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Mukhtorali Turdaliyevich Zokirov
Ferghana State University
candidate of philological sciences, docent
Fergana, Uzbekistan

Munisa Sa'natovna Ibragimova
Tashkent State Pedagogical University
Master
Tashkent, Uzbekistan

ALISHER NAVOI ABOUT STYLE PROBLEMS

Abstract: *The article examines the issues of style, culture of speech, rhetoric and etiquette on the basis of their coverage in the works of Alisher Navoi. Particular attention is paid to the study of the content and essence of the scientific and educational heritage of the great poet, his scientific generalization, attitude to the modern Uzbek culture of speech and oratory.*

Key words: *speech culture, style, artistic creation, art, language.*

Language: *English*

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Introduction

Today we are talking about the culture of speech, the role of the word in art, the art of word use, in general, the history of ideas about style, the emergence and development of such statements in Uzbek literature, linguistics, it is noted with satisfaction that the history of Uzbek literature is connected with the much older history of the Uzbek people. As a bright proof of this idea, we can refer to the heritage of our great ancestor Alisher Navoi.

The main part

If we talk about Alisher Navoi's thoughts on speech culture, language, style, first of all, we can see his invaluable work "Muhokamatul-lug'atayn", which is of great importance for linguistics and comparative linguistics in general. However, Alisher Navoi also expressed valuable ideas about the word, its significance, some aspects of the functional style, the use of words in the poetic work in his works such as "Khamsa", "Munshaot", "Majlis un-nafois", and thus clearly expressed his attitude to language.

Chapter 14 of Hayrat al-Abrar, the first epic poem of Hamsa, begins with, "The human body is in the definition of the word, which is the world's brightest stars in the sky and the innumerable jewels of the human race ..." and this chapter is devoted entirely to the definition of the word.

According to Alisher Navoi, the word is one of the most valuable things in the world, as well as its preserver. It is the same word for the pearl in the four pearls (water, air, grass, soil), and it is the same water for the constellation of the seven heavenly stars.

It is here, in Chapter 14, that the relation of words to language, with great passion, describes the word as the most important means of speech culture, compares the word to the most precious thing, finds its place, and uses 32 words to give a pure spirit to the body of a dead person. emphasizes that it can destroy. This idea has not lost its value even today for style, speech culture.

For the great poet, "the word is a pearl in the sea." He must be a skilled diver to collect these masterpieces, and a master of poetry who has worked hard to put them in place and use them. In his work, he artistically fulfilled both of these requirements. For this reason, Hussein Boykaro Navoi, taking into account his great contribution to literature, called him

"Sahibkiran" - the king of poets. His contemporary and teacher, the great son of the Tajik people, the poet Abdurahmon Jami, called Navoi mutakallim (famous, unprecedented master of words).

Navoi was very demanding of his work. At the same time, in general, the language of fiction, including the language of poetic works, also placed high demands on the language of contemporary poets. Even poetic ability criticizes people who have no or very little knowledge with bitter words.

Alisher Navoi criticizes poets who write poetry for fun as diluents of our poetic style, destroyers of it. He always supported the unity of form and content, talking about the nature of the artistic style, the important aspects of the fluency of the style, the logic. Let us turn to Hayrat al-Abrar: «The main thing in poetry is meaning, and its form can be different. Poetry that doesn't have good content doesn't get good reviews from people who understand it. A poem that is in good shape and based on beautiful meaning is a real poem». At the same time, when Alisher Navoi talks about form and content, of course, he puts the content first: "Whoever has the pearl of meaning, he is the diver of the river of words." Alisher Navoi, who was bilingual as a bilingual "master of science in Turkish and favl in Persian" (State Samarkand's "Tazkirat ush-shuaro"), said that at the age of 33 it is possible to create works in Uzbek (Turkish) along with the treasures of world literature. In conclusion, he is primarily concerned with the Uzbek artistic style, or rather, its appearance - the poetic method, its future. The features of this style were also shown theoretically ("Mezonul-avzon", "Muhokamatullugatayn"), hum practically ("Khamsa", "Khazoinul-maoniy").

In the sense of developing the appearance of functional styles in our modern understanding, Navoi's works such as "Holoti Sayid Hasan Ardasher", "Holot Pahlavon Muhammad", "Muhokamatul-lug'otayn", "Mezonul-avzon", "Tarihi muluki ajam" are vivid examples of scientific style of that time.

In particular, Alisher Navoi's contribution to the creation and formation of the Uzbek epistolary style is invaluable. Prior to Navoi and during his lifetime, official and even personal correspondence was written in Persian. He concluded that the Uzbek language could be used in practice, and defended his native language in this area as well. For this purpose, he created a special collection called "Munshaoot" ("Samples of letters"). In doing so, he collected different views of the epistolary genre.

Many of the thoughts of the poet and scholar Alisher Navoi on language, characterization of various aspects of the Uzbek language, its stylistic features were revealed in the process of comparing Uzbek with Persian in the work "Muhokamatul-lug'atayn" written in 1499.

In the introductory part of Muhokamatul-lug'atayn, first of all, the word and its value are discussed. It is then well known that it deals with the question of synonymy and emotional-expressiveness, which are at the forefront of the teaching of functional methods after methodology.

It is well known that synonymous words have differences in meaning. If their meanings are completely consistent with each other, they give linguistic parallels and one of the synonyms falls out of use. For this reason, we will try to explain Navoi's views on synonyms in Muhokamatul-luhatayn in connection with his views on the subtleties of meaning.

In Muhokamatul-lug'otayn, Alisher Navoi gives a list of 100 verbs that differ from each other with different subtleties of meaning and are synonymous with each other, where Alisher Navoi writes: "It is a hundred words that have been appointed on the basis of a strange purpose..

Here are a few examples. In this linguistic work, the name of which is given above, the verbs *sipqarmak, tamshimaq, and bohsamaq,* which mean "to drink," are given, and subtle differences in their meanings are shown. Or in the Turkish language, the verb "cry" cites seven of the verbs that express several different subtleties (such as *yig'lamsinmoq, ingramok, singramoq, o'qirmoq, hoy-xoy yig'lamoq, inchqirmoq*) depending on the person's condition (how they cry) and proves their semantic differences with examples.

According to Alisher Navoi, *yiglamsinmoq* is to pretend to be crying; *ingramok* and *singramoq* is a secret slow weeping with pain; *siqtamoq* is an exaggeration of weeping; *o'qurmoq* is to weep loudly in a riot; *inchqirmoq* is to cry in a thin voice. Just as it is illogical and inappropriate to say, *"Chaqaloq o'qirib yig'ladi, chol ingalab yig'ladi"* it is not appropriate to use such verbs indifferently, depending on the circumstances. But all of them (7 verbs) can be united in spite of certain subtle differences in the concept of a single mahrajig.

In our opinion, it is worth mentioning Alisher Navoi's views on the phenomena of homonymy and antonymy, which are important events for the methodology. Navoi emphasizes the usefulness of homonyms in the art of tajnis and believes that they adorn and make poetry poetic.

It is true that Navoi did not call this phenomenon homonymy, polysemy, or polysemous words in Turkish. In modern terminology, most of the words quoted are homonymous with each other. For example, *it- dog; it (to lose)* - now some dialects have *yitirdim* form; *bor* - existence, command *to go, cargo, fruit*; the words *ot-name, animal, otmoq (command)* can be compared.

Let's take an example from Navoi:

Chun pariyu hurdir oting begim,
Sur'at ichra dev erur oting begim,
Xar xadangikim, ulus andin qochar,

Notavon jonim sari oting begim.

In Muhakamat al-Lughatayn, the meanings of words such as *to'z, ko'k, sog'in* are also shown with great skill. Thoughts on the phonetic means of stylistics are especially valuable in the play. In particular, the role of phonetic variants of a single sound in the derivation of semantic subtleties, the idea of the compatibility of sounds in the formation of rhymes can serve as an example. For example, Navoi describes the subtleties caused by the sounds *O'* and *O*; *U* and *O'* as follows: 1) *o't* - in the sense of burning (fire), *o't* - in the sense of transition; *ut* - in the sense of tearing; *ut* - in the sense of purifying the hair by burning the head.

At the end of "Muhokamatul-lug'atayn" the lexical richness of the Uzbek (Turkish) language is revealed on the basis of many examples. In Uzbek, for example, the eldest brother is called *og'a*, the youngest is called *ini*, the eldest sister is called *egachi*, and the youngest is called *singil*, the male of *a deer* is called *"huna"*, the female of *qilchoqchi*, the male of a pig is called *"kabon"*, the female is called *"megajin"*, the child is called *churna*. Even the bird-fanciers know 70 species of *ducks*, the types of *horses* are *tubuchok, argumoq, yaka, yobu, totu:* according to age, the species are pronounced as *toy, gunan, donan, tulan, chirga,* and *langa*, which from a methodological point of view cannot be used in place of one. The representation of a single object or animal with several different terms does not exist in many languages today.

Alisher Navoi's views on the affixes "sh" (shin) and "t", which form the proportions of verbs, are particularly noteworthy in this work, in terms of the subtleties of meaning of grammatical devices. It assesses the role of this suffix in ensuring the conciseness of a single word in the expression of an idea that can be expressed in two or three words: ". And "muoraza" and "muqabala" and "mushaara" and "mukolama" and the whole chapter are very useful here ... But the Turkish source has criticized this benefit. And they found that purpose by adding a "shin" danger to the masdar. It's like "chopishmoq" and "topishmoq" and "o'pishmoq" and that's shoe words".

Conclusions

Based on the above, the well-known stylist R. Kungurov concludes: "Thus, the above brief and general ideas allow us to say that Alisher Navoi is not only the founder of the Uzbek literary language, but also the founder of Uzbek stylistics."

Alisher Navoi's ocean is so wide, deep and unique that you can contact him on any topic and get a detailed answer. After all, the works of Alisher Navoi, in general, are like an encyclopedia of life. Because there is no vital issue, no human values and feelings, no virtues and no vices, if he did not write. Therefore, the interest in the wisdom of Alisher Navoi has always been high.

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QR – Issue QR – Article

Danil Sergeevich Shcherbakov
Institute of Service and Entrepreneurship (branch) DSTU
bachelor

Vladimir Timofeevich Prokhorov
Institute of Service and Entrepreneurship (branch) DSTU
Doctor of Technical Sciences, Professor
Shakhty, Russia

Galina Yurievna Volkova
LLC TsPOSN «Ortomoda»
Doctor of Economics, Professor
Moscow, Russia

ON NEW POSSIBILITIES OF STATISTICAL QUALITY CONTROL METHODS FOR MANAGING DIGITAL PRODUCTION OF IMPORT-SUBSTITUTING PRODUCTS FOR CONSUMERS IN THE REGIONS OF THE SOUTHERN FEDERAL DISTRICT AND THE NORTH CAUCASUS FEDERAL DISTRICT

Abstract: *in the authors analyzed the possibilities of the enterprise's policy and goals in the field of quality within the framework of the QMS in order to fight for defect-free production, for reducing rejects and guaranteeing consumers a high quality of manufactured products. The use of software to assess the validity of the choice of innovative technological solutions for the production of import-substituting products by domestic enterprises creates the preconditions for its demand and competitiveness not only in the domestic market, but, which is especially important, in its export. The need to improve the quality management system at domestic enterprises is due to the following important reasons. Firstly, this is an increase in the confidence of potential consumers in the products that will be produced by domestic enterprises. Secondly, this is an opportunity to significantly strengthen its position in existing markets, as well as significantly expand the spheres of influence by entering new domestic and foreign markets. And thirdly, this is a significant increase in labor productivity of any industrial enterprise, which is supposed to introduce QMS with the use of participatory management.*

Key words: *quality, import substitution, demand, competitiveness, market, profit, demand, buyer, manufacturer, financial stability, sustainable TPP, attractiveness, assortment, assortment policy, demand, sales. paradigm, economic policy, economic analysis, team, success.*

Language: *English*

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Introduction

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The need to tighten responsibility for the quality of import-substituting products is confirmed by the results of checking this very quality by specialists from Roskachestvo. In their opinion, the quality of products does not depend on their price, it is only necessary to strictly comply with the requirements of

GOSTs and technical regulations during their production, increasing the level of responsibility of enterprise managers for the results of their work and the level of individual responsibility of performers employed in workplaces in the digital production of import-substituting products.

The experience of applying statistical methods of quality control using the Pareto diagram at machine-building enterprises in the regions of the Southern Federal District and the North Caucasus Federal District are presented below in the form of research results

The modern market economy makes fundamentally new requirements for the quality of products. Quality management is one of the key functions of both corporate and project management, the main means of achieving and maintaining the competitiveness of any enterprise. The key task of the management of companies is the creation, practical implementation and subsequent certification of the quality management system (a modern term that replaced the previously used term - "quality management systems"), and the products supplied for a certain period of time (contract validity, release date for this type of product, etc. etc.). Quality management is, in essence, a cross-cutting aspect of the enterprise management system - similar to such as time, costs, personnel management.

Quality is formed in the production process, therefore, the main factor in ensuring quality and one of the decisive elements of ensuring the competitiveness of an enterprise is the quality management system operating at the enterprise.

The reason for the development of the QMS is the awareness of the new realities of the market. Now the presence of a certified QMS is practically becoming a necessity: this is a mandatory requirement of some customers when concluding contracts, this is a mandatory requirement for participation in most tenders. Voluntary certification of the QMS is gradually becoming a necessity for manufacturers, in fact, becoming mandatory. That is why QMS is one of the stages in the development of every modern enterprise. When developing a QMS, it is necessary to coordinate management activities in relation to quality, thereby strengthening the relationship of all structural divisions.

The quality of products, their technical level is assessed by comparing the technical and economic indicators of products with the best domestic and foreign samples, as well as with products of competing organizations. In this case, the assessment is carried out according to the main indicators characterizing the most important properties of the products.

The manufacture of rejected products leads to a decrease in the amount for manufactured and sold products, to an increase in the cost of production, to a decrease in profits and profitability.

In the process of analysis, the dynamics of marriage is studied in terms of the absolute amount and share in the total output of marketable products; losses from marriage are determined. Then the reasons for the decrease in the quality and admitted defects of products are studied in the places of their occurrence and in the centers of responsibility, and measures are developed to eliminate them.

