Ministry of Education and Science of Ukraine
Ternopil Ivan Puluj National Technical University
Economics and management department
Management and Administration Department

EXPLANATORY NOTE

to the Bachelor's paper

ON TOPIC
"Evaluation of resource management in the organization by using data of LCC TerPolymerGas"

Performed by: 4-th year student
Group: IBM-43
Speciality: 073 Management

_____ Pascal Ifeanyi Igboanugo
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Ternopil – 2022

Ministry of Education and Science of Ukraine
Ternopil Ivan Puluj National Technical University

Faculty Economics and Management
Department Management and Administration
Educational Degree Bachelor's Degree
Specialty 073 Management

Approved by:
Department Head *Olena Sorokivska*

BACHELOR'S PAPER TASK

Pascal Ifeanyi Igboanugo
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1. Bachelor's paper Topic:
Evaluation of resource management in the organization by using data of LCC TerPolymerGas"

Supervisor PhD Tetiana Kuzhda
(full name, scientific degree, academic rank)
Approved by the Order on «20» September 2022 №4/7-771
2. Submission deadline
3. Input data financial statement, balance sheet, productivity report, product catalogue, and pricing catalogue
4. Brief Content of the Bachelor's paper:

Chapter 1. The theoretical framework and studies
Chapter 2. Research and analysis
Chapter 3. Recommendations
Chapter 4. Occupational health and safety in emergencies

5. List of tables and figures: 1) tables: product types description, statistical data on TerPolymerGas performance, statistics and working time analysis metrics, data on the LCC TerPolymerGas fixed assets, SWOT analysis results of the LCC TerPolymerGas business operations, variables and constraints for resource optimization model; 2) figures: economic resource types used in a business company, the main resource management components, LCC TerPolymerGas organizational, relative volume of products sold in foreign markets in 2021, the resource optimization model for production of water / gas pipe, diam. 25-40 by using Solver

6. Consultants to Bachelor's paper Chapters

Chapter	Consultant's full name	Signature, date	
		given by	checked by
Chapter 4.	Struchok Volodymyr		
Bachelor's paper style and format	Mosiy Olha		

7. Date of assigning the task _____

CALENDAR PLAN

№	Content	Chapters Deadline	Note
	Introduction	October	Done
1	The theoretical framework and studies	October	Done
1.1	Meanings and definitions of organization's resources	October	Done
1.2	Theoretical review of resource management in the organization	October	Done
2	Research and analysis	November	Done
2.1	LCC TerPolymerGas introduction	November	Done
2.2	Evaluation of the LCC TerPolymerGas resource management	November	Done
3	Recommendations	November	Done
3.1	Recommendations for improving the LCC TerPolymerGas business operations	November	Done
3.2	Recommendations for improving the LCC TerPolymerGas management	December	Done
4	Occupational health and safety in emergencies	December	Done
4.1	Occupational health at work	December	Done
4.2	Creation of material reserves in case of emergencies	December	Done
	Conclusions	December	Done
	References	December	Done
	Appendices	January	Done

Student _____ Pascal Ifeanyi Igboanugo
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SUMMARY

Bachelor paper topic: Evaluation of resource management in the organization by using data of LCC TerPolymerGas".

Bachelor paper consists of 52 pages, 9 figures, 15 tables, and 25 references.

The object of investigation is the resource management of LCC TerPolymerGas".

The aim of the Bachelor paper is to evaluate the LCC TerPolymerGas" resource management.

The results are obtained with the following research methods: analysis (comparative, econometric, time series), SWOT analysis, and resource optimization model.

The recommendations concerning the businees operations of the LCC TerPolymerGas" have been developed. SWOT-analysis of the LCC TerPolymerGas" businees operations has been done. The LCC TerPolymerGas strengths and weaknesses as well as the external opportunities and threats has been evaluated and scored. Pipe output (diam. 32) from recycled plastic waste at the LCC TerPolymerGas has been calculated. The resource optimization model for production of water / gas pipe, diam. 25, 32, 40 has been built and solved where the objective function is the maximum sales revenue.

Keywords: resource, asset, resource management, strengths, weakness, opportunities and threats, water and gas pipes, and resource optimization model.

CONTENT

INTRODUCTION

This bachelor paper is about the evaluation of resource management of the LCC TerPolymerGas. Resource management is a type of management in the organization, which is carried out on the basis of certain principles and methods of enterprise resource management, and also refers to the implementation of management decisions regarding the effective use of resources in the specific conditions of the enterprise.

The aim of the bachelor paper is to examine and evaluate the resource management of the LCC TerPolymerGas. We used some research methods including analysis (comparative, econometric, time series), SWOT analysis, and resource optimization model.

This bachelor paper consists of 4 chapters where we have described resource management of the LCC TerPolymerGas and evaluated resource management components in order to find the ways on how to improve decision making regarding resource management.

The main tasks of this bachelor paper are:

- to review the theoretical framework and studies regarding organization's resources and resource management;

- to investigate and analyze the LCC TerPolymerGas activity;

- to estimate the LCC TerPolymerGas resource management;

- to propose the ways on how to improve the LCC TerPolymerGas business operations;

- to design the recommendations concerning the LCC TerPolymerGas resource management improvement;

-to describe occupational health at work and material reserves in case of emergencies.

CHAPTER 1
THE THEORETICAL FRAMEWORK AND STUDIES

1.1 Meanings and definitions of organization's resources

A company must comprehend the resources it employs, how they work in its business model, and how to get the most out of them if it wants to succeed in the modern market. The assets a company has at its disposal to use in the production process are collectively referred to as organizational resources.

Organizational resources can be divided into four categories: raw materials, capital, financial, and human resources. To produce final goods, organizational resources are integrated and put to use. Employees who work for the business are considered human resources. Financial resources are the funds that senior management employs to make purchases for the company. Products are made from raw materials, such as wheat, butter, sugar, and eggs, which are the raw materials used to manufacture baked goods. The equipment employed in the manufacturing process is referred to as capital resources [9].

The resources of a company can be divided into a number of categories. Resources serve as the foundational elements of an organization since they are its assets. Intangible assets like its technology (patents and copyrights), culture, and reputation are also included. Tangible assets are things like a company's plant, equipment, money, and location. Human assets include things like the number of people, their abilities, and their motivation [9].

The least amount of resources necessary to withstand competition are called threshold resources. Three crucial internal factors determine organizational strategic capabilities: present resources; abilities to carry out business activities; activity, resource, and business unit balance.

The figure below shows the influence of organizational resources on company strategy development, strategy execution.

Figure 1.1 – Framework demonstrating how strategy and execution are connected

Every company, firm or organization try to find an answer on what factors determine resource value. The ability to meet a customer's needs more effectively than the rival companies depends on the resource or talent. In fact the resource is limited and access to them can be difficult due to bad logistics and other factors. Is it difficult to replicate, replace, or find in small supply? Whether a resource is appropriate depends on whether it will produce benefits.

The following list includes the best categories of corporate resources that are essential to the industry: 1) financial resources (liquid assets, available funds, capital goods and etc.); 2) human resources (manpower, company staff, management, labour, human capital, etc.); 3) material resources (assets, wealth and etc.); 4) intellectual resources (brain power, mental resources, etc.).

The description below explains corporate resources in detail.

Financial resources are frequently obtained through an institution or an investor. A major organization may acquire capital from individual or equity

investors, mutual funds, and shares, but small enterprises typically have difficulty receiving bank loans. Venture capitalists also make investments in firms, but they have a lot of requirements for both small and large enterprises. They could want a set rate of return, a share in the company, and a say in management choices. The assets of the business are its financial resources, which are utilized for tasks like paying employees' salaries and purchasing supplies, among other things. It's crucial to use the greatest financial resource management strategy to meet the company's goals and objectives. According to the level, the monetary system is made up of a wide variety of elements. A company's financial system contains processes that adhere to its financial operations, in its eyes. It would include topics including money, accounting, income, outlays, salaries, and more.

Figure below shows the financial resource composition of an enterprise.

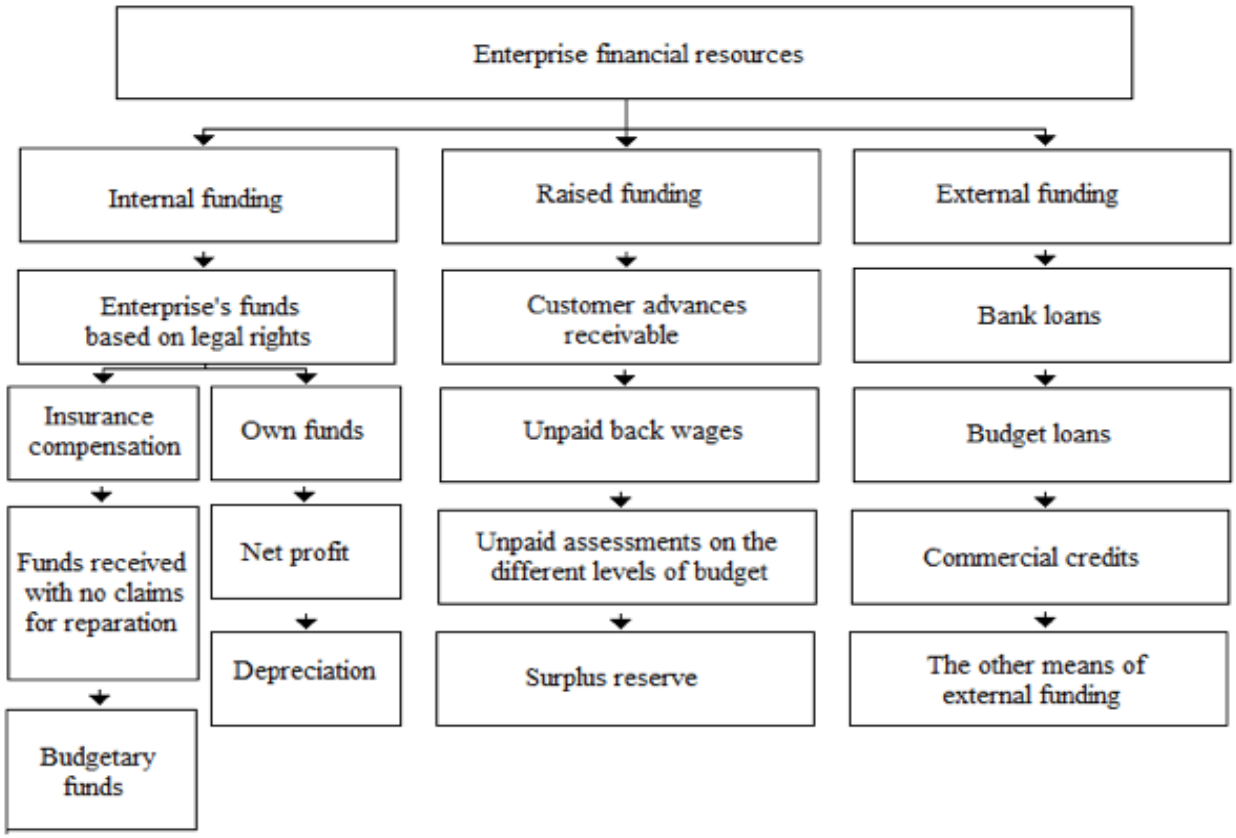


Figure 1.2 – Enterprise financial resource types

Internal funding refers to the ongoing movement of money within an organization. It is unknown how long internal funds will be used. It is produced using

the organization's own capital, which includes assets left over after all of the organization's assets have been used up. Financial asset balances that resulted from routine economic activity in the interests of persons and/or legal entities are included in raised financing. These funds may have been obtained directly or indirectly from individuals and/or legal entities on a payback basis [10].

External funding refers to the reimbursable, repayable money that the business receives for a brief time. Typically, the company obtains its outside finance through short- and long-term bank loans. An organization's financial resources, productivity, and all of the sources mentioned above are used in commercial operations that attempt to make profits. Businesses may employ both internal financing, which refers to resources produced from internal sources (share capital, capital surplus and reserve capital, retained earnings), and external finance in the short term on the basis of predetermined principles (credits and loans, accounts payable, other liabilities).

A corporation uses the following categories of funding sources when it needs financial resources; shares of equity or capital, preference shares or preference capital, retained profits, debenture, market credit, financial services, loans for working capital, discounting bills, venture capital, rental finance.

Human resources – all organizations regardless of the legal form are built on their human resources. The absence of human resources prevents performance and accomplishment. If you are employed by a company, you are already somewhat familiar with human resources. The company has a department that handles hiring new workers and managing existing ones, such as handling payroll, onboarding, training, and development. The group of individuals who work for a certain company, corporate sector, industry, or economy is referred to as its human resources. Human capital, or the knowledge and abilities that people possess, is a more specific idea. Manpower, labor, personnel, colleagues, or simply "people" are comparable concepts [6]. An organization's human resources department (HR department) handles human resource management, supervising various employment-related tasks like ensuring that labor laws and employment standards are followed, conducting interviews, managing employee benefits, organizing employee files with the

necessary paperwork for future use, and managing some aspects of recruitment (also known as talent acquisition) and employee offboarding. They act as a liaison between a company's management and its workers.

Planning, the hiring and selection process, posting job adverts, and performance evaluation are among the responsibilities security checks are made, credentials and applications are organized, interviews are scheduled, help is provided, and interviews are conducted. Payroll and benefits administration is a different activity that involves monitoring vacation and sick time accruals, evaluating payroll, and taking part in benefits-related activities including claim resolution, benefits statement reconciliation, and invoice approval for payment. Employee counseling is only one of the programs and activities that HR organizes in regard to employees. The last task is routine maintenance, which involves executing payroll/benefit-related reconciliations, ensuring that the databases and files used for HR are updated, and sustaining employee benefits and occupational status [9].

Material resources – the physical building blocks of the economy are the natural resources and other commodities they offer, which are necessary to sustain economic activity. Their usage for commercial purposes and the associated production and consumption processes have numerous negative environmental, economic, and social effects that frequently cross national or regional boundaries.

The kind, quantity, and stage of the resource cycle at which they occur, the method in which the material resources are utilized and managed, and the sort and location of the natural environment from which they originate all affect the severity and character of these repercussions. It's crucial to use resources efficiently across the economy in order to provide sufficient supply of materials for economic activity, reduce waste, and increase minimizing the resulting environmental impact and limiting the deterioration and exhaustion of natural resources. Natural resources classified as having value are those that may be exploited for useful, utilitarian human purposes [9].

Intellectual resources include he worth of a company's staff expertise, skills, professional training, or other private information that might provide the organization

a competitive advantage is known as intellectual capital. The accumulation of all knowledge assets a business has at its disposal that may be utilized to increase sales, attract new clients, develop new products, or generally enhance the firm is collectively referred to as intellectual capital and is regarded to be an asset. The combination of organizational procedures, personnel knowledge, and other intangibles is what determines a company's profitability [2].

Human capital, information capital, brand awareness, and instructional capital are a few of the subgroups of intellectual capital. Although assessing intellectual resource is a very individualized endeavor, it is a valuable company asset. Figure below shows that human, structural, and relational capital are added up to form company's intellectual capital.

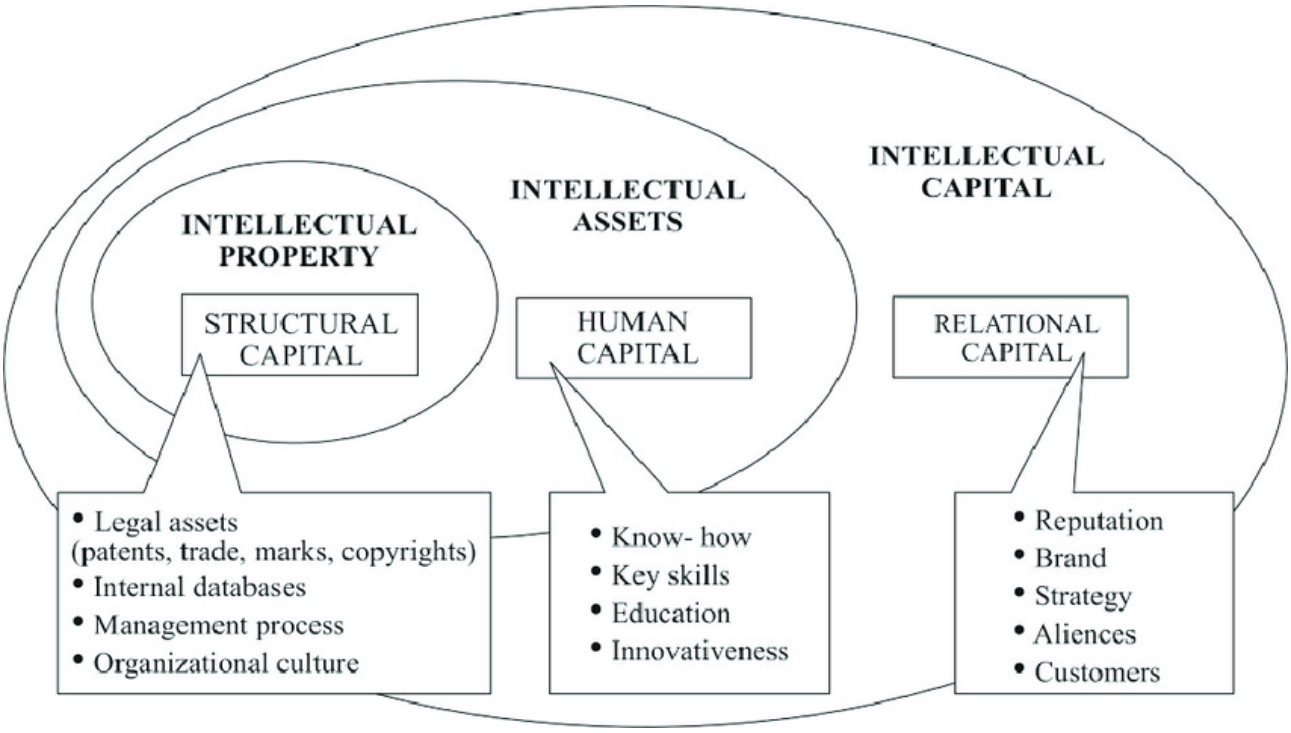


Figure 1.3 – Intellectual capital relationships with other components

To increase the "brain capacity" so to speak, companies invest a lot of time and money in educating personnel in business-specific skills and creating managerial knowledge. These resources serve as a clear source of competitive edge and set one firm's financial performance apart from another. Therefore, intellectual capital plays a bigger role in succeeding in a competitive market.

