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## EXPLANATORY NOTE

for Master's Thesis

topic: **“TRENDS OF ENTERPRISE QUALITY MANAGEMENT  
SYSTEM IMPROVEMENT BASED ON INNOVATIONS  
(LLC “CORPORATION VATRA” AS A CASE STUDY)”**

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**ASSIGNMENT**

**FOR MASTER'S THESIS FOR STUDENT**

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Master's Thesis supervisor Nagornyak Galyna Stepanivna, PhD.

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## 6. Advisors of design Master's Thesis chapters

Chapter	Advisor's surname, initials and position	Signature, date	
		assignment given	assignment accepted
<i>Labor protection</i>	<i>Doctor of Economics, Assos. Prof., Sherstiuk R. P.</i>		
<i>Emergency safety</i>	<i>Senior Lecturer, Struchok V.S.</i>		
<i>Justification of economic efficiency</i>	<i>Assos. Prof., PhD. Stoiko I. I.</i>		
<i>Special part</i>	<i>Doctor of Economics, Assos. Prof., Melnyk L. M.</i>		

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3	<i>Chapter 3. Ways of increase in efficiency of control systems of quality of LLC "OSP Korporation Vatra" on the basis of innovations</i>	<i>04.12.2020</i>	
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## ANNOTATION

*Ekayawhe Djoshua Oghenegare. Trends of enterprise quality management system improvement based on innovations (LLC "Corporation VATRA" as a case study).*

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The object of research is the development of a strategy for the implementation of a comprehensive product quality management system based on innovations.

The aim of the work is to develop innovative approaches to the product quality management system at this enterprise.

Research methods – economic-mathematical, statistical, trend forecasting, historical-economic, technical-economic

A package of information resources required for innovative approaches to the development of a strategy for the implementation of a comprehensive product quality management system on the example of LLC "Corporation VATRA", an analysis of production and economic activities of the enterprise. The dynamics of changes in losses from marriage was also carried out, alternative options for improving the quality of products were considered. The quality management system at LLC "Corporation VATRA" has been improved through the implementation of alternative technical and technological improvement projects, as well as the introduction of new equipment.

*Key words: quality, quality management, quality management system (QMS), financial and economic condition, ISO 9000 series standards, TQM (Total Quality Management).*

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## INTRODUCTION

Actuality of theme. Strengthening of the market relations stimulates the enterprises with the expressed innovative accent to apply new approaches and forms in management, to change the nature of solvable tasks and methods of achievement of results, and at times and the vector direction of innovative activity. Search of new ways of innovative activity is defined by need of studying innovative opportunities not only at the microlevel, but also at the meso-level, within the industry. The lighting industry is not an exception.

Issues of development of the national lighting industry were and remain relevant as this industry plays a key role in formation of dynamic development of economy. Thanks to work of the lighting industry the economic capacity of all state including the budget of the country is formed. In a number of branches of the national economy, results of work of the industry are used. Considering technical and technological complexity of productions at the enterprises of the lighting industry, there is obvious a need of realization of new approaches for management, introduction of innovations and quality systems for the purpose of creation and stimulation of innovative potential which, in turn, influences development of innovative susceptibility.

The dynamism of external and internal conditions in which the enterprise functions demands accurately formulated strategy and the model of management based on an integrated approach to realization of innovative activity. An integrated approach will allow to estimate comprehensively specifics of carrying out innovative activity at the enterprise and in a section of the industry.

Everything listed above and also the analysis of tools and methods of management of innovative activity of the enterprise of the industry, assessment of factors of influence, identification of problems at realization of innovative activity of quality systems at the enterprise of the lighting industry, fragmentary development of

theoretical provisions of the specified subject domain designated relevance of the chosen subject of scientific research.

Introduction of modern control systems of quality at the enterprises of the developed countries of the world was carried out, first of all, for the purpose of improving competitiveness and overall performance, representation to customers and societies of more effective proofs of a quality assurance of tests and stability of this level of quality thanks to modern methods of quality management.

Ensuring quality of products at the enterprises making lighting products is defined by a number of internal factors: technical, organizational, economic, social and psychological. The important place among these factors is taken by the organizational factors connected with improvement of the organization of production and work, etc. With these factors it is connected uses of effective approach to the solution of problems of quality at the enterprise - system quality management.

The quality of products and services is one of the most important factors of successful activity of any organization. Today requirements of the consumer to quality of products became around the world much tougher. Without continuous improvement of quality it is impossible, achievement and maintenance of effective economic activity. The production efficiency is important category of market economy which is directly connected with achievement of the goal and the purposes of development, both each enterprise separately and societies in general.

In modern conditions of tough competition for sales markets of products of the enterprise (the company, firm) of the developed countries use the effective instrument of ensuring success more and more widely – quality systems. The efficiency of this tool especially increases now in connection with acceptance in many countries of the legislation which establishes strict requirements on health and human life safety of products, protection of the rights and the interests of consumers, environmental protections and so forth.

Development of the industry is characterized by increase in attention of producers and consumers to quality of industrial output. Quality production is considered now worldwide as one of important conditions of development of

economy on which rates of industrial development of the country, efficiency of use of human resources, progress of foreign trade and national prestige of the country on the international scene depend. Also it should be noted that one of the reasons of similar position of the Ukrainian enterprises is the imperfect legal framework: untimely development and adoption of the relevant state acts, their incompleteness and instability.

The relevance of development, application of methods and instruments of productive innovative management and also a control system of quality of the enterprises defined a research objective and a number of the tasks necessary for its achievement. Importance and need of a research of this subject is caused by the fact that in modern conditions the increase in its competitiveness as which it is necessary to understand ability to create, make and market goods and services which consumer and price characteristics more attractive similar products of competitors is the key to achievement of financial success of the enterprise.

Object of a research is LLC “Corporation VATRA”. As object of research theoretical and practical bases on development of innovative approaches of a control system of quality of products at this enterprise act. The purpose of work is development of innovative approaches of a control system of quality of lighting products at this enterprise.

In work are used economic-mathematical, statistical, trend forecasting, historical and economic, technical and economic. By means of these methods the specific proposals and recommendations necessary for development of strategy of introduction of a complex control system of quality of products on the example of LLC “Corporation VATRA” are developed.

The analysis of production economic activity of the enterprise is carried out, dynamics of changes of losses from marriage is carried out, alternative options of increase in level of quality of products are considered. Improvement of a control system of quality on LLC “Corporation VATRA” by introduction of alternative projects of technical and technological improvement and also introduction of the new equipment is carried out.



# **CHAPTER 1**

## **BASIC PRINCIPLES OF QUALITY MANAGEMENT AND ELEMENTS OF THE QUALITY SYSTEM OF THE ENTERPRISE ON THE BASIS OF INNOVATIONS**

### **1.1. Innovative development of the enterprises as basis of productive activity**

Innovations today are one of the key means allowing the enterprise to exist productively in the market and to provide itself with competitive and possible advantages. Working in modern conditions, the enterprises repeatedly proved that the lack of innovations allows the enterprise to hold only a position of "outsider" or "to follow the leader". If to consider innovations in linguistic definition, then they are understood as the extended innovation. And today in a row educational editions, study guides, in periodicals we can meet broadcasting of innovations as the innovation or an innovation which found realization in receiving commercial profit irrespective of the field of use.

Innovations begin at a stage of research and development. In manufacturing industry – it is nearly one of significant stages of an innovative cycle. Therefore we consider that when developing specialized research institutes can yield the greatest positive result. The similar organizations have, in our opinion, indisputable competences:

- support highly qualified industry specialists;
- are quickly ready to solve objectives;
- are aimed at the positive end result;
- coordination and comfort of psychological climate;
- creativity in developments that allows to satisfy qualitatively social and economic requirements and to form new including in manufacturing industry.

We consider the second aspect which is not considered in definition, existence

of life cycle of innovations is. We will understand the time log including a number of stages within which innovations develop consistently as life cycle of innovations, under objective economic laws and have the points of bifurcation.

Today during the toughening of environmental conditions, integration world and the regional markets innovative development becomes one of basic components of success and the perspective directions for the enterprises. Our research demands specification of the concept "innovative development". Some of scientists consider that innovative development is a process only of positive changes that in our opinion, is justified. So, changes at the enterprise assume the positive end result and dynamics of development "up". But process of innovative development can take place and is balanced i.e. when total positive economic effect of innovations is equal to the expenses connected with innovations.

The situation when development due to the lack of innovative competences and innovative susceptibility is characterized by negative dynamics or "development down" can become one more option of innovative development at the enterprise. The exception is made in this case by the venture companies. Innovative development assumes positive dynamics of growth with the ascending trend of growth or the enterprise has to have the balanced innovative development with absolutely elastic dynamics of growth [9].

The following approach in definition of innovative development is its gradation on levels: macro - and microlevel. It is necessary to consider innovative development as process of structurally functional positive changes in a system (or an object) on acquisition new or to transformation of the available useful properties which will make a system steadier and viable that will provide it competitive advantages in effective interaction from system [35]. At the microlevel we consider that innovative development is an ability of the enterprise to reflect long-term requirements of economic entity and its actual compliance to opportunities of innovative capacity of the enterprise and innovative susceptibility [17].

Actually management of productive activity today, is directed to preservation of the enterprise through innovative development. Even at the beginning of formation

of an economic thought William Stafford showed the importance of development of the industry for economy. He wrote that the industry – an important issue, it can occupy all workers of the country and provide all with earnings and allow to develop" [16].

Are allocated one – two- and multiple-factor approaches in a research of innovative development of the enterprises. innovative development has to be based on existence of basic factors. To which we will carry:

1. The assuming factors. These are factors which stimulate development of innovations under favorable external and internal conditions. To such a factor, in our opinion, it is possible to carry, the internal innovative capacity of the enterprise, innovative susceptibility and innovative enterprise.

2. Fundamental. Factors without which innovative development is impossible. They provide development of the innovative and production sphere (competent shots, new technologies, NTP, information, innovations, the legislation and the legal framework, etc.).

3. Stimulating. Factors which stimulate innovative development. Here it is possible to refer the competition, tendency of the population to consumption and saving, income, profit.

4. Supporting. These are factors without which innovative development can slow down, or develop into a "zero" indicator of development. To belong to such factors public policy, the external environment, risk.

5. Favorable. These are factors which contribute to the effective development. To this factor it is possible to refer innovative climate at the enterprise, additional federal financing, increase in terms at research and development, etc.

Conditions are necessary for formation of innovative development of the enterprise:

1. The markets are already saturated by uniform products and are ready to accept an innovation;

2. Emergence of an innovation in the market will provide to the enterprise indisputable competitive advantages;

3. As a result of integration of the markets the modern consumers give preference to individual demand which is based on individualization of requirements.

Innovative development of the enterprise, in our opinion, is based on three basic components:

- innovative potential on the basis of which innovations are formed;
- innovative enterprise and innovative susceptibility.

Innovative development allows to track dynamics of the key quantitative and quality indicators and a component, to estimate structural communications of the managing objects and to develop practical recommendations about management of innovative activity of the enterprise.

We will understand purposefully improved relations between subjects of managing and organizational structures of different form of ownership concerning a research, development, creation, development and diffusion of the innovations which are basis for productive reproduction as innovative activity.

Innovative activity is based on two main prerequisites:

- systemcities;
- uncertainty, i.e. degree of risk of a discrepancy at achievement of actual state at the set standard state in the specified terms is big.

Innovative activity, as a rule, is the whole range of the directions which stimulate and lead to innovations in the form of absolutely new or modified product. The mechanism of innovative activity, in our opinion, is based on flexible distribution financial and economic, production and technological, scientific and technical and personnel components that allows the enterprise to provide a certain level of innovative potential, sensitivity of innovative susceptibility and in total to have productive impact on innovative development.

Positive dynamics of innovative development is impossible without a certain innovative capacity of the enterprise. We will understand set as innovative potential available a component (conditions, factors, resources) the enterprises and its ability to get the components and resources from the external environment directed to improvement of technical and economic opportunities of the enterprise, development

and production of the unique competitive products (services, technologies) meeting the modern requirements lacking for innovative process.

Having taken J. This's statements as a basis, we consider that orientation to creation of innovations leads the enterprise to significant radical changes. As development of the skills increasing value demanded for management helps the enterprise will turn from administrative into innovatively enterprise [15]. Such approach demands presence of innovative potential. And innovative potential, in turn, will determine duration of the last phase of a production cycle and its real throughput opportunity that will be positively affect the end result of activity [22].

Innovative potential under the influence of the predicted innovative enterprise in combination with the set growth rates coordinated and accepted for this period of time by target indicators is formed. That is actually innovative potential stimulates innovative enterprise.

Innovative capacity of the enterprise includes also a number of system components:

- ability of a system to updating and creation demanded by society, enterprises, individuals of innovations;
- ability of a system to transformation of an innovation in a profitable component;
- ability of a system to diffusion of an innovative product.

The carried-out analysis shows that innovative potential and always completely tends to realization. In some cases between actually used innovative potential and available innovative potential the gap is formed. One of the events reasons, we consider, information cascading is [10, page 24]. So, desire of the producer to be fixed in this market at the expense of the new innovative products which already appeared at competitors and to increase profitability of the business, forces to study actions of competitors or to copy them without information, resources and potential opportunities which are available at own order.

## **1.2. Quality system: formation stages, basic elements, functions**

In the conditions of the market relations the quality of products provides and the manufacturing enterprise of goods / service guarantees. The quality of products depends on a significant amount of factors. These factors act as separately, and in interrelation among themselves, as on certain stages of life cycle of products, and on several. But all factors can be united in 4 groups: technical, organizational, economic and subjective [28].

Belong to technical factors: design, scheme of consecutive communication of elements, system of reservation, circuit decisions, manufacturing techniques, means of maintenance and repair, technological level of base of design, production, operation, etc. The correct assessment of a role of technical factors promotes the solution of many scientific and engineering tasks at design, production and operation of products. At the same time it is important to know structure and real opportunities of use both each factor separately, and their sets. Use of progressive technological processes, high level of mechanization and automation, perfection of methods and control devices and test of products promote increase in stability of production which provides constant characteristics of quality of products. Incorrectly chosen technology and also its violation in production worsen quality. And after all, increase in technological level of the design and design organizations allows to carry out deeply and carefully an experimental inspection of results of researches and engineering decisions which it in turn influences improvement of quality of products.