In the production process of any product, it is impossible to obtain all products of the same quality, that is, the parameters of various units of products fluctuate within certain limits. This fluctuation is caused by a complex of random and systematic reasons that operate in the production process and determine the errors of this technological process. If the fluctuation of the parameters is within the permissible limits (within the tolerance), then the product is suitable, but if it goes beyond these limits - the rejects, which are either disposed of or restored and re-sold.

In modern conditions of aggravation of competition, its transformation into a global basis for the survival and success of an enterprise, the basis of a stable position of an enterprise in the market is a timely offer of products that meet the world level of quality. At the same time, the competitiveness of any enterprise, regardless of size, form of ownership and other features, depends primarily on the quality of the product and the commensurability of its price with the offered quality, i.e. on the extent to which the company's products meet the needs of the consumer.

These circumstances lead to a natural growth of the role of the quality management system of the enterprise as a universal tool for increasing the competitiveness of the enterprise, which allows to achieve the goal of reducing the cost of manufactured products with absolute satisfaction of consumer requirements.

The most widespread in the world organizational and methodological basis for creating a quality management system for enterprises is the international standards ISO 9000 series. Creation of a quality system based on these standards allows an enterprise to move from product quality management to quality management of the entire enterprise.

Within the framework of the quality system, the economic aspect is also implemented - taking into account the relationship between product quality and the results of the economic activity of an enterprise through taking into account its costs for quality assurance and comparing them with losses associated with the release of low-quality products.

The crisis state of the domestic economy determines the exceptional urgency of creating a quality management system at Russian enterprises in order to ensure the competitiveness of enterprises. For the majority of enterprises in our country, a situation is typical when the non-competitiveness of products in terms of quality is aggravated by non-

competitiveness in terms of price due to the excessive cost of production. Therefore, one of the prerequisites for bringing the Russian economy out of the crisis is the introduction of effective quality management systems capable of ensuring the competitiveness of the manufactured product in terms of price and quality.

Thus, in order to increase the competitiveness of enterprises, the problem of creating quality systems should be solved both at the level of individual enterprises and at the state level. Among the measures designed to stimulate enterprises to introduce quality management systems, the establishment in 1996 of the annual Prize of the Government of the Russian Federation in the field of quality, as well as the adoption by the Government in 1998 of a resolution "On some measures aimed at improving systems for ensuring the quality of products and services" ...

However, the task of creating an efficiently functioning quality management system should be solved, first of all, at the level of a particular enterprise, taking into account its characteristics determined by the field of activity, the current financial condition, the existing level of implementation of consistency in work on quality assurance, etc.

Currently, the number of enterprises implementing a quality management system based on the ISO 9000 series has increased dramatically, which is facilitated by a number of circumstances, the main of which are:

organization of work on the implementation of quality systems is an important element of several federal programs;⁎

when creating joint ventures, foreign firms and companies often set a prerequisite: preparation and operation of a quality system in accordance with the ISO 9000 series standards;⁎

⁎ enterprises of various industries seeking to export products are faced with the problem of introducing ISO standards and certification of quality systems for compliance with these standards during contract negotiations, and also in a number of countries it becomes difficult to sell products without confirming the stability of quality during their release;

creation of more favorable conditions for insurance, obtaining a loan, investment, participation in tenders, competitions and other events that may end with a contract; ⁎

the executive discipline at the enterprise is increased, the motivation of employees is improved, the losses that were provoked by defects and inconsistencies are reduced;⁎

the enterprise becomes more "transparent" for management, in this regard, the quality of management decisions increases;⁎

A number of problems that the company faces on the way to create a quality management system, namely:

⁎the specialists of our enterprises have no real experience of work in the conditions of market relations. During the certification of quality systems, the lack of such experience is observed in many forms, namely: in the inability to establish effective feedback with consumers; lack of skills in the assessment and selection of suppliers; in an unclear distribution of responsibility between managers of different levels; in duplication of some processes, etc .;

⁎Taking managerial decisions on the implementation of quality assurance activities, the heads of enterprises pursue the goal of not creating an efficiently functioning quality system, which will actually guarantee the quality of products in accordance with the needs and expectations of consumers, namely, obtaining a certificate, certificate. The external market for domestic enterprises that do not have a quality system based on the ISO 9000 series is practically closed. Therefore, the administration of enterprises is primarily interested in the timing of obtaining an international certificate of quality. And issues related to the volume of labor, material, technical and financial resources required for the implementation and certification of the quality system and, most importantly, to ensure its cost-effective operation, fade into the background;

⁎the appointment of specialists for the development and implementation of quality management systems according to the international quality management system by the management of an enterprise is often carried out without proper selection of candidates and understanding of the criteria that these candidates must satisfy.

Despite the many reasons that make the work of introducing an international system based on the international standards ISO 9000 series in domestic enterprises by no means easy, many enterprises have quite consciously embarked on this path. In the process of purposeful work on improving their quality management systems, they have made tangible changes for the better, strengthened their position among competitors and now set themselves more challenging goals. Increasing the competitiveness of an enterprise through the implementation and improvement of the quality management system is a problem that requires an integrated approach, covering not only the production process of products, but also its implementation and after-sales service.

In September 2015, the international standard ISO 9001: 2015 came into force. Russian version of GOST R ISO 9001-2015 “Quality management systems. Requirements "entered into force on November 01, 2015.

In the new version of the GOST R ISO 9001-2015 standard, relative to the previous one,significant changesin particular, the structure of the standard has changed. The new version of the standard now contains 10 sections instead of 9.

The updated version of GOST R ISO 9001-2015 includes the following sections:

0. Introduction.

This section of the GOST R ISO 9001-2015 standard provides general provisions on the quality management system, quality management principles and the process approach.

1 area of use.

This section establishes the scope of the GOST R ISO 9001-2015 standard. As in the previous version of the GOST ISO 9001-2011 standard, the section establishes uniform requirements for quality management systems of an enterprise, regardless of size and areas of activity. The GOST R ISO 9001-2015 standard can be applied:

⁕ when an enterprise wants to demonstrate the ability to manufacture products or provide services that meet customer requirements;

⁕ for the purpose of increasing customer satisfaction.

2. Normative references.

This section of the GOST R ISO 9001-2015 standard provides links to interrelated standards.

3. Terms and definitions.

The terms and definitions used in GOST R ISO 9001-2015 are given in the new version of GOST R ISO 9000-2015.

4. The environment of the enterprise.

This section of GOST R ISO 9001-2015 establishes requirements for:

identification of internal and external conditions of the enterprise, affecting the quality management system and the results of the enterprise;⁕

⁕ identification of interested parties influencing the QMS and determining the requirements of interested parties, monitoring these requirements;

⁕ defining the scope of the quality management system, which should be documented;

⁕to the definition and management of QMS processes. Opportunities and risks should also be identified for each QMS process.

5. Leadership.

This section of GOST R ISO 9001-2015 establishes requirements for:

⁕ top management, which should take a leading role in the implementation and management of the QMS;

⁕ quality policy;

⁕ top management, which must define responsibility, authority and assign roles at the enterprise for the functioning of the QMS and the implementation of customer requirements.

6. Planning.

This section of GOST R ISO 9001-2015 establishes requirements for:

⁕identification of risks and opportunities that can affect the QMS and the achievement of the enterprise's planned results. Requirements are established for developing a response plan for risks and opportunities;

⁕ defining quality objectives and planning the achievement of quality objectives;

⁕ planning changes to the QMS.

7. Provision

This section of GOST R ISO 9001-2015 establishes requirements for:

⁕ management of resources, infrastructure, personnel, knowledge, production environment, as well as tools for monitoring and measuring;

⁕ requirements for the competence of personnel;

⁕ awareness of personnel on QMS issues;

⁕ the definition of external and internal interactions affecting the QMS of the enterprise;

⁕ documentation (creation, updating, management of documented information).

8. Processes.

This section of GOST R ISO 9001-2015 establishes requirements for:

⁕ planning and management of QMS processes;

⁕ defining requirements for products and services;

⁕ development and design of products and services;

⁕ management of external support for products and services;

⁕ preservation of products and services;

⁕ production of products and services;

⁕ management of nonconforming products, services, processes.

9. Conducting an assessment.

This section of GOST R ISO 9001-2015 establishes requirements for:

⁕monitoring, measurements, analysis and assessment of the QMS and the activities of the enterprise. Also specifies requirements for measuring customer satisfaction;

⁕ to conduct internal audits of the QMS;

⁕ conducting an analysis of the enterprise's QMS by the top management.

10. Improvements

This section of GOST R ISO 9001-2015 establishes requirements for:

⁕ making improvements in products, services and processes, as well as the company's QMS.

⁕ actions upon detection of non-conformities, taking corrective actions;

⁕ continuous improvement of the QMS and the results of the enterprise.

The new structure of the standard is reflected in the schematic representation of the process approach. The process approach diagram reflects the relationship of all clauses of the standard, as shown in Figure 1.

The key changes in the new version of the standard are the requirements for risk assessment, as

well as a risk management approach in the design and development of a quality management system.

Figure 1 - Scheme of the process approach

The International Accreditation Forum (IAF) has approved a three-year transition period from mandatory ISO 9001: 2008 (GOST R ISO 9001-2011) to ISO 9001: 2015 (GOST R ISO 9001-2015). During this period, both standards and certificates of conformity issued to the enterprise by certification bodies will be in force. Certificates issued for compliance with ISO 9001: 2008 ceased to be valid only in September 2018.

Among the statistical methods of quality control, the most common both today and tomorrow, the so-called seven quality control tools:

- Pareto chart;
- Ishikawa's causal diagram;
- control card;
- bar graph;
- scatter chart;
- stratification method;
- checklists.

Taken together, these methods form an effective system of methods for quality control and analysis. Seven simple methods can be applied in any sequence, in any combination, in various analytical situations, they can be considered both as an integral system and as separate analysis tools. In each specific case, it is proposed to determine the composition and structure of the working set of methods.

The Pareto chart allows you to visualize the amount of defect loss depending on various objects; it is a kind of a bar chart used to visualize the factors under consideration in order of decreasing significance.

The construction of a Pareto chart begins with the classification of emerging problems according to individual factors (for example, problems related to marriage; problems related to the operation of equipment or performers, etc.) Then the collection and analysis of statistical material for each factor follows in order to find out which ones. of these factors are prevalent in solving problems.

With regard to the construction and use of a Pareto chart, the following can be recommended: it is advisable to use different classifications and make many Pareto charts. The essence of the problem can be grasped by observing the phenomenon from different points of view, so it is important to try different ways of classifying data until a few essential factors are identified, which, in fact, is the purpose of Pareto analysis; the group of factors "other" should not constitute a large percentage. A large percentage of this group indicates that the objects of observation are classified incorrectly and too many objects fell into one group, which means that a different classification principle should be used; if the data can be represented in monetary terms, it is best to show this on the vertical axes of the Pareto chart.

if an undesirable factor can be eliminated with a simple solution, this must be done immediately, no matter how insignificant it may be... Since the Pareto chart is regarded as an effective tool for solving problems, only a few, essential reasons should be

considered. However, the elimination of a relatively unimportant cause in a simple way can serve as an example of an effective solution to the problem, and the gained experience, information and moral satisfaction can have a beneficial effect on the further procedure for solving problems; Opportunities to draw up a Pareto chart should not be missed for reasons.

In a rectangular coordinate system, equal segments corresponding to the factors under consideration are laid along the abscissa, and the value of their contribution to the problem being solved along the ordinate. In this case, the order of the factors is such that the influence of each subsequent factor located on the abscissa decreases in comparison with the previous factor (or a group of factors). The result is a chart whose bars correspond to the individual factors that are causing the problem, and the height of the bars decreases from left to right. Then a cumulative curve is constructed based on this diagram.

Building a Pareto chart in Excel consists of the following steps.

Suppose we have the product sales data shown in the table figure 2:

	A	B
1	**Товар**	**Прибыль, млн. руб.**
2	Хлеб	962
3	Крупа	115
4	Овощи	190
5	Фрукты	226
6	Сахар	132
7	Мясо	537
8	Рыба	764
9	Молоко	157
10	Яйца	278
11	Масло	96

Figure .2 - Product sales data

The data in the table (Figure 2) is not ordered, so first of all we will sort the data in descending order of profit. To do this, select the table (Figure 3) and select Data -> Sort and Filter -> Sort in the tab bar:

Additionally, we added several columns to the table (Figure 3) (Figure 4):

Increasing percentage of profit,%- each product is summed up with the previous one and the total share in the profit is shown; Efficiency ratio - in this case 80% (according to the Pareto rule);

Backlight criterion - in the final diagram, the main sources of profit will be highlighted, we indicate a value obviously greater than 1.

To build a Pareto chart, the initial data are presented in the form of a table, in the first column of which the analyzed factors are indicated, in the second - absolute data characterizing the number of cases of detection of the analyzed factors in the period under consideration, in the third - the total number of factors by type, in the fourth - their percentage , in the fifth - the cumulative (accumulated) percentage of cases of detection of factors.

"Other factors" are always placed last on the ordinate; if the share of these factors is relatively large, then it is necessary to decipher them, highlighting the most significant ones. Based on these, the initial data, a bar chart is built (Figure 5), and then, using the data in column 5 and an additional ordinate denoting the cumulative percentage, a Lorentz curve is drawn. It is possible to build a Pareto diagram when the data of columns 4 are laid on the main ordinate; in this case, to plot the Lorentz curve, there is no need to include an additional ordinate in the diagram.