1.2 Theoretical review of resource management in the organization

Resource management is a complex, multi-faceted, multi-stage and continuous process that helps the executives and managers of the organization to manage and utilize various types of resources in more effective, cost-saving, rational ways aimed at producing demanded goods, products and providing services. Resource management is going through all management functions such as resource planning, organizing, and allocating to ensure company efficiency and profitability.

Resource management is a key activity of all management hierarchy covering CEO of particular company, heads of departments and low level managers. Resource management is used to help the company to manage, control and use both resources – tangible and intangible.

Generally speaking a “resource” is an asset, thing, factor, force or means that a business acquires and manages to produce some commodities or provide some services. By economic resources we mean both assets (tangible and intangible, movable or immovable), factor of production, technological means and technologies and other things necessary to change inputs into outputs. All economic resources can be divided into capital, land, labour and entrepreneurship. They can be tangible and intangible, renewable and non-renewable, natural and human-made resources.

Tangible resources are usually physical resources including the following:

- fixed assets are those things that are used to create the company productive capacity (equipment, machines, manufacturing plant, facilities, buildings, power supplies, etc.);

- working capital are those things that are used to produce some goods or provide some services (they include raw materials, components parts, spare parts, fuel, work in progress, and semi-finished products, etc.);

- financial resources are also necessary for company operations and activity, because they help to get some money from customers, consumers and other debtors or paid for some things for suppliers, borrowers or other creditors (they usually include company stocks, cash, money, available credits, and other marketable securities);

- labour resources include human efforts and performance, physical work and contributions, employee experience and skills, worker knowledge and abilities;

- intellectual resources are those things that are tangible and visible, including trade marks, brand names, patents, trade secrets, customer data, copyright, contract-based intellectual capital (lease, licensing, franchising and other agreements);

- land determines the place the company uses to deploy its facilities and capacity, warehouses and office buildings, production lines and others; conducts its business operations, manufacturing and distribution process [11].

Intangible resources include all non-physical resources using to improve company activity, management functions, and to solve day-to-day issues:

- human capital is the one of the most important and significant resource that the management of the company tries to guide and handle in order to create the economic value by combining staff experience and skills, their education, training, intelligence and other personality attributes;

- intellectual resources are those things that are intangible and invisible but they contribute to economic value of the company (they include relational capital such as customer relationships, supplier relationships; structural capital such as databases, processes, procedures, software, application programs, company reputation);

- information resources cover both internal (information on company purchases, personal, finance policy, manufacturing, sales, marketing, etc.) and external (economic data, technological environment data, information on laws and regulations, competitors, suppliers, distributors, market agents, social and political environment) company information, graphical, numerical, pictorial, quantitative or qualitative information that the top management collects, process and handle to get some benefits and make rational managerial decision, increase performance and gain profit [11].

Types of economic resources a company may use to provide its business operation are shown on figure 1.4.

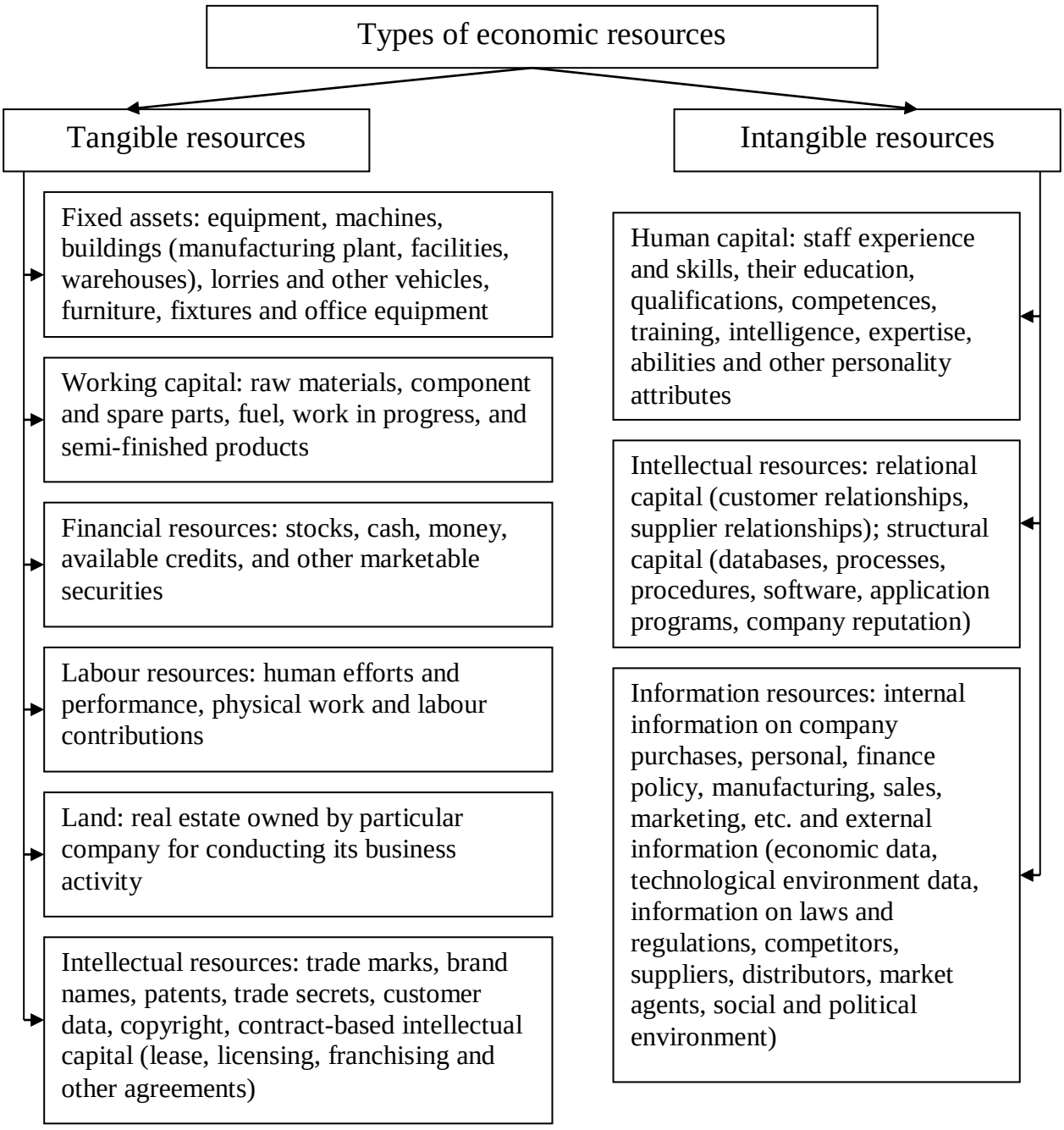


Figure 1.4 – Economic resource types used in a business company

Resource management refers to management category consisting of the following components [2]:

1) human resource management is a policy used by the executives to manage the employees, people's side, personal attitude, organizational structure by means of management hierarchy, functions, roles and responsibilities;

2) fixed asset management is a process used by the executives to acquire, track,

monitor, maintain and manage of all physical assets and equipment;

3) working capital management is used by the executives to purchase, monitor, manage of all current assets and liabilities, to improve working capital cycle and cash flow management;

4) inventory management is a process employed by company executives to source, store, control and optimize of all inventory types including both working capital and finished products;

5) facility management is a process used by company executives to support and maintain the functionality and safety of buildings, warehouses, other infrastructural assets by means of leasing, renting some assets, energy management, occupancy and space management;

6) project resource management is a process used by company executives, heads of department, project managers to plan and allocate resources assigned to a specific project, organize and schedule, manage and control of all resources necessary to complete a project;

7) information resource management is a company activity needed for directing all management information system including content management, data management, database management, document management, reporting management by using people (end users and IS specialists), hardware (machines and media), software (programs and procedures), data (data and knowledge basis), and networks (communications media and network support);

8) logistics resource management is an activity carried out by the heads of department and managers to manage and control all supply chain, resource flows between the origin and consumption;

9) marketing resource management is an activity carried out by the heads of department and managers to execute marketing strategy, penetrate new segments, support marketing campaigns and satisfy market requirements, customer needs;

10) intellectual capital management is an approach used by company rulers, heads of departments to transform all intellectual capital, renew knowledge and practice, gain new experience and improve organizational performance.

Resource management consists of specific components (figure 1.5). The first of them is called “Resource scheduling”, that is a process of identifying, planning and supplying, allocating and directing available resources to complete some tasks, company policy and strategy, specific project [2].

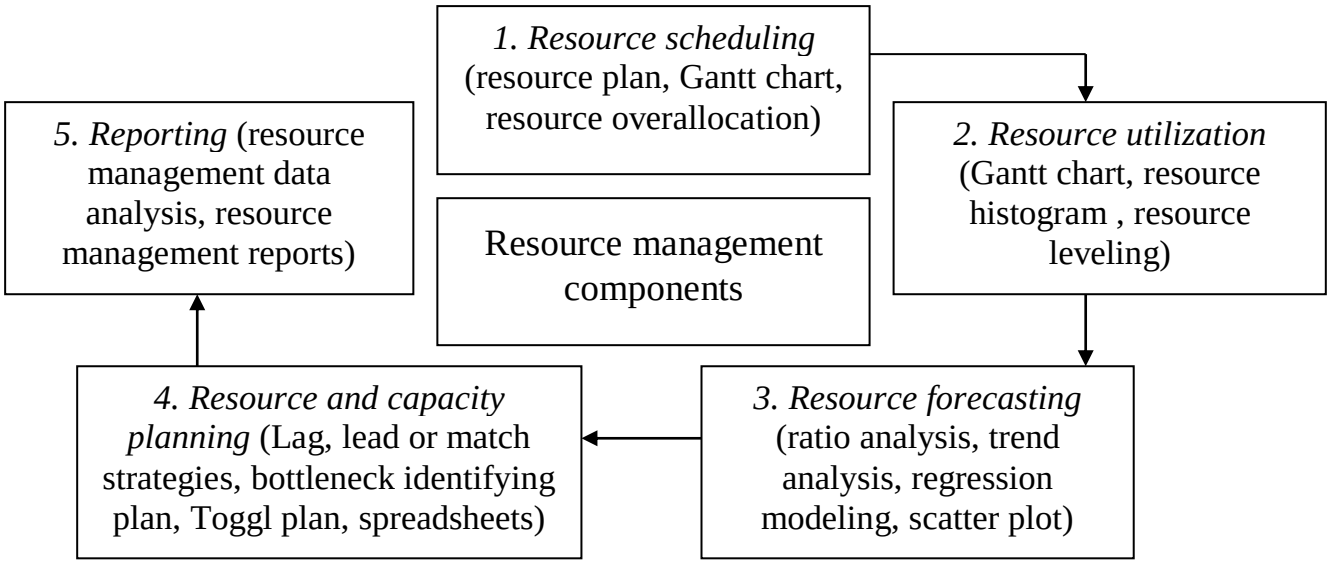


Figure 1.5 – The main resource management components

The second component of resource management is called “Resource utilization”, that is a process of how effectively and rationally a company may allocate and use limited amount of resources in order to get the goals of particular project or company strategy by using such tools like responsibility assignment matrix, overall resource utilization and strategic utilization. The third component of resource management is called “Resource forecasting”, that allows predicting resource needs by means of ratio analysis, trend analysis, regression modeling, scatter plot and other forecasting techniques. The fourth component of resource management is called “Resource and capacity planning”, that is critical process focusing on analysis the amount demand for resources versus the resources availability. The last component of resource management is “Reporting” necessary to monitor the project progress and make resource management decisions.

Resource management benefits for industrial organization. Any organization’s ability to expand depends on effective management of its human resources. The performance of personnel and how the enterprise (organization, firm) achieves its

initial goals are two areas where HR management can help. The individuals that work for a company or organization are known as its most valuable resource in terms of their talents and competencies. Therefore, human resource management is the efficient administration of the workforce in an organization [2].

Since HR managers are in charge of everything related to people, and people account for a sizable portion of a company's performance, good HR management may provide businesses an advantage over their rivals.

Some benefits of using of resource management in the organization are as follows [16]:

- Business objectives are met effectively and in appropriate time. The organization will quickly achieve its business objectives if the best people management practices are put into practice.

- Making simple but rational decisions – it will be simpler for an organization to make corporate decisions, including evaluating personnel and predicting labor requirements based on business demand, if it has the correct team of skilled HR managers.

- It improves how businesses operate in the market – any area under the HR managers' control will improve employee satisfaction across the board, which will reinforce the efficient functioning of businesses.

- Creation of a positive workplace culture – in any organization, effective channels of communication may encourage candid conversation and the sharing of criticism. HR directors must make sure employees can share their issues with the company more effectively thanks to excellent internal communication. Employers may benefit from this workplace culture by being able to freely critique workers' performance and praise them when they go above and beyond expectations.

- Enhances organizational effectiveness – by enhancing employees, workers skills and capacities, efficient management of human resources methods will enhance organizational performance. It will raise employee productivity levels in an organization and boost the effectiveness of labour output.

CHAPTER 2
RESEARCH AND ANALYSIS

2.1 LCC TerPolymerGas introduction

LCC TerPolymerGas is located in Ternopil, the office building of this company is located on Mykulynetska str., and the manufacturing plant (factory and production facilities) is located in the industrial part of the city (Lukyanovych str.) [19].

LCC TerPolymerGas has been operating for 17 year (from 2005 till now). The company entered the market segment of polyethylene pipes and their components. The main activity of particular company deals with manufacturing of pipes (water and gas), profiles, parts and components. Other activity types of that company include the following:

1) steel pipes and fittings, hollow profiles manufacturing;
2) plumbing, heating and air conditioning installation;
3) other machinery, equipment and supplies renting;
4) plumbing and heating equipment and supplies wholesale;
5) intermediate products wholesale;
6) non-specialized wholesale trade;
7) freight road transport;
8) other supporting transport activities;
9) leasing and operating of real estate;
10) trucks renting [20].

In a broad sense, the main activity of the LCC TerPolymerGas covers the goods manufacturing and wholesaling used in the installation and construction of polyethylene gas and water pipelines combining the thermistor (soldering) and butt welding.

LCC TerPolymerGas sells its pipes and other products both to domestic and international markets. The company operates on markets of Ukraine, Belarus, Georgia, Kazakhstan and other neighboring countries. Nowadays the company is

targeting the Turkish market segment.

LCC TerPolymerGas is one of the leading manufacturers in the Ukrainian market and has a good competitive position in the neighboring countries. The company offers a wide range of products including:

1) polyethylene pipes different diameters and sizes used in gas and water pipelines (and other pipelines);

2) pipe fittings are used to PE-100 and PE-80 polyethylene pipes;

3) pipes from heat-resistant polyethylene PE-RT;

4) molded fittings (polyethylene flanged bushes for butt welding);

5) segment fittings for butt welding;

6) compression fittings are used to connect polyethylene pipes to each other or metal transition;

7) polyethylene-steel transitions are used to connect metal and polyethylene pipes while constructing water and gas pipelines;

8) steel flanges are used to construct polyethylene pipes and connect fittings to them;

9) stuff off valves are used to close and open the flow of liquid or gas in pipelines [20].

The detailed company's product characteristics and descriptions are given in table 2.1.

Table 2.1 – Product types description

Product type	Characteristics and descriptions
1	2
1. Polyethylene pipes	PE-100 and PE-80 polyethylene pipes (including multilayer (co-extruded) for gas and water pipelines
2. Pipe fittings	Fittings range: coupling PE100 and PE-RT, knees 90 PE100, PE100 plugs, saddles PE100, etc.
3. Pipes made of heat-resistant polyethylene PE-RT	Pipes are used for municipal water and sewer system
4. Polyethylene-steel transitions	Transitions are used to connect steel pipe to polyethylene pipe
5. Fittings	Fittings are divided into: molded fittings; segment fittings; compression fittings, etc.