Belong to organizational factors: division of labor and specialization, forms of the organization of productions, rhythm of production, form and control methods, order of representation and delivery of products, form and image of transportation, storage, operation (consumption), maintenance, repair, etc.

Unfortunately, so much attention as technical is not paid to organizational factors yet therefore very often well designed and made products owing to the bad organization of production, transportation, operation and repair ahead of schedule lose the high quality.

Belong to economic factors: price, prime cost, forms and wage level, level of costs of maintenance and repair, extent of increase in performance of public work, etc. The most stimulating factors is the price and salary. Correctly organized pricing stimulates improvement of quality. At the same time the price has to cover all expenses of the enterprise on actions for improvement of quality and provide the necessary level of profitability. At the same time products with higher price have to be the superior quality. Salary forms affect quality of products too. At the same time the price-work form stimulates increase in release of products which often are followed by deterioration in its quality, and hourly creates prerequisites for more diligent performance of production operations, but no matter stimulates quantitative indices of production. The interests of improvement of quality demand use of such forms of compensation which at the same time would promote achievement and maintenance of high level of quality of products and would provide their considerable quantitative release [17].

Subjective factors. In ensuring quality of products the significant role is played by the person with its vocational training, physiological and psychological features which differently influence the factors considered above. From vocational training of people who are busy to proektirovaniye production and operation of products, the level of use of technical capabilities depends. But if in the course of functioning of technical factors the role of subjective weakens because at this stage the process takes place with use of the modern equipment and technology which as much as possible exempts technological process from participation of the person, then the subjective element plays already significant role in organizational factors, especially when language comes about forms and images of operation of products. How important subjective factors the thought of economic advantage of improvement of quality extended among producers testifies. The quality is considered at the same time as socially desirable purpose, but its influence on increase in profitability believes minimum. It is explained by insufficient awareness of producers which pripuskatsya such mistakes:

The control system of quality is a special organization in a production system. The basic in this organization is the documentirovannost of all processes which are related to production, beginning from purchase of materials and finishing with delivery to the consumer of finished goods. In many cases it leads to cardinal changes in the equipment, technology and the organization of production at the enterprise. It is possible to provide quality at the enterprise only when all processes – technical, technological, organizational – are interdependent among themselves through quality management. The quality is a system, and this system should be operated. Introduction of the quality system provides conducting of internal checks of a system for the purpose of check of correctness of distribution of functions between subsections, opportunities their performance and also sufficiency and quality of necessary standard documentation.

Let's consider stages of creation of the quality system.

Information meeting. Conducting of such meeting necessary to bring to the management and administrative personnel information which contains sheets about a role and value of quality management for ensuring successful activity of the enterprise.

Making decision on creation of the quality system. Such decision can be issued in the form of the order according to which:

- the representative of the management – the head of quality responsible for creations and functioning of the quality system is appointed;
- the service of quality, as a rule, as a part of VTK, department of quality management, metrological service and department of standardization is formed, and in some cases – with the assistance of the central factory laboratory and test subsections;
- the main stages, the performer, terms of development and deployment of the quality system and, if necessary, terms of its certification are established.

Development of the scheduled plan of creation of the quality system. Have to be provided in the plan performance of a number of works, such as, for example:

- development of policy in the field of quality;



- definition of functions and tasks of the quality system;
- determination of structure of structural subsections which have to perform functions in the quality system.

Definition of functions and tasks of the quality system. At this stage at first it is necessary to carry out the careful analysis of process of creation of products and to present it in the form of the detailed list of stages of works. The basis of the list is formed by the stages of life cycle of products characteristic of this enterprise. The full cycle covers design, supply (purchases), production preparation, production and test of products and service at operation.

Determination of structure of structural subsections of the quality system. After definition of the functions of the quality system necessary for quality management at all stages of creation of products, it is necessary to define structural subsections which will perform these functions. For this purpose it is necessary to analyze functions which are performed by the existing subsections and to compare them to the list of functions which join in the created quality system taking into account the recommendations of ISA 9000. As a result subsections performers of each function are established and to everyone the subsection its new functions officially join in functional duties.

Development of the block diagram of the quality system. The block diagram of the quality system is under construction on the basis of the block diagram of the enterprise and gives the chance to show the principle of action of a system structure and interrelation of all structural subsections which perform functions in the quality system. The separate block it is possible to show a quality system kernel - service of quality which as it was noted, joins technical inspection department, metrological service, service of standardization and also department of quality management which performs functions of the organization, coordination and methodical management of quality.

Development of the function chart of quality management. Unlike the block diagram which shows the principle of effect of the quality system the creation of the function chart allows to present visually process of management of quality and also to

render and discharge possible the admission at the organization of works on quality when for performance of some functions it can not appear the necessary performers. Therefore development of the function chart will help to provide the accurate organization of works on quality management.

Determination of structure and condition of documentation of the quality system. Having defined who and what has to do in the quality system, it is necessary to notice how, by what methods it has to be carried out behind what documentation. Performance of the majority of functions requires, as a rule, several documents. The largest number of documents it is necessary as usual for conducting of operational control in production.

Development of normative documents of the quality system. For development and correcting of normative documents the department of quality management has to make, approve at the management and trace the corresponding schedule with instructions of performers and terms of works. It is also necessary to make Management on quality with the description of the quality system.

Completion and introduction of the quality system. Completion of the quality system is carried out on the basis of planned internal inspections during which it is as usual checked:

- whether it is quite provided in the system of elements for effective management of quality of products;
- whether certain performers of all functions of the quality system;
- whether everything production phases are captured by effect of the quality system;
- or there are all necessary methods of works and or issued they are documentary;
- whether elements and functions of the quality system in workplaces are carried out.

Especially important object of management is the professional structure, competence and activity of personnel (engineering, production, personnel which control, etc.) and the managements.

## Functions of quality assurance behind stages of life cycle of products

### Stage "Marketing and Studying Market":

- participation in the analysis of data of an environment and the prices for products which is carried out by subsections (enterprises) of marketing and trade;
- participation in preparation of the program of works on design, development, productions and advance to the market of products;
- determination of the current and perspective needs in production for the different markets;
- periodic analysis of contracts;
- definition and specification of requirements of consumers behind technical characteristics, the nomenclature, volume, cost and other conditions of supply (sale);
- coordination of the choice of analogs at justification of commercial proportions and technical requirements on products which are offered;
- informing the guide and all interested subsections on requirements of the consumer and a condition of the market;
- the analysis of data on results of interactions with business partners, reports on revision of contracts, including performance of business obligations by partners, the losses caused to requirements of contracts from partners;
- participation in the analysis of results of implementation of programs of interaction with consumers (customers) and the organizations from consumer protection.

### Stage "Design and Development of Products":

- participation in planning of project works;
- the analysis of customer requirements for parameters of products which are intended for development and production;
- coordination with the developer of requirements to products and product indicators of its quality which establish at assessment of quality and certification of products;
- coordination with the customer and developer of requirements and criteria of reception and marriage of products;

- coordination with the customer and developer of objects and monitoring and test methods of products, performance of measurements;
- participation in the analysis of results of tests of the developed samples, conducting of research and constituent parties;
- coordination with the developer of production requirements to production;
- participation in work of the commissions on estimation of technological level of developments;
- coordination with the developer of level of unification and standardization of products and technology, indicators of safety of products and technology, the structure of normative and technical base for preparation and the organization of production and quality control;
- analysis of the project;
- verification of the project;
- approval of the project.

#### Stage "Planning and Development of Processes":

- analysis of the available level of the organization of works from ensuring quality of products in production and its compliances to requirements of certification of products and the quality system;
- formation of structure of actions for improvement of level of the organization of works from ensuring quality of products;
- choice, development and deployment of progressive technological processes and operations;
- development and deployment of progressive means and processes of control and tests, establishment of the status of products by results of control and tests;
- planning and adoption of productions, processes of installation and maintenance;
- production equipment by the necessary equipment, technological equipment and the instrument, instrumentations, means of mechanization and automation, office equipment and also the assembly and serving equipment;
- regulation of parameters of processes;

- ensuring implementation of requirements of documentation of all elements of a production cycle (personnel, documentation, equipment, equipment and tool, equipment, systems of power supply, production environment, raw materials, materials, semi-finished products, delivery details, assembly units);
- establishment and support of methods of identification of products;
- analysis of technological level of works from quality assurance in production;
- preparation of technical documentation and its finishing for data to personnel;
- check of readiness and knowledge of personnel;
- check of readiness of production from: entrance control and tests; production technologies; control and tests in the course of production; final control and tests; ensuring conducting of reliable measurements at control and tests; restoration and completion of products; sorting out, isolation and utilization of products of inadequate quality; storage of products; marking, forging and supply of products;
- certification of a control system and tests;
- formation and use of fund of normative and standard and legal documents in the field of quality;
- conducting of actions on training of personnel, establishment of criteria of performance of work and quality of works.

#### Stage "Purchase":

- definition of requirements to documentation, chercheniye and orders for supply (purchase) of products;
- choice of acceptable suppliers (subcontractors);
- control and estimations of the quality system in the supplier (subcontractor);
- development of agreements (terms of the contract) on quality of products which is delivered (is bought);
- establishment, coordination and fixing of methods of check of compliance of delivery to requirements of the customer;
- development of agreements (documents) from the solution of contradictory questions concerning quality of the bought products;

- planning and the organization of works on entrance control of products which treat from the supplier (subcontractor) and also the organization of interactions suppliers (subcontractors) on quality of products;

- registration and estimations of data on quality of the bought products, conducting pretentious work;

- analysis of data from claims to suppliers (subcontractors) concerning implementation of contractual obligations from technical characteristics, conditions of control and tests, a forging and marking of products;

- conducting of works on preparation by subsections technically and economically reasonable orders for purchase of delivery products, raw materials, materials, semi-finished products and other products, technological equipment, control devices and also orders for technical and other services;

- formation of programs of the general actions on suppliers (subcontractors) from quality assurance raw materials, materials, semi-finished products and delivery products;

- implementation of expeditious interaction with suppliers (subcontractors) on quality raw materials, materials, semi-finished products, delivery products, the equipment, equipment, the tool;

#### Stage "Production":

- control of a condition of observance of requirements of standard documentation;

- control of executive discipline and certification of personnel;

- ensuring rhythm of production;

- conducting of technical inspection, tests, technical diagnostics at different stages of production, including use of statistical control methods;

- systematic check (control) of a state, ensuring accuracy and stability of technological processes, respect for technological discipline;

- implementation of modern information technologies of prevention and identification of defects and shortcoming;

- check of observance of requirements to the general conditions of production (behind objects and types of operations);
- estimation of quality of production of products;
- conducting of maintenance and scheduled preventive maintenance of the equipment;
- restoration and completion of products, equipment, the tool, attached;
- conducting of special measures from ensuring quality of production of the tool, equipment, devices, the service equipment;
- conducting of measures from ensuring quality of production of the tool, equipment, devices, the service equipment;
- conducting of measures from quality assurance during the warehousing and storage raw materials, materials, semi-finished products, delivery products, the equipment, the tool, equipment, attached;
- control of inappropriate products, the organization and conductings of grading, marriage, isolation and utilization of products of inadequate quality, storage of products to completion of the procedures of control and tests;
- planning and organization of works on management of processes: technical inspection and tests of products; control of the production technology; technical diagnostics of a condition of the equipment; functioning of systems of providing (power supply, transport, communications); control of a state production environments;
- conducting of works on metrological support of production and quality of products;
- certification of production, technological processes and jobs, preparation for certification of the quality system;
- certification of equipment, equipping, tool, details and assembly units of own production;
- the organization and implementation of works from quality assurance at internal service (transportation intermediate internally - shop and intershop products, equipment, the tool, devices, cargo handling robots);

- introduction and the analysis of efficiency of functioning of economic methods of management of quality at production;
- conducting of the current training and to staff development;
- control of activity of personnel, implementation of actions of stimulation on it for ensuring quality of products;
- informing the guide and subsections on quality of products and a condition of works from quality assurance.

#### Stage "Check":

- entrance control and quality control of raw materials, materials, semi-finished products, delivery products, details, assembly units in processes their storage, transportation;
- control of parameters of the equipment, equipment, tool, devices, systems of power supply, systems of transportation and production environments;
- control of a condition of a container and packing, compliance of their parameters to requirements of normative documents and contracts;
- design control and supervision of production;
- control of respect for technological discipline;
- metrological control and supervision;
- control and tests of finished goods (in the set parameters), registration of results (execution of protocols);
- technical diagnostics of a condition of the equipment;
- identification of the status of products by results of control and tests;
- control and service of the control, measuring and test equipment;
- systematic analysis of intershop and external claims, reasons of return of products;
- development of offers from providing and improvement of quality of products.

#### Stage "Packing and Warehousing":

- conducting of measures from quality assurance during transportation, loading and unloading works and warehousing of products;



- identification of materials, semi-finished products, details, assembly units, finished goods;
- clarification, storage and forging of products;
- check of completeness and forging of technical and commodity documentation.

#### Stage "Sale and Sale":

- control over the implementation of specifications of departure of products (as necessary);
- control over the implementation of specifications of receiving products;
- implementation of interaction with the consumer of products and preparation of offers on elimination of their remarks;
- registration and data storage about quality of products.

#### Stage "Installation and Commissionings":

- participation in preparation and coordination between the customer, the enterprises (subsections) of trade, subsections of maintenance of technical documentation on conducting of pre-sale preparation, establishment and control (regulation) of products;
- pre-sale preparation, establishment and control (regulation) of products;
- installation of products in the customer.

#### Stage "Technical Assistance and Service":

- participation in coordination between the developer, the customer (trade enterprise) and subsections (enterprises) of maintenance of standard and technical documentation on maintenance conducting (in the guarantee and post warranty periods);
- participation in supervision and the analysis of data from observance of requirements of standard documentation from maintenance of products;
- organization of maintenance.

#### Stage "Operation":

- participation in creation of an information system and analysis of data from observance of requirements of standard and technical documentation, identification

of the latent defects, emergence of violations and deviations in functioning of products;

- preparation of offers from providing and improvement of quality of products on the basis of the obtained data at design stages, production and operation of products.