	A	B	C	D	E
1	**Товар**	**Прибыль, млн. руб.**	**Нарастающий процент прибыли, %**	**Коэффициент**	**Подсветка**
2	Хлеб	962	27,8%	80%	200%
3	Рыба	764	49,9%	80%	200%
4	Мясо	537	65,5%	80%	200%
5	Яйца	278	73,5%	80%	200%
6	Фрукты	226	80,0%	80%	0%
7	Овощи	190	85,5%	80%	0%
8	Молоко	157	90,1%	80%	0%
9	Сахар	132	93,9%	80%	0%
10	Крупа	115	97,2%	80%	0%
11	Масло	96	100,0%	80%	0%

Figure 3 - Product sales data with added columns

	A	B	C	D	E
1	Товар	Прибыль, млн. руб.	Нарастающий процент прибыли, %	Коэффициент	Подсветка
2	Хлеб	962	=СУММ($B$2:B2)/СУММ($B$2:$B$11)	0,8	=ЕСЛИ(C2<D2;2;0)
3	Рыба	764	=СУММ($B$2:B3)/СУММ($B$2:$B$11)	=D2	=ЕСЛИ(C3<D3;2;0)
4	Мясо	537	=СУММ($B$2:B4)/СУММ($B$2:$B$11)	=D3	=ЕСЛИ(C4<D4;2;0)
5	Яйца	278	=СУММ($B$2:B5)/СУММ($B$2:$B$11)	=D4	=ЕСЛИ(C5<D5;2;0)
6	Фрукты	226	=СУММ($B$2:B6)/СУММ($B$2:$B$11)	=D5	=ЕСЛИ(C6<D6;2;0)
7	Овощи	190	=СУММ($B$2:B7)/СУММ($B$2:$B$11)	=D6	=ЕСЛИ(C7<D7;2;0)
8	Молоко	157	=СУММ($B$2:B8)/СУММ($B$2:$B$11)	=D7	=ЕСЛИ(C8<D8;2;0)
9	Сахар	132	=СУММ($B$2:B9)/СУММ($B$2:$B$11)	=D8	=ЕСЛИ(C9<D9;2;0)
10	Крупа	115	=СУММ($B$2:B10)/СУММ($B$2:$B$11)	=D9	=ЕСЛИ(C10<D10;2;0)
11	Масло	96	=СУММ($B$2:B11)/СУММ($B$2:$B$11)	=D10	=ЕСЛИ(C11<D11;2;0)

Figure 4 - Deciphering the formulas of the auxiliary table (Figure 3)

To build a Pareto chart, the initial data are presented in the form of a table, in the first column of which the analyzed factors are indicated, in the second - absolute data characterizing the number of cases of detection of the analyzed factors in the period under consideration, in the third - the total number of factors by type, in the fourth - their percentage , in the fifth - the cumulative (accumulated) percentage of cases of detection of factors.

"Other factors" are always placed last on the ordinate; if the share of these factors is relatively large, then it is necessary to decipher them, highlighting the most significant ones. Based on these, the initial data, a bar chart is built (Figure 5), and then, using the data in column 5 and an additional ordinate denoting the cumulative percentage, a Lorentz curve is drawn. It is possible to build a Pareto diagram when the data of columns 4 are laid on the main ordinate; in this case, to plot the Lorentz curve, there is no need to include an additional ordinate in the diagram.

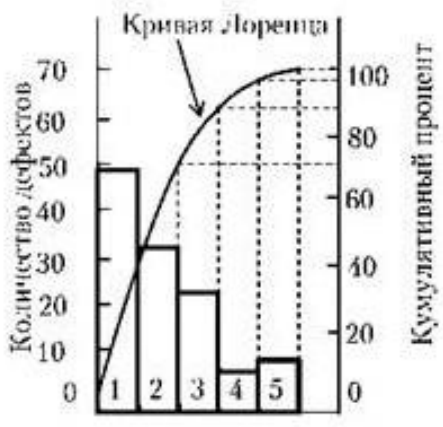

Figure 5 - Pareto chart

To solve all kinds of problems associated with the appearance of defects, equipment malfunctions, an increase in the time from the release of a batch of products to its sale, the presence of unsold products in the warehouse, the receipt of complaints, the Pareto chart is used (Figures 6 and 7).

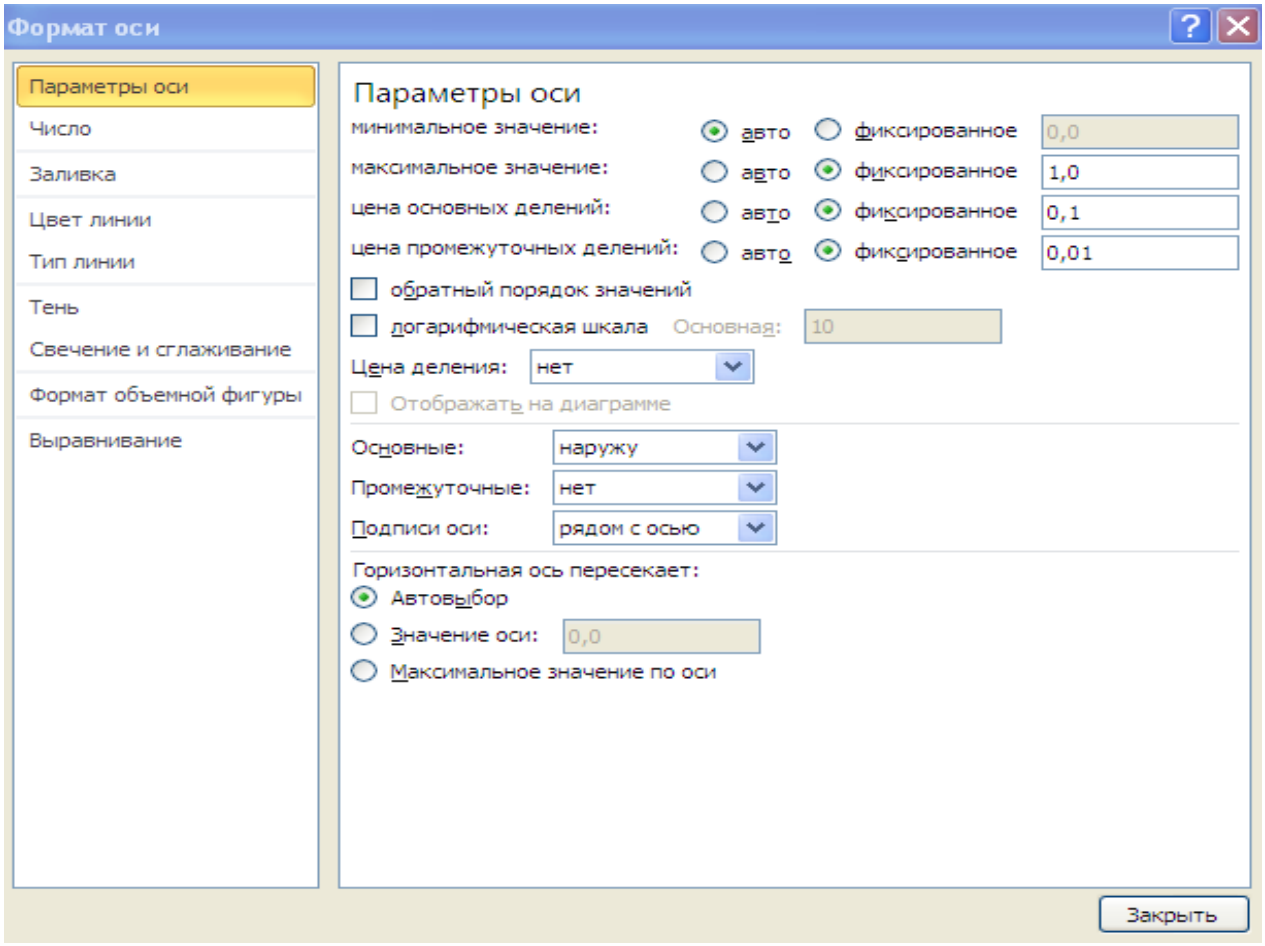

Figure 6 - Window for building a Pareto chart in Excel

Defect	Number of defects	Accumulated share of defects	Cumulative percentage
knotting	96	12	12%
span	94	13	25%
hood	85	eleven	36%
white	84	eleven	47%
massive cliff	72	nine	56%
"Sliding" warp threads	69	nine	65%
"Prickly" surface	58	7	72%
oil stains	56	eight	80%
knots	53	6	86%
overshoot	41	6	92%
edge flaking	39	5	97%
others	25	3	100%
total	772		

Figure 7. Initial data for building a Pareto chart in Excel

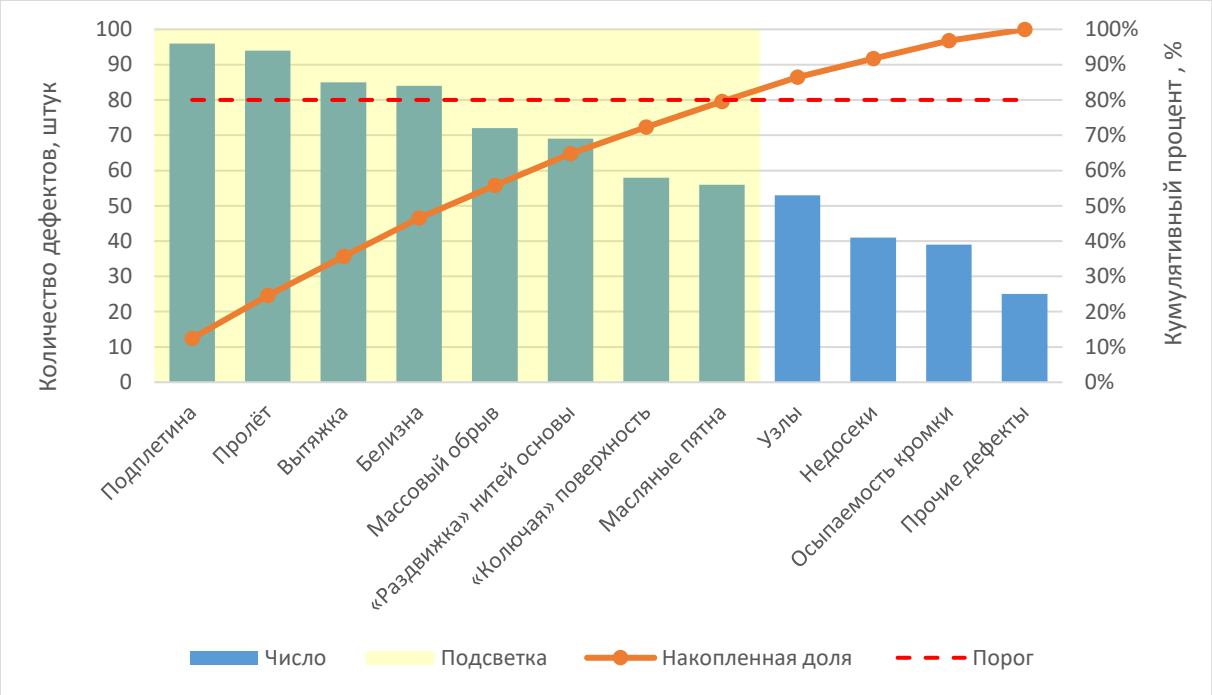

Figure 8 - An example of building a Pareto chart for identified defects Select all the data (Figure 2) and insert it into the histogram. To do this, go to the tab bar on Insert -> Chart -> Histogram -> Histogram with grouping (Figure 1.9):

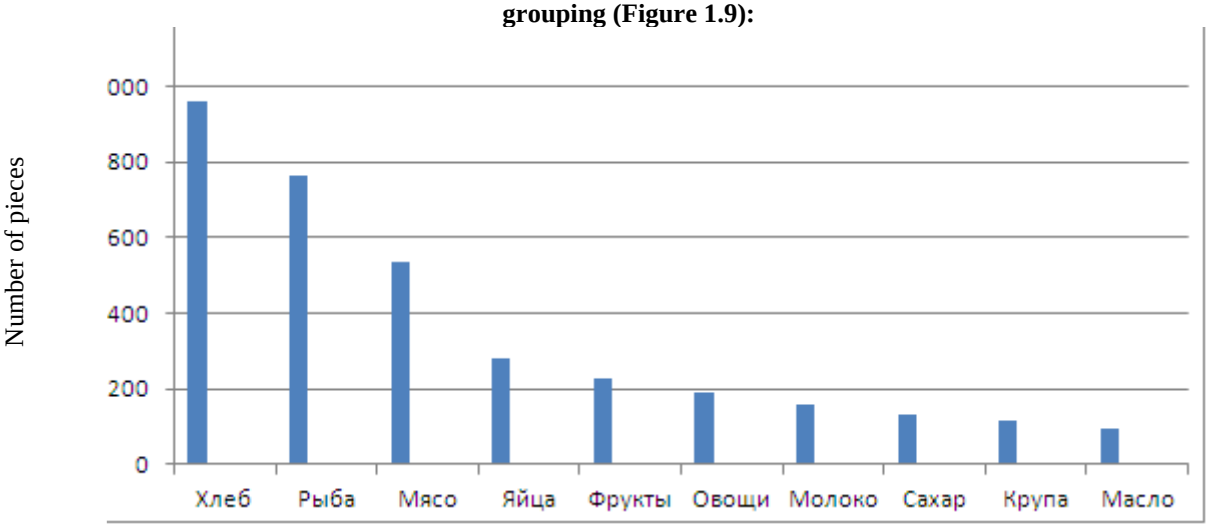

Figure 9 - Building a histogram

Now let's transform the graph into a more convenient form. Select the row "Increasing percentage of profit,%" and transfer it to the secondary axis (right-click on the row, select Format data series -> Row parameters -> Along the secondary axis) (Figure 10):