Table 2.1 Continuation

1	2
6. Steel flanges	Steel flanges of different diameter are used to construct polyethylene pipes and connect fittings to them
7. Stuff off valves	Valves are used to control the passage of fluid or gas through a pipe

Terpolimergaz Polymer Company LLC, Terpolimergaz Polymer Group LLC and Terpolimergaz Trading House LLC have been established and operate within this company. Organizational chart of LCC TerPolymerGas is given below.

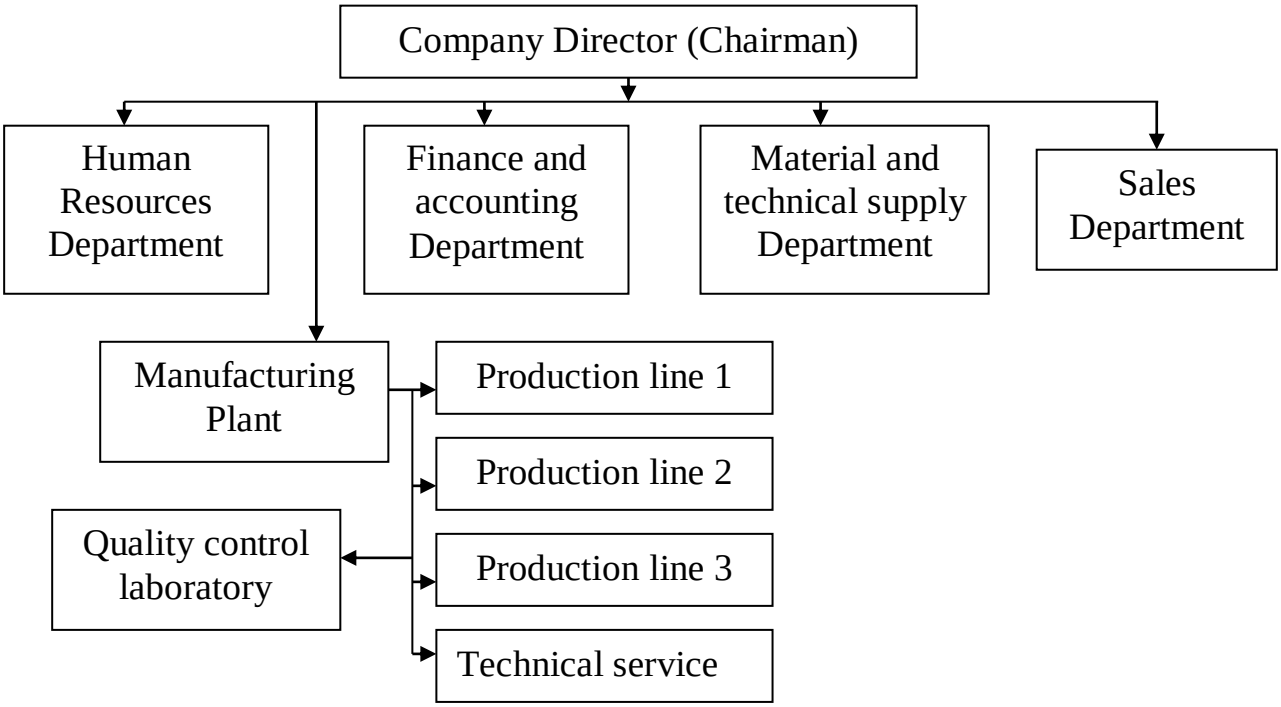


Figure 2.1 – LCC TerPolymerGas organizational chart

Company organizational chart includes some departments and manufacturing plant. Top management level covers the company CEO (director), chief accountant and technical director [19]. The middle management level consists of department heads mainly:

- head (chief) of Human Resources Department;
- head (chief) of Finance and accounting Department;

- head of Material and technical supply Department;
- head of Sales Department;
- chief of Manufacturing Plant (plant manager);
- production lines leaders (heads);
- head of technical service;
- head of product quality control laboratory.

LCC TerPolymerGas is a company trying to hold and increase its market share in domestic market. To estimate the company's market share we need to express market segment as a percentage that belongs to that company. To find the market share we have to take statistics on TerPolymerGas sales for some period (for example, 2020, 2021) and total sales of the industry over the same period.

Table 2.2 – Input data on TerPolymerGas sales

Data, million hryvnias	2020	2021	Absolute increase	Growth rate
1. Company sales revenue	144,3406	163,254	18,91	1,13
2. Total sales of the industry	1174,390	1203,45	29,1	1,03

The company sales revenue in 2021 compared to 2020 increased by 18,91 million hryvnias, while the total industry sales increased for 2021 compared to 2020 by 29,1 million hryvnias. The growth rate of the company sales revenue in 2021 compared to 2020 increased by 13% while the growth rate of the total sales industry increased for 2021 compared to 2020 by 3%.

The formula to calculate the company market share is given below:

$$MS = \frac{SR}{SR\_Industry} \cdot 100\%,$$

where *SR* is the TerPolymerGas sales revenue;

SR_Industry is total sales of the industry (that's relevant market's total sales revenue).

TerPolymerGas market share for both periods:

1) market share for 2020 = (144,3406/1174,390)*100% = 12%

2) market share for 2021 = (163,254/1203,45)*100% = 13,6%

The market share of TerPolymarGas for 2021 compared to 2020 increased by 1,6%.

Besides Ukrainian market the company sells its products to markets of Romania, Belarus, Georgia, Kazakhstan, Moldova and Turkey. LCC TerPolymerGas markets (percentage expression) where company products are sold abroad are shown on figure 2.2.

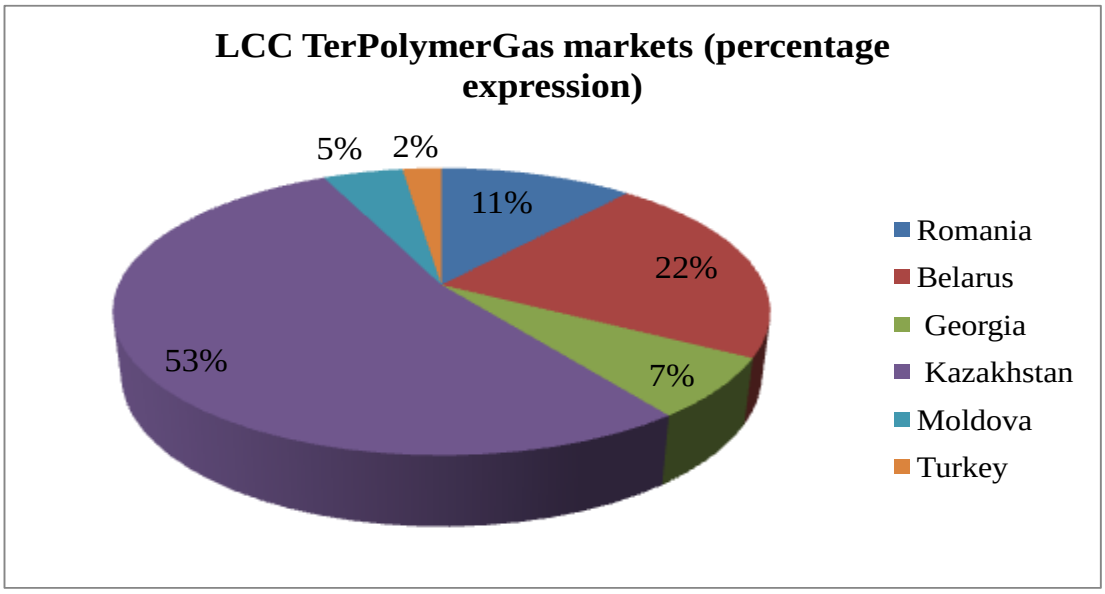


Figure 2.2 – Relative volume of products sold in foreign markets in 2021

The largest share of sales falls on the market in Kazakhstan. It comprises over 53%. The smallest share of sales is characterized for market in Turkey. It covers 2%. The share of sales in Belarus is 22%, in Romania – 11%, Georgia – 7%, Moldova – 5%.

LCC TerPolymerGas performance data is given in table 2.3.

Table 2.3 – Statistical data on TerPolymerGas performance

Statement data	2020	2021	Absolute increase	Growth rate
1. Sales revenue, million hryvnias	144,3406	163,254	18,91	1,13
2. Cost of goods sold, million hryvnias	97,241	106,45	9,21	1,1
3. Gross profit, million hryvnias	47,0996	56,804	9,7	1,21
4. Net profit, million hryvnias	4,8425	6,0477	1,21	1,25
5. Average fixed assets, million hryvnias	39,3	47,5	8,2	1,21
6. Total assets, million hryvnias	66,649	72,341	5,7	1,1
7. Total liabilities, million hryvnias	41,321	48,94	7,62	1,2
8. Employees	82	76	-6	0,9
9. Profitability, %	16	17,4	1,4	1,1

The statistical data on the performance of TerPolymerGas shows that the sales revenue in 2021 compared to 2020 increased by 18,91 million hryvnias; 13%. The cost of goods sold in 2021 compared to 2020 increased by 9,21 million hryvnias; 10%. Gross profit in 2021 compared to 2020 increased by 9,7 million hryvnias; 21%. Net profit in 2021 compared to 2020 increased by 1,21 million hryvnias; 25%. Value of the average fixed assets in 2021 compared to 2020 increased by 8,2 million hryvnias; 21%. Total assets in 2021 compared to 2020 increased by 5,7 million hryvnias; 10%. Total liability in 2021 compared to 2020 increased by 7,62 million hryvnias; 20%. Employees in 2021 compared to 2020 decreased by 6 or 10%. Profitability in 2021 compared to 2020 increased by 1,4 million hryvnias or 10%.

According to the statistical data, there is a 113% increase in sales, some of the reasons for this increase are: good product quality, most of the company products are top-notch, this easily attracts a lot of customers because their pipe and other product speaks for itself. Another reason for the increase in sale is the fact that the company is highly recognized and well known all over the country and Europe. The price range of their products also makes it interesting for customers to buy, as the prices are seen

to be modest and not very expensive.

Internally it is understood that there is active and efficient collaboration across departments in the company and not just the sales team. This facilitates the sale and distribution of products as several departments in the company work together to achieve the company's market share.

There is a high demand for polyethelene pipes and fittings nowadays because of rapid urbanization which has raised the demand for water and gas supply. Futhermore, it is a fact that bio-based polyethylene is extremely eco-friendly as it contains renewable carbon elements. Biodegradable plastic will return to the atmosphere at the conclusion of its life cycle but won't release any additional carbon dioxide into the atmosphere. It is made from plant based materials.

All public organizations, such as Oblagaz, Vodokanal (water supply), as well as farmers, developers of apartment buildings, industrial premises, and others are the customers of the LLC TerPolymerGas goods.

Some of the regular customers of TerPolymerGas include:

KyivOblgaz – is among the top of Ukraine's gas distribution firms. Regarding the length of gas pipes, it tops the nation (more than 44 thousand km). This company KyivOblgaz has been cooperating with the TerPolymerGas since 2019. The enterprise's primary function is to distribute gaseous fuel via neighborhood (local) pipes.

Trubopostachannya Ltd has been cooperating with the TerPolymerGas since 2010. The main activities of this company inclue designing and installation of drainage, water supply, and heating systems.

Plast-Fason Ltd has been a buyer of electrowelded and cast fittings since 2010. That is, the company has regular customers who recognize the quality and reliability of the products of the TerPolymerGas.

Kazakhstan Snabluxor-SL Ltd has been cooperating with the TerPolymerGas since 2014. Snabluxor-SL Ltd. are buyers of polyethylene fittings for water and gas pipelines. During the installation of the fittings and their operation, there were no comments on the quality and goods defects. The polyethylene fittings for water and

gas pipelines have proven itself to be reliable in operation and easy to install, meets the requirements and is certified.

Alfagaz Ltd. has been cooperating with the TerPolymerGas since 2017. The company is a buyer of pipes and fittings from TerPolymerGas. The price range is attractive for this company. Alfagaz Ltd. specializes in designing, fixing, and rebuilding gas equipment.

Evrobud Ltd. is a large consumer of TerPolymerGas products including polyethylene pipes; molded and segment fittings; compression fittings; polyethylene-steel transitions; steel flanges; stuff off valves and others.

The main competitors of the TerPolymerGas in the domestic marker are the following:

1. LLC Ukrpolimerkonstruktsiia is a domestic producer (located in Kyiv obkast) of polyethylene pipes and fittings for water and gas pipelines, sewage, irrigation systems, as well for industries such as mining, metallurgical, fuel and energy, chemical and others.

2. LLC Eurotrubplast (Lviv) produces water and sewage pipes, pipes for heat supply, gas supply, components for pipelines, industrial pipes, drainage systems, polymer wells, local treatment facilities and water tanks, etc.

3. LLC El-plast (Lviv) manufactures pipes for heating lines and hot water supply, polyethylene pipes for the supply of combustible gases, polyethylene pipes for water supply, double-layer corrugated pipes and others.

2.2 Evaluation of the LCC TerPolymerGas resource management

Evaluation of the company resource management is necessary for the following objectives:

1) to compare results of company resource management over some periods of time;

2) to measure the utilization of resources and to understand how to optimize it.

3) to make comparison of previous and present statistical data like net profit, gross profit, sales revenue, assets, liabilities, profitability.

4) to find out the growth rate of indicators such as revenue growth, revenue per client, profit margin, client retention rate, customer satisfaction.

5) to analyze the impact of resource management on implementation of technology, the work environment, training and development.

6) to evaluate company resources and find the ways to manage them effectively.

Evaluation of the LCC TerPolymerGas resource management concerns labour resources, material resources (working capital and fixed assets); financial resources and other resources of the company.

Firstly we will estimate labour resources of the LCC TerPolymerGas by looking at statistics on working hours in the LCC TerPolymerGas thar are presented in the table 2.4.

Table 2.4 – Statistics and working time analysis metrics

Statistics	2020	2021	Absolute increase	Growth rate
1. Man-days worked by employees	20951	21570	619	1,03
2. Man-hours worked by employees	167608	172560	4952	1,03
2.1. Man-hours worked by workers	117325,6	140931,4	23605,8	1,2
3. Total number of employees	82	76	-6	0,9
4. Total number of workers	53	62	9	1,2
5. Working time analysis metrics				
5.1. The average number of working days worked by one employee, days	209,5	220,1	10,6	1,1
5.2. The average number of working hours worked by one employee, hours	1676,08	1760,8	84,7	1,1
5.3. The average number of working hours worked by one workers, hours	2213,69	2273,09	59,4	1,03

According to the statistical analysis of workers, man-days worked by employees in 2021 compared to 2020 increased by 619 days; 3%, man-hours worked by employees in 2021 compared to 2020 increased by 4952 days; 13%, man-hours worked by workers in 2021 compared to 2020 increased by 23606 days; 20%. Total number of employees in 2021 compared to 2020 increased by 9 days; 20%.

According to the working time analysis metrics: the average number of

working days worked by one employee in 2021 compared to 2020 increased by 11 days; 10%. The average number of working hours worked by one employee in 2021 compared to 2020 increased by 84,7 hours; 10%. The average number of working hours worked by one worker in 2021 compared to 2020 increased by 59,4 hours; 3%.

To estimate labour resources we have to analyze labour productivity in the company. Statistical data for 2020-2021 and calculation results are given in table 2.5. The statistics on labour productivity shows that: the output in 2021 compared to 2020 increased by 19,02 million hryvnias; 10%. Total labour in 2021 compared to 2020 increased by 4952 hours; 3%. Employees in 2021 compared to 2020 decreased by 6 or 10%. Sales revenue in 2021 compared to 2020 increased by 18,9134 million Total labour in 2021 compared to 2020 increased by 4952 hours; 103%. Employees in 2021 compared to 2020 decreased by 6; 9%. Sales revenue in 2021 compared to 2020 increased by 18,9134 million; 10%.

Table 2.5 – Statistics and calculation results on labour productivity at the LCC TerPolymerGas

Statistics	2020	2021	Absolute increase	Growth rate
1. Output, million hryvnias	146,85	165,87	19,02	1,1
Total labour hours	167608	172560	4952	1,03
Employees	82	76	-6	0,9
Sales revenue, million hryvnias	144,3406	163,254	18,9134	1,1
Labour productivity metrics				
1. Output per hour worked, million hryvnias	876,15	961,23	85,1	1,1
2. Output per employee, million hryvnias	1,79	2,18	0,39	1,2
3. Revenue per employee, million hryvnias	1,76	2,14	0,38	1,2

The labour productivity metrics also shows that: output per hour worked in 2021 compared to 2020 increased by 85,1 million hryvnias; 10%. Output per employee in 2021 compared to 2020 increased by 0,39 milion hryvnias; 20%. Revenue per employee in 2021 compared to 2020 increased by 0,38 million hryvnias; 20%.

To estimate material resources we have to analyze fixed assets and working capital of the LCC TerPolymerGas. Working capital ratios estimation results are presented in table 2.6.

According to the working capital ratios:

- the current ratio in 2021 compared to 2020 increased by 0,32
- the quick ratio in 2021 compared to 2020 decreased by 0,4
- the cash ratio in 2021 compared to 2020 increased by 0,12.

