animals	6
Group 8	Perennial plants	10
Group 9	Other fixed assets	12
Group 10	Library funds	-
Group 11	Non-current tangible assets of low cost	-
Group 12	Temporary (denotified) facilities	5
Group 13	Natural Resources	-
Group 14	Returnable packaging (reusable containers)	6
Group 15	Items of renting (rent objects)	5
Group 16	Long-term biological assets	7

Depreciation charges are charged on balance (residual) value of the basic assets. This value in a quarter A is defined as:

$$BV_i = BV_{i-1} + C_{n\,i-1} - C_{r\,i-1} - A_{i-1}, \tag{4.9}$$

here RV_{A-1} – balance (residual) value in previous (A-1) quarter; $C_{n\,A-1}$ – the value of new basic assets for the previous quarter; $C_{r\,A-1}$ – the value of the basic assets which were removed in previous quarter; DC_{A-1} – depreciation charges for the previous quarter. Be careful! In the course project, the value of the corresponding group of fixed assets at the beginning of the first quarter is taken from appendix 1 (we have already calculated it earlier in this section and entered it in this appendix). The cost of fixed assets at the beginning of the next quarter is equal to the cost at the beginning of the previous quarter minus depreciation charges. There are no introduced and withdrawn fixed assets in the course project.

So:

$$A_i = \frac{\sum_{i=1}^{n} BV_i \cdot Da_i}{100}, \tag{4.10}$$

Where Da_i – rates of depreciation for i-th group of basic assets.

$Da_i = (1/T) \cdot 100\%$,

Results of accounts are reduced in tab. 4.6 and 4.7.

Table 4.6 – Balance (residual) value

Group of fixed assets and intangible assets	Quarters			
	1	2	3	4
Group 3 (building)				
Group 4 (machinery and equipment) *Vec*				
Group 4 (computers)				
Group 5				
Intangible assets				

Table 4.7 – Depreciation

Group of fixed assets and intangible assets	Quarters			
	1	2	3	4
Group 3 (building)				

Group 4 (machinery and equipment)				
Group 4 (computers)				
Group 5				
Intangible assets				

Depreciation calculation sequence:

1) The cost of fixed assets at the beginning of the first quarter is taken from Appendix 1.

2) Calculate the depreciation of the first quarter (be careful - we use the straight-line method!)

3) Calculate the cost of fixed assets in the following quarters.

5 EVALUATION OF PERFORMANCE INDICATORS OF PRODUCTION ASSETS

Productivity of production assets to a large degree defines efficiency of all manufacturing process.

Indicators of productivity of the fixed assets (use indicators) are divided into two groups: *partial and general*.

In this course project should be calculated *general indicators* of productivity of the basic assets.

So the following indicators of efficiency of the fixed assets use should be calculated: *capital productivity, capital intensity* and *fixed capital per worker*.

1. The most important and applied indicator is *capital productivity (CP)*:

$$CP = \frac{CO}{PA} \quad \text{or} \quad CP = \frac{CO}{C_{aa}}, \tag{5.1}$$

where: CO – volume of commodity output, in most cases, it is equal to the revenue, hrn.; PA – cost of production assets, hrn.; C_{aa} – average annual value of the fixed (basic) production assets.

The following changes in the volume of production in natural units by year of production (in% of the nominal value indicated in the initial data) should be

considered in determining the *CO*: 1 year – 80%; 2 years – 100%; 3 years – 120%; 4 years – 100%; 5 year – 90%

2. *The capital intensity* (CI) is the indicator, inverse to the capital productivity:

$$CI = \frac{C_{aa}}{CO} \quad CI = \frac{C_{aa}}{CO}, \tag{5.2}$$

It shows the value of the basic assets for one hryvna of output.

3. *Capital endowment, fixed capital per worker* (FC_w) is calculated as:

$$FC_w = \frac{PA}{N} \quad \text{or} \quad FC_w = \frac{C_{aa}}{N}, \tag{5.3}$$

where N – the number of manufacturing workers or all industrial-manufacturing staff.