Stage "Utilization or Secondary Processing after the Expiration of Service":

- participation in coordination with the enterprises (subsections) of maintenance of technical documentation and actions for utilization of products (or components of products, materials);

- participation in carried out actions for utilization of products (or components of products, materials).

Structure of functions of operational management (the adjusting and precautionary actions):

- operational analysis of the current data, identification of the reasons and establishment of the possible consequences of violations, deviations, discrepancies, shortcoming, defects;

- estimation of a condition of works from quality assurance;

- development, coordination and the statement of measures from prevention and elimination of violations, deviations, discrepancies, a shortcoming, defects;

- the organization and regulations of the use of the planned measures;

- collecting and systematization of the current data from violations, deviations, discrepancies which arise in production processes, from quality assurance;

- control and accounting of results of the use of measures;

- formation of the reporting of rather taken measures, informing the guide and the interested subsections.

Structure of functions of strategic management (systematic activity from improvement of quality):

- analysis and estimations of technological level and quality of products;

- analysis and estimations of level and efficiency of expenses on works from quality assurance;

- analysis and estimations of efficiency of functioning of the quality system, satisfaction of needs of consumers.

### **1.3. Basic principles of management of the quality system of products**

Distribution of the best domestic and foreign practices of product quality control is implemented by way of scientific generalization and development on the basis of methodical materials.

Essentially important result of generalization is development of the basic principles of complex control systems of quality of products (TQM):

- complexity – in systems actions of technical, economic, organizational and social character are implemented;

- systemacity – different communications in difficult to an object unite in the uniform theoretical scheme which cornerstone the unity and interrelation of the purposes is;

- planned character – all actions are carried out in a planned order;

- use of methods of material and moral incentive;

- use of general provisions of the theory of management;

- quality management is implemented at all stages of life cycle of products.

- basing on standardization:

The normative document the standard, specifications, a compounding, a standard is the regulatory base for requirements to quality of products.

The large role in ensuring quality of products is played by technical standards: Uniform system of design documentation of = SKD, Uniform system of technological preparation of production, System of development and setting of products on production, etc.

Standards of the enterprise are a standard basis of functioning of control systems of quality of products at the enterprise.

It is important that the analysis and estimations of system effectiveness of quality were carried out with application of economic indicators. The effective quality system positively influences the profit of the organization as through improvement of processes, procedures, operations, reduces losses owing to mistakes, and at the expense of fuller satisfaction of the consumer. Such estimation and providing reports on its results have to create a basis for identification of inefficient types of activity and initiation of actions for internal improvement of a system.

For data acquisition about results of all subsections on a uniform sample reports on functioning of the quality system and its efficiency with application of also financial performance have to be employed the management.

Approach or approaches to financial statements which them can apply the concrete organizations depend on them structure, sphere of activity and perfection of their quality systems. There are several approaches to collecting, representation and the analysis of economic data. In standards approaches are recommended for quality systems, but at the same time it is not excluded application of their options and combinations or other approaches.

1. Approach in terms of expenses on quality. This approach concerns expenses on quality assurance which are accepted to be divided into the expenses connected with internal operations and the expenses connected with external activity. At internal operations the elements of expenses are analyzed by ZOD technique (preventive measures, estimations, defects). Expenses on preventive measures and estimation consider by capital investments while expenses on elimination of defects consider losses. These expenses have such compound:

- on preventive measures - expenses on actions for prevention of defects;
- on estimation – expenses on conducting of tests, control and researches on definition of compliance to requirements concerning quality;
- owing to defects in the course of production – expenses which are caused by discrepancy of products with requirements of quality which is revealed to supply (for example, the services connected with repeated granting, to processings, repeated to conductings of tests, write-off in waste);

- owing to defects which are revealed out of production – expenses which are caused by discrepancy of products with requirements of quality which is revealed after supply (for example, connected with maintenance and repair of products, claims of the consumer and return, compensation of losses and discounts of the price, claims for products and claims for legal responsibility).

2. Approach in terms of expenses on processes. Approach consists in the analysis of two expenses: connected with ensuring compliance and connected with elimination of discrepancy by what process. Management of each of these types of expenses can become an economy source. These types of expenses such:

- the expenses connected with ensuring compliance are expenses on satisfaction of all established and provided needs of consumers at lack of defects of the existing process;

- the expenses connected with elimination of discrepancy are expenses owing to defects of the existing process.

3. Approach in terms of losses owing to independent quality. At this approach, losses in the course of production and out of production owing to inadequate quality are considered and also the current and long-term types of losses are defined. Decrease in sale owing to displeasure of the consumer belongs to typical long-term losses out of production, for example. Typical long-term losses in the course of production are connected with the low performance of work, bad ergonomic indicators, the irrational organization of production, etc. The current losses are connected with expenses on elimination of defects in the course of production and out of production.

The management has to receive regularly financial statements of activity in the sphere of quality to have an opportunity to control them with other economic indicators such, for example as: sale, goods turnover, conditionally net production, for the purpose of adoption of the justified decisions relatively:

- estimation of compliance and system effectiveness of quality;
- identification of additional types of activity (processes, procedures, operations) which require attention and improvement.

## **CHAPTER 2**

### **THE ANALYSIS OF THE EXISTING CONDITION OF THE CONTROL SYSTEM OF QUALITY ON LLC "CORPORATION VATRA " ON THE BASIS OF INNOVATIONS**

#### **2.1. General characteristic of the studied enterprise**

LLC “Corporation VATRA” is lighting manufacturing enterprise which is engaged in design, designing and production of lighting fixtures. Based 1957 in the city of Ternopil as the state enterprise Elektroarmatura. Of 1971 – production association, of 1988 – scientific and production association, of 1996 – open joint stock company. From 2006 – LLC “Corporation VATRA”.

Production capacities:

- foundry production specializes in production of castings from aluminum alloy: dense, with high purity of a surface, different configuration, with decorative art surfaces;
- production of plastic details produces plastic details by a casting method under a crush of thermoplastic materials, direct and instant pressing of reaktoplast and carries out their machining.

Machining production is engaged in processing of cast details from aluminum alloy on universal, specialized and modular machines and also production of details from black and color alloys.

Forming and welding production produces details by method of a deep extract, stamping from metal rolling, to weldings in the environment of carbon dioxide and argon, to weldings in atmospheric conditions.

Tool production produces foundry equipment (compression molds, stamps) for foundry production, casting molds, equipment for production of plastic details, forming and machining productions, galvano-tinctorial production, production of special equipping, implementation of individual orders.

Galvano-production is engaged in coloring cast, stamped, etc. details in method of pneumatic or electrostatic dispersion, drawing decorative coverings: chromium plating, galvanizing and also carries out electrochemical polishing, phosphate coating, gilding of details.

The transport economy is engaged internal (internally shop and intershop) and external transportations, the suspended and land electric transport, automobile and by rail (from the enterprise territory).

Assembly production carries out drawing up products on assembly conveyors and individual jobs by means of special electro- and the pneumoequipment.

At present the enterprise is the greatest producer of lighting engineering in the former Soviet Union. Needs of Ukraine of rather industrial lighting engineering are entirely provided. The enterprise exports over 60% of the products. The wide geography of supply of our products covers such countries as Poland, Russia, Belarus, Moldova, Kazakhstan, Uzbekistan, etc. The close attention is paid to development and release of energy efficient lighting fixtures with application of high-intensity light sources, including light-emitting diodes. The available designs are improved and accustom new with the improved consumer properties.

All products are certified in the Ukrsepro systems and GOST. The control system of quality on production is certified behind the international ISO 9001.

In 2017 together with the German service center of construction technologies and illumination of DIAL GmbH it is created a special plug-in which allows to carry out computer design of lighting in the Dialux program, on the basis of photometric characteristics of lamps and searchlights of Vatra Corporation.

LLC "Corporation VATRA" possesses own scientific and technical potential capable to carry out at high technological level development, preparation of production and development of the new equipment. A part are it:

- design-technology center with department of design, design and technological offices, department of design of special technological equipment, special design office of design of equipment and the tool, skilled testing laboratory, experimental laboratory;

- department of quality and competitiveness with complex research laboratory, bureau of metrology and bureau of standardization.

On own testing facilities, researches of samples of lighting fixtures are conducted. Acceptance, qualification and certified tests are carried out at the Ukrainian lighting institute (Ternopil).

Development of means of technological equipping and new technological processes are carried out by service of the chief technologist and also other specialized domestic and foreign organizations. For example, together with ATOTECH (Germany) technological processes and special equipping for nickel plating, gilding and black galvanizing are entered. Together with AMADA (Japan) it is put into operation a coordinate and revolving press of bending with the CNC.

LLC “Corporation VATRA” repeatedly won tenders for important state orders. In particular, considerable achievement "FIRES" are creations of the projector equipment for sporting venues of 22 Olympic Games (1980) in Moscow (10 thousand searchlights) and also lighting fixtures for Ukraine Palace of culture (126 gilded chandeliers), the National opera of Ukraine, the sessional hall of the Verkhovna Rada of Ukraine in Kiev, objects of the Baikonur spaceport (Kazakhstan).

LLC is one of the most considerable consumers of labor in the Ternopil region and enters the five of the biggest enterprises of Ternopil. The enterprise – one of the biggest in the field of taxpayers.

Corporation covers the wide nomenclature of development and production of lighting engineering which includes almost all scopes of application:

- explosive lighting fixtures (LF) for objects of gas, chemical, oil-processing industry and also coal mines;

- common industrial OP for production rooms practically all fields of the industry, with different types of light sources, for operation in rooms with normal conditions surrounding environments;

- floodlight. These are unique highly effective a searchlight for illumination of the opened and closed sports constructions which provide a possibility of an exact color rendition in television and also scale of searchlights with high-intensity sources



of light, high degree of protection and modern design for the general illumination of open spaces and architectural objects;

- external lighting. Road, street and park lamps with energy-saving lamps;
- administrative, office, public lighting and lamps for premises are lamps wide assortment with fluorescent lamps, lamps of light-emitting diodes;
- lamps of local lighting for local lighting of working areas of machines;
- transport lighting. It is the group for insides of cars of the subway, trolleybuses, the diesel - and electric trains of cars;
- equipment for fluorescent lamps from 7 W to 80 W and GLVT of all types and capacities (from 50 W to 3500 W);
- exclusive lamps of a vip-class with remarkable crystal elements and gilded by fittings.

The products of the enterprise are characterized by quite high level of quality, ten percent of production volume are products which have certificates of quality of the most exacting certified centers of Europe (for example, Germany).

Trademark of LLC: registered in Gospatenta of Ukraine.

## **2.2. Organizational structure of the quality system of LLC “Corporation VATRA”**

The policy in the sphere of ensuring quality of the studied enterprises is implemented through distribution of functions of the quality system between heads of the enterprises and also between subsections.

Fundamental obligations of bosses in the sphere of quality is:

- formation and adjustment of the quality system as instrument of realization of long-term strategy of the enterprise;
- providing quality of products of paramount value in the current economic activity, conducting of this principle through the system of tasks, powers and

responsibility of subsections, distribution of resources, establishment of the corresponding procedures of acceptance and implementation of economic decisions;

- the prevailing orientation of a system of stimulation to achievement in the sphere of ensuring quality of products;

- definition of the general concept of quality management and directions its realization, purpose of management and also implementation of management;

- control of implementation of plans and programs in the quality system, estimation of implementation of programs of quality;

- control and the analysis of total costs on quality, their interrelation with other items of expenditure, the analysis of real losses from inadequate quality, the passed opportunities.

At distribution of duties, powers and responsibility in the sphere of quality assurance between directors and also between subsections it is necessary implementation of such requirements:

- concentration of the top management on the solution of strategic tasks of management. It means delegation on the lowest the level of management of duties and powers from the solution of the current tasks with simultaneous assignment of responsibility on these level;

- hierarchical subordination. The highest level of its powers and responsibility has to answer the highest hierarchical position of the head;

- concentration of duties, powers and responsibility. It means concentration at that level which has all necessary information for decision-making from realization of functions of the quality system;

- exception of excess duplication of duties, powers and responsibility, that is disengagement for each head and the subsection of their duties, powers and responsibility;

- uniformity and balance of loading of heads and subsections.

- legal security of activity of heads and subsections.

It means creation of the productive and economic relations between officials who are responsible for quality on a legal basis, introduction, in case of need, of the

contract system of hiring, regular revision of regulations on subsections and duty regulations on accounting of new duties, powers and responsibility in the sphere of quality;

- economic security of activity of heads and subsections, that is consideration of the corresponding internal relations between subsections as relationship between the internal supplier and the internal consumer.

Power of bosses in the sphere of their functional competence of limits the quality systems are installed concerning interactions with the public (government), regional, industry and public authorities (institutions, the organizations), with foreign firms (institutions, the organizations), with the enterprises and the organizations of Ukraine and also with other heads of the enterprise and subsections (departments, services).

Concerning interactions with other enterprises, institutions, the organizations of power of bosses consist in an opportunity to conduct negotiations, to sign protocols, to conclude or break off contracts and contracts, to correspond.

Concerning interactions with other heads and subsections of power of bosses consist in an opportunity to set a task, to coordinate and control their performance, to give out and approve the decision, to detain or terminate the made decisions, to impose collecting and to establish the amount of stimulation, etc.

The management of the enterprise has to be responsible for definitions and conducting of policy in the sphere of quality.

The sphere of responsibility of heads in the quality system is defined by the sphere of their competence according to functional duties and powers.

Quality control of products on LLC “Corporation VATRA” carries out department of quality and certification of products.

Functions of department of engineering support of quality and competitiveness:

- engineering and laboratory quality assurance and competitiveness of products;

- formation of level of quality;

- standardization and compliance assessment;

- entrance control;
- laboratory and test works on quality and reliability;
- metrological support, certification.

The organizational structure of quality management constructed on the principles of delegation to local links of considerable powers concerning quality assurance, being progressive behind the essence for conditions of gradual reforming of the present plants, it is not capable to solve the problems adequate to a situation. In this regard there is a need of strengthening of centralization for quality management owing to what the following measures for optimization of organizational structure of quality management on corporation were proposed:

- to centralize quality management functions, having subordinated them to the director of quality;
- to transfer the following function blocks at maintaining the director of quality: department of engineering support of quality and certification; department of the chief quality controller;

The main activities of society define general shareholder meetings. They elect members of council of joint-stock company. Council of such society considers and approves reports in a quarter, year. Control of the current activity is exercised by the chairman of the board – the CEO, the deputy CEO, the chief accountant. Check of economic and financial activity is carried out by the audit commission elected at general shareholder meeting. Branches, no subsidiaries of LLC has, directly – to the CEO – all departments and structural units of society submit to the chairman of the board.