The inventory turnover in 2021 compared to 2020 decreased by 0,6 (negative), the account receivable turnover in 2021 compared to 2020 decreased by 0,8, the accounts payable turnover in 2021 compared to 2020 increased by 0,3, the days sales in inventory turnover in 2021 compared to 2020 increased by 4, this is not good because it shows that the company is weak in managing its inventory.

Table 2.6 – Working capital ratios estimation results at the LCC TerPolymerGas

Calculation results	At the beginning of 2021	At the end of 2021	Absolute increase
1. Current ratio	4,86	5,18	0,32
2. Quick ratio	2,7	2,3	-0,4
3. Cash ratio	0,51	0,63	0,12
Calculation results	2020	2021	Absolute increase
1. Inventory turnover	14,2	13,6	-0,6
2. Accounts receivable turnover	6,1	5,3	-0,8
3. Accounts payable turnover	8,6	8,9	0,3
4. Days sales in inventory	20	24	4
5. Days sales outstanding	32	28	-4
6. Days payable outstanding	36	40	4

The days sales outstanding turnover in 2021 compared to 2020 decreased by 4, this is good for the company because it shows that the company does not experience delays in receiving payments. The days payable outstanding turnover in 2021 compared to 2020 increased by 4, this is a good thing for the company because, the company takes a longer time to pay its suppliers and creditors therefore allowing the

company to use the cash for longer period.

To estimate the LCC TerPolymerGas fixed assets we will use some statistical data shown in the table 2.7.

Table 2.7 – Data on the LCC TerPolymerGas fixed assets, million hryvnias

Groups of fixed assets	2020	2021	Absolute increase	Growth rate
1. Land and buildings	5,9	6,2	0,3	1,05
2. Plant and equipment	21,1	26,4	5,3	1,25
3. Computer equipment	1,25	1,7	0,45	1,36
4. Office equipment	1,82	2,02	0,2	1,11
5. Motor vehicles	7,2	9,25	2,05	1,28
6. Furniture and fixtures	2,03	1,93	-0,1	0,95
Total	39,3	47,5	8,2	1,2

The data on the company's fixed assets shows that: land and buildings in 2021 compared to 2020 increased by 0,3 million hryvnias or 5%. Plant and equipment in 2021 compared to 2020 increased by 5,3 million hryvnias or 25%. Computer equipment in 2021 compared to 2020 increased by 0,45 million hryvnias or 36%. Office equipment in 2021 compared to 2020 increased by 0,2 million hryvnias or 11%. Motor vehicles in 2021 compared to 2020 increased by 2,05 million hryvnias or 28%. Furniture and fixtures in 2021 compared to 2020 decreased by 0,1 million hryvnias or 5%. The total fixed assets in 2021 compared to 2020 increased by 8,2 million hryvnias or 20%.

To examine the LCC TerPolymerGas financial health we have to estimate financial resources. The input data comes from company balance sheet. The statistics on company financial resources and the calculated ratios are given in table 2.8.

The results of the solvency ratio shows that: total assets in 2021 compared to 2020 increased by 5,692 million hryvnias, total liabilities in 2021 compared to 2020 increased by 7619 million hryvnias, equity in 2021 compared to 2020 increased by 2,846 million hryvnias. Debt ratio in 2021 compared to 2020 increased by 0,06, assets-to-equity ratio in 2021 compared to 2020 decreased by 0,18, debt-to-equity ratio in 2021 compared to 2020 increased by 0,07.

Table 2.8 – Solvency ratio analysis results for 2020-2021

Input data	2020	2021	Absolute increase
1. Total assets, million hryvnias	66,649	72,341	5,692
2. Total liabilities, million hryvnias	41,321	48,94	7619
3. Equity, million hryvnias	19,625	22,471	2,846
Ratios			
1. Debt ratio	0,62	0,68	0,06
2. Assets-to-equity ratio	3,4	3,22	-0,18
3. Debt-to-equity ratio	2,11	2,18	0,07

The LCC TerPolymerGas pays attention to the quality of input resources and output that depends on the policy of quality management and Certificates ISO and State Standard of Ukraine.

The Certification Body “UkrCert” certifies that the Quality Management System at LCC TerPolymerGas concerning: plastic pipe and fitting production and distribution (PE-100 and PE-80 polyethylene connections, polyethylene connections PE-RT II with high heat resistance for thermistor and butt welding of water, gas and heat supply networks, technological pipelines, etc.; integral polyethylene-steel transitions; thermoresistor integral polyethylene-steel transitions; polyethylene flanged bushes for butt welding; PE-100 and PE-80 polyethylene pipes (including multilayer (co-extruded)) for gas- and water pipelines construction (including utility and drinking water supply), drainage and sewerage networks, technological pipelines, and polyethylene pressure pipes PE-RT II with high heat resistance for cold, hot water and heat supply networks; steel flanges comply with the international standard comply with ISO 9001:2015 “Quality management systems. Requirements”, International standard.

LCC TerPolymerGas has got a certificate that shows that the company operates an Environmental management system which complies with the requirements of ISO 14001:2015 for the following scope: production and sales of polyethylene pipes for supplying cold water type PE100, pipes without pressure two-layer corrugated pipes with polypropylene pipe for external sewerage networks of buildings and structures and cable drainage.

CHAPTER 3
RECOMMENDATIONS

3.1 Recommendations for enhancing the LCC TerPolymerGas business operations

In order to find ways to improve business operations in the LCC TerPolymerGas, we have conducted SWOT analysis of the company's activities. This analysis refers to analytical method focused on the examine the set of internal and external factors affecting the enterprise business operations. SWOT analysis made it possible to evaluate the LCC TerPolymerGas internal environment, that is, to group and estimate enterprise strengths and weaknesses as well as to assess the external environment, that is, to point out some weaknesses and opportunities.

The global industrial pipe market increases every year because of increasing rates in petrochemical, water supply, industrial and other branches of the economy. The size of global industrial pipe market expects of 26,7 billion dollars by 2027 and growth rate in this market will increase in average 3,8% from 2022 to 2027. The main growth factors for global industrial pipe market include: 1) an increase in new pipelines construction, 2) replacement and modernization of aging pipelines, 3) an increase of urbanization rate, 4) the need for infrastructure development.

Trends and forecasts in the global industrial pipe market [25] are shown on figure 3.1. The figure shows that the value of global industrial pipe market increased by 2,4 billion dollars or 2,5% in 2021 compared to 2016. The forecasted increase by 2027 will be 6 billion dollars or 4%.

The worldwide pipe market was estimated at 127,2 billion dollars (2021) and the forecasted growth expects to be 5,4% that's provide $ 225,5 billion dollars by 2032. Gobal pipes market expansion is predicted to be aided by rising need for rapid industrial, commercial, and residential building. Additionally, there is a growing need for wastewater management in the municipal and industrial sectors. Governments

around tht world spend funds on operating and maintaining water and wastewater management systems as well as installing new pipelines as a result.

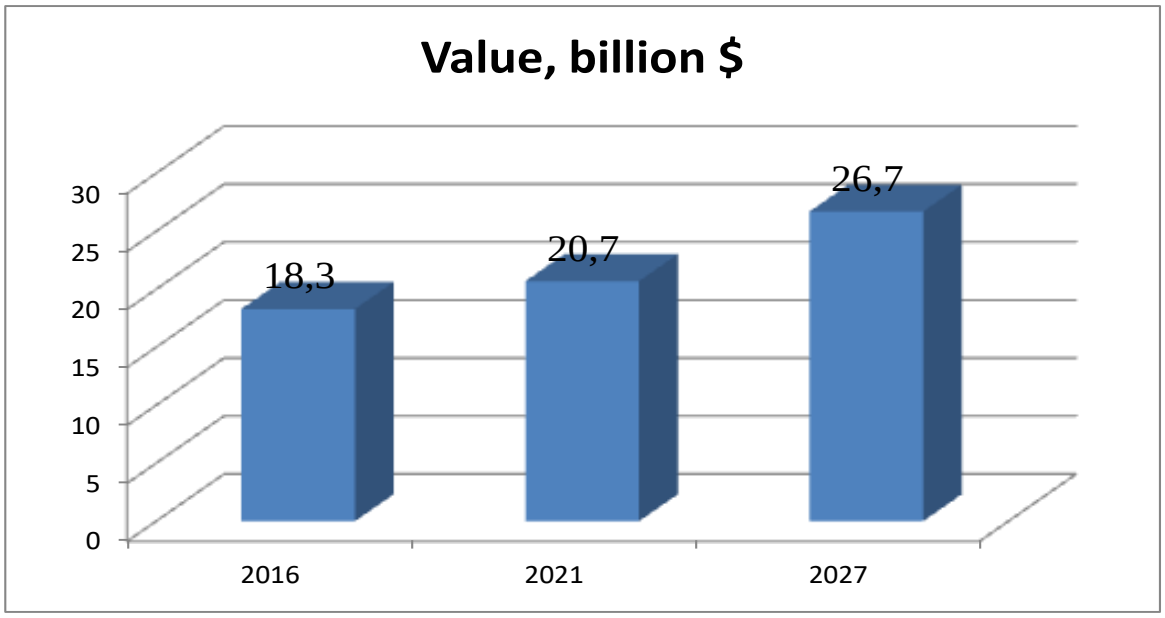


Figure 3.1 – Predicted value of global industrial pipe market

In 2021, demand for pipes was 127,2 billion dollars. Its predicted that the overall pipe sales will increase by 4,6% for 2022-2032. Due to rising infrastructure spending, a large growth in the worldwide pipes industry is predicted. The governments spend funds to install pipes that will supply water or gas in urban and rural areas. It should be noted that rha main factor restrictinfg the growth of pipes market is transportation and logistics costs.

This situation allows the LCC TerPolymerGas to enter new markets in the EU countries, to gain new customers abroad as well as to expand manufacturing capacity and production buildings and plant.

The results of the SWOT analysis of the LCC TerPolymerGas business operations are shown in the table 3.1.

Once the LCC TerPolymerGas strengths and weaknesses have been identified we are going to evaluate them by using 3 categories: their importance (where 0,01 (not important) to 1 (most important); rating (3 – to the most influencing strength

and 1 – to less influencing strength; 1 – to minor weakness and 3 to major weakness) and score (multiplying importance by rating).

Table 3.1 – SWOT analysis results of the LCC TerPolymerGas business operations

LCC TerPolymerGas Strengths	LCC TerPolymerGas Weaknesses
1. Wide range of enterprise products (pipes (water and gas), profiles, parts and components) 2. The enterprise has leading positions among pipe producers in the Ukrainian market; 3. Strong production capacity 4. Clear and simple organizational chart 5. Increasing market share for 2020-2021 6. Conducting foreign economic activity and selling products on foreign markets 7. Increasing sales revenue, labour productivity for 2020-2021 8. Enterprise products comply with the requirements of ISO	1. Decrease in inventory turnover for 2020-2021 2. Increase in days sales in inventory shows that the enterprise faced with some problems in managing its inventory for 2020-2021 3. Problems in solving recycling and waste management issues
Opportunities for LCC TerPolymerGas Opportunities	Threats for LCC TerPolymerGas
1. Increasing global pipes market and growing demand for water, gas and other pipes 2. Opportunities to penetrate new market segments in the EU countries 3. Possibility of acquiring new customers abroad 4. Opportunities to increase production capacity and production plant 5. Possibility of choosing suppliers of raw materials for the manufacture of pipes according to the target criteria 6. Possibility of using the recycled material in polyethylene pipes and save material in pipe production	1. War in Ukraine 2. Increasing raw material prices and prices of equipment maintenance and repair 3. Intense competition with foreign rivals 4. Rising fuel prices 5. Devaluation of the national currency and exchange rate fluctuations

Opportunities and threats for the LCC TerPolymerGas can be estimated by: their importance (0,01 – no impact, 1 – the highest impact; total of weights should equal 1); probability (1 for lowest probability and 3 for highest probability).

Estimation of the LCC TerPolymerGas strengths and weaknesses as well as the external opportunities and threats for the LCC TerPolymerGas is given in the tables 3.2 and 3.3.

Table 3.2 – Evaluation of the LCC TerPolymerGas strengths and weaknesses

Strengths			
	Importance	Rating	Score
1. Wide range of enterprise products (pipes (water and gas), profiles, parts and components)	0,05	2	0,10
2. The enterprise has leading positions among pipe producers in the Ukrainian market	0,15	2	0,3
3. Strong production capacity	0,10	3	0,3
4. Clear and simple organizational chart	0,03	1	0,03
5. Increasing market share for 2020-2021	0,09	3	0,27
6. Conducting foreign economic activity and selling products on foreign markets	0,08	2	0,16
7. Increasing sales revenue, labour productivity for 2020-2021	0,10	3	0,3
8. Enterprise products comply with the requirements of ISO	0,01	1	0,01
Total			1,47
Weaknesses			
1. Decrease in inventory turnover for 2020-2021	0,13	2	0,26
2. Increase in days sales in inventory shows that the enterprise faced with some problems in managing its inventory for 2020-2021	0,2	3	0,6
3. Problems in solving recycling and waste management issues	0,06	1	0,06
Total			0,92

According to the table, the strengths of the LCC TerPolymerGas have been evaluated and got the score of 1,47; while weaknesses have been estimated and got the score of 0,92. It means the company strengths exceed its weaknesses and this allows developing and competing successfully in the market.

The results of estimation of external opportunities and threats for the LCC TerPolymerGas are given in the table 3.3. The company opportunities have got an assessment of 1,35 and threats from environment have got a score of 0,74.

Table 3.3 – Estimation of external opportunities and threats for the LCC TerPolymerGas

Opportunities			
	Importance	Probability	Score
1. Increasing global pipes market and growing demand for water, gas and other pipes	0,05	2	0,10
2. Opportunities to penetrate new market segments in the EU countries	0,10	1	0,10
3. Possibility of acquiring new customers abroad	0,3	3	0,9
4. Opportunities to increase production capacity and production plant	0,08	1	0,08
5. Possibility of choosing suppliers of raw materials for the manufacture of pipes according to the target criteria	0,06	2	0,12
6. Possibility of using the recycled material in polyethylene pipes and save material in pipe production	0,05	1	0,05
Total			1,35
Threats			
1. War in Ukraine	0,1	3	0,3
2. Increasing raw material prices and prices of equipment maintenance and repair	0,03	2	0,06
3. Intense competition with foreign rivals	0,08	1	0,08
4. Rising fuel prices	0,1	2	0,2
5. Devaluation of the national currency and exchange rate fluctuations	0,05	2	0,10
Total			0,74

The external opportunities for the LCC TerPolymerGas exceed the external threats and it allows the company to successfully compete in the domestic pipe market as well as to gain the extra market share abroad.

The production of polyethylene pipes is faced with the production of defective products due to an improperly organized production process and other reasons. Therefore, one of the main tasks for management of particular company is to improve the efficiency of waste management.

To decrease plastic wastes the enterprise has the opportunity to manufacture pipes from waste – recycled plastic. It should be noted that the production of pipes from recycled plastic can be carried out in accordance with state standards for pipe production in Ukraine and international standards or pipe production. So, pipes produced by the enterprise from quality-assured recycled plastic can meet the relevant standards.

On average, the enterprise can process up to 10 tons of rejected plastic or rejected polyethylene products per day. The manufacturing process of the LCC TerPolymerGas is set up in such a way that production is continuous, provided that the equipment, production lines do not fail. The LCC TerPolymerGas is a manufacturer of pipes (water or gas) of different diameter ranges from 25 to 500 (mainly 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 315, 355, 400, 450, and 500 diameters)

Taking into account that the enterprise can process up to 10 tons of recycled plastic per day and 360 days in a year then 3600 tonnes of plastic waste is suitable for recycled use in plastic pipes per year.

We have been calculated how many pipes with a diameter of 32 in kilometers can be made from recycled plastic at the LCC TerPolymerGas. Knowing that the weight of a pipe with a diameter of 32 is 0,28 kg per 1 meter, the company can produce 280 kilograms for 1 km pipes. Calculation results are shown in the table 3.4.

Table 3.4 – Pipe output (diam. 32) from recycled plastic waste at the LCC TerPolymerGas

Input data	
1. Recycled plastic in an average per day, tonnes	10
2. Recycled plastic in an average per year, tonnes	3600
3. Pipe (diameter of 32) weight, kg per meter	0,28
4. Pipe output (diameter of 32) per 1 km	0,28*1000=280
5. Annual pipe output (diameter of 32), km	3600000/280=12857

Therefore, the LCC TerPolymerGas can produce 12857 kilometers of pipes with a diameter of 32 from recycled plastic with a volume of 3600 tons.

3.2 Recommendations for improving the LCC TerPolymerGas resource management

Improvements of resource management at the enterprise are the one of many factors influencing the LCC TerPolymerGas management. The resource management effectiveness at the LCC TerPolymerGas is related to the internal strengths or weaknesses and external opportunities and threats of business operations, as well as to optimize the use of available resources. As known, the resources of any enterprise are limited, so it's necessary to improve and optimize resource management. The optimizing of available resources and its rational use allows to increase the economic efficiency of pipe production and to find resource opportunities in a long run.