Indicators of productivity of the working capital.

Working capital of the enterprise always moves. During the analysis, three stages of movement are allocated. At the first stage, monetary resources (*M*) transform into stocks of commodities and materials (*S*). At the second stage commodities and materials go to production process and turn into the work in progress (W_p), and then into finished products (P^1). At the third stage, finished products P^1 go into the sphere of circulation and are sold for the amount of money M^1. This process can be represented as:

$$M - S - ...W_p - ...P^1 - M^1,$$

As a rule, $M^1 > M$.

The difference between M^1 and *M* is a profit.

The following indicators of efficiency of circulating assets should be calculated:

1. *Inventory turnover factor* (f*actor of turnover of circulating assets)*:

$$F_{IT} = \frac{CO}{CC_a}, \tag{5.4}$$

where CC_a – the average rest of working capital, hrn.

2. *Duration of one turn-over (duration of one turn of the circulating capital)*:

$$D = \frac{T}{F_{IT}}, \tag{5.5}$$

where T – duration of the planned period in days. If T is a fiscal year, then it is = 360 days, and if financial quarter, $T = 90$ days.

3. *Loading factor of circulating assets*:

$$F_l = \frac{Ac}{CO} \; F_L = \frac{CC_a}{CO}, \tag{5.6}$$

We define also the profitability of each unit of production:

$$P_u = \frac{P_{un}}{C_{fu}} \cdot 100\%, \tag{5.7}$$

where P_{un} – profit per one unit of production, hrn.; C_{fu} – the full cost price, hrn.

Profitability of production by the full cost price and profitability of production assets:

$$P_{FCP} = \frac{P_t}{CP_{fT}} \cdot 100\%; \quad Đ_{PA} = \frac{P_t}{PA} \cdot 100\%, \tag{5.8}$$

where P_t – total profit for a year, hrn.; CP_{fT} – the full cost price of annual output, hrn.

Table 5.1 – Indicators of productivity of production assets

Indicator	Variant	Value by years				
		1	2	3	4	5
CP	1					
	2					
CI	1					
	2					
FC_w	1					
	2					
F_{IT}	1					
	2					
D	1					

	2					
F_L	1					
	2					
$P_и$						
P_{FCP}						
P_{PA}						

6 CALCULATION OF THE NUMBER OF EMPLOYEES AND WAGES

This section defines the effective annual fund for one employee's work time, calculates the number of main workers, calculates the annual fund and the average monthly wage of workers.

Effective fund of the working time of one worker (working time of one worker during the planned period) is defined as:

$$F_e = F_{reg(w)} \cdot \left(1 - \frac{L_{t(w)}}{100\%}\right), \quad (6.1)$$

where $F_{reg\ (w)}$ – regime fund of an operating time of one worker for the period, hours (for workers with normal working conditions, $F_{reg\ (w)}$ can be taken in 2024 h/year, for work with severe and harmful working conditions – 1836 h/year); $L_{t(w)}$ – percentage of planned losses of working time of workers (absences: tariff vacation etc. (10-12 %)).

$F_{e\ (normal\ work)} = 2024 \cdot 0.9 = 1822$ h/year

$F_{e\ (s\text{-}h\ work)} = 1836 \cdot 0.9 = 1655$ h/year

The *number* of workers engaged to normalized works (main workers):

$$n_{m\ wi} = \frac{\sum_{i=1}^{i=m} A_{a_i} \cdot t_i}{F_e \cdot F_f}, \quad (6.2)$$

Where $n_{m\ wi}$ – number of main workers of i-th category of the given profession and speciality; t_i – Labour intensity of unit of work (operation) of i-th category; A_{ai} –

quantity of units of work of i-th category (for period); $\sum_{i=1}^{i=m} A_{ai} \cdot t_i$ – labour intensity of the program for the planned period in norm-hours; F_e – effective fund of the working time of one worker (working time of one worker during the planned period); m – quantity of categories on works of the given profession and speciality; F_f – factor of fulfilment of time rates.