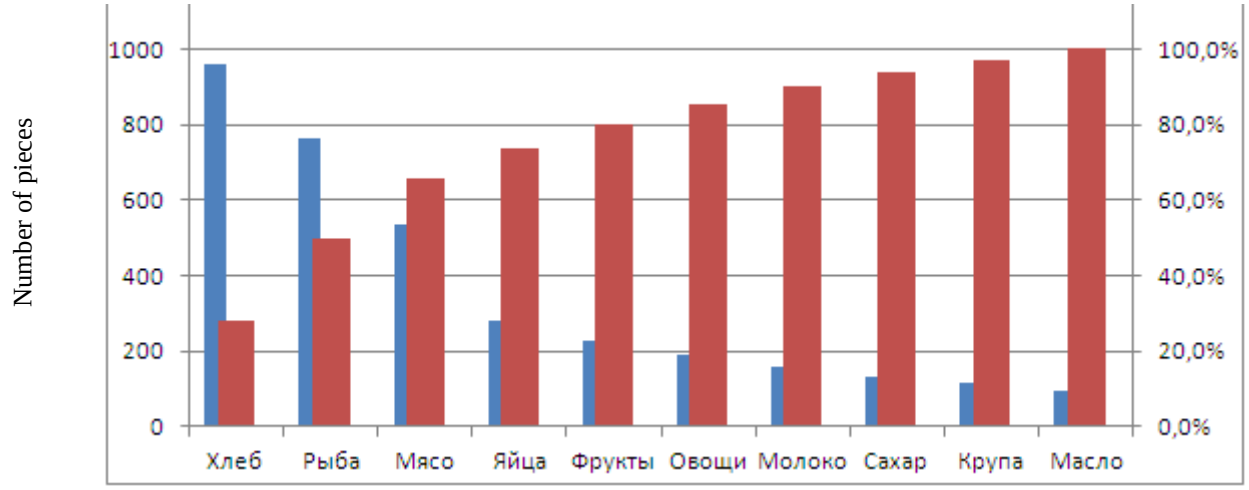

Figure 10 – Transferring the row to the auxiliary axis

We will also change the chart type for this series to a regular line chart (right-click on the series, select Change chart type for the series) (Figure 11):

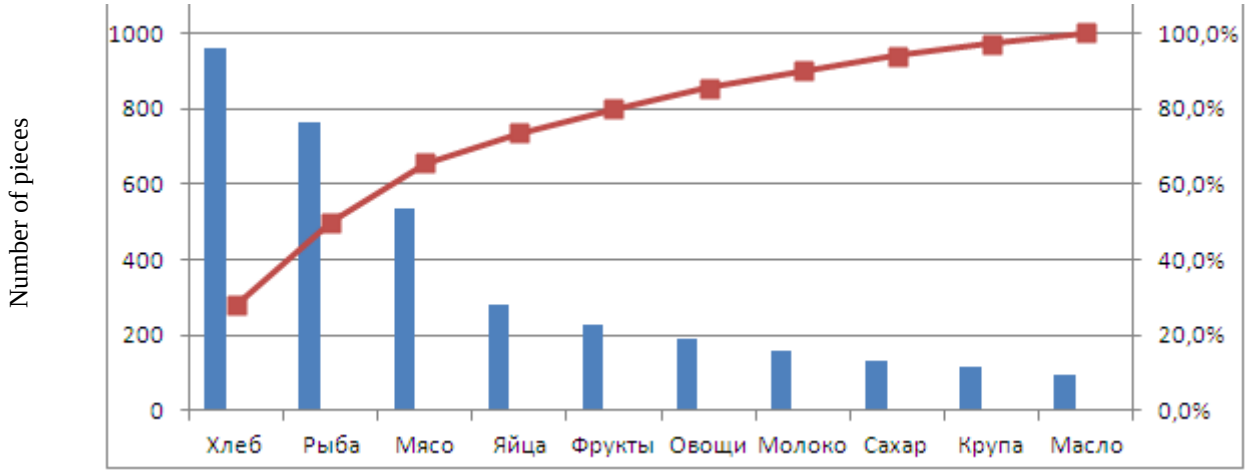

Figure 11 - Changing the type of chart for a series

Further, we carry out similar actions for the "Coefficient" series, which we transfer to the auxiliary axis and make it a horizontal line (Figure 12):

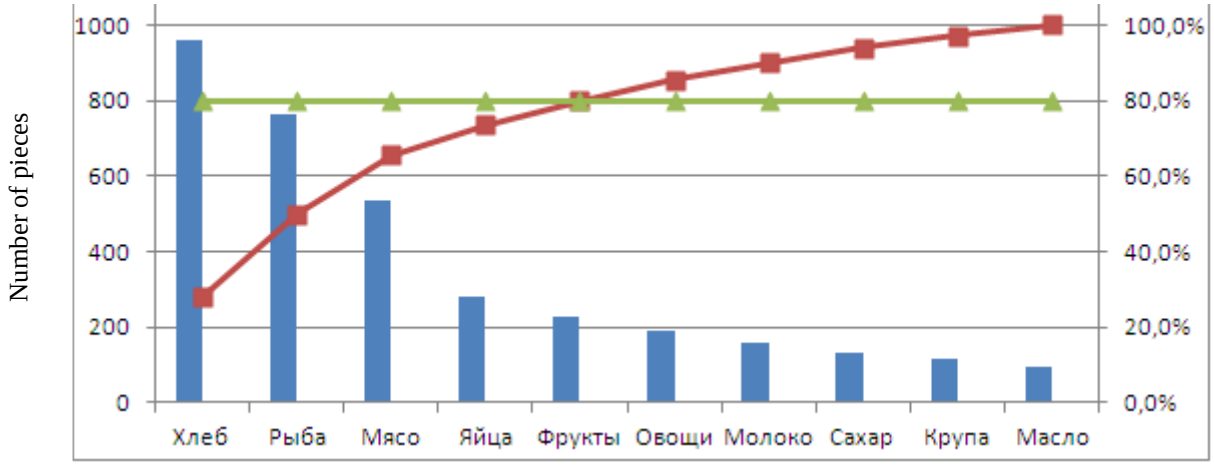

Figure 12 - Adding a horizontal line to the diagram

Let's add highlighting to the chart that shows which specific product groups bring the main profit. Select the "Highlight" row and transfer it to the secondary axis. Set the side clearance to 0 - right-click on the row, select Format data row -> Row parameters -> Side clearance (Figure 13):

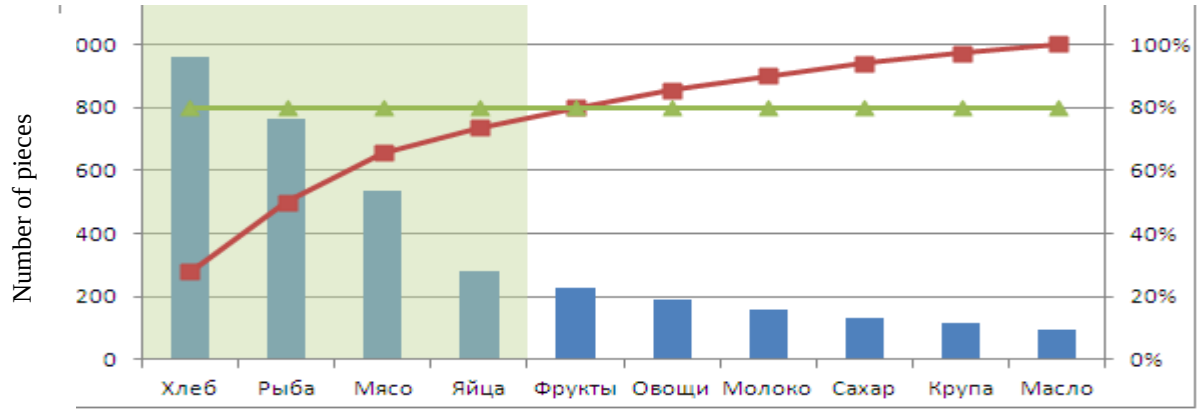

Figure 13 - An example of a Pareto chart in Excel for product sales data (Figure 3)

We customize the chart at our discretion and get the final look of the Pareto chart in Excel (Figure 114):

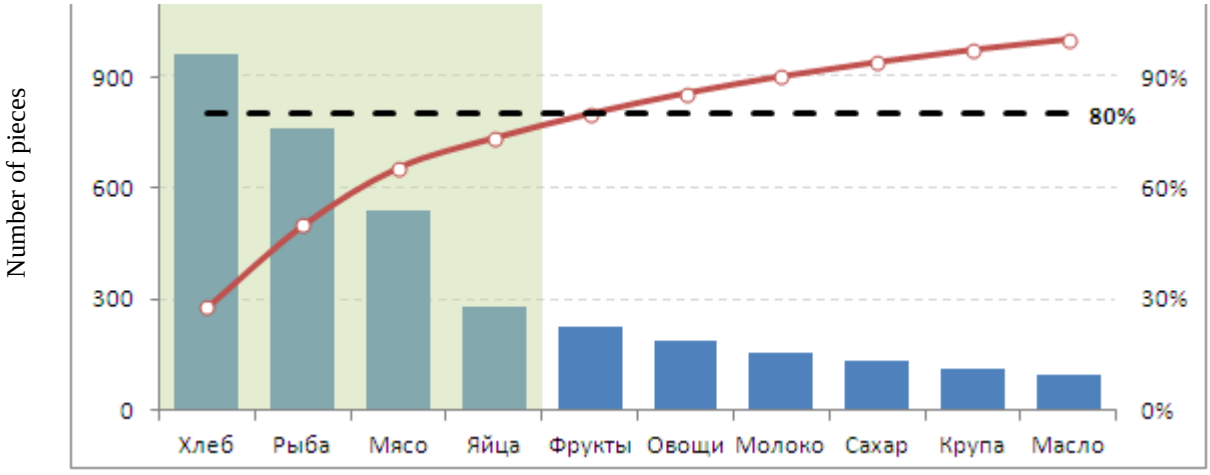

Figure 14 - The final view of the Pareto chart in Excel (wrong)

If Figures 12 and 13 are constructed correctly and the condition for the formation of the cumulative percentage is satisfied, the total value of which cannot be more than 100%, and scaling must be implemented in accordance with the rules for drawing up charts, namely: the scale of the right ordinate is set to 10% and the axis is split, thus, there are always only ten parts, which provokes the formation of the left ordinate axis, namely, choosing the scale ratio between the left and right ordinate axes 1: 1; 1: 2; 15; 1: 10; or 1: 1; 2: 1; 5: 1; 10: 1; then Figures 1.14 and 1.15 are incorrectly constructed.

The Pareto chart allows you to distribute efforts to resolve emerging problems and establish the main factors with which you need to start acting in order to overcome the problems that arise.

Further, we carry out similar actions for the "Coefficient" series, which we transfer to the auxiliary axis, and make it a horizontal line:

We customize the chart at our discretion and get the final look of the Pareto chart in Excel (Figure 15), but the plotted incorrectly - the ordinate axis has the designation 120%, and it should be no more than 100%

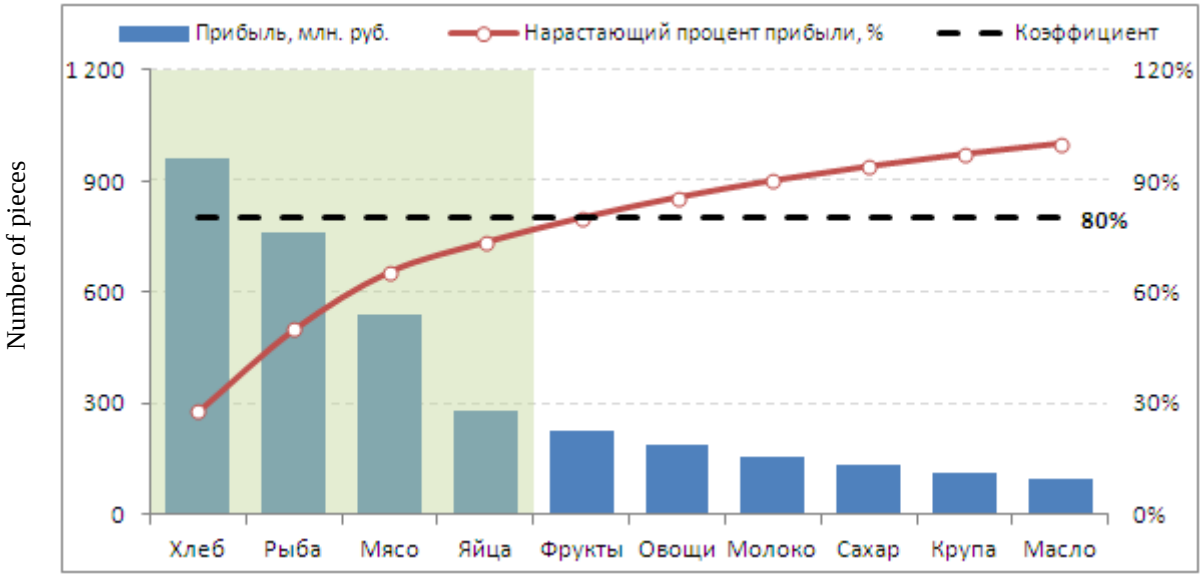

Figure 15 - The second option for building the final form of the Pareto chart in Excel

Let's clarify the stages of solving the problem of constructing a Pareto chart in Excel, namely:

Stage 1. First you need to decide:

1. What problems need to be investigated (e.g. defective products, money losses, accidents);

2. what data needs to be collected and how to classify them (for example, by the types of defects, by the place of their occurrence, by processes, by machines, by workers, by technological reasons, by equipment, by measurement methods and measuring instruments used; not common signs combined under the general heading "other");

3. Determine the method and period of data collection.

Stage 2. Development of a checklist for registering data with a list of the types of information collected.

Stage 3. Filling out the data registration sheet and calculating the totals.

Stage 4. Development of a table for checking data with columns for totals for each checked feature separately, the accumulated amount of the number of defects, percent of the total and accumulated interest (table 1).

Stage 5. Arrangement of the data obtained for each checked feature, in order of importance and filling out the table (table 1).

Table 1 - Results of data registration by types of defects for constructing a Pareto chart in Excel

Types of defects	Number of defects	Accumulated number of defects	The percentage of the number of defects for each feature to the total amount	Accrued interest
Deformation	104	104	52	52
Scratches	41	146	21	73
Sinks	20	166	10	83
Cracks	10	176	5	88
Stains	6	182	3	91
The gap	4	186	2	93
Other	14	200	7	100
Total	200	-		

The group "others" should be placed in the last line regardless of its numerical values, since it is a set of characteristics, the numerical result for each of which is less than the smallest value obtained for the characteristic highlighted in a separate line.

Stage 6. Drawing horizontal and vertical axes.

1. The vertical axis contains percentages, and the horizontal axis contains intervals in accordance with the number of controlled features.

2. The horizontal axis is divided into intervals in accordance with the number of controlled features.

Stage 7. Building a bar chart (Figures 17 and 18).