The pipes production optimization at the LCC TerPolymerGas can be carried out by using economic and mathematical modeling [22]. The optimizing of resource capabilities is solved by linear programming based on a certain criterion, which allows calculating the maximum amount of income (revenue) and minimize the resource cost involved in the production process. Linear programming optimization is used to determine the maximum amount of income (sales revenue) under limited company resources.

In the linear programming optimization there are resource constraints such as labor, material, time, space, equipment and technology, energy and others. Formulating a linear programming problem involves optimization such variables as company output, profit or income, sales revenue or minimization costs, expenses, wastes, time, and distance. Once the problem has been indentified and described, the inputs are known we are going to use the linear programming technique for the given problem, and express the problem in a mathematical model [22].

The linear programming model includes the following 3 elements:

- decision variables,
- objective function (maximize something (profit, income) or minimize something (costs, wastes, etc.),
- model constraints shows the linear relation among the decision variables.

To build the linear programming model we need some statistical data which include:

1) sales revenue (r);

2) selling price per unit (p);

3) quantity of pipes (q);

4) the volume of *i* resource type (Vi);

5) resource cost norms per unit (rc);

5) number of manufactured pipe types (n);

6) the number of available resources used in the production of pipes (m).

In the optimization model, we have to optimize some objective, while satisfying some resource constraints. This information is summarized in the table 3.5.

Table 3.5 – Variables and constraints for resource optimization model

Input variables	resource cost norms and prices
Decision variables	quantity of piles
Objective	maximum revenue
Constraints	limited material, labour, equipment and energy resources

The objective function can be expressed by the equation

$$r = p_1 \cdot x_1 + p_2 \cdot x_2 + ... + p_n \cdot x_n \rightarrow \max \tag{3.1}$$

The constraints are also described mathematically as:

$$\begin{cases} c_{11} \cdot x_1 + c_{12} \cdot x_2 + ... + c_{1n} \cdot x_n \{\leq, =, \geq\} \mathrm{V}_1 \\ c_{21} \cdot x_1 + c_{22} \cdot x_2 + ... + c_{2n} \cdot x_n \{\leq, =, \geq\} V_2 \\ ..... \\ c_{m1} \cdot x_1 + c_{m2} \cdot x_2 + ... + c_{mn} \cdot x_n \{\leq, =, \geq\} M_m \end{cases} \tag{3.2}$$

In the optimization model, the objective function is the maximum revenue from the sale of pipes. The LCC TerPolymerGas produces pipes with a diameter of 25, 32,

40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 315, 355, 400, 450, and 500. We will include 2 pipe types in the optimization model (n=2) when using 4 main resource types (m=4).

Below is given input data to the optimization model for production of water / gas pipe, diam. 25-40. It should be noted that resource optimization models can be build for different pipes production despite on diameter. The pipes with a diameter of 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 315, 355, 400 are used for both water and gas supply. The pipes with a diameter of 450, 500 are used only for gas supply.

Table 3.6 – Input data to the resource optimization model for production of water / gas pipe, diam. 25-40

Resources	Resources, million UAH	Production cost per unit meter, UAH.		
		water / gas pipe, diam. 25	water / gas pipe, diam. 32	water / gas pipe, diam. 40
Labour	3,1	5,8	6,1	6,4
Material	10,2	9,5	11,8	12,3
Equipment	17,5	7,5	8,9	9,1
Energy	0,62	3,2	3,4	3,6
Price per unit meter, UAH	-	33	41	47

We label x_1 – is the quantity of water / gas pipe, diam. 25; x_2 – quantity of water / gas pipe, diam. 32; x_3 – quantity of water / gas pipe, diam. 40. Next, we write equations for the maximum revenue and the constraints concerning resources.

The resulting optimization model is

$$33* x_1 + 41*x_2 + 47* x_3 \qquad maximize$$

subject to

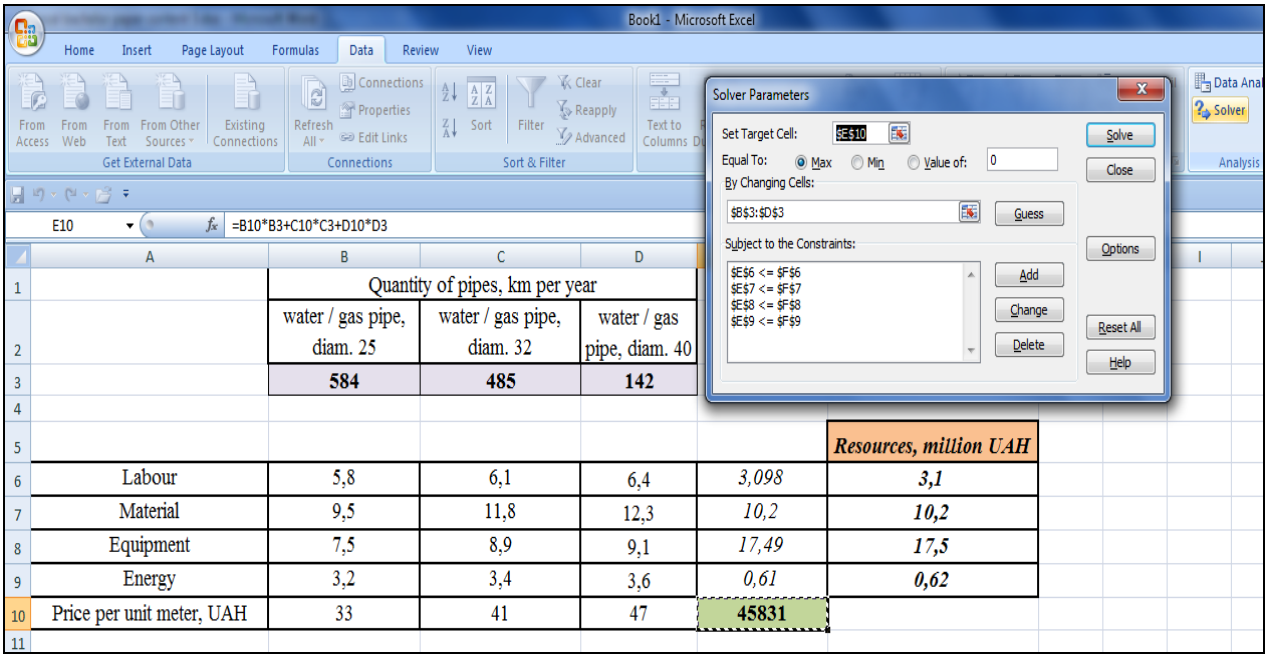
$$5{,}8* x_1 + 6{,}1* x_2 + 6{,}4* x_3 \leq 3{,}1$$

$$9{,}5* x_1 + 11{,}8* x_2 + 12{,}3* x_3 \leq 10{,}2$$

$$7{,}5* x_1 + 8{,}9* x_2 + 9{,}1* x_3 \leq 17{,}5$$

$$3{,}2^{*}\, x_1 + 3{,}4^{*}\, x_2 + 3{,}6^{*}\, x_3 \leq 0{,}62$$

To solve this resource optimization model for production of water / gas pipe, diam. 25-40 we use Microsoft Excel, application program Solver by setting the Solver parameters, target cell, changing cells, and constraints (figure 3.2).



	A	B	C	D		
1		Quantity of pipes, km per year				
2		water / gas pipe, diam. 25	water / gas pipe, diam. 32	water / gas pipe, diam. 40		
3		**584**	**485**	**142**		
4						
5						***Resources, million UAH***
6	Labour	5,8	6,1	6,4	*3,098*	***3,1***
7	Material	9,5	11,8	12,3	*10,2*	***10,2***
8	Equipment	7,5	8,9	9,1	*17,49*	***17,5***
9	Energy	3,2	3,4	3,6	*0,61*	***0,62***
10	Price per unit meter, UAH	33	41	47	**45831**	
11						

Figure 3.2 – The resource optimization model for production of water / gas pipe, diam. 25-40 by using Solver

Using the available limited resources, the LCC TerPolymerGas can manufacture pipes with a diameter of 25 in the amount of 584 km per year, pipes with a diameter of 32 in the amount of 485 km per year, pipes with a diameter of 40 in the amount of 142 km per year receiving the annual revenue of 45,831 million hryvnias.

The construction of resource optimization models will allow the company's management to see the expected benefits and make managerial decisions on increasing the efficiency of the resource use for the pipes production of various diameters.

CHAPTER 4
OCCUPATIONAL HEALTH AND SAFETY IN EMERGENCIES

4.1 Occupational health at work

The term “organizational health” refers to the various and frequently intricate aspects that influence an organization's ability and performance. Work hours, job description, stress levels, financial constraints, workload, employee turnover, and a host of other variables all have an effect on how well an organization is doing. The health of each person is at the very heart of this, including how they feel about their professions, how they execute them, how devoted they are to their positions, and the effect their jobs have on them.

Occupational health activities at LCC TerPolymerGas are likely to include:

- ensuring compliance with health and safety regulations – and helping maintain a healthy workforce,
- offering pre employment health assessments preventing and removing health risks arising in the workplace,
- providing screening and surveillance services in the early stages of ill health and developing solutions to keep staff with health issues at work,
- providing independent and professional diagnosis, prognosis and advice on staff unable to work due to long-term or short-term intermittent health problems, and organisational wide steps to reduce sickness absence,
- advising on ergonomic issues and workplace design lifestyle, health promotion and wellbeing services increasing productivity and staff retention.

An occupational health and safety at the LCC TerPolymerGas are guided by laws such as: The Law of Ukraine “On Labor Protection”, the Code of Labor Laws of Ukraine, the Law of Ukraine “On Mandatory State Social Insurance against Accidents at Work and Occupational Diseases that Caused Loss of Working Capacity”, internal documents, regulations, instructions and others documents.

An occupational health and safety management system encompasses more than

just health and safety program. It includes health and safety policies, systems, standards, and records, and involves incorporating health and safety activities and program into other business processes. Having an effective management system improves ability to continuously identify hazards and control risks in the workplace.

Components of an effective occupational health and safety management system at the LCC TerPolymerGas are shown on the figure 4.1.

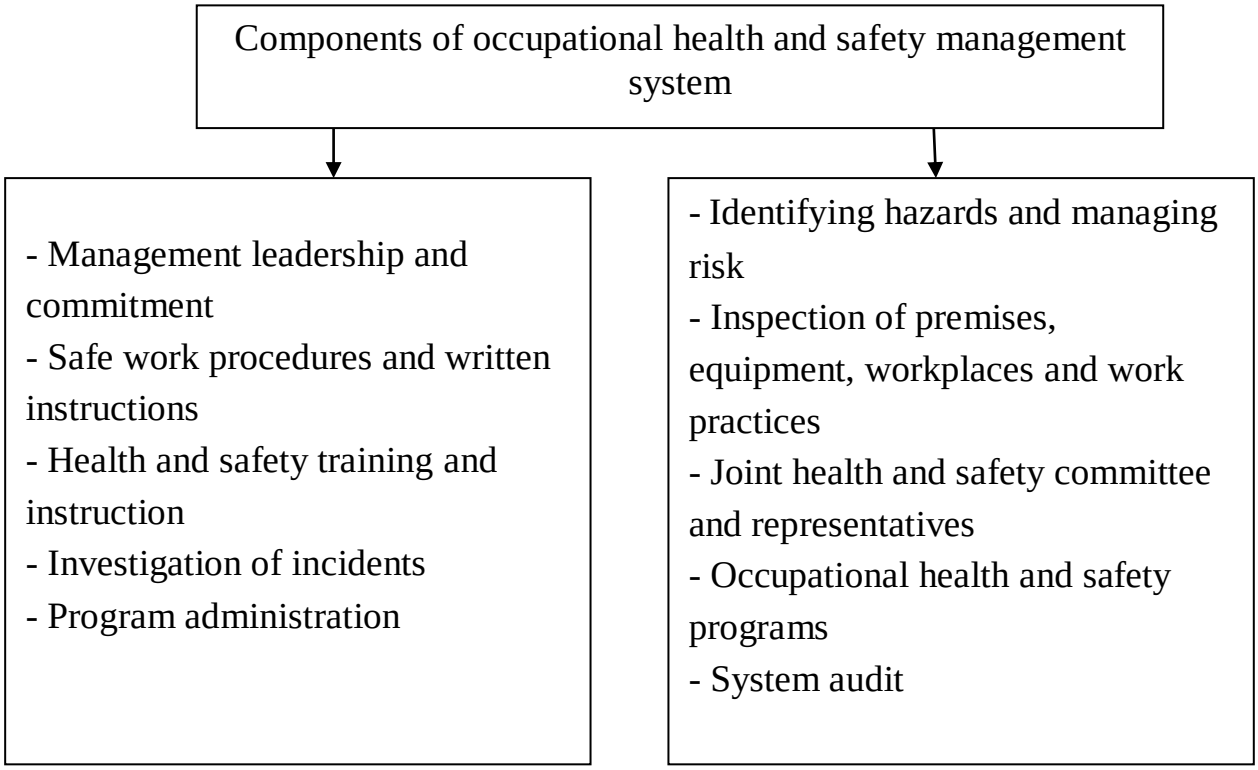


Figure 4.1 – Components of an effective occupational health and safety management system at the LCC TerPolymerGas

The scope and complexity of occupational health and safety system may vary, depending on the size and hazards of workplace and the nature of the work performed.

1) Management leadership and commitment by senior management (the CEO or most senior management) provides the vision, establishes policy, sets goals, and provides resources to lead and support the implementation of occupational health and safety management programs and system.

2) Safe work procedures, practices and written instructions ensure that

everyone in the organization knows their responsibilities and can perform their duties effectively.

3) Health and safety training and instruction – everyone in the workplace needs to understand their responsibilities when it comes to implementing and maintaining a healthy and safe workplace. Senior management should understand their role in establishing policies and continually driving the occupational health and safety management system and programs. Employers must ensure that workers are trained, qualified, and competent to perform their tasks. Supervisors must provide adequate instruction and oversight to workers so they can safely perform their work. And workers need to work safely, according to how they were trained.

4) Identifying hazards and managing risk – managing the risk in the workplace includes identifying hazards, assessing the risks those hazards present, and controlling the risks to prevent workers from getting injured.

5) Inspection of premises, equipment, workplaces and work practices can help a company to continually identify hazards and prevent unsafe working conditions from developing.

6) Investigation of incidents helps identify immediate, and root causes of unsafe conditions. The Occupational Health and Safety Regulation has specific requirements for incident investigation documentation and reporting that employers are required to meet.

7) Program administration – regularly assessing how well an organization is doing when it comes to meeting its health and safety goals is essential to improving occupational health and safety management system.

8) Occupational health and safety programs are an essential part of the occupational health and safety management system.

9) System audit – the auditor reviews key aspects of occupational health and safety management system to ensure that its quality and effectiveness meet the expectations of the standards and guidelines.

4.2 Emergency plan at workplace

Emergencies can be of any size or shape. Whether a company is confronted by a tornado, a robbery, or a gas leakage, the extent of the harm will depend on how well-prepared they are. The emergency plan that has been created holds the key.

Some companies are required by law to have an emergency plan in place. However, every business owner wishes to guard against potential threats for his premises and staff. The facility director can contribute to lowering the risks of workplace emergencies and unintended damage by following the procedures for creating a plan that will describe how to handle emergency circumstances in the workplace.

An evaluation of the risks should be done before creating the official corporate emergency plan. The evaluation looks for potential dangers in a facility and considers how to manage them. For instance, a nursing home might discover that their danger of a sudden violent entrance is lower since the structure has an open, well-lit perimeter. However, a facility with an industrial kitchen in the basement may find that their danger for a fire is considerable; therefore, it's necessary to address that before preparing an emergency checklist for your workplace.

Emergencies may be natural or manmade and include the following: floods, hurricanes, tornadoes, fires, toxic gas releases, chemical spills, radiological accidents, explosions, civil disturbances, and workplace violence resulting in bodily harm and trauma. The best way is to prepare to respond to an emergency before it happens. Few people can think clearly and logically in a crisis, so it is important to do so in advance, when you have time to be thorough.

When developing an emergency action plan, it’s a good idea to look at a wide variety of potential emergencies that could occur in the workplace. It should be tailored to worksite and include information about all potential sources of emergencies. Developing an emergency action plan means it should do a hazard assessment to determine what, if any, physical or chemical hazards in the workplaces could cause an emergency. If the company has more than one worksite, each site should have an emergency action plan.

The main components of an emergency action plan at the LCC TerPolymerGas are given in the table 4.1.

Table 4.1 – Components of an emergency action plan at the LCC TerPolymerGas

№	Components of an emergency action plan
1	A preferred method for reporting fires and other emergencies
2	An evacuation policy and procedure
3	Emergency escape procedures and route assignments, such as floor plans, workplace maps, and safe or refuge areas
4	Names, titles, departments, and telephone numbers of individuals both within and outside a company to contact for additional information or explanation of duties and responsibilities under the emergency plan
5	Procedures for employees who remain to perform or shut down critical plant operations, operate fire extinguishers, or perform other essential services that cannot be shut down for every emergency alarm before evacuating
6	Rescue and medical duties for any workers designated to perform them

An emergency action plan must include a way to alert employees, including disabled workers, to evacuate or take other action, and how to report emergencies, as required. Among the steps you must take are the following:

- make sure alarms are distinctive and recognized by all employees as a signal to evacuate the work area or perform actions identified in plan;

- make available an emergency communications system such as a public address system, portable radio unit, or other means to notify employees of the emergency and to contact local law enforcement, the fire department, and others;

- stipulate that alarms must be able to be heard, seen, or otherwise perceived by everyone in the workplace. The company might want to consider providing an auxiliary power supply in the event that electricity is shut off.