The calculation of the number of main workers by occupation and area is performed in table 6.1. The accepted (actual) number of workers is determined by rounding to an integer.

Table 6.1 – Calculation of main workers number

Indicators by variants	Designations of indicators	Kind of works				Total
		Machine-tools	Metalwork-assembly (cold)	Hot and harmful	Others works	
Base item						
Labor intensity of an item, norm-hours	t_i					
Labor intensity of the annual program, norm-hours	$Aa * t_i$					
Labor intensity of the annual program, machine-hours	$(A_a * t_i)/F_f$					
Quantity of main workers calculated,	n_{mw}					
Quantity of main workers accepted (actual) - round to an integer,	$n_{mw\ act}$					
New item (the same calculations are made)						

The annual wage fund for production workers (WF_a) is calculated as follows:

$$WF_a = (W_b + W_a) \cdot A_a, \quad (6.3)$$

where W_b – basic wages of one item; W_a – additional wages.

The average monthly wage per worker (W_m) is defined as:

$$W_m = \frac{WF_a \cdot PR}{12 \cdot n_{mw\ act}}, \quad (6.4)$$

where PR – premium rate (accepted in the range of 1.1-1.2).

The calculations of the annual fund and the average monthly wage of production workers are performed in Table 6.2.

Table 6.2 – Calculation of wage indicators

Indicators	Designations of indicators	Value	
		Base item	New item
Basic wages of one item	W_b		
Basic wages of annual output	$W_b * A_a$		
Additional wages of annual output	$W_a * A_a$		
Annual wage fund	WF_a		
Accepted (actual) quantity of main workers	$n_{mw\,act}$		
Average monthly wage	W_m		

Along with the calculation of the number of production workers, it is necessary to determine the number of industrial-manufacturing personnel, considering the following production structure: workers – 75.2% (including the main – 57.1%); engineering and technical staff (including administrative and management staff) - 19%; employees – 3.0%; apprentices – 1.5%, junior service personnel – 0.8% security – 0.5%. Calculations can be made out in the form of a table 6.3.

Table 6.3 – Number of industrial-manufacturing personnel (IMP)

IMP	%	People
Workers including main worker	75,2 57,1	$n_{mw\,act}$
Engineering and technical staff (including administrative and management staff)	19	
Employees (clerks, secretaries, printers etc)	3	
Junior service staff (couriers, cleaners) Security (guard)	0,8 0,5	
Apprentices	1,5	
Total	100	

7 FINANCIAL PLAN

In foreign practice, this section provides a forecast of sales volumes; balance of cash expenses and receipts; table of income and expenses; consolidated balance sheet of assets and liabilities of the enterprise; break-even chart. These financial documents comply with European accounting standards and differ from domestic practice, however, in connection with the trend towards unification of financial and economic

documents in the future, obviously, we should focus on them. Given the existing tax system, in the course project it is necessary to determine the profit (P_{rof}) for the annual sales (A_s):

$$P_{rof} = (P_w - C_f) * A_s. \quad (7.1)$$

The objective of most enterprises is to make profits – or at least to avoid losses. All business firms need to know at what point their sales revenue or income will permit them to meet all their obligations – fixed (contractual) and variable (non-contractual). This point is called the *breakeven point*. They are also interested in knowing at what point income from sales will exceed expenses, thus yielding a profit.

Break-even analysis, also known as cost-volume-profit analysis, is a useful tool that permits firms to visualize more clearly the revenue-cost relationship at different levels of output. It is based on certain concepts used in preparing a variable budget.

In the process of breakeven analysis, the classification of costs by the nature of their behavior when changing the volume of sales of products is used. Full (total) costs are divided into fixed and variable.

$$C_f = FC + VC, \quad (7.2)$$

In the course project is also being built a break-even chart. The objective of break-even analysis is to show diagrammatically revenues and costs to determine at what volume (of production or sales) a company's total costs equal total revenues, leaving neither profit nor loss.