Submit to the chairman of the board:

- commercial director;
- financial director;
- deputy CEO with a scientific and technological revolution;
- deputy CEO for quality;
- deputy CEO from personnel management;
- to the deputy CEO from production.

### **2.3. Innovative policy of LLC “Corporation VATRA” in the sphere of quality**

Achievements and maintaining reputation of the enterprise which reports an effort maximum for the sake of the guaranteed satisfaction of needs of the customers at competitive prices are a main goal of production activity of LLC “Corporation Vatra”. Quality – the best guarantee of favor of the customer, gaining of new sales markets and a uniform way to constant development and receiving profit. The quality of products is one of important factors of successful activity of the enterprise.

Increase in requirements concerning quality of products is the general trend which follows from increase in requirements of consumers and development of scientific and technical progress which creates real opportunities of satisfaction of these requirements. Successful (effective) activity of the enterprise is provided with development, production and supply of products which:

- meets requirements of consumers;
- meets the existing standards and specifications;
- meets the existing acts and other requirements of society, including criteria of environmental protection, health and safety, economy of energy, materials and other resources;
- is implemented to consumers behind economically justified (profitable) and competitive prices;
- causes, at timely its supply, receiving profit is not lower than the planned norm.

The priority directions in work of LLC “Corporation Vatra” is:

- aspiration to the mutually advantageous relation with external and internal suppliers, customers and maintenance of feedback from them;
- constant finding solutions concerning improvement of quality of products, adoption of standards with the maximum requirements to quality, regular revision of the accepted requirements;

- improvement of processes and technologies, introduction of new types of competitive products;
- formation of climate of continuous improvement of a quality management system.

Realization of goals and tasks is promoted by existence at the enterprise of a quality management system (SMQ) according to ISO 9001 MS: 2008 which extends to all products which release LLC “Corporation VATRA”.

The leading role, favor and leadership of the management of LLC “Corporation VATRA” which assumes liabilities to provide the maximum satisfaction of consumers is the basic in ensuring functioning and efficiency of the operating SMQ.

The management the main objective in creation of conditions which provide conscious participation of workers in process of management of quality, sees the maximum disclosure of their creative abilities and undertakes to create all conditions and to take necessary measures for achievement of a goal. Each head is responsible for quality and perfection of activity in the area and also defines a task and duties of subordinates concerning quality assurance within SMQ and takes part in continuous process of improvement of activity of corporation.

In turn the personnel of LLC undertake three main to structure concerning quality: products which do not answer conditions not to produce, not to accept and not to deliver.

Each employee of the enterprise of strictly existing rules, to reveal discrepancies and to discharge the reasons their emergence, to make proposals on improvement of processes and procedures, to carry out the self-checking, to increase the level of the professional knowledge and not to allow performance of work and production of products which do not meet the established requirements obliged to be observed. The management provides staff development, stimulates improvement of quality of performance of work and constantly controls processes and promotes continuous improvement of quality according to the increasing needs of the market for what periodically looks through and adjusts policy in the sphere of quality.

The management undertakes to support comprehensively all ideas and proposals of workers aimed at the development and strengthening of the quality system to exercise constant and effective control of functioning of all its elements, to provide workers with all necessary means of performance of productions according to accepted standards.

One of key indicators of work of LLC is timely and qualitative supply of products to consumers. The top management of VATRA wants to establishment of mutually advantageous partnership as with suppliers, so with customers of products, exchanging with them information and plans for the future, initiates the general developments directed to improvement of quality indicators of products.

The quality management system of the enterprise meets the requirements of MS of ISO 9001. The CEO of LLC "Corporation VATRA" obliges heads of subsections and all workers to apply in the work this Installation on quality and other documents SMQ. SMQ consists of a number of standards of the enterprise which are developed, coordinated and approved in accordance with the established procedure. All standards have signs which contain the established code of the enterprise, the registration number and two last figures of year of a statement or revision. SMQ serves as means which guarantees compliance of products to the established requirements concerning quality.

Main objectives of SMQ:

- formation and providing rational policy in the sphere of quality of products;
- determination of the principles of the basic and general provisions of SMQ;
- establishment of rules and procedures of the organization of functioning of SMQ by definition of the list of solvable tasks;
- determination of responsibility and powers (rights and duties) of leadership team of the enterprise;

1. Functional problems of SMQ:

- assistance to more effective organization of marketing activity and search of the markets;

- quality assurance at design, development, tests and maintenance of production;
- quality assurance by preparation of production and production of products;
- the systematized monitoring quality and comprehensive tests of products;
- ensuring preservation of materials, raw materials and delivery products when conducting cargo-unloading;
- ensuring quality of performance of work of maintenance.

All functional problems of SMQ developed are also affected by the corresponding documents standards which define that who and when has to make for performance of objectives. Behind the corresponding subsections which are responsible for development and deployment of the corresponding standards or groups of standards of the SMQ complex the fixed such functional tasks:

- "implementation of marketing" is solved by service of marketing which studies, generalizes and predicts needs in products abroad and within the country;
- "quality assurance at design, development, tests and maintenance of production" is solved by service of the chief designer, they are displayed in the corresponding standards which regulate procedures of development of technical documentation, production and test of samples and an order of setting on production;
- the "ensuring quality of delivery products and materials" assigned to service of material support and the subsection of entrance control of service of the chief controller;
- the "quality assurance by preparation of production and production of products" assigned to service of the chief technologist in interaction from LLC "Vatra-technosvet", metrological laboratory of service of the chief manager on quality at direct participation of the corresponding subsections;
- the "monitoring quality and tests of products" assigned to subsections of technical inspection of Societies, services of the chief controller and service of the chief manager on quality. In standards of this group the displayed requirements concerning monitoring implementation, reception and test of products.

## 2. Security problems of SMQ:



- requirements to personnel and purposeful training;
- metrological support of activity of Societies of Corporation;
- development of concrete plans of measures concerning quality;
- ensuring identification and traceability of products and its components;
- actions at identification of defects and a shortcoming;
- providing safety requirements of products;
- application of statistical methods of data processing for product quality control.

### 3. System-wide tasks:

- establishment of the uniform factory brand and trademark on products;
- ensuring activity of groups of quality in subsections;
- regulation of the rights and duties of performers and development of creative potential;
- establishment of possible measures of moral and material incentive of providing and improvement of quality of products.

The factory brand and the trademark of the enterprise have the legal status and moral value, they are developed by service of the chief designer and the service of quality controls. Methods and order of estimation of efficiency of improvement of quality of products and functioning of SMQ develop economic subsections with the assistance of the chief quality controller.

SMQ functions is interconnected with all other types of activity of the enterprise, interacts with them and extended to all stages of life cycle of products:

- marketing;
- design, development and maintenance of production;
- logistics (providing);
- technological preparation of production, production of products;
- monitoring and conducting of tests;
- forging, storage and transportation of products;
- realization and supply of products;
- after-sale maintenance.

SMQ developed also functions, proceeding from the requirements stated in ISO 9001-2008 MS "A control system of quality. Requirements".

Such principles are the basis for the SMQ model:

- orientation to requirements of the Customer;
- leading role of the management of the enterprise in SMQ;
- process approach to quality management;
- system approach to quality management;
- decision-making on the basis of the facts;
- involvement of personnel;
- mutually beneficial relations with suppliers;
- constant improvement of SMQ.

In a quality management system:

- certain processes which apply at the enterprise, their sequence and interaction;
- certain owners, the performer and customers of processes, the criteria and methods necessary for ensuring efficiency of processes during their functioning and management of them;
- processes constantly provide with resources and information which necessary for them functioning and monitoring;
- carry out continuous monitoring, measurement and analysis of processes;
- provide decision-making and died, the necessary for achievement planned results and continuous improvement of processes;
- exercise control of processes.
- monitoring and reduction in compliance of means of monitoring and tests;
- implementation of systematic metrological supervision of measuring instruments, monitoring and tests at all stages of life cycle of products;
- analysis and entering of specifications into standard documentation on products and its components for the purpose of ensuring objectivity of checks and tests of products;
- systematic influence on selection and developing the skills of shots which provide quality of products;

- performance of different actions for development of technical creativity and an initiative of the performers directed to increase and quality assurance;
- identification of products, its components for the purpose of analysis and preparation of different materials and reports on quality.

Each process has the owner, performers and the customer.

Owner of process:

- provides process with necessary resources;
- defines input, basic data of process and carries out their analysis;
- defines the sequence and interaction of process with other processes;
- defines the purposes of process and criteria of their measurement;
- defines methods of ensuring effectiveness of process;
- provides process monitoring conducting;
- carries out analysis of performance of the purposes and functioning of process;
- defines protocols concerning process;
- takes the adjusting and precautionary actions directed to process improvement;
- provides informing on effectiveness of process.

Performer of process:

- carries out process according to a technique of its sale, achieving the objectives process;
- makes out, registers and keeps protocols concerning process performance;
- performs the adjusting and precautionary operations directed to process improvement;
- informs personnel on effectiveness of process;
- provides to the owner of process of the offer of improvement concerning it.

The technical and economic efficiency of SMQ has direct impact on quality of the products manufactured according to acting with design, technological and standard documentation.

The technological level and quality of products are directly connected with the prices, level of profitability and the amount of profit.

Economic effect of improvement of quality of the manufactured products when functioning SMQ is formed for the account:

- possible increase in contract prices;
- establishment of raises of the small prices;
- decrease in production costs of elimination of defects and losses from a shortcoming;
- bonuses for quality and reliability of products;
- decrease in the non-productive expenses connected with claims and claims of consumers.

The actual economic effect of improvement of quality of products and improvement of quality their production in production is a basis for implementation of moral and material incentive of subsections and performers for quality of products.

The main criteria for estimation of efficiency of functioning of SMQ is:

- stability of quality of products at its normal exploitation at consumers;
- improvement of quality of products;
- decrease in internal production expenses and after-sale expenses for ensuring quality of products.

## **2.4. Analysis of production economic activity of corporation**

In actual practice economic activity to each enterprise their emergence and developments of concrete recommendations for activity improvement is expedient to carry out periodically the comprehensive economic analysis of the property, for the purpose of identification of shortcomings of work of the enterprise, the reasons. The analysis of a financial and economic condition of the enterprise has multi-purpose focus and in particular, can be carried out behind such to the main directions:

- continuous monitoring of the actual efficiency of activity of the enterprise taking into account financial statements;

- identification of solvency of the enterprise of the city and satisfactory structure of balance of the enterprise from prevention of its bankruptcy;
- assessment an economic situation of the enterprise from positions of expedient investment of financial resources into production development.

Also at modern economic conditions activity of each economic subject an attention subject a big circle of participants of the market relations, which in results of its functioning. Successful activity of the enterprise it is necessary to notice everything its strong and weak to a side, an opportunity and potential threats from competitors. To provide survival of the enterprise in modern conditions, it is necessary, first of all, to be able to assess really an economic situation, the of the enterprise, and the existing potential competitors. The firmness of the enterprise is characterized by set of indicators which beat off process of formation and use of funds, and beats off the end results of activity of the enterprise. She defines competitiveness, potential on business cooperation, estimates in what measure the guaranteed economic interests the enterprises of his partners in the financial and production relation.

The unevenness of productions, deterioration of products, difficulty with its realization lead to reduction of receipt of funds on accounts of the enterprise therefore its worsens. There is also feedback as the lack of means can lead to interruptions in providing with material resources and consequently in production. Financial activity of the enterprise have to be aimed at providing systematic receipt and effective use of financial resources, respect for estimated and credit discipline, achievement of a rational ratio of own and involved means, financial firmness for the purpose of effective functioning of the enterprise. It predetermines need and the practical importance of systematic assessment of a financial condition of the enterprise which possesses an essential role in providing its stable a financial state.

Table 2.1

Analysis of dynamics and structure of an active and passive  
balance of LLC “Corporation VATRA” for 2017-2019 years

Articles of balance Sum, thousand UAH Absolute deviation	Articles of balance sum, thousand UAH Absolute deviation			Articles of balance sum, thousand UAH Absolute deviation	
	2017	2018	2019	2018 from 2017	2019 from 2018
1	2	3	4	5	6
Active					
Fixed assets:					
residual cost	12085	15113	17052	3028	1939
depreciation	4799	6410	8638	1611	2228
initial cost	16884	21523	25690	4639	4167
Intangible assets					
Final cost	6	79	192	73	113
Original cost	260	343	475	83	132
The saved-up depreciation	254	264	283	10	19
Incomplete capital investments	713	3703	2384	2990	-1319
Other financial investments	4412	32	32	-4380	0
Reserve	7502	9755	8234	2253	-1521
Manufacturing inventory	4559	7068	6137	2509	-931
Work in progress	361	561	553	200	-8
Finished product	1965	1539	1297	-426	-242
Goods	617	587	247	-30	-340
Receivables for products, goods, services	9873	10867	11188	994	321
Receivables behind calculations:					
with the budget	1734	2185	2003	451	-182
After the issued advance payments	162	3083	298	2921	-2785
Other current receivables	219	4565	4503	4346	-62
Money and their equivalents	1296	16	826	-1280	810
including in cash desk	1	1	1	0	0
Accounts in banks	1295	15	825	-1280	810
Expenses of future periods	-	634	-	634	-634
Other current assets	104	1128	20	1024	-1108
Balance	38106	51160	46732	13054	-4428
Passive					
Authorized capital	2181	2181	2181	0	0
Reserve capital	39	39	39	0	0
Retained earnings	20806	24466	26287	3660	1821
Short-term credits of banks	6150	6387	7318	237	931
Accounts payable for goods, works, services	5768	8843	8521	3075	-322
The current obligations behind accounts:					

Continuation of tab. 2.1

1	2	3	4	5	6
from the received advance payments	16	6748	932	6732	-5816
with the budget	425	167	51	-258	-116
from insurance	551	578	428	27	-150
from compensation	1134	1201	893	67	-308
with participants	989	32	32	-957	0
Other current obligations	47	518	50	471	-468
Balance	38106	51160	46732	13054	-4428

Table 2.2

Economic indicators of LLC “Corporation VATRA”  
for 2017 – 2019 years

Noun	2017	2018	2019
Net income from product sales	131376	110453	105343
Cost of sales	110957	93872	84883
Gross profit	20419	16581	20459
Other operating income	6373	4528	5790
Administrative expenses	10906	11087	11627
Distribution costs	3804	3451	3218
Other operating expenses	5958	4714	7693
Financial result from operating activities:			
Profit	2019	4562	-
Other income	983	862	1070
Other expenses	7	2	3
Financial result to taxation:	7153	5555	2638
Profit	1689	1245	816
Expenses on income	5464	4310	1822
Comprehensive income	5464	4310	1822
Material inputs	52028	39239	37631
Expenses on compensation	18675	18027	15226
Assignment on social measures	6957	6689	5710
Depreciation	1321	1891	2268
Other operating expenses	15122	14892	14442
Adverb	94103	80738	75277

In parallel, according to financial statements, we will consider dynamics of change of losses from a shortcoming for the same years (2017-2019).