To minimize damages from workplace emergencies, prevention is essential. If an emergency does occur, having a strategy in place that includes risk assessment and making sure top management has taken all reasonable steps to prevent it in the first place can have a significant positive impact. Every significant building should have

sufficient cooling systems in place to minimize heat and avoid fires, especially those in the healthcare or food processing industries.

Smoke detectors and public address systems for announcements are two examples of emergency notification systems that should be in good functioning order. The instructions on fire extinguishers should be simple to read and in good functioning order. Any employee who may require personal protective equipment to handle a crisis like a chemical leak should be aware of its location. Identifying who is most likely to suffer injury in an emergency is a component of risk assessment. How to effectively assist people who are most at risk must be taken into account when creating the plan, with the goal of prioritizing saving lives before protecting assets.

When a catastrophe does arise, having been prepared has a visible impact on the employees' level of composure. Knowing what to do in the event of an emergency at work makes it lot simpler psychologically. Lower stress levels enable tension to be managed more rationally, which further reduces loss.

Below are some plans that must be put in place for emergency situations:

1) Identify the biggest risks to the enterprise – it means determining the biggest workplace emergencies an enterprise might encounter. This will depend on a number of variables. Top management must prepare for emergencies involving the machine industries if the business exposes its workers to powerful machinery. Then, go over each potential danger and decide exactly what steps personnel should take.

2) Provide shelter spaces – if natural disaster, war ever occurs, every employer should have a location where employees can go.

3) Create an emergency plan in case of workplace evacuation – the staff should be familiar with your evacuation plan at all times. Maps of the exits should be posted on each floor of building so that people can leave more quickly in the event of a fire or other emergency.

4) Install defibrillators on each floor – defibrillators ought to be located on each floor of workplace. If a person suffers a cardiac arrest inside building, defibrillators will be able to save their life.

CONCLUSIONS

In the first chapter we have described meanings and definitions of organization's resources. The influence of organizational resources on company strategy development and strategy execution has been shown on the figure. The essential corporate resources including financial, human, material, intellectual resources have been pointed out. It was noted that resource management is a complex, multi-faceted, multi-stage and continuous process that helps the executives and managers of the organization to manage and utilize various types of resources in more effective, cost-saving, rational ways aimed at producing demanded goods, products and providing services. The tangible and intangible, renewable and non-renewable, natural and human-made resources have been distinguished. Types of economic resources a company may use to provide its business operation have been shown on the figure. The main resource management components have been described. These components include resource scheduling, resource utilization, resource forecasting, resource and capacity planning, and reporting. The benefits of using of resource management in the organization have been highlighted.

In the second chapter we have introduced to the LCC TerPolymerGas, main activity of the company (pipes manufacturing (water and gas pipes), profiles, parts and components and other activity types. It was noted that the company operates in the domestic and international markets. The detailed company's product characteristics and descriptions have been given. Organizational chart of the LCC TerPolymerGas has been drawn. The market share of the LCC TerPolymerGas has been calculated and compared for two periods. Relative volume of products sold in foreign markets in 2021 is shown in the paper. The TerPolymerGas performance has been analyzed for 2020-2021. The main objectives in the evaluation of the company resource management are described. Labour resources, material resources (working capital and fixed assets); financial resources and other resources of the company have been evaluated and analyzed for 2020-2021. The LCC TerPolymerGas

pays attention to the quality of input resources and output that depends on the policy of quality management and Certificates ISO and State Standard of Ukraine.

In the third chapter we have made the recommendations on how to improve the LCC TerPolymerGas business operation and the LCC TerPolymerGas resource management. we have conducted SWOT analysis of the company's activities. We evaluated the LCC TerPolymerGas internal environment, that is, grouped and estimated enterprise strengths and weaknesses as well as assessed the external environment that is, pointed out some weaknesses and opportunities. The global industrial pipe market trend has been described. The main growth factors for global industrial pipe market have been pointed out including: an increase in new pipelines construction, replacement and modernization of aging pipelines, an increase of urbanization rate, the need for infrastructure development. Predicted value of global industrial pipe market is shown. The results of the SWOT analysis of the LCC TerPolymerGas business operations are shown in the paper. Estimation of the LCC TerPolymerGas strengths and weaknesses as well as the external opportunities and threats for the LCC TerPolymerGas has been given. It was noted that the company strengths exceed its weaknesses and the external opportunities for the LCC TerPolymerGas exceed the external threats.

The resources of any enterprise are limited, so it's necessary to improve and optimize resource management. We have built the resource optimization model, where the objective function is the maximum revenue from the sale of pipes. The resource optimization model for production of water / gas pipe, diam. 25, 32, 40 has been solved. The construction of resource optimization models will allow the company's management to see the expected benefits and make managerial decisions on increasing the efficiency of the resource use for the pipes production of various diameters.

In the chapter 4 we have described the occupational health activities at LCC TerPolymerGas, main components of an effective occupational health and safety management system at the LCC TerPolymerGas as well as the components of an emergency action plan at the LCC TerPolymerGas.

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Appendices

Фінансова звітність 2020-2021 рр.

Актив

Назва рядка	Код рядка	На початок звітного року, тис. грн.	На кінець звітного періоду, тис. грн.
I. Необоротні активи Нематеріальні активи	1000	0.00	0.00
первісна вартість	1001	0.00	0.00
накопичена амортизація	1002	0.00	0.00
Незавершені капітальні інвестиції	1005	0.00	0.00
Основні засоби:	1010	1 068.40	298.80
первісна вартість	1011	4 677.20	4 411.70
знос	1012	3 608.80	4 112.90
Довгострокові біологічні активи	1020	0.00	0.00
Довгострокові фінансові інвестиції	1030	0.00	0.00
Інші необоротні активи	1090	0.00	0.00
Усього за розділом I	1095	1 068.40	298.80
II. Оборотні активи Запаси:	1100	15 422.90	17 936.40
у тому числі готова продукція	1103	522.30	1 182.10
Поточні біологічні активи	1110	0.00	0.00
Дебіторська заборгованість за товари, роботи, послуги	1125	29 592.80	43 557.20
Дебіторська заборгованість за розрахунками з бюджетом	1135	2 190.60	19.60
у тому числі з податку на прибуток	1136	0.00	0.00
Інша поточна дебіторська заборгованість	1155	15 537.40	16 994.10
Поточні фінансові інвестиції	1160	0.00	0.00
Гроші та їх еквіваленти	1165	1 916.00	18 894.20
Витрати майбутніх періодів	1170	31.80	9.30
Інші оборотні активи	1190	889.60	3 248.70
Усього за розділом II	1195	65 581.10	100 659.50
III. Необоротні активи, утримувані для продажу, та групи вибуття	1200	0.00	0.00
Баланс	1300	66 649.50	100 958.30

Пасив

Назва рядка	Код рядка	На початок звітного року, тис. грн.	На кінець звітного періоду, тис. грн.
I. Власний капітал Зареєстрований (пайовий) капітал	1400	5 323.00	5 323.00
Додатковий капітал	1410	0.00	0.00
Резервний капітал	1415	625.00	625.00
Нерозподілений прибуток (непокритий збиток)	1420	13 595.10	16 226.80
Неоплачений капітал	1425	0.00	0.00
Усього за розділом I	1495	19 543.10	22 174.80
II. Довгострокові зобов'язання, цільове фінансування та забезпечення	1595	0.00	0.00
Короткострокові кредити банків	1600	7 800.00	0.00
III. Поточні зобов'язання Поточна кредиторська заборгованість за: довгостроковими зобов'язаннями	1610	0.00	0.00
товари, роботи, послуги	1615	30 596.10	61 500.50
розрахунками з бюджетом	1620	237.30	570.00
у тому числі з податку на прибуток	1621	148.00	568.10

Назва рядка	Код рядка	На початок звітного року, тис. грн.	На кінець звітного періоду, тис. грн.
розрахунками зі страхування	1625	1.90	1.20
розрахунками з оплати праці	1630	29.20	0.50
Доходи майбутніх періодів	1665	0.00	0.00
Інші поточні зобов'язання	1690	8 441.90	16 711.30
Усього за розділом III	1695	47 106.40	78 783.50
IV. Зобов'язання, пов'язані з необоротними активами, утримуваними для продажу, та групами вибуття	1700	0.00	0.00
Баланс	1900	66 649.50	100 958.30

Звіт про фінансові результати за 2020-2021 рр.

Назва рядка	Код рядка	За звітний період, тис. грн.	За аналогічний період попереднього року, тис. грн.
Чистий дохід від реалізації продукції (товарів, робіт, послуг)	2000	282 047.80	142 060.80
Собівартість реалізованої продукції (товарів, робіт, послуг)	2050	260 882.10	122 877.50
Інші операційні доходи	2120	1 933.90	2 114.00
Інші операційні витрати	2180	14 151.30	14 238.10
Інші доходи	2240	6.10	165.80
Інші витрати	2270	770.80	1 319.50
Разом доходи (2000 + 2120 + 2240)	2280	283 987.80	144 340.60
Разом витрати (2050 + 2180 + 2270)	2285	275 804.20	138 435.10
Фінансовий результат до оподаткування (2280 - 2285)	2290	8 183.60	5 905.50
Податок на прибуток	2300	1 473.20	1 063.00
Чистий прибуток (збиток) (2290 - 2300)	2350	6 710.40	4 842.50

ТерПолімерГаз TerPolymerGas

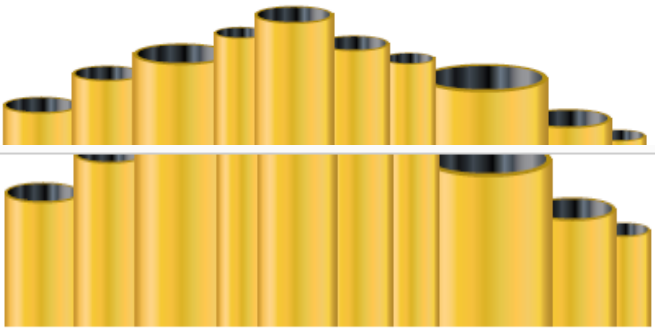
ТРУБИ БАГАТОШАРОВІ (СОЕКСТРУДОВАНІ) ГАЗОПРОВІДНІ З ПОЛІЕТИЛЕНУ

PIPES OF MULTILAYER (coextruded) GAS CONDUCTING FROM POLYETHYLENE

ДСТУ Б EN 1555-2:2012

Поліетиленові багатошарові (соекструдовані) труби використовуються для подачі горючих газів з робочим тиском до 10,0 бар, призначених для будівництва та ремонту в мережі газопостачання. Гарантійний термін експлуатації труб при дотриманні правил монтажу - 100 років. Випускаються із поліетилену PE 100 RC у відрізках від 5 до 13 метрів, а також в бухтах різної довжини.

Polyethylene multilayer (coextruded) pipes are used to supply combustible gases with a pressure of up to 10.0 bar designed for the building and repair in the gas supply network. Warranty period of operation in compliance with the installation rules - 100 years. Made from polyethylene PE 100 RC in segments from 5 to 13 meters, as well as in bays of different lengths.



Зовнішній діаметр, dn mm	ПЕ 80						ПЕ 100						Бухти / обрізки, м.п.
	SDR 11		SDR 17		SDR 17,6		SDR 11		SDR 17		SDR 17,6		
	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	
20	3,0	0,162	***	***	***	***	3,0	0,162	***	***	***	***	100-200
25	3,0	0,209	***	***	***	***	3,0	0,209	***	***	***	***	100-200
32	3,0	0,276	2,3	0,197	2,3	0,197	3,0	0,276	2,3	0,197	2,3	0,197	100-200
40	3,7	0,427	2,4	0,302	2,3	0,286	3,7	0,427	2,4	0,302	2,3	0,286	100-200
50	4,6	0,663	3,0	0,462	2,9	0,443	4,6	0,663	3,0	0,462	2,9	0,443	100-200
63	5,8	1,050	3,8	0,731	3,6	0,691	5,8	1,050	3,8	0,731	3,6	0,691	50-100-200
75	6,8	1,462	4,5	1,318	4,3	0,970	6,8	1,462	4,5	1,318	4,3	0,970	50-100
90	8,2	2,120	5,4	1,485	5,2	1,400	8,2	2,120	5,4	1,485	5,2	1,400	50-100
110	10,0	3,140	6,6	2,208	6,3	2,070	10,0	3,140	6,6	2,208	6,3	2,070	50-100
125	11,4	4,080	7,4	2,818	7,1	2,660	11,4	4,080	7,4	2,818	7,1	2,660	5-13м
140	12,7	5,080	8,3	3,538	8,0	3,330	12,7	5,080	8,3	3,538	8,0	3,330	5-13м
160	14,6	6,700	9,5	4,615	9,1	4,340	14,6	6,700	9,5	4,615	9,1	4,340	5-13м
180	16,4	8,430	10,7	5,834	10,3	5,520	16,4	8,430	10,7	5,834	10,3	5,520	5-13м
200	18,2	10,400	11,9	7,197	11,4	6,780	18,2	10,400	11,9	7,197	11,4	6,780	5-13м
225	20,5	13,200	13,4	9,135	12,8	8,550	20,5	13,200	13,4	9,135	12,8	8,550	5-13м
250	22,7	16,300	14,8	11,188	14,2	10,600	22,7	16,300	14,8	11,188	14,2	10,600	5-13м
280	25,4	20,400	16,6	14,059	15,9	13,300	25,4	20,400	16,6	14,059	15,9	13,300	5-13м
315	28,6	25,100	18,7	17,800	17,9	16,800	28,6	25,100	18,7	17,800	17,9	16,800	5-13м
355	32,2	32,800	21,1	22,609	20,2	21,300	32,2	32,800	21,1	22,609	20,2	21,300	5-13м
400	36,4	41,800	23,7	28,630	22,8	27,000	36,4	41,800	23,7	28,630	22,8	27,000	5-13м
450	40,9	53,276	26,7	36,36	25,6	34,800	40,9	53,276	26,7	36,36	25,6	34,800	5-13м
500	45,4	65,538	29,7	44,817	28,4	42,900	45,4	65,538	29,7	44,817	28,4	42,900	5-13м
560	50,8	82,119	33,2	56,162	31,9	53,700	50,8	82,119	33,2	56,162	31,9	53,700	5-13м
630	57,2	104,034	37,4	71,119	35,8	68,100	57,2	104,034	37,4	71,119	35,8	68,100	5-13м

TerPolymerGas

ТерПолімерГаз

ТРУБИ БАГАТОШАРОВІ (СОЕКСТРУДОВАНІ) ВОДОПРОВІДНІ З ПОЛІЕТИЛЕНУ

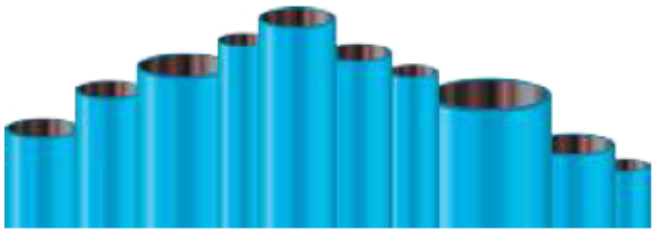
PIPES OF MULTILAYER (COEXTRUCTURED) WATERPROOF FROM POLYETHYLENE

ДСТУ Б В.2.7 - 151:2008, ДСТУ Б EN 12201-2:2018

Поліетиленові багатошарові (соекструдовані) труби використовуються для трубопроводів в будівництві зовнішніх мереж (водопроводів, артезіанських свердловин, систем меліорації, самотічних і напірних каналізаційних колекторів) як з традиційною траншейною прокладкою із засипкою піщаним або глинистим ґрунтом, так і без неї. Гарантійний термін експлуатації при дотриманні правил монтажу - 100 років. Труби випускаються в бухтах різної довжини, а також у відрізках від 5 до 13 метрів. Виготовляємо труби з PE 100 RC в SDR 7,4 - SDR 41.

Polyethylene multilayer (co-extruded) pipes are used for pipelines in the construction of external networks (water pipes, artesian wells, reclamation systems, self-discharge and pressure sewer collectors) as with a traditional trench gasket with sand or clay soil, and without it. Warranty period of operation in compliance with the installation rules - 100 years. Pipes are produced in bays of different lengths, as well as in sections from 5 to 13 meters. We manufacture pipes from PE 100 RC in SDR 7.4 - SDR 41.

PE 100 RC в SDR 7,4 - SDR 41.