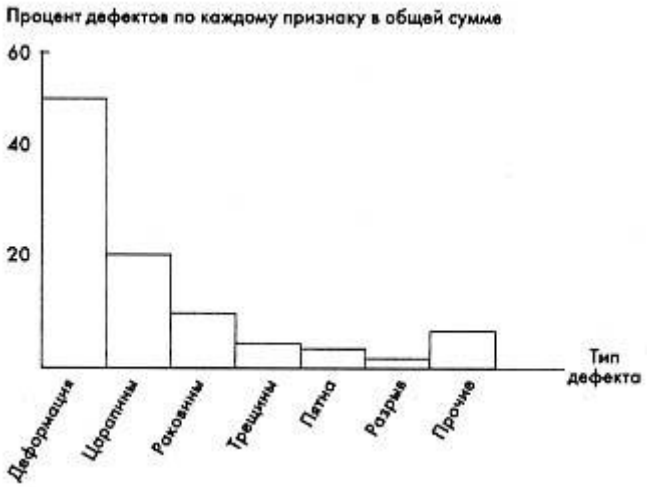

Figure 17. Pareto Chart

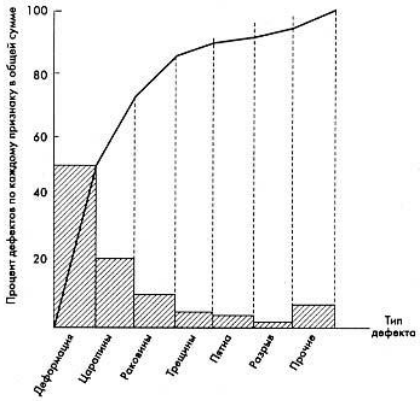

Figure 18. Cumulative Curve in Pareto Chart

Stage 8. Drawing a cumulative curve (Pareto curve) on the diagram (Fig. 1.18).

Step 9. Drawing on the diagram of all designations and inscriptions concerning the diagram (name, marking of numerical values on the axes, the name of the controlled item, the name of the diagrammer), and data (the period of information collection, the object of research and the place of its conduct, the total number of objects of control).

After identifying the problem by building a Pareto chart from the results, it is important to determine the causes of its occurrence. This is necessary to solve it. When using a Pareto chart to identify performance and causes, the most common method is ABC analysis.

The essence of ABC analysis in this context is to identify three groups that have three levels of importance for quality management:

1. group A - the most important, significant problems, causes, defects. The relative percentage of Group A in the total number of defects (causes) is usually 60 to 80%. Accordingly, the elimination of the causes of group A has a high priority, and the related activities are the highest efficiency;

2. group B - reasons that in total have no more than 20%;

group C - the most numerous, but at the same time the least significant causes and problems.

An example of using ABC analysis within the Pareto chart is shown in Figure 19.

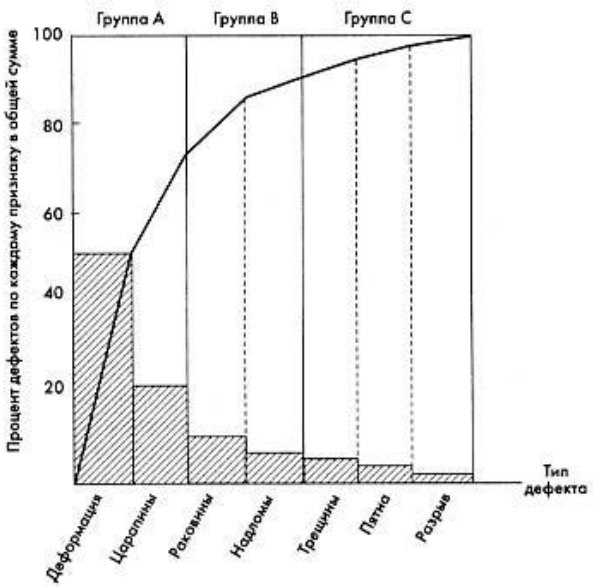

Figure 19 - An example of the use of ABC - analysis in the framework of the Pareto chart

ABC analysis allows you to reasonably determine the priorities of work on project quality management.

Enterprises of the Russian metallurgical industry have actively engaged in the development, implementation and certification of quality systems for compliance with international standards ISO 9000 series. This industry is characterized by problems that currently exist in all sectors of the country's economy, namely, due to a significant decline in production use of production facilities. The metallurgy market is not monopolized, but highly concentrated. The share of deliveries of metallurgical products to non-CIS countries is also high. Therefore, for the enterprises of the industry, the task of introducing and certifying quality management systems for compliance with international standards ISO 9000 series is very relevant.The history of Lipetsk has always been closely associated with ferrous metallurgy. The first factories appeared here at the end of the seventeenth century. Cast iron was smelted from local iron ores, from which cannons, cannon balls and anchors were made for the Petrovsky fleet. These factories existed until the end of the 18th century. Metallurgy received further development here only at the beginning of the twentieth century with the construction of first the Sokolsk and then the Novolipetsk metallurgical plant. NLMK Group announced a new stage of development with the start of Strategy 2017, which is aimed at unlocking the company's internal potential by increasing the operational efficiency of the production chain, strengthening vertical integration in key raw materials, increasing sales of high value-added products, and continuing programs in the field of environmental protection, industrial safety and human capital development.

As an object of production, a rectangular forging made of carbon steel by free forging and using backing dies was selected. The external view of the forging is shown in Figure 20.

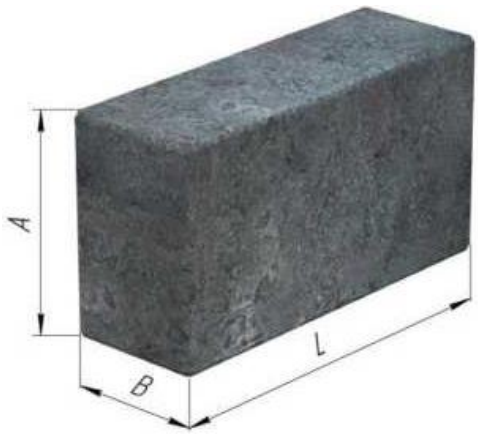

Figure 20 - Rectangular section forging:
A- height, mm; B - width, mm; L - length, mm.

Forgings are manufactured in accordance with GOST 8479-70 “Forgings from structural carbon and alloy steel. General technical conditions ".

Forgings are used for the manufacture of machine parts and spare parts for metallurgical, mining and machine-building equipment: blast furnace charging rods, shroud rings, gear shaft, gear and crane wheels, MH / 13 rollers, metal-cutting knives, etc.

For the manufacture of forgings, the following steel grades are used from ingots of our own production, as well as from purchased rolled products and customer material: 15, 20, 35, 45, 40X, 65G, 40XN, 35XM, 40X1MFA, 18XGT, 38XGN, 38XGSA, ZOHGSA, 10XSND, 5XNM , 34XH1M, 34XH3M, 40XH2MA, ХВГ, Х12М, Х12Ф1, 20Х13, 30Х13, 12Х18Н9Т, 12Х18Н10Т, 5ХВ2СФ, 6ХВ2С, 24Х1М1Ф.

Technical characteristics of the forging are presented in table 2.

Table 2 - Technical characteristics of forgings manufactured by OJSC "NLMK"

Forgings type	Blank	Parameters of forgings, mm	Weight forgings, Kg	Regulatory documentation
Rectangular cross-sections	Press broach	A, B 40-400; L 100-4000.	Up to 1700	GOST 8479-70
	Ingot m = 1.6 t.	A, B 100-300; B <L <3000; A <B <2.5A.	Up to 1000	

Forgings are manufactured in accordance with the requirements of GOST 8479-70 according to drawings approved in the prescribed manner, and regulatory and technical documentation for specific products. Forgings by type of testing are divided into groups indicated in Table 3.

Table 3 - Groups of forgings by test type

Group of forgings	Types of tests	Batch picking conditions	Delivery characteristics
1	2	3	4
I	No tests	Forgings of one or different steel grades	-
II	Determination of hardness	Forgings of the same steel grade, jointly heat treated	Hardness
III	Determination of hardness	Forgings of the same steel grade, heat treated in the same mode	Also
IV	1. Tensile test 2. Determination of impact strength 3. Determination of hardness	Forgings of one steel heat, jointly heat treated	Yield point Relative narrowing Impact strength
V	1. Tensile test 2. Determination of impact strength 3. Determination of hardness	Each forging is individually accepted	Yield point Relative narrowing Impact strength

The assignment of the forgings to a particular group is made by the consumer, the group number is indicated in the technical requirements on the part drawing.

The type, volume, norms and methods of additional tests are indicated in the drawing of the forging or in the order.

The dimensions of forgings should take into account machining allowances, dimensional tolerances and technological overlaps for forgings manufactured by forging on presses in accordance with GOST 7062-79, manufactured by hammer forging in accordance with GOST 7829-70 and manufactured by hot stamping in accordance with GOST 7505-74, as well as overlaps for samples for control tests.

Hardness standards for group II and III forgings and strength categories for group IV and V forgings are established by agreement between the manufacturer and the consumer. The steel grade is established by agreement between the manufacturer and the consumer and is indicated on the drawing of the part and forging.

There should be no cracks, shackles, films, sands on the surface of the forgings.

On untreated surfaces of forgings, dents from scale and nicks are allowed, as well as shallow cutting or cleaning of defects, provided that the depth of these defects does not exceed the limits of the smallest allowable dimensions of forgings in accordance with GOST 7062-79.

Defects are not allowed on the surfaces of forgings being chased. On the machined surfaces of forgings, individual defects are allowed without removal if their depth, determined by control punching or stripping, does not exceed 75% of the actual one-sided allowance for machining for forgings produced by forging, and 50% for forgings produced by stamping. On forgings made of carbon and low-carbon steel, with a depth of surface defects exceeding the actual one-sided allowance for machining, it is allowed to remove defects by gentle cutting with subsequent welding.

The permissible brewing depth must be agreed with the consumer.

Forgings should not have flakes, cracks, shrinkage looseness, the absence of which is guaranteed by the manufacturer.

Forgings in which the above defects are found are rejected, and all other forgings of this batch can be recognized as suitable only after individual control, the number of packages manufactured at OJSC Novolipetsk Metallurgical Plant per year reaches up to 1,500,000 pieces. A quality management system that meets the requirements of the international standard ISO 9001-2015 has been implemented at OJSC Novolipetsk Metallurgical Plant.

The quality management system of NLMK includes:

- the management structure of the Managing Director of NLMK OJSC and the management structure of the structural divisions of NLMK OJSC;

- processes of the NLMK Quality Management System, their application, consistency and interaction;

- documentation of the NLMK Quality Management System, containing the requirements in accordance with which personnel perform activities in the field of quality, and records (data) confirming the fulfillment of these requirements;

- the resources required for the efficient and effective functioning of the processes and the Quality Management System of NLMK as a whole.

The quality management system of NLMK operates on the basis of processes covering all types of activities that determine the quality of products. The top management of NLMK OJSC defines and forms the governing, main and auxiliary processes, as well as processes aimed at continuous improvement of the NLMK OJSC Quality Management System. The tasks of defining the structure of processes, their documenting as a means of ensuring the implementation of NLMK's Quality Policy, achieving goals and product compliance with established requirements are being addressed.

The quality management system of NLMK operates as follows:

- top management determines the priority areas of NLMK's activities, formulates the NLMK Group's Quality Policy and NLMK's goals in terms of quality. NLMK Group's quality policy is approved by the President (Chairman of the Management Board);

–NLMK's Managing Director approves quality objectives, holds a meeting of NLMK's management to analyze the functioning of the quality management system;

- the authorized management of NLMK for the Quality Management System heads all work on organizing the functioning and improvement of the quality management system of NLMK in accordance with the requirements of the Regulations on the authorized management of NLMK for the quality management system;

–The technical center coordinates the development and implementation of normative documents of the quality management system, organizes and conducts internal audits of technological processes and products, participates in the organization of external audits of the QMS, prepares information on the functioning of the quality management system for analysis by the management of NLMK;

–The Center for Management Systems and Scientific and Technical Information (CSMSTI) organizes and conducts internal audits of the quality management system, organizes external audits by certification bodies;

- heads of structural divisions, appoint a responsible structural division for the quality management system, organize the activities of personnel to meet the requirements of the quality management system;

–Responsible structural units for the quality management system in accordance with the requirements of the "Regulations on the responsible structural unit for the quality management system" organize work for the effective functioning and continuous improvement of the quality management system in structural units;

–Responsible for document management of the Quality Management System in the structural divisions of OJSC NLMK provide personnel with regulatory documents of the quality management system;

–The personnel of structural divisions carry out activities in accordance with the requirements of the quality management system.

NLMK's quality management system documentation is formed in accordance with the requirements of the legislation of the Russian Federation and interstate, national (state) standards of the Russian Federation, as well as taking into account the requirements of international standards ISO 9001 and ISO / TS 16949 and consumer requirements.

NLMK's Quality Management System documentation includes:

–Formed by the top management of NLMK and approved by the NLMK Group Quality Policy and quality objectives.

–NLMK Quality Manual, which defines the Quality Management System of NLMK in accordance with the requirements of ISO 9001 and ISO / TS 16949;

–Process maps that establish the goal of the process, inputs and outputs of the process, the main stages of its implementation, resources, parameters and control methods; process performance indicators and performance indicators (for main and auxiliary processes), current documents, in accordance with the requirements of which activities are carried out on this process;

- standards for the organization of the quality management system, which establish the procedures for the quality management system of NLMK;

- documents developed in accordance with the requirements of the enterprise quality management system standards (regulations on structural units, job and production and technical instructions, technological instructions, flow charts of technological operations, technological maps, technical specifications, product standards, etc.);

–Organizational and administrative documents (orders, orders of the management of OJSC NLMK).

The structure of documenting the quality management system of NLMK is shown in Figure 121.

⁎ planning the level of product quality, planning quality control and technical controls;

⁎collecting quality information, determining the cost of quality assurance, processing information and analyzing quality data from production and operations;

⁎quality management of products supplied by suppliers and products of our own enterprise;

⁎development of control methods to ensure comparability and reliability of quality control results;

⁎development (together with technical departments) of technical conditions, conditions, standards for product quality management.