Table 2.3

## Dynamics of changes of losses from a shortcoming for 2017-2019 years

№ п/п	Indicators	Value (in the prices of 2017)		
		2017	2018	2019
1	Products (thousand UAH)	131376	110453	105342
2	Prime cost of a final shortcoming (markdown of finished goods), thousand UAH.	1005	1 010	1 013
3	Planned production prime cost of products, thousand UAH.	44125	38 900	39900
4	Specific weight of losses from a lack of product cost (item 2 * 100/item 3), %	2,27	2,6	2,53
5	Influence of a shortcoming on release of products (item 1 * item 4 / 100), thousand UAH.	-1073,1	-1 172	-1 147

Let's submit graphically (fig. 2.1) dynamics of change of specific weight of a lack of total number of production (according to these tab. 2.2).

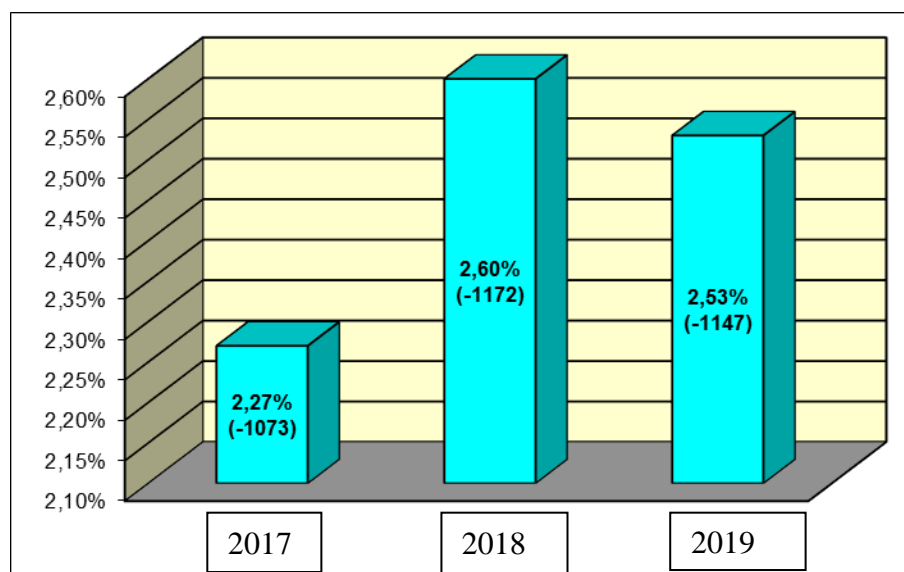


Fig. 2.1. Dynamics of change of losses from a shortcoming on LLC "Corporation VATRA" for 2017-2019 years

Thus:

- growth of level of a shortcoming and expenses (for 98.9 thousand UAH) in 2017 it is caused by deterioration in a financial state on LLC "Corporation VATRA"



(owing to what bought low-quality raw materials and materials, there were not enough funds for purchase of necessary instrumentations, for financing of researches in the sphere of quality);

- in 2017 reductions to a shortcoming (insignificant) allowed to reduce losses from a shortcoming by 25 thousand UAH. It was promoted by inflationary situation, attraction of the additional credits for purchase of the equipment with numerical program control, revenues from sale of excess floor spaces.

The analysis demonstrates that there is a direct connection between dynamics of production (structure) and its quality (dynamics of losses from a shortcoming). At the same time the inversely proportional dependence is observed: the bigger % of a shortcoming, the lowest is production level, so its realization which leads to deterioration in a financial state. Number working every year decreases. The reasons of departure of workers from the enterprise: natural losses (retirement); release owing to reduction of amount of works, the contract expiration; departure in connection with personal desire, family circumstances, for truancies and from other reasons which are not provided by the law.

# **CHAPTER 3**

## **WAYS OF INCREASE IN EFFICIENCY OF CONTROL SYSTEMS OF QUALITY OF LLC “CORPORATION VATRA” ON THE BASIS OF INNOVATIONS**

### **3.1. Efficiency of investment of introduction of a technique of TQM - integrated management of quality on the basis of the ISO standards in activity of LLC “Corporation VATRA”**

Before choosing the concrete design decision, it is necessary to define and estimate all its possible alternative options and to choose the most effective.

For the purpose of improvement of quality of products on LLC “Corporation VATRA” it is possible to consider following alternative versions of projects:

- improvement of a control system of quality of products (TQM);
- introduction of the new equipment, technical complexes;
- technological updating of production;
- engineering automation (application to a package of application programs for automation of design of products, technical equipment and technological processes);
- improvement of design, appearance of lighting engineering;
- material stimulation of workers for increase in performance, improvement of quality of products and innovative developments.

Considering financial opportunities of the enterprise and relevance of the specified directions, we will analyze reserves of introduction of the new equipment and new technologies which have direct impact on quality of a product already at an initial stage of its creation.

So, we allocate the complex basic and changed models of projects of improvement of quality:

The model I (basic) includes the following elements:

- balance of the enterprise;
- financial performance of LLC “Corporation VATRA”;
- general organizational structure of LLC “Corporation VATRA”;
- organizational structure of department of quality and certifications (basic);
- the quality system focused on the ISO standards;
- equipment and technologies.

The model II (advanced) is characterized by the following elements a planned balance of the enterprise:

- the planned financial performance;
- organizational structure of LLC “Corporation VATRA”;
- advanced organizational structure of department of quality and certification;
- transition to the complex control system of quality (TQM) focused on the new international ISO standards;
- projects of technical and technological updating of production.

In the history of the international standardization the ISO standards of series 9000 took the important place and won huge popularity. They are known by heads of the enterprises, presidents of the countries, workers. They are widely applied in the diverse spheres: in the industry, at transport enterprises, in construction, in the educational sphere, in health care, in administrative agencies and many other spheres.

For incomplete data in the world registered today more than 500 thousand enterprises which certified the systems on compliance to the ISO standards of series 9000. The unusual popularity of standards in various spheres and is explained different levels by the fact that they touch universal and all necessary area – management of the organization with orientation to quality of the end result.

The first ISO standards of series 9000 were published in 1987. It is known that everything has property to grow old including ideology of management. Rates of an obsolescence today much faster, than yesterday. The quality systems constructed on ideology of the ISO standards of series 9000 of the version of 1994 do not meet the requirements of the modern market any more. Though certificates on the quality systems ISO of series 9000:1994 are still necessary and it is even "obscene" to enter

the world market without the certified quality system, the system according to ISO of series 9000:1994 is already considered as the necessary lowest level which not always meets requirements of consumers and will lose in competition with more effective systems.

Effective quality systems which meet the requirements of the market are integrated in the concept TQM (Total Quality Management) today that at different schools and in different specific cases has different shades, uses different methods and approaches. Therefore their rapprochement with TQM ideology became the main concept of revision and preparation of the new version of the ISO standards of series 9000.

First of all, developers of this version of standards on the basis of the analysis and synthesis of practice of TQM formulated eight principles of quality management which are the basis for standards – tab. 3.1, fig. 3.1. Let's track the main differences of the new version of the ISO standards of series 9000.

Table 3.1

Advantages of the new version of the ISO standards of series 9000

Structure of the standard	Advantage of the new version
1	2
<b>Principles</b>	
The organization focused on the consumer.	Ensuring balanced approach to inquiries of consumers and needs of other interested parties (shareholders, suppliers, society in general, regions, etc.). The satisfaction of consumers needs to be measured and estimated a certain rank.
	Determination by the director of long-term policy and the mission of the enterprise for questions of quality and transformation of this policy are measured the purposes and tasks including for production and functional subsections. The head has to take constantly care of training in personnel and "cultivation" of experts, to provide the solution of problems of quality with necessary resources.
Involvement of workers.	Motivation of workers to reveal an initiative in continuous improvement of quality of activity of the organization, to take the responsibility in the solution of problems of quality, to actively increase the knowledge, to impart the knowledge and experience to colleagues.
Approach as to process	Algorithmic approach to design of the quality system as sets of interdependent processes. At the same time each process is considered as a system.
System approach to management.	Continuous improvement of a system through measurement and assessment.

1	2
Continuous improvement	If to set before itself the purpose to reach 0 defects, then such purpose (though it and inaccessible) will induce to constant improvement and improvement
Decision-making method, factual	Decisions will be the most effective if they are based on the analysis of data and information Realization of the principle demands, first of all, measurements and collecting reliable and exact data which belong to a task
Mutually advantageous relation with suppliers	Identification of the main suppliers, the organizations of the accurate and open communications and the relations (based on balance of short-term and long-term goals of both parties), exchange of information and plans for the future, the general work with a clear understanding of needs of consumers, initiation of the general developments and improvements of products and processes.

The general quality management (TQM) allows to reduce costs of the consumer and producer. Expenses on elimination of defects of finished goods by the time of its receipt in the consumer, expenses on elimination of defects already in use (guarantee maintenance) for traditional the systems of quality assurance are distributed until recently between the producer and the consumer. Also expenses on elimination of defects which are not included by the producer in guarantee terms of delivery belong to expenses of the consumer.

According to TQM, "preventive measures" during the developing and the organization of production with continuous inspection of quality at each its stage are the most effective measures for reduction of deficiency. Besides expenses on these two types of the actions aimed at ensuring quality of products, significantly smaller for cumulative expenses of the producer and consumer on elimination of defects.

In above the specified differences of the new version of standards all provisions of TQM displayed practically therefore we will consider the basic principles underlain in series 9000 ISO ("Quality management systems – Fundamentals and vocabulary" – in Ukraine DSTU ISO 9000):

1. Understanding of today's needs and expectations of the consumer. Assessment of customer satisfaction and action of the producer according to them results.

2. Formation of vision of ways and values. Establishment of ambitious indicators and purposes, development of strategy their achievement. Training in people, providing to them support and delegation of powers.

3. Personal property on indicators and the whole organizations - on all that is reached by knowledge and experience of people, their aspiration to knowledge, to participation in operational decisions and process of improvement.

4. Accurate establishment of external and internal consumers and internal processes. Focusing on resources and processes which leads to effective use of people, the equipment, methods and materials.

5. Identification of many processes in any system, establishment of their internal interrelations. Assessment of processes on organizational indicators and the purposes: Comparison of results with main objectives.

6. Establishment of ambitious, but surely realistic purposes of improvement, ensuring process with resources and creation of tools of identification of human opportunities and conditions for activization, common efforts when the contribution to continuous improvement of processes is made.

7. The decision and actions which are based on the analysis of data and prior information go for maximizing performance and minimization of waste and processing. All arsenal of creative practices and properties treats on service of minimization of expenses, improvement of indicators, expansion of a market niche with use of suitable administrative tools and technologies.

8. Creation of strategic alliances or partnership which guarantee easy attraction and the coordinated work under conditions of the general development and improvement of products, processes and systems. Creation of the atmosphere of mutual trust, respect and consent directed to satisfaction of consumers and constant improvement.

From the principles given above a conclusion that determination of needs and expectations of the consumer is the basic at development of the system of quality management arises. In standard 9001 "A quality management system. Requirements" it is written down that the organization has to define:

- " paragraph 7.2.1... of the requirement, established by the consumer, including requirements concerning delivery and actions following delivery...";

- "p-8.2.1. The organization has to trace information which concerns perception by the consumer of whether the organization fulfilled his requirements. Such information is one of indicators of functioning of a quality management system. Methods of receiving and use of this information have to be defined".

After acceptance by the management of the organization of the decision on creation of a control system of quality service of marketing have to determine volumes and contents of necessary information on the consumer, his needs and expectation, to develop techniques of collecting and information processing and also to establish time intervals because of which estimates of changes of needs and expectations of the consumer and his satisfaction with products of the organization have to become.

Existence of the documentary control system of quality constructed on adequate marketing model will give the chance of the organization to secure with powerful competitive advantage in the market due to such aspects:

1. The documentary system of collecting and information processing about the consumer gives an opportunity in due time, depending on the available fluctuations of the market to estimate changes in needs and expectations of the consumer.

2. In due time received tributes about the consumer is the basis for modification of products (service during sale, after-sales service) and, respectively, for consumer increase in value of products.

3. A control system of quality of products at all stages, since its design and design of the processes connected with production and also continuous inspection of all chains of the quality system will give the chance to significantly reduce consumer cost of products.

Main signs of TQM:

- priority role of quality in business management;
- minimization of the expenses connected with insufficient level of quality;

- involvement of all personnel (from the top management to the worker) to quality management;
- work on the concept of continuous improvement – everywhere and always;
- distribution of practice of work of personnel in team;
- possession of each worker of methods of the analysis and solution of problems;
- orientation to prevention of defects and discrepancies (but not control and elimination after emergence);
- decision-making on the basis of the confirmed facts (but not accidental data or an intuition), application of statistical methods of collecting and data processing;
- the enterprise is considered as set of the interconnected and interdependent processes;
- observance by the top management of the principles of quality management and continuous improvement;
- education in personnel of culture of quality, training in methods of management of quality.