Зовнішній діаметр, dn mm	ПЕ 100 SDR 26 (0.6 МПа)		ПЕ 100 SDR 21 (0.8 МПа)		ПЕ 100 SDR 17 (1,0 МПа)		ПЕ 100 SDR 11 (1,6 МПа)		Бухти / обрізки, м.п.
	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	
20	***	***	***	***	***	***	2,0	0,119	100-200
25	***	***	***	***	***	***	2,3	0,152	100-200
32	***	***	***	***	2,0	0,197	3,0	0,282	100-200
40	***	***	2,0	0,255	2,4	0,302	3,7	0,437	100-200
50	2,0	0,322	2,4	0,383	3,0	0,462	4,6	0,674	100-200
63	2,5	0,504	3,0	0,590	3,8	0,731	5,8	1,062	100-200
75	2,9	0,978	3,6	1,130	4,5	1,318	6,8	1,769	100-200
90	3,5	1,005	4,3	1,212	5,4	1,485	8,2	2,15	50-100
110	4,2	1,474	5,3	1,816	6,6	2,208	10	3,187	50-100
125	4,8	1,899	6,0	2,322	7,4	2,818	11,4	4,135	5-13м
140	5,4	2,397	6,7	2,909	8,3	3,538	12,7	5,155	5-13м
160	6,2	3,140	7,7	3,811	9,5	4,615	14,6	6,762	5-13м
180	6,9	3,909	8,6	4,787	10,7	5,834	16,4	8,544	5-13м
200	7,7	4,843	9,6	5,927	11,9	7,197	18,2	10,534	5-13м
225	8,6	6,096	10,8	7,499	13,4	9,135	20,5	13,341	5-13м
250	9,6	7,542	11,9	9,169	14,8	11,188	22,7	16,399	5-13м
280	10,7	9,413	13,4	11,577	16,6	14,059	25,4	20,564	5-13м
315	12,1	11,986	15,0	14,549	18,7	17,800	28,6	26,028	5-13м
355	13,6	15,165	16,9	18,488	21,1	22,609	32,2	33,054	5-13м
400	15,3	19,209	19,1	23,549	23,7	28,630	36,3	41,944	5-13м
450	17,2	24,288	21,5	29,781	26,7	36,360	40,9	53,276	5-13м
500	19,1	29,963	23,9	36,745	29,7	44,817	45,4	65,538	5-13м
560	21,4	37,575	26,7	46,007	33,2	56,162	50,8	82,119	5-13м
630	24,1	47,597	30,0	58,110	37,4	71,119	57,2	104,034	5-13м

ТРУБИ ГАЗОПРОВІДНІ З ПОЛІЕТИЛЕНУ

GAS PIPES FROM POLYETHYLENE

ДСТУ Б EN 1555-2:2012

Труби використовуються для подачі горючих газів з робочим тиском до 10,0 бар, призначені для будівництва та ремонту в мережі газопостачання. Гарантійний термін експлуатації труб при дотриманні правил монтажу - 50 років. Випускаються чорного кольору з жовтими продольними полосами.

The pipes used for the combustible gases with working pressure up to 10,0 bar, which is used for the building and repairing the gas supply. The warranty period of pipes exploitation is 50 years if all rules of assembling were used. They are manufactured in black colour with yellow lengthwise lines.

Зовнішній діаметр, dn mm	ПЕ 80						ПЕ 100						Бухти / обрізки, м.п.
	SDR 11		SDR 17		SDR 17,6		SDR 11		SDR 17		SDR 17,6		
	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	
20	3,0	0,162	***	***	***	***	3,0	0,162	***	***	***	***	100-200
25	3,0	0,209	***	***	***	***	3,0	0,209	***	***	***	***	100-200
32	3,0	0,276	2,3	0,197	2,3	0,197	3,0	0,276	2,3	0,197	2,3	0,197	100-200
40	3,7	0,427	2,4	0,302	2,3	0,286	3,7	0,427	2,4	0,302	2,3	0,286	100-200
50	4,6	0,663	3,0	0,462	2,9	0,443	4,6	0,663	3,0	0,462	2,9	0,443	100-200
63	5,8	1,050	3,8	0,731	3,6	0,691	5,8	1,050	3,8	0,731	3,6	0,691	50-100-200
75	6,8	1,462	4,5	1,318	4,3	0,970	6,8	1,462	4,5	1,318	4,3	0,970	50-100
90	8,2	2,120	5,4	1,485	5,2	1,400	8,2	2,120	5,4	1,485	5,2	1,400	50-100
110	10,0	3,140	6,6	2,208	6,3	2,070	10,0	3,140	6,6	2,208	6,3	2,070	50-100
125	11,4	4,080	7,4	2,818	7,1	2,660	11,4	4,080	7,4	2,818	7,1	2,660	5-13м
140	12,7	5,080	8,3	3,538	8,0	3,330	12,7	5,080	8,3	3,538	8,0	3,330	5-13м
160	14,6	6,700	9,5	4,615	9,1	4,340	14,6	6,700	9,5	4,615	9,1	4,340	5-13м
180	16,4	8,430	10,7	5,834	10,3	5,520	16,4	8,430	10,7	5,834	10,3	5,520	5-13м
200	18,2	10,400	11,9	7,197	11,4	6,780	18,2	10,400	11,9	7,197	11,4	6,780	5-13м
225	20,5	13,200	13,4	9,135	12,8	8,550	20,5	13,200	13,4	9,135	12,8	8,550	5-13м
250	22,7	16,300	14,8	11,188	14,2	10,600	22,7	16,300	14,8	11,188	14,2	10,600	5-13м
280	25,4	20,400	16,6	14,059	15,9	13,300	25,4	20,400	16,6	14,059	15,9	13,300	5-13м
315	28,6	25,100	18,7	17,800	17,9	16,800	28,6	25,100	18,7	17,800	17,9	16,800	5-13м
355	32,2	32,800	21,1	22,609	20,2	21,300	32,2	32,800	21,1	22,609	20,2	21,300	5-13м
400	36,4	41,800	23,7	28,630	22,8	27,000	36,4	41,800	23,7	28,630	22,8	27,000	5-13м
450	40,9	53,276	26,7	36,36	25,6	34,800	40,9	53,276	26,7	36,36	25,6	34,800	5-13м
500	45,4	65,538	29,7	44,817	28,4	42,900	45,4	65,538	29,7	44,817	28,4	42,900	5-13м
560	50,8	82,119	33,2	56,162	31,9	53,700	50,8	82,119	33,2	56,162	31,9	53,700	5-13м
630	57,2	104,034	37,4	71,119	35,8	68,100	57,2	104,034	37,4	71,119	35,8	68,100	5-13м

ТРУБИ ВОДОПРОВІДНІ НАПІРНІ З ПОЛІЕТИЛЕНУ

PLUMBING PRESSURE PIPES FROM POLYETHYLEN

ДСТУ Б В.2.7 - 151:2008, ДСТУ Б EN 12201-2:2018

Труби використовуються для будівництва зовнішніх мереж (водопроводів, артезіанських скважин, систем меліорації, самопливних та напірних каналізаційних колекторів). Гарантійний термін експлуатації труб при дотриманні правил монтажу - 50 років. Випускаються чорного кольору з синіми продольними полосами. Виготовляємо труби з ПЕ 80 и ПЕ 100 в SDR 7,4 - SDR 41.

The pipes used for building extranets (plumbings, artesian wells, reclamation systems, gravity and pressure sewers). The warranty period of pipes exploitation is 50 years if all rules of assembling were used. They are manufactured in black colour with blue lengthwise lines. The pipes production of PE 80 and PE 100 in SDR 7,4 - SDR 41.

Зовнішній діаметр, dn mm	ПЕ 100 SDR 26 (0.63 МПа)		ПЕ 100 SDR 21 (0.8 МПа)		ПЕ 100 SDR 17 (1,0 МПа)		ПЕ 100 SDR 11 (1,6 МПа)		Бухти / обрізки, м.п.
	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	Товщина стінки, мм	Вага, кг / м.п.	
20	***	***	***	***	***	***	2,0	0,119	100-200
25	***	***	***	***	***	***	2,3	0,152	100-200
32	***	***	***	***	2,0	0,197	3,0	0,282	100-200
40	***	***	2,0	0,255	2,4	0,302	3,7	0,437	100-200
50	2,0	0,322	2,4	0,383	3,0	0,462	4,6	0,674	100-200
63	2,5	0,504	3,0	0,590	3,8	0,731	5,8	1,062	100-200
75	2,9	0,978	3,6	1,130	4,5	1,318	6,8	1,769	100-200
90	3,5	1,005	4,3	1,212	5,4	1,485	8,2	2,15	50-100
110	4,2	1,474	5,3	1,816	6,6	2,208	10	3,187	50-100
125	4,8	1,899	6,0	2,322	7,4	2,818	11,4	4,135	5-13м
140	5,4	2,397	6,7	2,909	8,3	3,538	12,7	5,155	5-13м
160	6,2	3,140	7,7	3,811	9,5	4,615	14,6	6,762	5-13м
180	6,9	3,909	8,6	4,787	10,7	5,834	16,4	8,544	5-13м
200	7,7	4,843	9,6	5,927	11,9	7,197	18,2	10,534	5-13м
225	8,6	6,096	10,8	7,499	13,4	9,135	20,5	13,341	5-13м
250	9,6	7,542	11,9	9,169	14,8	11,188	22,7	16,399	5-13м
280	10,7	9,413	13,4	11,577	16,6	14,059	25,4	20,564	5-13м
315	12,1	11,986	15,0	14,549	18,7	17,800	28,6	26,028	5-13м
355	13,6	15,165	16,9	18,488	21,1	22,609	32,2	33,054	5-13м
400	15,3	19,209	19,1	23,549	23,7	28,630	36,3	41,944	5-13м
450	17,2	24,288	21,5	29,781	26,7	36,360	40,9	53,276	5-13м
500	19,1	29,963	23,9	36,745	29,7	44,817	45,4	65,538	5-13м
560	21,4	37,575	26,7	46,007	33,2	56,162	50,8	82,119	5-13м
630	24,1	47,597	30,0	58,110	37,4	71,119	57,2	104,034	5-13м

SYSTEM OF INTERNATIONAL CERTIFICATION

SYSTEM OF INTERNATIONAL CERTIFICATION

CERTIFICATE

of Quality Management System
Certificate №: SIC.MS.040.ISO9001.2311

The Certification Body "RosUkrCert" hereby certifies that the Quality Management System of

"POLYMER GROUP "TERPOLIMERGAZ"

LIMITED LIABILITY COMPANY

Legal address: 31 Mykulynetska Str., Ternopil, Ternopil region, Ukraine, 46005
Production address (of the main location): 8 Lukianovycha Str., Ternopil, Ternopil region, Ukraine, 47707
EDRPOU Code 37306731

concerning:

- plastic pipe and fitting production and distribution (PE-100 and PE-80 polyethylene connections, polyethylene connections PE-RT II with high heat resistance for thermistor and butt welding of water, gas and heat supply networks, technological pipelines, etc.; integral polyethylene-steel transitions thermistor; integral polyethylene-steel transitions; polyethylene flanged bushes for butt welding; PE-100 and PE-80 polyethylene pipes (including multilayer (co-extruded)) for gas- and water pipelines construction (including utility and drinking water supply), drainage and sewerage networks, technological pipelines, and polyethylene pressure pipes PE-RT II with high heat resistance for cold, hot water and heat supply networks; steel flanges

comply with the international standard

ISO 9001:2015

"Quality management systems. Requirements"

INTERNATIONAL STANDARD

Issue date	:	**14.05.2021**
Certification cycle	:	**3 years**
Valid through*	:	**14.05.2022**
Date of the next surveillance audit	:	**14.04.2022**

** The certificate is subject to reissuance for a new term based on the results of annual surveillance audit*

Head of the Certification body O. Shcherbyna

ISO 9001 CERTIFIED

SIC.MS.040.ISO9001.2311

RosUkrCert, notification letter: **SIC.CB.804.040** dated **10.02.2021**.
02192, Ukraine, Kiev, 7 Yunosti str., off. 33 Tel.: +38(096)559-0434, +38(067)536-3802
issued **S.I.C. Global Inc.**, 346 WIGSTON DR, Suite 4, NORTH BAY, ONTARIO, P1A 1X3, CANADA
http://ukrcert.com.ua
http://sic-global.com

ОРГАН СЕРТИФІКАЦІЇ «ЦЕНТРСЕПРОТЕПЛОМЕРЕЖА»

Номер призначеного органу UA.TR.045, атестат акредитації НААУ №1О112

СЕРТИФІКАТ ВІДПОВІДНОСТІ

СЕРТИФИКАТ СООТВЕТСТВИЯ/CERTIFICATE OF CONFORMITY

Зареєстровано в реєстрі органу з оцінки відповідності за № UA.TR.045.000082-19
Зарегистрирован в реестре органа оценки соответствия по №
Registered at the Record of conformity assessment body under №

Термін дії з 08 квітня 2019 до 07 квітня 2022
Срок действия с
Term of vaildity is from

Сертифікат видано
Сертификат выдан
Certificate is issued on
ТОВ «Полімерна група «ТерПолімерГаз», (код ЄДРПОУ 37306731), за адресою: Україна, 46005, м. Тернопіль, вул. Микулинецька, 31

Продукція
Продукция / Production
Втулки під фланець буртові поліетиленові для зварювання встик при будівництві водопроводів та газопроводів з поліетиленових труб номінальним зовнішнім діаметром d_n = 25 - 1200 мм
22.21.29-70.00
(код(ы) ТНВЭД (ДК 016); ДКПП)
(код(ы) ТНВЭД (ДК 016); ДКПП)
(ICCS (UKTZED) code(s) (ДК 016); ОКРР)

(повна назва, тип, вид, марка, торгова марка (товарний знак))
(полное название, тип, вид, марка, торговая марка (товарный знак))
(complete product designation, type, kind or model, trademark (brand))

Відповідає вимогам
Соответствует требованиям
Complies with the requirements
п.п. 5.1.6, 5.3.5, 5.5, 6.4.1, 6.7.1 (рядки 1, 2 таблиці 5) ДСТУ Б В.2.7-179:2009, п.п. 1.3, 1.4.1, 1.6 (рядки 1, 2 таблиці 4), ТУ У В.2.7-22.2-33706122-002:2014 «Втулки під фланець буртові поліетиленові для мереж водопостачання та газопостачання. Технічні умови» (перелік перевірених показників наведено у додатку)

(найменування та позначення нормативних документів/ name and denotation of normative documents)

Виробник(и)
Производитель(и) / Producer(s)
ТОВ «Полімерна група «ТерПолімерГаз», за адресою: Україна, 46005, м. Тернопіль, вул. Микулинецька, 31

Місце(я) виробництва
Место(а) производства
Place(s) of production
ТОВ «Полімерна група «ТерПолімерГаз», за адресою: Україна, 46005, м. Тернопіль, вул. Микулинецька, 31

Додаткова інформація
Дополнительная информация
Additional information
Добровільна сертифікація продукції, що виробляється серійно з 08.04.2019 до 07.04.2022. Технічний нагляд - 1 раз на рік.

Сертифікат видано органом з оцінки відповідності
Сертификат выдан органом оценки соответствия
Certificate is issued by the conformity assessment body
ОС «ЦентрСЕПРОтепломережа», м. Київ, вул. Казимира Малевича, 86Г, офіс 205, т/факс (044) 333-30-87; Номер призначеного органу UA.TR.045 згідно наказу Мінекономрозвитку України №890 від 02.08.2013 р., Атестат акредитації НААУ № 1О112 від 16.10.2018 р.

На підставі
На основании
On the grounds of
Протоколу сертифікаційних випробувань № 247-2019 від 05 квітня 2019 р. Випробувальної лабораторії «ЦСТМ» з випробувань трубопровідної продукції та полімерних матеріалів будівельного призначення ТОВ «Орган сертифікації «ЦентрСЕПРОтепломережа» (03150, м. Київ, Залізничне шосе, 47), Атестат акредитації №2Н1064 від 01.11.2014 р. (чинний до 31.10.2019 р.), Висновку державної санітарно-епідеміологічної експертизи № 05.03.02-04/34374 від 31 липня 2015 р., Звіт з оцінки системи якості від 18 січня 2019 р.

Керівник органу з оцінки відповідності Л.О. Полтавська
Руководитель органа оценки соответствия
Director of the conformity assessment body
(підпис, ініціали, прізвище)/(подпись, инициалы, фамилия)/(signature, initials, surname)

М.П./М.П./Stamp

Чинність сертифіката відповідності можна перевірити в базі даних ООВ, що розміщена на www.cstmlab.com.ua
Действие сертификата соответствия можно проверить в базе данных ООС, размещенной на www.cstmlab.com.ua
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ОРГАН СЕРТИФІКАЦІЇ «ЦЕНТРСЕПРОТЕПЛОМЕРЕЖА»
Атестат акредитації 10112 від 16 жовтня 2018 року, свідоцтво призначення згідно Технічного регламенту будівельних виробів, будівель та споруд №UA.TR.045

Випробувальна лабораторія «ЦСТМ»
Атестат акредитації НААУ № 2Н1064 від 01 листопада 2014 року
Україна, 03150, м. Київ, вул. Казимира Малевича 86 Б, тел./факс. (044) 333-30-87
e-mail: ***cstmlab@gmail.com***

ЗАТВЕРДЖУЮ
В. о. керівника випробувальної лабораторії «ЦСТМ»
_____ А. Ю. Дятлов
«05» квітня 2019 р.