Quality control includes:

⁎incoming quality control of raw materials, basic and auxiliary materials, semi-finished products, components, tools supplied to the warehouses of the enterprise;

⁎production operational control over compliance with the established technological regime, and sometimes inter-operational acceptance of products;

⁎systematic monitoring of the condition of equipment, machines, cutting and measuring instruments, control and measuring instruments, precision measuring instruments, stamps, models of testing equipment and weighing facilities, new and in operation devices, conditions of production and transportation of products and other checks;

⁎control of models and prototypes;

⁎control of finished products (parts, small assembly units, sub-assemblies, assemblies, blocks, products).

Quality promotion covers:

⁎development of documentation reflecting methods and means of motivation in the field of product quality assurance;

⁎development of regulations on bonuses to employees of the enterprise for the quality of work (together with the department of labor organization and wages);

⁎training and professional development.

The characteristics of forging defects are shown in Table 4.

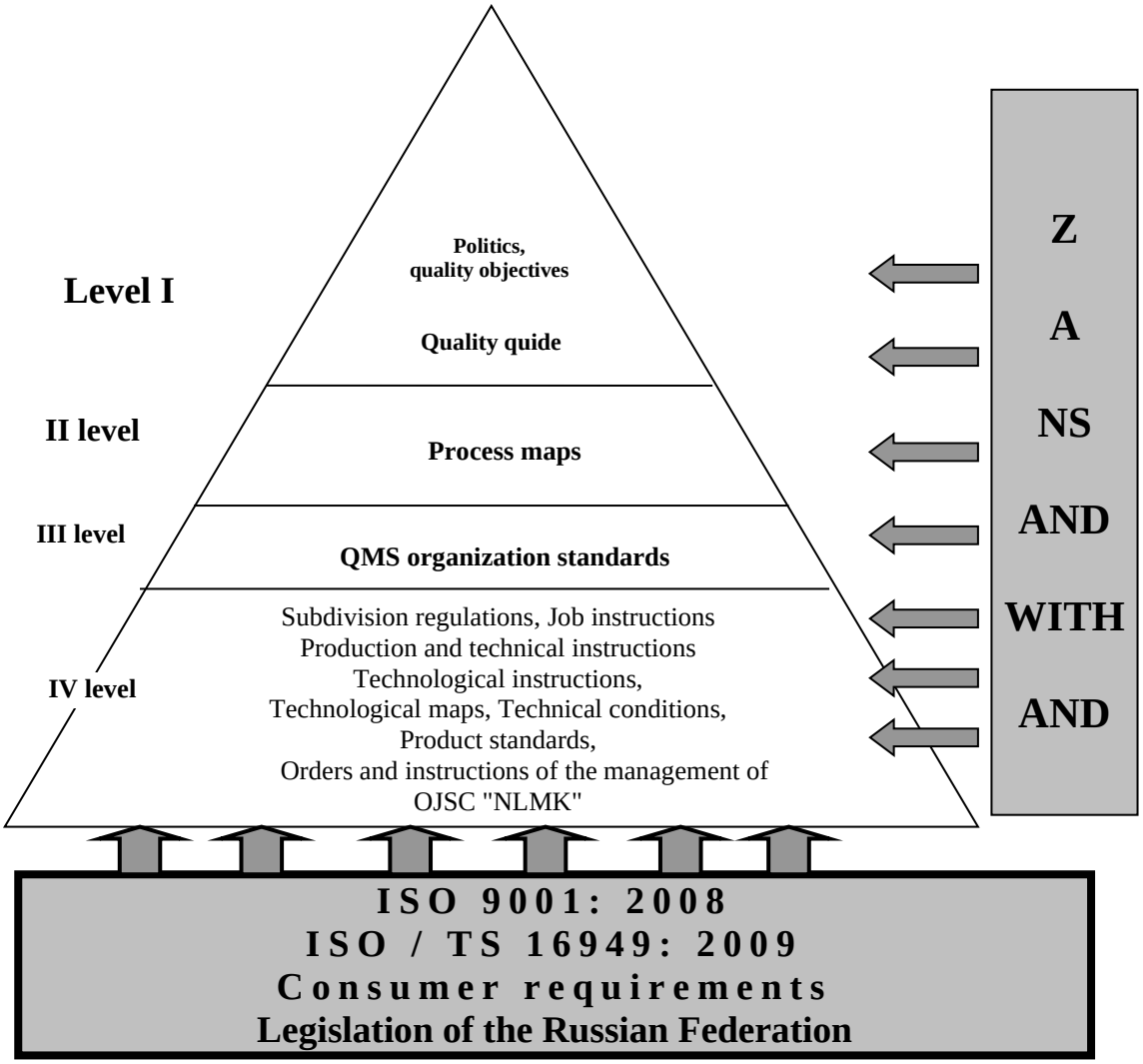

Figure 21 - The structure of documentary registration of the quality management system of OJSC "NLMK"

Table 4 - List of forging defects

No. p / p	Type of product defect	Defect characteristic	The cause of the defect	Defect elimination method	The culprit of the defect
Heating defects					
1	Scale	The surface of the forging is covered with a layer of oxidized metal	1 High heating temperature 2 Excessively long heating time	Descaling the workpiece	Heater
2	Underheating	Internal cracks in the workpiece	1 High heating rate 2 Insufficient holding of the workpiece in the heating furnace	When cracks appear, the defect is not eliminated	Heater

3	Overheat	Excessive grain growth in steel and decreased mechanical properties	1 Heating to temperatures exceeding the allowable for a given steel grade 2 Excessive heating time to required forging temperatures 3 End of forging at high temperatures well above the optimum	Overheating is eliminated by normalization, annealing or improvement	Heater
4	Burned	Oxidation or melting along the grain boundaries of steel, characterized by abundant emission of sparks from a white-hot workpiece	Long-term heating at high temperatures (1300-1350˚C)	Burn-in forgings cannot be repaired	Heater
Forging defects					
5	Clamps	Chained folds of metal on blanks	1 The use of incorrect techniques for broaching and disperse workpieces	If there are tolerance limits, remove forgings by fire stripping.	Blacksmith
6	Concave ends	The ends of the forging appear in the form of a "bootleg"	1 Active feed of a workpiece with a circular cross-section 2 Insufficient heating of the workpiece 3 Low weight of the falling parts of the hammer 4 Insufficient length of the pull-off end	1 Feed with moderate feed 2 Heating the workpiece according to the modes 3 Forging should be done on a heavier hammer 4 Correctly calculate the volume of metal required for a given forging	Blacksmith, heater, foreman, technologist

7	External cracks or flaws	Cracks and flaws	1 Forging at low temperatures 2 Rapid cooling of forgings (especially alloy steels) 3 Inadequate heating of the workpiece, causing severe burnout or overheating of the workpiece surface 4 Poor quality of the original ingot or billet 5 Inhomogeneity of the chemical composition of the ingot or billet over the section	1 Heat metal for forging in accordance with the normative technological documentation (NTD) 2 Cooling should be done according to NTD	Blacksmith, heater, ingot (billet) manufacturer
8	Internal breaks	When forging metal, holes appear in the central zone of the section of the forging	1 Forging metal at high feed rates 2 Rolling round billets in flat strikers 3 Significant settlement in flat strikers with large contact surfaces and low height of the upset forging	1 Forge the workpiece at low feed rates 2 Run in a round workpiece in cut-out strikers 3 It is necessary to correctly calculate the initial blank for upsetting	Blacksmith, technologist
9	Curvature	The geometric surface of the forging is curved	1 Broaching an unevenly cooled billet during forging and non-observance of the order of tilting the billet 2 Under the action of its own weight, the forgings of long shafts 3 Upsetting of an unevenly heated workpiece 4 Excessive ratio of forging length to diameter	Straightening of forgings	Blacksmith, heater, technologist
10	Insufficient uk.	The presence of a large crystalline cast structure in the forging	The ratio of the sectional area of the ingot to the sectional area of the forging does not correspond to the forging ratio	Correctly calculate the selection of the original workpiece	Technologist

11	Internal breaks	When forging metal, holes appear in the central zone of the section of the forging	1 Forging metal at high feed rates 2 Rolling round billets in flat strikers 3 Significant settlement in flat strikers with large contact surfaces and low height of the upset forging	1 Forge the workpiece at low feed rates 2 Run in a round workpiece in cut-out strikers 3 It is necessary to correctly calculate the initial blank for upsetting	Blacksmith, technologist
12	Curvature	The geometric surface of the forging is curved	1 Broaching an unevenly cooled billet during forging and non-observance of the order of tilting the billet 2 Under the action of its own weight, the forgings of long shafts 3 Upsetting of an unevenly heated workpiece 4 Excessive ratio of forging length to diameter	Straightening of forgings	Blacksmith, heater, technologist
13	Insufficient uk.	The presence of a large crystalline cast structure in the forging	The ratio of the sectional area of the ingot to the sectional area of the forging does not correspond to the forging ratio	Correctly calculate the selection of the original workpiece	Technologist
14	Dents	Traces in the form of stepped transitions and dents from strikers, traces of scale pressed into the body of the forging	Careless work in the manufacture of forging	Increase the responsibility of personnel for the quality of products	Blacksmith
15	The geometric dimensions of the forging are not maintained	Deviation of the forging from the specified dimensions and tolerances.	1 Incorrectly dimensioned original blank 2 Unsustained dimensions of forging tolerances during forging	1 Calculate expertly the original workpiece 2 Forgings are made according to NTD	Technologist, blacksmith
16	Indicators of mechanical properties of the forging are not maintained	Deviations from NTD requirements after heat treatment: ultimate strength and yield strength; relative elongation or	1 Incomplete hardening 2 Excessive holiday temperature 3 Decarburization of the forging surface during repeated heating	Heat treatment of forgings is carried out in accordance with the approved schedule	Technologist, master

		compression; impact strength and hardness on forgings or samples	4 Inconsistency of the chemical composition of the metal of the workpiece		
17	Dents	Traces of scale stamped and then removed from the forging with a depth of up to 3 mm	Negligence in the work of a blacksmith	1 It is necessary to thoroughly clean the scale from the heated workpiece before stamping 2 Re-stamping	Blacksmith
18	Nicks	Mechanical damage to forgings	Bottoms appear when forgings are removed from dies in the event of jamming or when foreign objects get into edging dies	It is necessary to lubricate the figure of the stamp, as well as to prevent the ingress of foreign objects on the stamps	Blacksmith
19	Scrap Boy	Fatal damage to the forging	Impact when the forging is displaced from the bottom shape of the stamp when punching or cutting a burr	Observe the correct installation of the forging in the dies	Blacksmith
20	Not filling a figure	Deviation from the specified geometrical dimensions of the forging due to non-filling of the finishing die at projections, corners, roundings and ribs	Insufficient heating of workpieces or insufficient number of punching blows, improperly designed die, insufficient weight, length or inappropriate workpiece profile	Eliminate re-stamping	Blacksmith,. technologist, constructor
21	Under stamping	Increase of all dimensions of the forging in excess of the tolerance in the direction perpendicular to the main plane of the part.	1 Insufficient heating blanks 2 Insufficient number of blows in the final result or insufficient mass of the falling parts of the hammer 3 Enlarged workpiece profile	Re-stamping or preliminary roughing of forgings before machining	Blacksmith, technologist

22	Skew	Displacement in excess of the specified tolerance of one half of the forging relative to the other along the split plane	Equipment malfunction (increased clearance of the guides, development of the planes of the stamp holder) or stamps (knocked down locks, the development of fastening planes), poor installation and fastening of the stamps	In some cases, by re-stamping, and a slight misalignment - by sharpening the base surfaces of the forgings	Blacksmith, mechanic
23	Clamp	Stamped crease resulting from improper metal flow in the finishing stream or rolling of burrs resulting from improper execution of the first punching passes	Eccentric stacking of workpieces in the die strand, excessively sharp blows in the broaching or rolling strands, inconsistent sizes of the roughing and finishing strands	Minor clamps are removed by sharpening with a circle or punching out with a chisel	Blacksmith, technologist, constructor
24	Burr	Uncut flash residue	Unsatisfactory installation and adjustment of stamps	Removed by sharpening with an emery wheel	Blacksmith, adjuster
25	Curvature	Deviation of the axes and planes of the forging from their correct geometric position	1 Occurs when cropping burrs for forgings with a complex trimming contour, with thin sections and long lengths 2 Use of faulty trimming punches or dies of improper design, as well as when extracting forgings from dies and their heat treatment	Curvature is eliminated by cold stamping or hand-fitting with a template	Blacksmith, technologist, constructor

26	Looseness in size	Lack of allowance for cutting or reduction of the working section of the part in non-machined places	1 Stamping of forgings with a thick layer of scale or in worn out dies 2 Excessive mass of falling parts of the hammer 3 Incorrect adjustment of cutting dies (one-side cut)	Not corrected.	Blacksmith, technologist, adjuster
27	Clamp	Stamped crease resulting from improper metal flow in the finishing stream or rolling of burrs resulting from improper execution of the first punching passes	Eccentric stacking of workpieces in the die strand, excessively sharp blows in the broaching or rolling strands, inconsistent sizes of the roughing and finishing strands	Minor clamps are removed by sharpening with a circle or punching out with a chisel	Blacksmith, technologist, constructor
28	Burr	Uncut flash residue	Unsatisfactory installation and adjustment of stamps	Removed by sharpening with an emery wheel	Blacksmith, adjuster
29	Curvature	Deviation of the axes and planes of the forging from their correct geometric position	1 Occurs when cropping burrs for forgings with a complex trimming contour, with thin sections and long lengths 2 Use of faulty trimming punches or dies of improper design, as well as when extracting forgings from dies and their heat treatment	Curvature is eliminated by cold stamping or hand-fitting with a template	Blacksmith, technologist, constructor
30	Looseness in size	Lack of allowance for cutting or reduction of the working section of the part in non-machined places	1 Stamping of forgings with a thick layer of scale or in worn out dies 2 Excessive mass of falling parts of the hammer 3 Incorrect adjustment of cutting dies (one-side cut)	Not corrected.	Blacksmith, technologist, adjuster

31	Length deviation	-	The consequence of different temperature shrinkage in the volume of forgings during stamping or instability of the length of the workpieces, improper design and installation of stops for dies during upsetting and bending	Not corrected	Constructor, adjuster

The number of detected defects in the forging for 2020 is shown in Table 5, and in Figure 22, the constructed Pareto chart for the identified defects for 2020, the expected number of defects in 2021 is given in Table 6, and the constructed Pareto chart in Figure 23.