If LLC “Corporation VATRA” does not pass to new approaches to quality management (which are provided by TQM), it will mean the low level of response to requirements of consumers, means will not promote ability of own products. For the lack of financing possible option of partial transition to TQM – some basic principles. External investments and crediting, sale (leasing) of excess floor spaces can be additional sources of means. To promote TQM – management on "SMALLPOX BATPA Corporation" can establishing process of certification of all types of products – the Ternopil branch of the Ukrainian Lighting institute (explosion-proof lamps). Potential results of introduction of TQM – management in LLC are confirmed by these tab. 3.3.



Table 3.3

The predicted results of introduction of TQM in  
LLC “Corporation VATRA”

Indicators at existing level of quality of products at introduction of TQM	Indicators at existing level of quality of products at introduction of TQM	Indicators at existing level of quality of products at introduction of TQM
1. Redistribution (expansion) of sales markets	Ukraine – 40% THE CIS - 40% Measure – 20%	Ukraine – 25% THE CIS - 45% Measure – 30%
2. Change of the nomenclature of sale		Industrial - + 25% Puskoreguliruyushchy - + 15% (The West is Germany, Poland, Hungary) Administrative and household - + 30% (CIS countries, especially Belarus)

However before LLC “Corporation VATRA” there is a problem of expediency of transition to the considered technique as it will pull along a certain growth of the price of its products. Therefore the TQM enterprise is able to afford to make the decision in favor of introduction only when the predicted indicators (tab. 3.3) are confirmed by detailed market researches, and the products will pass necessary certified tests of the international standard.

### **3.2. Improvement of a control system of quality at the enterprise by introduction of alternative projects of technical and technological improvement**

If the technique of TQM is focused on improvement of a control system of quality, then for improvement of quality of the products of LLC “Corporation VATRA” we suggest to implement projects of technical and technological updating of production (fig. 3.2) which will be carried out on condition of attraction of external investments

Power of corporation from release of the lighting equipment is Ukraine, sufficient for filling of the market, however a considerable share of the technical equipment (45%) worn-out and obsolete that idle time on corrective maintenance and need of updating of separate working parts enters into excess expenses through frequent.

Therefore introductions of the new equipment are a necessary element which will have direct impact on quality of the manufactured products, LLC “Corporation VATRA” will have an opportunity to buy at attraction of investments.

Let's consider different versions of this project and we will carry out its technical and economic assessment (tab. 3.4).

The planned payback time 2 years.

The cost of the capital is 14% a year.

Table 3.4

#### Alternative options of attraction of the new equipment

№	Essence results of the project are also expected.	Essence results of the project are also expected.	Essence results of the project are also expected.	Essence results of the project are also expected.
I	1. LSP 2500	1. LSP 2500	1. LSP 2500	1. LSP 2500
	2. Milling machine with ChPK 1 335.0 "REDERS"	2. Milling machine with ChPK 1 335.0 "REDERS"	2. Milling machine with ChPK 1 335.0 "REDERS"	2. Milling machine with ChPK 1 335.0 "REDERS"
	1. Will give the chance: - to twice reduce production preparation terms; - to reduce materials and labor input of production of details, to reduce production preparation term; - to have new technological capabilities in production of details of irregular or nonconventional shapes. 2. Opportunity: - production of high-quality details of different forms; - considerable reduction of production time of technological equipment			
II	1. Machine for a rotational extract of details of type of bodies of the address	1	240,0	“Laifeld” Germany
	2. Automatic machine universal for bending of details like contact	1	300,0	“Biller” Germany
	1. Opportunity: - reduction of number of the stamped equipment – reduction of terms of preparation of production, reduction materials; 2. Will allow: - to reduce the price of the cost of products, in particular lamps of luminescent group; - to organize production of elektro products, to refuse them purchase; - to replace physically worn-out and obsolete the equipment of fasteners.			

The expected cash flows = PF is Depreciation (tab. 3.5).

Table 3.5

Calculations of cash flows for 2021-2022 (forecast)

	Noun cash flow	
	thous. UAH.	thous. \$
1 год: 2021	7600 - 3896 = 3704	674
2 год: 2022	7000 - 3650 = 3350	609

- net real project cost (gr. odes.):

$$CHTV (NPV) = TV - Cfi = \sum_{i=1}^t \frac{CF_i}{(1+R)^t} - Pl, \quad (3.1)$$

where TV – the real project cost (gr. odes.);

Cfi – a cash flow for and-y the period (gr. odes.);

R – capital cost for AI the period (discount rate, %);

P – the sum of initial investments (the capital, gr. odes.).

- real project cost:

$$TB = \sum_{i=1}^t \frac{CF_i}{(1+R)^t}; \quad (3.2)$$

$$TB = \frac{674}{(1+0,14)^1} + \frac{609}{(1+0,14)^2} = 1060 \text{ (thous. \$)}$$

Let's carry out the assessment of return of initial investments into the project on a basis for indicators:

- index of profitability:  $IR_{pr} = \frac{TB}{III};$

- actual payback period of the project:  $T_{\text{окуп. факт}} = \frac{\sum CF_i}{\sum III_i}$

- internal rate of profitability of VSD (IRR) – a critical rate of discount which

allows to implement the project at "0" ChTV (TV = P):

$$\Pi\Pi = TB = \sum_{i=1}^t \frac{CF_i}{(1 + BCD)^i} \quad (3.2)$$

We will enter the received calculation results in tab. 3.6.

Table 3.6

Assessment of return of capital investments of projects  
technical updating

Project	CHTV <sub>pr</sub>	Tokup. fact = $\frac{\sum CF_i}{\sum \Pi\Pi_i}$
I	PI = 400 + 335 = 735 CHTV = 1060 – 735 = 325	$T_{ok. fl1} = 1 \text{ год} + \frac{735 - 674}{609} = 1,1 \text{ год}$
II	PI = 240 + 300 = 540 CHTV = 1060 – 540 = 520	$T_{ok. fl1} = \frac{540}{674} = 0,8 \text{ year}$
Project	$IP_{np.} = \frac{TB}{\Pi\Pi}$	$PI = TV = \sum_{i=1}^t \frac{CF_i}{(1 + BCD)^i}$
I	$IP_1 = \frac{1060}{735} = 1,44$	$735 = \frac{674}{(1+x)^1} + \frac{609}{(1+x)^2}; x \approx 47\%$ at R Crete = 47%, project ChTV = 0 (critical)
II	$IP_2 = \frac{1060}{540} = 1.96$	$540 = \frac{674}{(1+x)^1} + \frac{609}{(1+x)^2}; x \approx 75\%$ at R Crete = %, project ChTV = 0.

As showed the analysis of competitiveness of products of LLC “Corporation VATRA” (in the internal and external markets), the high technological level of products is the obligatory key to success. Especially it concerns quality of a surface of a detail, design and registration which influence an esthetic type of a product.

Therefore we will carry out the assessment of different options of conducting of technological updating of production (tab. 3.7) which will allow to strengthen quality control on all technological chain, will provide a high-quality modern covering, having lowered materialo-that labor input of products, a handmade share, will increase environmental safety of processes of a covering.

Table 3.7

Assessment of alternative projects of  
technological production updating

№	Essence results of the project are also expected.	Essence results of the project are also expected.	Essence results of the project are also expected.	Essence results of the project are also expected.
I	The Lithuania complex under OL 1100 crush (with the camera of cold pressing)	1	950,0	“IDRA – PRESS” Moldova
	Possibility of receiving: - lithuania under a crush; - thin-walled, highly dimensional case aluminum alloy details; - energoyekonomny searchlights and street lamps			
II	1. Line 2-chamber ekstruduvannya	1	450,0	ENTEX Germany
	2. Line of coloring by color powder materials	1	350,0	“Brennen” Germany
	1. possibility of production: - bilocular lenses for energoyekonomny lamps of administrative and household purpose; - introduction ekstruz i ï plastic 2. implementation of new technology of a covering (will increase competitiveness of products); - receiving eco-friendly high-performance processes			
III	ayermoplast-automatic machine	5	250,0 * 5 = 1250	“ARBURG” Germany
	- replacement of the outdated equipment modern automated for production of details from thermoplastic materials			

The expected cash flows:

- 2021 – \$674 thousand.

- 2022 – \$609 thousand.

The planned payback time 2 years (i =2).

The cost of the capital is 14% in a year (R).

We will enter the received calculation results in tab. 3.8.

Table 3.8

Assessment of return of capital investments of projects  
technological updating

Проект	CHTV <sub>pr.</sub>	$T_{\text{ocup. fact}} = \frac{\sum CF_i}{\sum III_i}$
I	PI = 950 CHTV = 1060 – 950 = 110	$T_{\text{ok. fl}} = 1 \text{ hour} + \frac{950 - 674}{609} = 1,45 \text{ years}$
II	PI = 450 + 350 = 800 CHTV = 1060 - 800 = 260	$T_{\text{ok. fl II}} = 1 \text{ hour} + \frac{800 - 674}{609} = 1,2 \text{ years}$
III	PI = 5 * 250 = 1250 CHTV = 1060 – 1250 = - 190	$T_{\text{ok. fl III}} = 1 \text{ hour} + \frac{1250 - 674}{609} = 1,95 \text{ years}$
Проект	$IPR_{\text{pr.}} = \frac{TB}{III}$	$PII = TB = \sum_{i=1}^i \frac{CF_i}{(1 + BCD)^i}$
I	$IP_1 = \frac{1060}{950} = 1,11$	$950 = \frac{674}{(1+x)^1} + \frac{609}{(1+x)^2}; x \approx 23\%$ at R Crete = 23%, project ChTV = 0 (critical)
II	$IP_2 = \frac{1060}{800} = 1,33$	$800 = \frac{674}{(1+x)^1} + \frac{609}{(1+x)^2}; x \approx 36\%$ at R Crete = 36% okuplyayutsya initial investments
III	$IP_2 = \frac{1060}{1250} = 0,85$	$1250 = \frac{674}{(1+x)^1} + \frac{609}{(1+x)^2}; x \approx 2\%$ at R Crete = 2%, project ChTV = 0 (critical)

### 3.3. Choice and technical and economic analysis of projects of technical and technological improvement

Having carried out assessment of possible projects of improvement of quality of products, we will carry out their technical and economic comparison (on the basis of the consolidated calculated data) and we will choose an optimal variant for the

Table 3.9

Comparative characteristic of the reduced TEP alternative  
projects of technological improvement of production

Project title	Cost (P), thousand.\$	Tokup. fact	ChTV (for T = 2 years), thous. \$	Index of profitability (IP)	Internal rate of profitability, (IRP)
I. IDRA-PRESS Lithuania complex	950,0	1,45 year	+ 110,0	1,1	23%
II. Line of extruding + line of a color powder covering	800,0	1,2 year	+ 260,0	1,33	36%
III. Automatic automatic molding machine	1250,0	1,95 year	- 190,0	0,85	2%

Having analyzed the obtained data, we choose project No. II through:

- minimum financial investments (\$ 800,0 thousand);
- the smallest period of payback (1,2 years) that will allow to pay back quicker project cost and to get profits;
- the maximum index of profitability (1,33) – for 2 years for 100 involved \$ will be earned with \$33 profit;
- the highest acceptable level of cost of the capital (discount rate) – 36%, rather from planned 14%.

Project no. III is the least favorable – it has the maximum payback period (nearly 2 years), the planned cost of the capital of 14% will not provide payback of initial investments; for 2 years on will make for profit, the incurred capital expenses will not manage to pay off ("-" ChTV and the low index of profitability is  $0.85 < 1$ ).

We will carry out comparative characteristic of projects of technical updating of LLC “Corporation VATRA” further, having considered several alternative options and having carried out their assessment. Discharged we will display results graphically.

Table 3.10

Comparative characteristic of the reduced TEP alternative  
projects of technical updating of production

Project title	Cost (P), thous. \$	Tokup. fact	ChTV (for T = 2 years), thous. \$	Profitability index (IP)	Internal rate of profitability, (IRR)
I. LSP 2500 the Hydraulic press of dual action + the milling machine with ChPK II. The machine for a rotational extract of details of type of bodies of the address + the automatic machine universal for bending of details like contact	735,0	1,1 year	+ 325,0	1,44	47 %
I. LSP 2500 the Hydraulic press of dual action + the milling machine with ChPK II. The machine for a rotational extract of details of type of bodies of the address + the automatic machine universal for bending of details like contact	540,0	1,08 year	+ 520,0	1,96	75%

Thus, optimum there is project No. II thanks to:

- to the smaller period of payback (1, 08 years), that is faster receiving profits;
- to the lowest initial investments at the equipment (for \$195 thousand);
- to the ChTV bigger positive value and the index of profitability (for 48%);
- to the highest stock of cost of investments (75%, compared with basic 14%).

The project II is less favorable through bigger time of payback both the big project cost and low level of profitability

Having chosen optimal variants of technical and technological projects (proceeding from them initial cost there are equipment costs), we will develop



structure of project works (WBS) and we will make the estimate of expenses on the studied projects for calculations of their influence on a financial condition of LLC “Corporation VATRA”.

Calculations of the estimate of expenses on projects

Let's find the estimated cost of projects I i II:

In a money. =  $V_{p\_dg. \text{quarrystone. (10\%)}} + V_{mont. (15\%)} + V_{oblas. (40\% \text{ i megapixel.+5\% vlasn.})} + V_{nsh.vitr. (25\%)} + V_{neperedb. (5\%)}$

Project I. Technological improvement:

$V_{oblas. (40\% \text{ i megapixel.})} = \$800 \text{ thousand (tab. 4)} = 4,400 \text{ thousand UAH.}$

$V_{oblas. (40\% \text{ i megapixel.+5\% vlasn.})} = 4,400 + 550 = 4,950 \text{ thousand UAH.}$

$V_{p\_dg. \text{quarrystone. (10\%)}} = 1,100 \text{ thousand UAH.}$

$V_{priym.mont. (15\%)} = 1,500 \text{ thousand UAH.}$

$V_{nsh.vitr. (25\%)} = 2,900 \text{ thousand UAH.}$

$V_{neperedb. (5\%)} = 550 \text{ thousand UAH.}$

$\sum V_{kosht.} = 4950 + 1100 + 1500 + 2900 + 550 = 11000 \text{ (one thousand UAH)}$

Project II. Technical updating:

$V_{oblas. (40\% \text{ i megapixel.})} = \$ 540 \text{ thousand (tab. 4)} = 2,970 \text{ thousand UAH.}$

$V_{oblas. (40\% \text{ i megapixel.+5\% vlasn.})} = 2970 + 372,0 = 3,342,0 \text{ thousand UAH.}$

$V_{p\_dg. \text{quarrystone. (10\%)}} = 742,0 \text{ thousand UAH.}$

$V_{priym.mont. (15\%)} = 1,028 \text{ thousand UAH.}$

$V_{nsh.vitr. (25\%)} = 1,941 \text{ thousand UAH.}$

$V_{neperedb. (5\%)} = 372,0 \text{ thousand UAH.}$

$\sum V_{kosht.} = 3342,0 + 742,0 + 1028,0 + 1941,0 + 372,0 = 7425 \text{ (one thousand UAH)}$

On the basis of the calculated budget costs and structure of works we will make the consolidated estimates of expenses on projects I i II.