ПРОТОКОЛ ЦСТМ № 248 - 2019
СЕРТИФІКАЦІЙНИХ ВИПРОБУВАНЬ

1. Підстава для проведення випробувань

Сертифікаційні випробування проводяться на замовлення Органу сертифікації «ЦентрСЕПРОтепломережа» (далі за текстом – *ОС)* згідно рішення ОС № 225 від 25.02.2019 р.

2. Об'єкт випробувань:

Зразки Продукції виробництва ТОВ «Полімерна група «Терполімергаз» (Україна, 46005, м. Тернопіль, вул. Микулинецька, 31):

- **муфта терморезисторна** з розмірним співвідношенням **SDR 11** номінальним діаметром **D_n = 110 мм** в кількості 5 шт., **партія № 021903, дата виготовлення 02.2019 р.;**

для проведення сертифікаційних випробувань у відповідності з вимогами п.п. 5.1.5.1, 5.1.5.2, 5.1.5.3, 5.1.5.4, 5.1.5.5, 5.1.5.6, 5.1.6, 6.4.1, 6.7.1 (р. 1, 2 табл. 5) ДСТУ Б В.2.7-179:2009 «Деталі з'єднувальні для газопроводів із поліетиленових труб Технічні умови» згідно з актом відбору зразків № 1 від 06.03.2019 р.

далі за текстом – Продукція.

3. Дата отримання зразків:

Зразки Продукції отримано 25.03.2019 р.

Випробувальні гірлянди з відповідних труб та фітингів під торгівельною маркою «Терполімергаз» були зварені уповноваженими представниками ТОВ «Полімерна група «Терполімергаз» 06 березня 2019 р. у приміщенні лабораторії ТОВ «Полімерна група «Терполімергаз» під наглядом в. о. керівника лабораторії «ЦСТМ» Дятлова А. Ю. із застосуванням інструменту монтажного під торгівельною маркою «Терполімергаз», далі за текстом – *зразки випробувальних гірлянд.*

4. Дата проведення випробувань:

26.03.2019 р. – 04.04.2019 р.

5. Мета випробувань:

Перевірка відповідності зразків Продукції вимогам ДСТУ Б В.2.7-179:2009 «Деталі з'єднувальні для газопроводів із поліетиленових труб Технічні умови».

6. Показники властивостей об'єкта випробувань та нормативна документація на методи їх контролювання:

6.1 Показники випробувань зразків Продукції:

6.1.1 Відповідно ДСТУ Б В.2.7-179:2009 «Деталі з'єднувальні для газопроводів із поліетиленових труб Технічні умови»:

- п. 5.1.5.1 Основні розміри розтруба терморезисторного;
- п. 5.1.5.2 Значення довжини розтруба, мм;
- п. 5.1.5.3 Номінальна довжина холодної зони розтруба, мм;

- п. 5.1.5.5 Овальність внутрішнього діаметра розтруба терморезисторного, мм;
- п. 5.1.5.6 Товщина стінки розтруба терморезисторного, мм;
- п. 5.1.6 Товщина стінки корпусу деталі, мм;
- п. 6.4.1 Зовнішній вигляд деталей;
- п. 6.7.1 р.1 табл. 5 Стійкість при постійному внутрішньому тиску при 20^{0}С, год;
- п. 6.7.1 р.2 табл. 5 Стійкість при постійному внутрішньому тиску при 80^{0}С, год.

6.2 Нормативна документація:

6.2.1 ДСТУ Б В.2.7-179:2009 «Деталі з'єднувальні для газопроводів із поліетиленових труб Технічні умови»;

6.2.2 ДСТУ ISO 3126:2015 (ISO 3126:2005, IDT) Трубопроводи з пластмаси. Пластмасові елементи трубопроводу. Визначення розмірів;

6.2.3 ДСТУ Б EN ISO 1167-1:2012 Труби, фітинги й вузли з термопластів для транспортування рідких і газоподібних середовищ. Визначення опору внутрішньому тиску. Частина 1. Загальні методи;

6.2.4 ДСТУ Б EN ISO 1167-2:2012 Труби, фітинги й вузли з термопластів для транспортування рідких і газоподібних середовищ. Визначення опору внутрішньому тиску. Частина 2. Підготовка зразків труб для випробувань

7. Умови проведення випробувань:

- атмосферний тиск (738 - 761) мм.рт. ст;
- температура навколишнього середовища (20 – 21)^{0}С;
- відносна вологість повітря (61 – 70) %.

8. Назви та основні характеристики використаного випробувального обладнання наведено у таблиці 1.

Таблиця 1

Назва випробувального обладнання	Тип, марка	Основні технічні характеристики	Інформація щодо повірки, атестації
Стенд SCITEQ-Hammel A/S (Данія) для випробування внутрішнім тиском	«Sciteq-2000»	Регульований тиск від 0,1МПа до 10МПа з похибкою 1%; регульована температура від 15^{0}С до 95^{0}С з точністю 0,1^{0}С	Свідоцтво ДМА № UA 02 02 910 від 31.10.2013 р.
Універсальна розривна машина Beijing Century Wang An International Trade (Китай)	WDT-W	Робочий діапазон 5-100 кН; хід траверзи не більше 2000 мм; похибка у робочому діапазоні (±1,0)%	Свідоцтво ДМА № UA 02 04 34288 від 13.11.2013 р.
Комп'ютер	Intel Pentium V	IP 600 MHz/128 Mb/100 Mb,	Атестації не підлягає

9. Назви та основні характеристики використаних засобів вимірювання приведені в таблиці 2

Таблиця 2

Назва засобів вимірювання	Заводський номер	Технічна характеристика	Інформація щодо повірки, атестації
Штангенциркуль ШЦ-11 250	Е 17872 (17978)	Діапазон вимірювань 0-250 мм ціна поділки 0,05 мм	Свідоцтво ДМА № UA 0204 № 23394 від 29.09.2013 р.
Стінкомір індикаторний С-25	№ 4203	Діапазон вимірювань0-25 мм, ціна поділки 0,1 мм	Свідоцтво UA 0204 № 23388 від 23.09.2013 р.

10. Результати випробувань приведені в таблиці 3

Таблиця 3

Назва показника	НД на нормативні вимоги	НД на метод контролювання	Нормативне значення показника	Фактичне значення показника	Результат випробувань	Наявність комп'ютерного роздрукування результатів
1	2	3	4	5	6	7
Муфта терморезисторна з розмірним співвідношенням **SDR 11** номінальним діаметром **D_n = 110 мм,** партія **№ 021903**, дата виготовлення **02.2019 р.**						

1	2	3	4	5	6	7
Конструкція	п.5.1.2÷ 5.1.4 ДСТУ Б В.2.7-179	п.5.1.2÷ 5.1.4 ДСТУ Б В.2.7-179	Конструкція деталі для терморезисторного зварювання повинна передбачати наявність не менше одного (чи декількох торців викнаних у вигляді втулкового кінця) торця з розтрубом терморезисторним із розмірами та характеристиками згідно з стандартом. Конструкція деталі не повинна мати різких (не плавних) змін у товщини стінки корпуса деталі для запобігання зосереджень внутрішньої напруги матеріалу деталі.	Розтрубів терморезисторних 2. Різкі зміни у товщини стінки корпуса деталі відсутні	Відпові дає	Ні
Товщина стінки деталі для терморезисторного зварювання, мм	п.5.1.6, табл.2 ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В.2.7-179, ДСТУ ISO 3126	≥E ≥e_n	min 10,6 max 11,0	Відпові дає	Ні
Основні розміри розтруба терморезисторного п.5.1.5 ДСТУ Б В.7-179						
Довжина розтруба L_1, мм	п.5.1.5.2 (табл.1) ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В.2.7-179, ДСТУ ISO 3126	min 32 max 82	min 75,0 max 75,2	Відпові дає	Ні
Довжина зони зварювання розтруба L_2, мм, не менше	п.5.1.5.2 (табл.1) ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В.2.7-179, ДСТУ ISO 3126	15	min 41,5 max 42,0	Відпові дає	Ні
Довжина холодної зони розтруба L_3, мм, не менше	п.5.1.5.3 ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В.2.7-179, ДСТУ ISO 3126	15	min 17,0 max 17,2	Відпові дає	Ні
Середній внутрішній діаметр зони зварювання D_1	п.5.1.5.4 ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В.2.7-179, ДСТУ ISO 3126	$110,0^{+0,7}$	min 110,2 max 110,5	Відпові дає	Ні
Овальність внутрішній діаметр зони зварювання D_1, не більше	п.5.1.5.5 ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В.2.7-179, ДСТУ ISO 3126	$0,015d_n$ (1,6)	0,3	Відпові дає	Ні
Зовнішній діаметр розтруба D_3, мм, не менше	п.5.1.5.7, табл.2 ДСТУ Б В.2.7-179	п.9.6 ДСТУ Б В:2.7-179, ДСТУ ISO 3126	(D_1+2e_n)	min 131,0 max 133,0	Відпові дає	Ні
Зовнішній вигляд	п.6.4.1 ДСТУ Б В.2.7-179	п. 9.5 ДСТУ Б В.2.7-179	При розгляді без збільшувальних приладів, внутрішні та зовнішні поверхні деталей повинні бути гладкими і чистими, не мати тріщин, здуттів, раковин чи інших ушкоджень, що погіршують експлуатаційні властивості, та залишків мастила на поверхнях для зварювання. Складові елементи деталі не повинні мати ознак ушкоджень, подряпин, щербин, міхурів, задирок, сторонніх включень, тріщин або ознак	Внутрішні та зовнішні поверхні деталей є гладкими і чистими, не мають тріщин, здуттів, раковин чи інших ушкоджень. Колір деталі - чорний	Відпові дає	Ні

1		2	3	4	5	6	7
				корозії. Колір деталей з поліетилену повинен бути чорним або синім. Відтінки кольорів не регламентуються.			
Стійкість при постійному внутрішньому тиску, год, не менше	при 20°С	п.6.7.1 р.1 табл.5 ДСТУ Б В.2.7-179	п.9.7 ДСТУ Б В.2.7-179, ДСТУ Б EN ISO 1167-1, ДСТУ Б EN ISO 1167-2	100 (початкова напруга в стінці труби 12,4 МПа)	105 год. 00 хв. (випробувальний тиск 25,29 бар)	Відповідає	Ні, додаток А, табл. А.1
	при 80°С	п.6.7.1 р.2 табл.5 ДСТУ Б В.2.7-179	п.9.7 ДСТУ Б В.2.7-179, ДСТУ Б EN ISO 1167-1, ДСТУ Б EN ISO 1167-2	165 (початкова напруга в стінці труби 5,4 МПа)	180 год. 00 хв. (випробувальний тиск 11,01 бар)	Відповідає	Ні, додаток А, табл. А.2

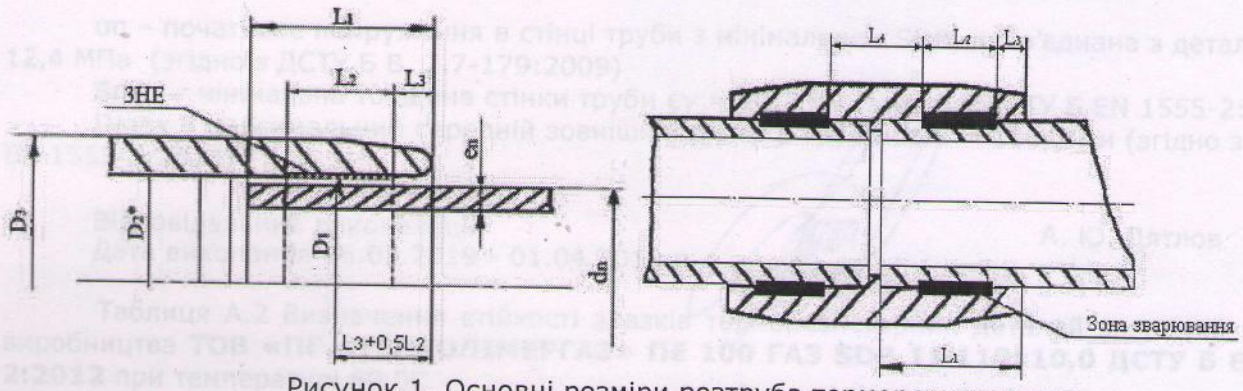

Рисунок 1. Основні розміри розтруба терморезисторного

Висновок.

Піддані випробуванням зразки Продукції ТОВ «Полімерна група «Терполімергаз» (Україна, 46005, м. Тернопіль, вул. Микулинецька, 31):

- **муфта терморезисторна** з розмірним співвідношенням **SDR 11** номінальним діаметром **D_n = 110 мм** в кількості 5 шт., **партія № 021903, дата виготовлення 02.2019 р.;**

для проведення сертифікаційних випробувань у відповідності з вимогами п.п. 5.1.5.1, 5.1.5.2, 5.1.5.3, 5.1.5.4, 5.1.5.5, 5.1.5.6, 5.1.6, 6.4.1, 6.7.1 (р. 1, 2 табл. 5) ДСТУ Б В.2.7-179:2009 «Деталі з'єднувальні для газопроводів із поліетиленових труб Технічні умови» згідно з актом відбору зразків № 1 від 06.03.2019 р. відповідають вимогам стандартів.

Перелік додатків:

Додаток А. Показники процесу визначення стійкості зразків терморезисторних деталей до дії постійного внутрішнього тиску

Кількість видрукуваних екземплярів – 3 прим.

Замовнику – 1 прим;

Орган сертифікації «ЦентрСЕПРОтепломережа» - 1 прим.

Архів лабораторії «ЦСТМ» - 1 прим.

Зауваження:

Цей протокол випробувань, включно із всіма додатками до нього та результатами комп'ютерного роздрукування, не може бути повністю або частково відтворений та розповсюджений як офіційний документ без дозволу випробувальної лабораторії «ЦСТМ».

Цей протокол випробувань, включно із всіма додатками до нього, стосується тільки тих зразків, які піддавались випробуванням.

Відповідальний виконавець:

Заступник директора з якості _____ А. Ю. Дятлов

Контроль:

Керівник відділу сертифікації _____ Б.В.Морозов

Таблиця А.1 Визначення стійкості зразків терморезисторних деталей зварений з трубою виробництва **ТОВ «ПГ «ТЕРПОЛІМЕРГАЗ» ПЕ 100 ГАЗ SDR 11 110х10,0 ДСТУ Б EN 1555-2:2012** при температурі 20 0С

Позначення зразка	Маркування зразка	Режим випробувань			Відхилення від режиму	Результати випробувань
		Термін, год.	Температура, ^{0}С	Тиск Р, бар		
Випробувальна гірлянда 110-1	1	100	20	25,29	Відхилень не зафіксовано	105 год. 00 хв. без ознак руйнування та втрати герметичності
	2					
	3					

P= 2Smin σп /(Dmax - Smin) = 2 x 10,2 x 12,4 / (110,2 – 10,2) = 2,529 МПа = 25,29 бар

σп – початкове напруження в стінці труби з мінімальним SDR, що з'єднана з деталлю - 12,4 МПа (згідно з ДСТУ Б В. 2.7-179:2009)

Smin – мінімальна товщина стінки труби еу = 10,2 мм (згідно з ДСТУ Б EN 1555-2:2012)

Dmax – максимальний середній зовнішній діаметр труби dem = 110,2 мм (згідно з ДСТУ Б EN 1555-2:2012)

Відповідальний виконавець А. Ю. Дятлов
Дата виконання 26.03.2019 - 01.04.2019 р

Таблиця А.2 Визначення стійкості зразків терморезисторних деталей зварений з трубою виробництва **ТОВ «ПГ «ТЕРПОЛІМЕРГАЗ» ПЕ 100 ГАЗ SDR 11 110х10,0 ДСТУ Б EN 1555-2:2012** при температурі 80 0С

Позначення зразка	Маркування зразка	Режим випробувань			Відхилення від режиму	Результати випробувань
		Термін, год.	Температура, ^{0}С	Тиск Р, бар		
Випробувальна гірлянда 110-2	1	165	80	11,01	Відхилень не зафіксовано	180 год. 00 хв. без ознак руйнування та втрати герметичності
	2					
	3					

$P= 2S_{min}\ \sigma_n /(D_{max} - S_{min}) = 2 \times 10,2 \times 5,4 / (110,2 - 10,2) = 1,101$ МПа = 11,01 бар

σ_n – початкове напруження в стінці труби з мінімальним SDR, що з'єднана з деталлю - 5,4 МПа (згідно з ДСТУ Б В. 2.7-179:2009)

S_{min} – мінімальна товщина стінки труби e_y = 10,2 мм (згідно з ДСТУ Б EN 1555-2:2012)

D_{max} – максимальний середній зовнішній діаметр труби d_{em} = 110,2 мм (згідно з ДСТУ Б EN 1555-2:2012)

Відповідальний виконавець А. Ю. Дятлов
Дата виконання 27.03.2019-04.04.2019 р.