Computing the Break-Even Point: *The break-even point (BEP*) is the point on a chart at which total revenue exactly equals total costs (fixed and variable).

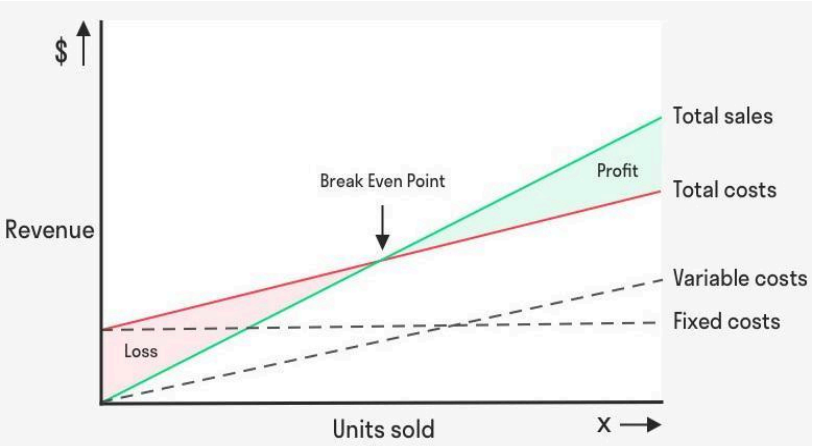

Figure 7.1 – Break-even chart

To build a break-even chart, the variable costs for one product and the fixed costs for the annual volume of product output are calculated.

Unit-specific variable costs:

$$VC^{unit} = C_m + C_{om} + C_{pa} + W_b + W_a + SSC_n + 0{,}7*C_{mo} + 0{,}2*C_s\,, \qquad (7.3)$$

$$Cf = FC + VC => FC = (Cf - VC^{unit}) \quad * Aa$$

A *breakeven analysis formula* is a mathematical formula that can help you determine when your company will break even and, as such, when and how to become profitable. Break-Even Point formula in units consider fixed costs, selling price and variable costs per unit of production:

$$BEP = FC / (P_w - VC^{unit}), \qquad (7.4)$$

Thus, ceteris paribus (if everything else being equal), an increase in production output leads to a decrease in the cost per unit of output, which is the reason for the decrease in cost as a whole.

CONCLUSION

In conclusion, the main results of the work done are presented. Predicted, if possible, the dynamics of the most important technical and economic indicators of

these products. Make a final conclusion about which product is more expedient to manufacture at the enterprise – basic or new.

THE APPENDIX 1

Structure of the fixed production assets of the enterprise

Kinds of basic production assets	Relative density, %	Value, th UAH	Value, th UAH
1 Buildings.	36,3		
2 Structures.	6,3		
3 Transfer systems.	3,6		
4 Machines and equipment.	49,8		
Including:			
4.1 Power machines and equipment	2,3		
4.2 Working machines and equipment, **Vec**	39,3	*	*
4.3 Measuring and regulating devices and systems, laboratory equipment.	3,0		
4.4 Computer facilities.	4,7		
4.5 Other machines and the equipment.	0,5		
5 Transport.	2,1		
6 Tools.	1,0		
7 Industrial stock.	0,7		
8 Economic stock.	0,2		
TOTAL	100		

THE APPENDIX 2

Structure of working capital of the enterprise

Elements of circulating assets	Relative density, %	Value, mln UAH	Value, mln UAH
I. Circulating industrial assets:			
1. Industrial stocks:			
a) Raw materials, basic materials and purchased semi-finished products, $C_{m\Sigma}$	43,5	*	*
b) Auxiliary materials	3,1		
c) Fuel	1,4		
d) Invaluable and high wear tools and instruments	8,6		
e) Spare parts for repair of equipment	1,6		
f) Containers and tare materials	1,6		
2. A work in progress and half-finished products owr manufacturing.	24,6		
3. Costs of the future periods.	1,0		
II. Cash and disposal stocks:			
1. Finished goods in warehouses.	14,4		
2. Production shipped, but not received by the buyer.	0,1		
3. Money resources and means in not finished accounts.	0,1		
TOTAL	100		