Table 3.11

## The consolidated estimates of expenses on projects I i II

№ п/п	Name of works, objects and expenses	Estimated cost, thousand UAH	
		Project I technological	Project II technical
1.	Construction works:		
	- preparation of the territory for installation the line / equipment	400,0	217,0
	- preparation of the base for installation, including:		
	a) objects of external power and transport communication;	200,0	200,0
	b) leading of municipal networks (the sewerage, water - warm, gas supply);	500,0	325,0
	Together:	1100,0	742,0
2.	Installation works:		
	- reception of the equipment of technological lines / technical complexes;	450,0	288,0
	- installation works	1050,0	740,0
	Together:	1500,0	1028,0
3.	Equipment, working stock:		
	- imported (subject of the project);	4400,0	2970,0
	- working equipment and stock (hoisting-and-transport mechanisms, transport internal transportations, erection facilities)	550,0	372,0
	Together:	4950,0	3342,0
4.	Other works and expenses (including salary):		
	- costs of a business trip (Germany);	950,0	525,0
	- preparation and training in special group on implementation of the project;	150,0	181,0
	- technical supervision, control and monitoring of the project;	450,0	350,0
	- design research works (development of technological / technical drawing, design of objects of researches)	1200,0	800,0
	- works on end of the project	150,0	85,0
	Together:	2900,0	1941,0
5.	Unforeseen expenses (5 %)	550,0	372,0
	In total on the project:	11 000,0	7 425,0

Let's define operating costs of the chosen projects – according to estimates (tab. 3.12).

Let's divide projects of technical and technological improvement into stages: I – a preinvestment phase; II – an investment phase; III – an operational phase.

Each phase is answered by certain types of works according to sections of the estimate.

Table 3.12

## Calculations of operating costs for implementation of projects I i II

Structure of projects	Works which are performed		Operating costs according to the estimate, one thousand UAH.	
	Project of technological improvement	Project technical improvement	Project I technological improvement	Project II technological improvement
I – before - an investment phase estimates	1. analysis of investment opportunities (definition of sources of attraction and size of necessary investments)		1200,0	800,0
	2. search and the analysis of offers concerning purchase of technological lines (Moldova, Germany)	2. search and assessment of offers on purchase of the new equipment (Sweden, Germany)		
	3. the previous TEO of projects (the generalized TEA, assessment of expediency of introduction)			
	4. preparation of the report on investment opportunities			
II – investment phase	1. negotiations of signing of the contract with the German side (ENTEX, "Brennen") 1. negotiations of signing of the contract with the German partner (Laifeld and Biller company)	1. negotiations of signing of the contract with the German side (ENTEX, "Brennen") 1. negotiations of signing of the contract with the German partner (Laifeld and Biller company)	950,0	525,0
	Sum of business trips of paragraph 4a of the estimate			
	2 design and preparation of projects (installation and construction works, ensuring communication and leading of municipal networks) – paragraph 1 of the estimate		1100,0	742,0
	3. preparation and training in special group on work with the project – paragraph 4by of the estimate		150,0	181,0
III – operational phase	1. reception, documentary registration of purchased:		1500,0 + 4950,0	1028,0 + 3342,0
	technological lines of a powder covering and extrusion of plastic. universal to the automatic machine for bending and press of a rotational extract	technological lines of a powder covering and extrusion of plastic. universal to the automatic machine for bending and press of a rotational extract		
	2. installation and start in operation of the necessary equipment: item 2 + paragraph 3 of the estimate			
	3. adjustment works, technical supervision, check of compliance of work of lines of the planned technology of a covering and ekstruz i i lamps 3. technical supervision and monitoring of compliance of work to a press and the automatic machine to the established technical indicators of processing of details	3. adjustment works, technical supervision, check of compliance of work of lines of the planned technology of a covering and ekstruz i i lamps 3. technical supervision and monitoring of compliance of work to a press and the automatic machine to the established technical indicators of processing of details	450,0 + 150,0 + 550,0	350,0 + 85,0 + 372,0
	4v, d, d + paragraph 5 of the estimate			
Everything. thousand UAH (sum of the estimate of the project)			11 000	7 425

Let's carry out also versatile analysis (technical, social, ecological, institutional) the proposed design solutions (tab. 3.13, 3.14).

Table 3.13

### Technical analysis of the studied projects

Project I. Technological improvement	
Line of extruding	Line of extruding Line of a color powder covering
<ul style="list-style-type: none"> <li>- expansion of opportunities for release of the new nomenclature of lamps with lenses of different profiles;</li> <li>- decrease in material inputs twice on production of lenses;</li> <li>- considerable reduction of terms of preparation of production of new lenses;</li> <li>- reduction of material expenses on 30% at equipment production;</li> <li>- need under repair of the worn-out equipment disappears.</li> </ul>	<ul style="list-style-type: none"> <li>- transition to modern technology of a color powder covering;</li> <li>- high quality and density of a covering;</li> <li>- decrease in a handmade share by 1, 5 times;</li> <li>- improvement of a product of an esthetic type;</li> <li>- increase in environmental safety of processes of a covering.</li> </ul>
Project II. Technical updating	
The universal press automatic machine for bending The machine for a rotational extract	The universal press automatic machine for bending The machine for a rotational extract
<ul style="list-style-type: none"> <li>- establishing own production of elektroustanovitely products;</li> <li>- reduction in cost of lamps of luminescent group;</li> <li>- automatic control of bending process;</li> <li>- increase in reliability of operation of the equipment for 35%;</li> <li>- possibility of fast readjustment on different dimensions and the modes of pressing;</li> <li>- production wide assortment of quality details</li> <li>- reduction of terms of preparation of production.</li> </ul>	<ul style="list-style-type: none"> <li>- reduction of number of the stamped equipment for 15%;</li> <li>- considerable reduction of terms of preparation of production;</li> <li>- reduction of consumption of materials in 1, 3 times;</li> <li>- allows to produce high-quality reflectors for the projector equipment;</li> <li>- compliance of quality of reflectors to the global standards.</li> </ul>

Table 3.14

### Social, ecological, institutional analyses

Type of the analysis of the project I	Type of the analysis The project I –	Type of the analysis The project I –
1	2	3
1. Social	- the line of a color powder covering will allow to lower a handmade share by 1, 5 times;	- automatic control of process of bending by production of details of lamps;
	- introduction of the new automated equipment (lines) will stimulate training and developing the skills of working personnel of LLC “Corporation VATRA”	

1	2	3
2. Ecological	- increase in environmental safety of processes of a powder covering, compared with galvanic-compliance of quality of reflectors to global environmental standards	- increase in environmental safety of processes of a powder covering, compared with galvanic-compliance of quality of reflectors to global environmental standards
3. Institutional	- promotes implementation of projects; - the low cost of the invested capital (14%); - low rates of inflation, compared with the last periods; - state support of national producer interferes: - imperfection of a legal institution of the state; - big rates of customs fees for import of the equipment (from Germany – tab. 3.4); - possible problems at internal management of implementation of projects.	

So, the considered projects of technical and technological improvement will give the chance:

- to reduce consumption of materials on average by 12%;
- to increase reliability of operation of the equipment by 35%;
- fast readjustment on different dimensions and the modes of pressing;
- productions wide assortment of quality details;
- reduction of terms of preparation of production.

The new equipment will allow to reduce wear of the equipment at the expense of what the book value of fixed assets will increase.

The advanced technology will provide improvement of quality of lighting engineering (covering, appearance) owing to what the shortcoming, that is, the article of balance "losses" will decrease.

Complex influence of projects I i II will give the chance with to save 16.6% of sources of means.

## **CHAPTER 4**

### **LABOR PROTECTION AND SAFETY IN EMERGENCIES**

#### **4.1. Labor protection**

The task of labor protection – to ensure safe, harmless and favorable working conditions through the solution of many complex problems. Scientific and technological progress is crucial in solving these problems. The use of advances in science and technology helps to increase occupational safety, culture and organization of production, facilitates work, enhance its attractiveness. The level of human security with the development of civilization is constantly growing. The development of science and technology, in general, increasing the safety of human life, has led to a number of new problems. Technical factors include, first of all, the reliability of equipment (structural defects, technological and operational violations, destruction of machine parts under the action of corrosion and corrosion cracking), the organization of labor protection management (documentation, legal norms, occupational safety standards, training methods, etc.), sanitation.

Modern production requires that labor protection be based on scientific and technical basis. Recent years have been characterized by the widespread introduction into production of semi-automatic and automatic machines, safe technological processes with software control. The energy functions of man in the system "man-machine" are greatly simplified. They facilitate the work of workers, make it comfortable. The role of man is reduced to the management and control of machines and the course of technological processes.

We will analyze the working conditions in the planning and economic department of LCC "Corporation VATRA". This department has 6 employees, 5 economists and 1 chief economist. The size of the room is 22.5 square meters. The room has 2 windows, the size of the window openings – 1,4 m x 1,2 m. The windows of the room have adjustable devices for opening and blinds. The height of the room is

2,6 m. The volume of the room is 58.5 m<sup>3</sup>. There is an area of 5,6 m<sup>2</sup> per employee, which is insufficient.

At the same time, several harmful factors have a negative impact on the health and efficiency of employees of the planning and economic department of LCC "Corporation VATRA". The main negative factors of the employees of this department include: psychosocial factors of the production environment, nervous and emotional stress, radiation of different ranges of the electromagnetic spectrum, noise at the source of VDT and others. The operation of the computer leads to a change in the background concentration of air ions in the room of this department. After about 5 minutes of monitor operation, the concentration of light negative ions decreases by 5-10 times, and after 3 hours their concentration approaches zero. The concentration of medium and heavy negative ions also decreases, while the concentration of positively charged ions increases sharply, which has a very negative effect on gas exchange in the lungs, the general human feeling. The optimal level of air ionization in the workplace, which must be provided in the planning and economic department of LCC "Corporation VATRA", is the content of light ions from 150 to 5000 in 1 cm<sup>3</sup> of air.

Employees of the department face the danger of a number of diseases due to the available electromagnetic radiation. Performance and well-being are also negatively affected by noise from the computer, which is one of the causes of stress, reduced mental performance, impaired attention and more. Working conditions of persons working with computers in the planning and economic department of LCC "Corporation VATRA" must meet the second class according to the Hygienic classification of work on the indicators of harmfulness. Proper natural and artificial lighting has been created in the premises of the planning and economic department. The level of illumination in the workplace is 300-500 lux. When using combined lighting, glare on the screen surface is not allowed. An important condition for the safety of workers in front of the screen is the correct choice of visual parameters of the display and lighting conditions of the workplace. Working with the display with the wrong choice of brightness and brightness of the screen, in the presence of glare,

flicker of the image leads to visual fatigue, headache, significant psychophysiological load. Ventilation in the room – supply and exhaust.

#### **4.2. Safety in emergencies**

We will discuss localization and liquidation of consequences of emergency situations. Consequences of emergencies (ES) are: destroyed buildings, fires, flooding or contamination of the area, injured people. The organization and carrying out of rescue and emergency-recovery works takes place in a short time, because every hour of the state of emergency has additional victims, losses, additional losses.

The main work in the lesion is performed by specially created forces of the Central Command:

- central command troops;
- specialized formations (teams, detachments);
- non-military formations of objects.

The central troops and specialized formations have centralized subordination, and non-military formations are created from the workers and employees of the facility. Elimination of the consequences of an emergency in the center of the lesion begins with the conduct of rescue and emergency operations (REO). The purpose of the REO is to save people, localize accidents and create conditions for further restoration work.

The REO at the facility is usually scheduled for one day. If they do not have time, they can continue REO for some time. REO within a city or district can last for several days until all living people are rescued. REO is carried out continuously until their complete completion. Continuity of work is provided by creation of work changes. After the REO, restoration works are carried out until the complete elimination of the consequences of the emergency. As can be seen from the diagram, rescue operations are the main ones during the REO, they are performed in the first place and the main efforts are focused on them.



Types of rescue operations:

- reconnaissance of the nomination route and work area;
- extinguishing fires in houses where people are;
- supply of air to flooded protective structures and their opening;
- search and rescue of victims from under the rubble;
- first aid;
- sanitary treatment of people, disinfection of the territory, transport, equipment.

Reconnaissance of the route is carried out in order to quickly overcome obstacles on the march. The purpose of reconnaissance of the work area is to determine the places where people are and ways to save them.

If it so happened that some protective structures were overwhelmed and no air got there, then people there can withstand 3-4 hours. Therefore first of all it is necessary to punch an aperture in a construction and to give there under pressure (from compressor station) external air. After that, open the building, disassemble the blockage above the entrance (emergency exit), open the jammed door or cut a hole in it. If this is not possible, a hole is punched in the wall or ceiling of the storage (shelter).

People left under the rubble of destroyed buildings are searched very carefully, periodically giving loud signals by voice or blows to the elements of the blockage. Widely used search dogs. People are rescued by dismantling the blockage, or looking for other approaches to the victims. First aid is provided as soon as the victim is released. It includes stopping the bleeding, applying bandages to the affected areas, and applying splints to the bone fractures. If necessary (bone fractures, significant burns, etc.) with a syringe-tube make an analgesic injection. All victims are sent to the nearest hospital. Most rescue operations cannot be performed efficiently and in a short time unless urgent work is carried out.

Types of urgent work:

- creation of passages and passages in blockages and zones of infection;

- localization of accidents on utility and energy networks (KEM) and communication lines;
- strengthening or destruction of unstable structures of buildings and structures;
- restoration of destroyed protective structures, etc.