Table 15 - Characteristics of forging defects (2020) (pieces)

The name of the defects revealed in the forging	The number of defects found in the forging	Accumulated share of detected defects in forging	The total number of detected defects in the forging (cumulative percentage)
Underheating	15200	15%	15%
Burned out	13600	14%	29%
Looseness in size	12800	13%	42%
Length deviation	10500	10%	52%
Concave ends	9700	10%	62%
External cracks or holes	8300	8%	70%
Internal breaks	7200	7%	77%
Insufficient uk	6400	6%	83%
Dents	5600	6%	89%
The geometric dimensions of the forging are not maintained	4800	5%	94%
Skew	3850	4%	98%
Other	2050	2%	100%
Total	100,000		

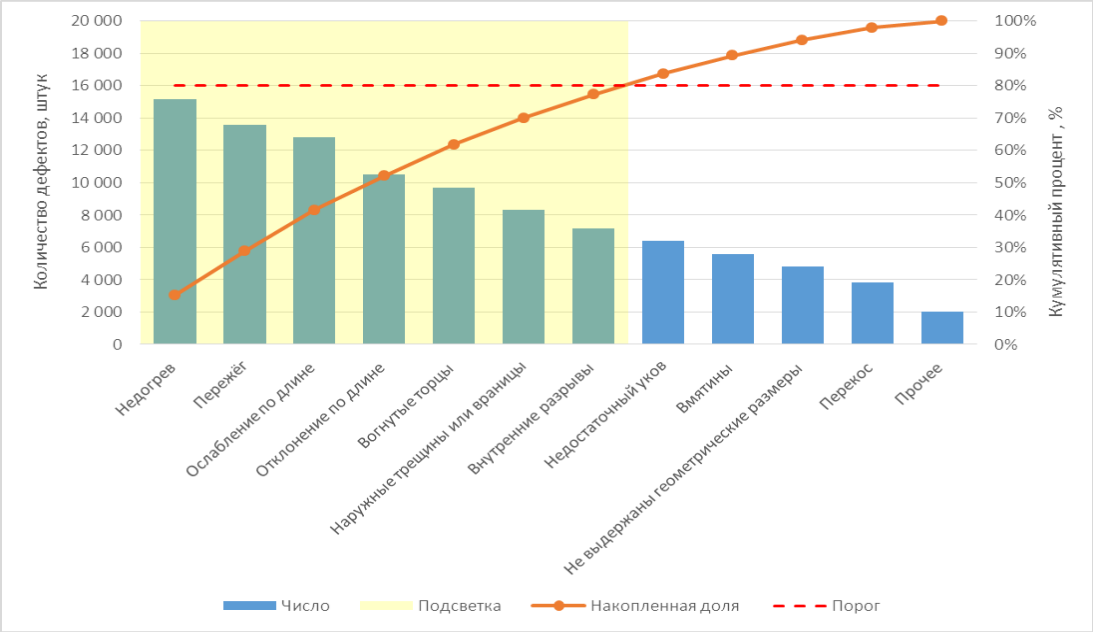

Figure 22 - Diagram for defects in products manufactured by NLMK for 2020

Table 6 - Characteristics of forging defects (2021) (pieces) (expected)

The name of the defects revealed in the forging	The number of defects found in the forging	Accumulated share of detected defects in forging	The total number of detected defects in the forging (cumulative percentage)
Scale	1510	19%	19%
Overheat	1,430	17%	36%
Clamps	1,300	13%	49%
Curvature	1 180	11%	60%
Indicators of mechanical properties of the forging are not maintained	1 170	9%	69%
Dents	1 110	7%	76%
Slaughtered	1,050	6%	82%
Scrap Boy	1,000	5%	87%
Unfilled shapes	930	3%	90%
Under stamping	900	2%	92%
Curvature	880	2%	94%
Other	410	6%	100%
Total	12 870	100%	

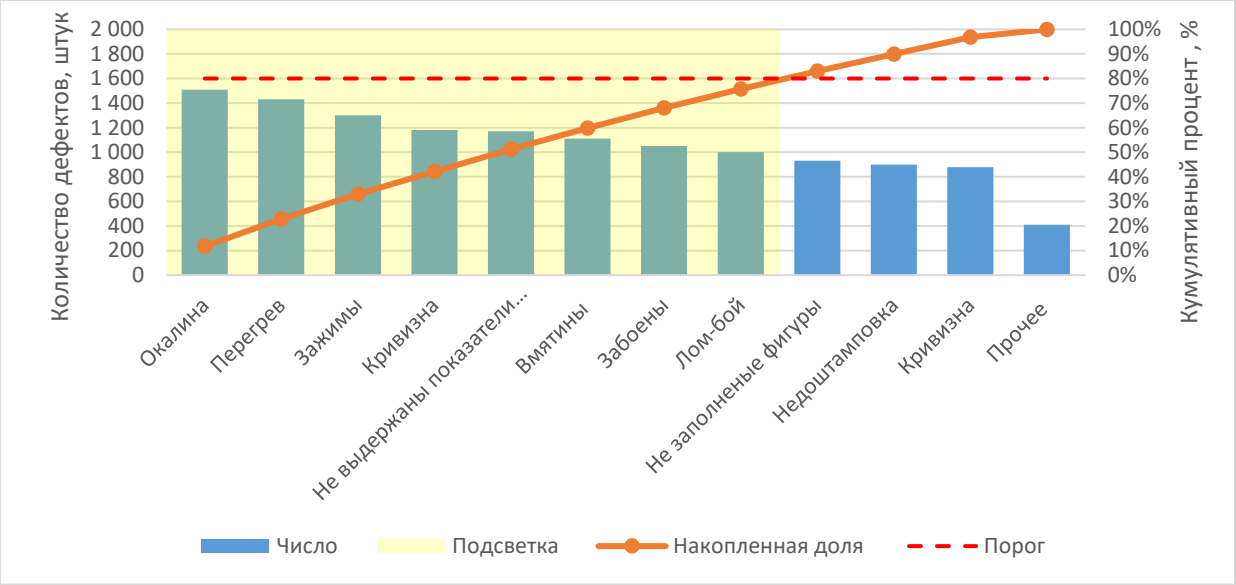

Figure 23 - Diagram for defects in products manufactured by NLMK for 2021 (expected)

Production efficiency is the ratio between the results obtained in the production of products, on the one hand, and the cost of labor and means of production, on the other. It is the most important quality indicator of the economy, its technical equipment and labor qualifications. Comparison of costs and benefits is used in the practice of managing firms, enterprises and other economic entities.

The main indicators of production efficiency are: labor productivity; capital intensity of a unit of GDP or specific types of products; return on assets of a unit of fixed assets; material consumption per unit of GDP or specific types of products; the ratio of extensive and intensive factors in GDP growth; competitiveness of manufactured products; payback period, etc.

Efficiency is understood as the correspondence between the social effect of the application of the results of standardization work in production and the costs associated with their application.

Product quality assurance comes with a cost. The quality of the product should guarantee the consumer satisfaction of his needs, its reliability and cost savings. These properties are formed in the course of the entire reproductive activity of the enterprise, at all its stages and in all links. Together with them, the value of the product is formed, which characterizes these properties from planning product development to its implementation and after-sales service.

Reclamation is a claim made by the buyer to the seller in connection with the discrepancy between the quality or quantity of the supplied goods with the terms of the contract. Complaints can only be made on such issues that were not the subject of acceptance of the goods, made in accordance with the terms of the contract.

The policy of the enterprise should initially aim at high quality products. However, marriage, which is its opposite, can occur in any enterprise. It must be taken into account. Defects can be found in the manufacturing enterprise itself and outside of it. A defect that manifests itself in the field of sale or in the process of using products indicates both the poor quality of the product and the quality of the enterprise. Complaints are compared in terms of cost and quantity with the previous period. They are calculated for 100, 1000, 10000 products, depending on the volume of production. The appearance of complaints causes the manufacturer not only material, but also moral damage, affecting his reputation.

The purpose of developing an enterprise organization standard is:

- reduction of marriage;
- improving the quality of production.
- increasing the volume of sales.

The volume of sales of products manufactured by the NLMK Repair Facility O1p is 14 million rubles.

Losses from complaints amount to 2.4% of the sales volume.

The costs for the development and implementation of the standard, according to the enterprise, amounted to 537,650 rubles. (Ztek).As a result of the introduction of the organizational standard, the quality of NLMK's products will increase, which will reduce losses from claims and fines up to 1.2%.

The savings from reducing the marriage Eb, rubles, is determined by the following formula:

$$Э_б = \frac{a_1 - a_2}{100} \cdot O_p, \qquad (1)$$

where a1 and a2 are the percentage of rejects before and after the implementation of measures,%.

$$0\ Эб = \frac{2{,}4 - 1{,}2}{100} \cdot 14000000 = 1680000 \text{ rubles.}$$

The results obtained confirm the effectiveness and feasibility of development and implementation STO SMK XX. XXX-2016 "Management of nonconforming products in the NLMK Repair Facility "using the Pareto chart.

Their experience in applying statistical methods of quality control using the Pareto chart has confirmed their effectiveness for the development of measures by enterprises in order to significantly improve the quality of their products, guaranteeing their consumers safety and its relevance.

The software developed by the authors for processing the results of statistical quality control methods using the Pareto chart creates the basis for their reliability and guarantees enterprises to ensure competitiveness and import substitution with their products.

The quality of import-substituting products that are offered to consumers in the regions of the Southern Federal District and the North Caucasus Federal District depends not only on Russian producers, but also due to an ineffective model of market control from illegal goods that enter these markets through the uncontrolled border of illegal imports of products (for example, through the border of Kazakhstan) hazardous to the health of consumers The Ministry of Industry and Trade of the Russian Federation introduced marking of fur products and marking by means of identification and monitoring of the turnover of import-substituted products in order to exclude the ingress of counterfeit products and significantly reduce the share of counterfeit products while improving the quality of domestic imports of substituted goods, including through the use of statistical methods quality control using the Pareto chart.The quality improvement results achieved are summarized below.

The reason for the development of the QMS is the awareness of the new realities of the market. Now the presence of a certified QMS is practically becoming a necessity: this is a mandatory requirement of some customers when concluding contracts, this is a mandatory requirement for participation in most tenders. Voluntary certification of the QMS is gradually becoming a necessity for manufacturers, in fact, becoming mandatory. That is why QMS is one of the stages in the development of every modern enterprise. When developing a QMS, it is necessary to coordinate management activities in relation to quality, thereby strengthening the relationship of all structural divisions.

Economic effect Eph, rubles, according to the following formula:

$$Ef = Eb - Ztek, \qquad (2)$$

where *Esoch* –Saving from a decrease in rejects, rubles;

Ztek - current costs, rub.

Ef = 1680000 - 537650= 369650 rubles.

However, the task of creating an efficiently functioning quality management system should be solved, first of all, at the level of a particular enterprise, taking into account its characteristics determined by the field of activity, the current financial condition, the existing level of implementation of consistency in work on quality assurance, etc.

Currently, the number of enterprises implementing a quality management system based on the ISO 9000 series has increased dramatically, which is facilitated by a number of circumstances, the main of which are:

organization of work on the implementation of quality systems is an important element of several federal programs;⁎

when creating joint ventures, foreign firms and companies often set a prerequisite: preparation and operation of a quality system in accordance with the ISO 9000 series standards;⁎

⁎ enterprises of various industries seeking to export products are faced with the problem of introducing ISO standards and certification of quality systems for compliance with these standards during contract negotiations, and also in a number of countries it becomes difficult to sell products without confirming the stability of quality during their release;

creation of more favorable conditions for insurance, obtaining a loan, investment, participation in tenders, competitions and other events that may end with a contract; ⁎

the executive discipline at the enterprise is increased, the motivation of employees is improved, the losses caused by defects and inconsistencies are reduced;⁎

the enterprise becomes more "transparent" for management, in this regard, the quality of management decisions increases;⁎

A number of problems that the company faces on the way to create a quality management system, namely:

⁎the specialists of our enterprises have no real experience of work in the conditions of market relations. During the certification of quality systems, the lack of such experience is observed in many forms, namely: in the inability to establish effective feedback with consumers; lack of skills in the assessment and selection of suppliers; in an unclear distribution of responsibility between managers of different levels; in duplication of some processes, etc .;

⁎Taking managerial decisions on the implementation of quality assurance activities, the heads of enterprises pursue the goal of not creating an efficiently functioning quality system, which will actually guarantee the quality of products in accordance with the needs and expectations of consumers, namely, obtaining a certificate, certificate. The external market for domestic enterprises that do not have a quality system based on the ISO 9000 series is practically closed. Therefore, the administration of enterprises is primarily interested in the timing of obtaining an international certificate of quality. And issues related to the volume of labor, material, technical and financial resources required for the implementation and certification of the quality system and, most importantly, to ensure its cost-effective operation, fade into the background;

⁎the appointment of specialists for the development and implementation of quality management systems according to the international quality management system by the management of an enterprise is often carried out without proper selection of candidates and understanding of the criteria that these candidates must satisfy.

Conclusion

The quality is "written by nature" to be at all times in the epicenter of scientific and amateurish reflections. The problem of ensuring the quality of activities is not just universal, relevant, it is strategic.

The domestic industry is going through hard times, and the consumer is offered products of dubious quality that have entered our markets by counterfeit and other illegal ways, that is, they have no guarantees for buyers to exercise their rights to protect themselves from unscrupulous manufacturers and suppliers.

To reanimate the role and importance of a quality-oriented strategy, since only in this case business leaders will subjectively and objectively have to improve their production using nanotechnology, innovative processes and digital production, so that competitive and import-substituting materials and products fully meet the needs of domestic consumers. At the same time, our statement is substantiated that the consumption of domestic materials and products is regulated by the market. In this case, market requirements should shape the role of the state and consumers in production in the formation of sustainable demand for domestic materials and products, namely:

maintain a range of goods, regulating it by federal, regional and municipal orders;

stimulate price stability;

increase consumer ability and gradually improve their quality. The implementation of these tasks will create the basis for the consumer to realize the need to pay for the advantages of high-quality materials and products, and the manufacturer to realize that improving the quality of materials and products cannot be associated only with rising prices, but also due to technical innovations in digital production, aimed on the use of new technological and engineering solutions.