LIST OF INFORMATION SOURCES

1. Shubik M., Smith E. The Guidance of an Enterprise Economy. Cambridge : The MIT Press, 2016. 592 p.
2. Ahuja H. L. Business Economics Paperback. New Delhi : S Chand & Co Ltd, 2017. 712 p.
3. Handbook on the Economics and Theory of the Firm / edited by M. Dietrich, Krafft J. Cheltenham : Edward Elgar, 2012. 608 p.
4. Mankiw N., Taylor M., Ashwin A. Business Economics. Cengage Learning EMEA, 2019. 562 p.
5. Ricketts M. The Economics of Business Enterprise: An Introduction to Economic Organisation and the Theory of the Firm. Cheltenham : International Student Edition, 2003. 592 p.
6. Caves Richard E. Multinational Enterprise and Economic Analysis.

Cambridge : Cambridge Surveys of Economic Literature, 2007. 402 p.

7. Neil Harris. Business Economics: Theory and Application. London : Routledge, 2001. 81 p.

8. Економіка підприємства : підручник : у 3 ч. Ч. 2 / А. А. Мазаракі, Г. В. Блакита, Г. В. Ситник та ін.; за заг. ред. А. А. Мазаракі. Київ : Держ. торг.-екон. ун-т, 2023. 472 с.

9. Бойчик І.М Економіка підприємства: підручник. К. : Кондор -Видавництво, 2016. 378 с.

10. Dietrich M. Economics of the Firm Analysis, Evolution and History. London : Routledge, 2007. 252 p.

11. Spread P. Companies and markets: economic theories of the firm and a concept of companies as bargaining agencies. *Cambridge Journal of Economics.* Cambridge, 2016. Vol. 40, No. 3. pp. 727-753.

12. Економіка підприємства : магістерський курс : навч. посіб. / за ред. А.І.Яковлєва, Л.С. Ларки. Харків: НТУ «ХПІ», 2018. 515 с.

13. Податковий кодекс України від 2 грудня 2010 року № 2755 (зі змінами та доповненнями). URL: http://zakon2.rada.gov.ua/laws/show/2755-17.

14. Положення (стандарт) бухгалтерського обліку 7 «Основні засоби»: наказ Міністерства фінансів України від 27.04.2000 р. № 92.URL: http://zakon3.rada.gov.ua/laws/show/z0288-00.

15. Шкварчук Л. О. Ціни і ціноутворення: навч. посіб. Київ : Кондор, 2004. 214 с.

CONTENT

Навчальне видання

«ЕКОНОМІКА ПІДПРИЄМСТВА»

методичні вказівки до виконання курсового проекту
для студентів спеціальності 073 — «Менеджмент»
денної та заочної форм навчання (англійською мовою)

Укладачі: ГАВРИСЬ Ольга Олександрівна
ГАВРИСЬ Микола Олександрович
ГАВРИСЬ Олександр Миколайович

Відповідальний за випуск проф. Перерва П. Г.
Роботу до видання рекомендував проф. Погорєлов С. М.
В авторській редакції

План 2024, поз. 22

Підп. до друку 2024 р. Формат 60x84 1/12. Папір офсетний.
Друк — рзографія. Гарнітура TimesNewRoman. Ум. друк. арк. 4
Обл.вид. арк. Наклад 50 прим. Зам. № Ціна договірна

Видавничий центр НТУ «ХПІ». 61002, Харків, вул. Кирпичова, 2
Свідоцтво про державну реєстрацію ДК № 5478 від 21.08.2017 р.

Самостійне електронне видання