Extinguishing fires, dismantling blockages, punching holes in flooded protective structures is impossible without extensive use of equipment. But almost all equipment is wheeled and can pass through blockages. Therefore, the creation of passages in the rubble is a priority work that provides rescue operations. If the height of the blockage does not exceed 1 m, then the passage is made by clearing the blockage. When the height of the blockage is higher than 1 m, the passage is arranged along the blockage, using heavy caterpillar equipment.

Unstable structures of buildings and structures can fall, which poses a danger to fighters and rescued people. Therefore, it is preferable to secure these structures or help them fall. Restoration of protective structures should be done at this time only if the recurrence of the emergency is expected. This is most often the case during war, when repeated air strikes are expected.

Ways to eliminate emergencies are numerous and depend on:

- type of emergency;
- the size of the lesion and the situation there;
- the state of readiness of formations to carry out works and provide them with technical means.

To locate and eliminate the accident and reduce the likelihood of injury to people who have been in the infected area or had contact with infected equipment or vehicles, it is necessary to carry out so-called special treatment. It consists of sanitation of people and disinfection of the territory, transport, equipment.

Partial sanitation is performed by a person independently after entering the uninfected area and includes: removal of radioactive dust from clothes, shoes, exposed parts of the body; disinfection of clothing and treatment of exposed parts of the body with an individual anti-chemical package.

## CONCLUSIONS

Quality management is a process of improvement of all set of parameters of quality connected with object of management by consecutive approach of their characteristics to set. The concept of the complex quality system (TQM) consists in complexity of approach to improvement of results. In this regard important there is a definition moment to a range of potential objects which will make this system because the direction of efforts only in one direction can lead to destabilization of a system in general.

For the purpose of improvement of quality of products on LLC “Corporation VATRA” it is possible to consider following alternative versions of projects:

- improvement of a control system of quality of products (TQM);
- introduction of the new equipment, technical complexes;
- technological updating of production;
- engineering automation (application to a package of application programs for automation of design of products, technical equipment and technological processes);
- improvement of design, appearance of lighting engineering;
- material stimulation of workers for increase in performance, improvement of quality of products and innovative developments.

In the history of the international standardization the standards of series ISO 9000 took the important place and won huge popularity.

The general quality management (TQM) allows to reduce costs of the consumer and producer. Expenses on elimination of defects of finished goods by the time of its receipt in the consumer, expenses on elimination of defects already in use (guarantee maintenance) for traditional the systems of quality assurance are distributed until recently between the producer and the consumer. Also expenses on elimination of defects which are not included by the producer in guarantee terms of delivery belong to expenses of the consumer.

Generally, the considered projects technical (the machine for a rotational extract of details of type of bodies of the address and the automatic machine universal for bending of details like contact) and technological (the line of 2-chamber extruding and the line of coloring by color powder materials) improvement will give the chance:

- to reduce consumption of materials on average by 12%;
- to increase reliability of operation of the equipment by 35%;
- fast readjustment on different dimensions and the modes of pressing;
- productions wide assortment of quality details;
- reduction of terms of preparation of production.

The new equipment will allow to reduce wear of the equipment at the expense of what the book value of fixed assets will increase. The advanced technology will provide improvement of quality of lighting engineering (covering, appearance) owing to what the shortcoming, that is, the article of balance "losses" will decrease. Complex influence of projects I i II will give the chance to save 16,6% of sources of means.

The following sections of work make recommendations about application of projects and define economic effect of researches. The efficiency from complex implementation of projects of technical and technological improvement and introduction of a complex control system of quality of products (TQM) which provides application of the new version of the standards of series ISO 9000 and includes a number of the principles is analyzed.

Thus, total economic effect (net real value) of implementation of both projects is 4158 thousand UAH which will allow to reduce product cost at least by 1900 thousand UAH a year (due to economy of material expenses on 12%) and, in turn, to increase profitability of production of LLC "Corporation VATRA" by 3,3% (up to 11,7%).

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## **ІННОВАЦІЙНА ДІЯЛЬНІСТЬ ЯК КЛЮЧОВИЙ ФАКТОР РОЗВИТКУ ВІТЧИЗНЯНИХ ПІДПРИЄМСТВ**

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## **INNOVATIVE ACTIVITY AS A KEY FACTOR FOR THE DEVELOPMENT OF DOMESTIC ENTERPRISES.**

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Ключові слова: інноваційний розвиток, науково-технічний розвиток, інновації.

Keywords: innovative development, scientific and technological development, innovations.

У цей складний для України період відродження ринкових відносин, коли важливими завданнями є збереження промислового комплексу, його структурна перебудова і забезпечення подальшого науково-технічного розвитку, принципового значення набуває проблема підвищення ефективності інноваційної діяльності вітчизняних підприємств, вирішення якої дасть можливість перейти до створення та використання технологій більш високого рівня, що, в свою чергу, прискорить економічне зростання національної економіки.

Економіка нашої держави сьогодні залишається несприйнятливою до науково-технічних нововведень через низький рівень виробничої бази промисловості та слабе державне фінансування науково-дослідних та дослідно-конструкторських розробок. Тому формування ефективної державної інвестиційної та науково-технічної політики, яка спрямована на досягнення більш високих технологічних укладів, має здійснюватись на основі перетворення власних дослідно-конструкторських та наукових розробок у базовий елемент виробництва. Досліджуючи економічні перетворення у світовому масштабі, можна зробити висновок, що суспільство сьогодні перебуває на тому етапі свого розвитку, коли більшість проблем вирішують на базі швидкої розробки та використання у виробництві нових технологічних та організаційних ідей, нової техніки, тобто інновацій. Тому важливим завданням та умовою становлення економічної незалежності нашої держави є саме активізація інноваційної діяльності наукової та виробничої сфер.

Вплив інноваційного чинника на виробництво сьогодні є радикальним та комплексним. Інновації, а також наука, що їх продукує, сьогодні мало доступні, ніж найцінніші природні ресурси. До чинників, що стримують розвиток інноваційної діяльності в Україні належать:

- нерозвиненість інноваційної інфраструктури;
- неадекватність систем організації і рівня менеджменту завданням інноваційного розвитку;
- високий ступінь зносу основних фондів;

- неплатоспроможність споживачів, що потребують високотехнологічної продукції;
- низький рівень фінансування державними та недержавними фінансовими установами;
- відсутність механізму комерціалізації результатів завершених науково-технічних розробок та передачі їх до сфери виробництва.

Для України проблема розвитку інноваційної діяльності є надзвичайно актуальною тому, що завдання підвищення ефективності виробництва постає перед кожною підприємницькою структурою, оскільки переважна їх кількість утворена в процесі приватизації на базі колишніх державних підприємств. Варто зауважити, що велика кількість підприємств працюють на застарілому обладнанні. Про те, що інноваційний розвиток вітчизняних підприємств перебуває на низькому рівні, свідчить той факт, що частка України в науково-технічному розвитку країн світу в десятки разів нижча від їх середнього розвитку. Хоча, в перспективі й вимальовується тенденція до збільшення частки нашої держави у науково-технічному розвитку серед країн світу, проте, варто зауважити, що це буде можливим за умов поживавлення інноваційної діяльності на всіх рівнях економічної системи.

Реалізація інноваційної стратегії потребує прискореного розвитку високотехнологічних виробництв, які зможуть виробляти наукоємну продукцію з високою доданою вартістю. До стратегічних орієнтирів забезпечення інноваційних компонентів наукової та виробничої сфер слід віднести:

- інтеграцію науки та виробництва;
- перетворення технологічних винаходів та розробок у комерціалізований продукт;
- забезпечення рівня конкурентоспроможності вітчизняних наукових досліджень на внутрішньому і міжнародному ринках;
- розвиток інноваційної інфраструктури, зокрема створення регіональних центрів, які сприяли б розвитку технічно пов'язаних між собою підприємств, фінансових інституцій, наукових установ, адміністративних органів;
- об'єднання промислового, торговельного та банківського капіталу у структури, що здатні продукувати високотехнологічні, конкурентоспроможні товари та послуги;
- створення гарантійних фондів, які мали б можливість страхувати кредити, надані комерційними банками для реалізації інноваційних проектів;
- підготовка кадрів у сфері менеджменту інноваційної діяльності.

Отже, можемо зробити висновок, що будь-які масштабні економічні перетворення залишаться незавершеними без налагодження ефективного вітчизняного виробництва, що матиме змогу мобілізувати внутрішні резерви виготовлення конкурентоспроможної продукції. Саме від цього сьогодні найбільшою мірою залежать можливості реалізації інноваційних процесів і забезпечення високої ефективності вітчизняної економіки.

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## **ПРИЧИНИ ГАЛЬМУВАННЯ ІННОВАЦІЙНОГО РОЗВИТКУ ЕКОНОМІКИ УКРАЇНИ**

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## **REASONS FOR SLOWDOWN OF INNOVATIVE DEVELOPMENT OF THE ECONOMY OF UKRAINE**

У XXI ст. економічне зростання забезпечується насамперед науково-технічним прогресом та інтелектуалізацією основних чинників виробництва в усіх сферах народного господарювання. Тому в глобальній економічній конкуренції виграють держави, які забезпечують сприятливі умови для інноваційної діяльності, пов'язані з розробленням, впровадженням і використанням новинок. Усвідомлення пріоритетності інноваційного розвитку для зростання соціально-економічних показників як окремих суб'єктів господарювання, так і держави у цілому змушують уряди країн, споживачів, постачальників та інших учасників економічних відносин спрямовувати свої зусилля на активізацію інноваційних процесів у різних галузях економіки. Адже в умовах високої світової конкуренції інноваційна діяльність промислових підприємств є потужним інструментом для посилення ринкових позицій нашої держави. Однак як свідчать сучасні реалії інноваційний розвиток не став потужним підґрунтям для зростання вітчизняної економіки. Позитивні тенденції хоча й спостерігалися протягом кількох років, але мали переважно тимчасовий нестійкий характер, позбавлений чітких довгострокових орієнтирів.

Констатуючи послаблення розвитку інноваційної діяльності в Україні з'ясовано основні причини таких процесів на різних рівнях управління:

- національному: військовий конфлікт на Донбасі та окупація Криму у 2014 р., що значно підірвало стабілізацію та деякі позитивні зрушення показників інноваційної активності промислових підприємств України; значне зниження технічного рівня виробництва; 3) відсутність дієвої системи стимулювання інноваційно-активних підприємств; 4) недосконалість державної інноваційної політики та відповідного законодавства щодо підтримки та захисту інноваційної діяльності; повільне формування в Україні ринку інноваційної продукції; високий рівень морального і технічного зносу основних фондів у промисловості; економічні суперечності між інтересами держави та підприємствами, орієнтованими на інноваційний шлях розвитку; активний «відтік мізків» до країн ЄС, США та інших держав; дисбаланс конкурентного середовища в різних регіонах тощо;

- підприємницькому: недосконалість зв'язків між учасниками інноваційного процесу; низька мотивація розроблення та фінансування інновацій; відсутність ефективного механізму управління інноваційними процесами; нестача фінансових коштів; не усвідомлення необхідності систематичного технологічного переоснащення виробництва сучасними технологіями та технікою; необізнаність маркетингових служб в особливостях комерціалізації інновацій; недосконалість мотивації персоналу, враховуючи підвищену значущість окремих фахівців; відсутність повноцінної інформаційної бази щодо інноваційних проектів тощо.

Таким чином, враховуючи підтверджений закордонним досвідом факт, що за часів уповільнення зростання економіки не знижують, а збільшують витрати на науку,

технологічне переоснащення виробництва, розроблення, впровадження та комерціалізацію інновацій, а також те, що інноваційний сценарій розвитку - це довгий і кропіткий процес на сьогодні вкрай потрібно активізувати інноваційні процеси в економіці України. Інновації ще не мають вирішального значення для розвитку економічної діяльності і забезпечення економічної стабільності держави, хоча інноваційна діяльність є сьогодні чи не найважливішою умовою створення конкурентоспроможних товарів та послуг як фактору зростання економіки нашої країни і держава повинна здійснювати пряме фінансування інноваційних проектів, стимулювати інвестиції в інноваційні проекти з боку приватних і державних підприємств через створення пільгових умов для тих підприємств, які впроваджують прогресивну техніку і технології, а також займаються науково-дослідною діяльністю.

Негативний вплив на інноваційну діяльність зовнішніх факторів посилюється дією внутрішніх негараздів господарювання – той самий «чиновник» у системі управління, а також відставання організації виробництва від розвитку умов та потреб ринкового середовища. Також в Україні на даний час відсутні достовірні схеми, чи адекватні сучасним умовам методи оцінювання інноваційного потенціалу. Через це багато наших підприємств у процесі приватизації втрачають вдвічі, а то і втричі від своєї реальної вартості.

Важливо зрозуміти, що інноваційний розвиток – це довготривалий національний проект. Його реалізація не повинна залежати ні від політичних, ні від будь-яких інших впливів. На основі дослідження вітчизняного та зарубіжного досвіду переходу економік на інноваційний шлях розвитку пропонується при формуванні державної економічної політики перенести центр уваги на роль знаннєвого фактору в забезпеченні переходу від індустріального до суспільства заснованого на знаннях.

Факторами, що гальмують інноваційний розвиток промисловості України є: відсутність власних та державних коштів; високі кредитні ставки; високий рівень інфляції; технічна недосконалість; високий екоризик; труднощі з сировиною; відсутність коштів у замовника та попиту на продукцію; відсутність інформації про ринок збуту; недосконалість законодавства; відсутність експериментальної бази; розвиток експортоорієнтованого сировинного сектору економіки, внаслідок чого доходи від експорту сировини залишаються за кордоном, і лише в незначному ступені трансформуються у попит на вітчизняну продукцію; відсутність програми підтримки перспективних напрямів розвитку п'ятого та шостого технологічного укладів; недорозвиненість інфраструктури, особливо транспортних мереж (дорожнє будівництво, лізинг нових літаків вітчизняного виробництва, будівництво і модернізація трубопроводів, водних шляхів тощо); відсутність мережі фондів кредитування малого бізнесу; відсутність мережі венчурних фондів для фінансування проривних інноваційних проектів.

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