Today, and even more so tomorrow, it is important to implement one of the defining principles of production efficiency - the manufacturer produces exactly what is needed not only for domestic, but also for foreign consumers.

It is no less important to understand the role and significance of quality activities, that is, how much the leaders got into the essence of things, learned how to manage things, change their properties (assortment), form, forcing them to serve a person without significant damage to nature, for the good and in the name of man.

Both political leaders and the government have recently started talking about the need for a competent industrial policy. However, if we carefully consider the normative, methodological documents on the restructuring of industry, then the thought arises whether we are not stepping on the same rake here that we have been stepping on during all the years of reforms.

What is the essence of economic reforms and the importance of industrial policy in them, which are theoretically substantiated and practically tested by a number of developed countries?

These are the fight against inflation, the strengthening of the national monetary unit and financial stabilization. This is a change in the forms of ownership in various spheres of the economy through the process of privatization. This is a restructuring of the economy under the conditions of market relations.

Moreover, all these fundamental processes of economic reform must be based on structural adjustment. Both financial stabilization and privatization should be subordinate to the process of structural adjustment, since it is structural adjustment that determines the final result of reforms and the effectiveness of adaptation of various forms of production to civilized market relations.

The end result should also be the basis for the restructuring of the economy. And these are products, services - their competitiveness in the domestic and world markets.

What happened in the Russian reforms? All three basic processes (financial stabilization, privatization and restructuring) went on their own, without interconnection. Therefore, the methods used by the government and the Central Bank to combat inflation and other economic indicators often ran counter to the tasks of structural adjustment.

As for the process of restructuring, the government's position is expressed by the following statement: "the market will put everything in its place by itself." With such a position towards structural restructuring, it is not surprising that at that time there

was no place for the words quality, competitiveness, import substitution in the national economic policy.

This is, unfortunately, the reality of the reforms carried out today. In this connection, I would like to refer to the well-known world experience.

A world-renowned quality specialist E. Deming, who at one time was a scientific advisor to the Japanese government and led Japan out of the economic crisis, in his book "Out of the Crisis" says: "... the management of paper money, and not a long-term digital strategy production - the way into the abyss. "

Regarding whether the state needs to pursue industrial policy, one can cite the statement of the outstanding economist of the past, Adam Smith, who 200 years ago laid the foundations for the scientific analysis of the market economy. About the role of the state, he said: "... only it can, in the interests of the nation, limit the greed of monopolists, adventurism, bankers and the egoism of merchants." It's like today about us and about our situation in the economy.

What are the results of economic activity today, what are the achievements in this area? Growth of gold and foreign exchange reserves, decrease in inflation, budget surplus and other financial and economic achievements. Is this the end result of public administration? And not the quantity and quality of goods and services sold in the domestic and foreign markets, and not the population's ability to pay to purchase these goods and services? And, ultimately, not the quality of life of the country's population ???

Therefore, it is quite natural that today the task is posed for all levels of the executive and legislative authorities - to improve the quality of life of Russian citizens.

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Danil Sergeevich Shcherbakov
Institute of Service and Entrepreneurship (branch) DSTU
Bachelor

Vladimir Timofeevich Prokhorov
Institute of Service and Entrepreneurship (branch) DSTU
Doctor of Technical Sciences, Professor
Shakhty, Russia

Galina Yurievna Volkova
LLC TsPOSN «Ortomoda»
Doctor of Economics, Professor
Moscow, Russia

ON THE IMPORTANCE OF OPTIMIZING THE NORMATIVE AND TECHNICAL DOCUMENTATION OF THE QUALITY MANAGEMENT SYSTEM TO ENSURE THE PRODUCTION OF DEMANDED AND COMPETITIVE PRODUCTS

Abstract: *in the article the authors justifiably paid attention to solving the problem of combining state and market mechanisms for managing competitivenessbecause it becomes a strategic resource for the economy of these regions. Today, and even more so tomorrow, in the world economy, the place of price competitiveness will be taken by the competitiveness of quality levels, which will widely increase its significance in connection with Russia's accession to the WTO and the need to use ISO 9000 series, in this regard, an increase in the quality factor of the results of the activities of the domestic light industry in The strategy of competitive struggle in world markets is for those enterprises that, due to external factors (increased competition due to globalization, the global financial crisis) and internal (ineffective management), have lost their competitive positions in the domestic and foreign markets.*

Key words: *quality, import substitution, demand, competitiveness, market, profit, demand, buyer, manufacturer, financial stability, sustainable TPP, attractiveness, assortment, assortment policy, demand, sales. paradigm, economic policy, economic analysis, team, success.*

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Introduction

UDC 685.39: 519.37

To analyze the quality of services of LLC Plant "Techmash", a certain information base is required. The sources of information are the data obtained by the marketing department in the course of research of the external environment of the enterprise.

Marketing research of the sales markets for the software product, the services provided in the field of programming and maintenance, made it possible to identify their features, namely, the sales market for the software product developed by the authors. The buyers of the software product are exclusively economic enterprises of the Rostov region and nearby settlements that need technical support. As a result,

both the technical support itself and its maintenance can be considered an urgent need for the specified buyer.

The product market is characteristic:

a high level of elasticity of demand - potential buyers, not understanding the specifics of certain configurations, are guided by price.⁎

growing competition, in the surrounding areas there are already enterprises with similar activities.⁎

⁎ market instability, which consists in the lack of a sufficient volume of technical support.

Achievement of high quality services of Tekhmash Plant LLC and its competitors is a rather elusive goal. However, with targeted approaches, such a goal is achievable.

When building a quality management system, the management of Tekhmash Plant LLC relied on the principles formulated in the ISO 9000 standard:

⁎customer orientation. The organization depends on its customers, therefore, must understand their current and future needs, fulfill their requirements and strive to exceed their expectations;

leadership leadership. Leaders ensure the unity of purpose and direction of the enterprise. They should create and maintain an internal environment in which workers can be fully involved in solving the problems of the enterprise;⁎

involvement of employees. Employees of all levels form the backbone of the enterprise, and their full involvement in the work of the company enables him to take advantage of his abilities;⁎

⁎process approach. The desired result is achieved more efficiently when activities and associated resources are managed as a process;

⁎systematic approach to management. Identification, understanding and management of interrelated processes as a system contribute to the effectiveness and efficiency of the enterprise in achieving its goals;

⁎ continuous improvement. Continuous improvement of the enterprise as a whole should be seen as its permanent goal;

⁎decision making based on facts. Effective decisions are based on the analysis of data and information;

⁎mutually beneficial supplier relationships. An enterprise and its suppliers are interdependent and mutually beneficial relationships enhance the ability of both parties to create value.

Research on the quality of manufactured products at OOO Plant "Techmash" in Shakhty provoked a desire to form goals and objectives within the framework of the QMS for them in order to significantly improve the quality of products. The plant produces continuous transport machines (conveyor and conveyor equipment), agricultural soil processing equipment, equipment for transportation, storage and processing of grain products (elevators, HPP, sugar factories), shaped pipes. (Table 1).

Table 1 - Characteristics of the assortment of machines manufactured by LLC Plant "Techmash", and a list of defects for 2020, including those manufactured with defects and returned by consumers at the end of 2020.

Types of products	Planned number of products	Actual number of products released	Number of defective products	Product defect	Product price
Harrow rotary hoe BMR-6 n	37	35	9	Bearing inappropriate to nomenclature	480,000
Harrow rotary hoe BMR - 9 ns	25	25	5	Jammed rotation discs	690,000
Harrow rotary hoe BMR-20	22	20	2	The use of a non-original cheaper copy of the bearing assembly	1,080,000
Extended disc harrow BDU 4x2	11	10	2	Violation of the part hardening technology	785,000
Extended disc harrow BDU 5x2	7	7	1	Crack disc	1,433,000
Extended disc harrow BDU 6x2	4	4	1	Violation of the part hardening technology	1,642,000
Seeder Vega 6	10	10	3	The frame is not correctly designed. Wheel axle deformation	1,550,000
Total	126	118	29/8		

Organization and implementation of technical quality control is one of the constituent elements of the quality management system at the stages of production and sale of these products. The process of interaction of production factors at an enterprise, aimed at converting raw materials (materials) into finished products suitable for consumption or for further processing, forms a production process or production.

The quality of the manufactured products at the enterprise LLC "Plant" Techmash "is determined by the quality of the initial products, the degree of equipment tuning, compliance with the technological regimes. In order to timely identify defects and the causes that caused it, it is necessary to carry out systematic control of product parameters, to receive and process data on controlled parameters. Using the methods of analyzing the causes of defects and defects in manufactured products and developing measures to prevent them, it is possible to find a solution to the occurrence of problems in the production process, for example, the cause of the appearance of defects.

The largest number of defects detected by NDT methods at LLC "Plant" Techmash "occurs at the stage of manufacturing products.

Consider metallurgical defects that are formed during the smelting of ingots or casting parts. The most common metallurgical defects are: shrinkage and gas cavities, cracks and inclusions, shrinkage cavities - represent a cavity formed as a result of a decrease in the volume of liquid metal during its solidification. The reason for the formation of such a defect is - a decrease in the volume of the metal during solidification of gas cavities - rounded cavities with a diameter of 1 ... 3 mm and more with a smooth shiny surface. The main reasons for the occurrence may be: low gas permeability of the mold and rods; poor processing of refrigerators, etc., cracks - are discontinuities in the form of metal breaks. The formation of cracks in a continuous ingot is associated with stresses arising during its formation,

Inclusions are of two kinds and origin: the inclusion of non-metallic particles trapped in the metal from the outside (slag, refractory, sand, graphite) and metallic inclusions (ferroalloys, sunken pieces of bars or marking bows, etc.)

Missing defects in the products of Zavod Tekhmash LLC may arise due to a number of reasons related to process control. The main factor affecting the omission of defects is the qualification, certification and training of personnel, as well as the conscientious performance of the NDT operator's work. The most common type of defects is cracks in die-forged parts. A crack is a clear (transparent) discontinuity-discontinuity passing along, or through the grain boundaries. Typically, cracks are caused by local overstressing of the metal during stamping or other shaping operations, or as a result of heat treatment. It is customary to subdivide cracks of such a group into longitudinal, shearing, internal and transverse cracks.

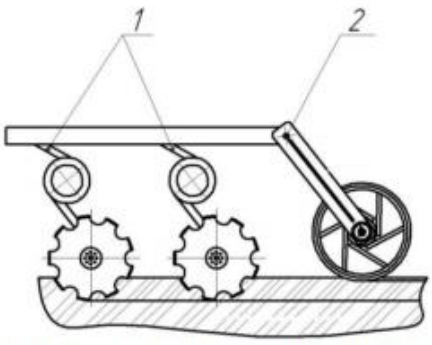
Let us consider, using the example of the products manufactured by OOO Zavod Tekhmash, one of the products most susceptible to rejection, a hoe rotary harrow BMR: The unit is designed for continuous and inter-row processing of any crops, cereals, soybeans, row crops, tobacco, vegetables, etc. Moreover, this tool is especially effective in regions where there is a lack of moisture for moisture conservation. It is used for combating weeds, incorporating crop residues into the soil.

BMR (Figure 1) allows you to perform a number of different quick jobs that are an integral part of professional soil cultivation. After completing the work, the unit prepares the soil before sowing, the sowing field, the same unit loosens the soil, thus preventing late germination of grain. Loosening also contributes to the even distribution of oxygen and moisture in the soil, thus, contributing to the strengthening and growth of the plant and further making it more resistant to drought. The machine effectively and evenly loosens the soil without damaging the plants. The implement is well suited for both continuous and inter-row cultivation, it has a high frame passage, which allows you to work the soil, even with an already grown plant.

Picture 1 - Hoe rotary harrow

The unit is designed according to the spring-loaded swing arm scheme. The flexibility of the lever is provided by a spring, which applies pressure to the soil by means of two gears, which are located on one lever and, when rotated, create an explosion effect that loosens the earth without damaging the plant. The row spacing is adjustable from 10 cm. The unit is produced serially, 6 m with a solid frame, 6 m with hydraulic folding in the mounted version and 12 m in the trailed version.

The most common defect in this harrow is disc wedging (Figure 2).



1 – дисковые рабочие органы на индивидуальных спиральных стойках; 2 – каток

Figure 2 - Schematic representation of an ICBM in profile

Jamming of the rotating disc occurs due to the failure of the bearing assembly. This is due to the fact that for the manufacture of a disk working body, low-quality bearings or bearings that do not correspond to the design of the product are used. As a result of the choice of a bearing that does not correspond to the calculated strength characteristics of the working body, its rapid wear and spalling occurs, due to loads exceeding the permissible for this bearing assembly. A way out of this situation can be the purchase of the highest quality bearings, as well as the correct selection according to the nomenclature of this unit.

The second most common defect is deformation and fractures of disks and bearing parts of metal structures. This is due to poor-quality metal processing in the process of manufacturing the part.

An invariable defect of the surface of metal and metal products, accompanying heat treatment, is the formation of a decarburized layer due to the burnout of a part of the carbon when the metal is heated for subsequent quenching. Decarburization of the metal surface can take place both at the stages of rolling, preparation of metal for upsetting, and during heat treatment to the appropriate strength class of finished parts. Decarburization and scale formation significantly reduces the mechanical properties in the surface layers of the metal, the surface becomes susceptible to the formation of scratches, scoring, scratches during rolling, calibration, upsetting, and thread breakage is possible during mechanical tests. The use of protective atmospheres during heating significantly reduces the likelihood of the formation of a decarburized layer.

During heat treatment of rod parts, especially with a rod length of more than ten diameters, product warpage and distortion of the geometric dimensions of the thread are possible. It is possible to exclude such a defect only by using isothermal quenching in more viscous quenching media.

Quenching cracks in a deformed metal can appear during quenching as a result of the occurrence of high stresses of structural transformation and temperature stresses. Quench cracks usually have an irregular wandering path on the surface of the fastener. The main reasons for the appearance of temperature stresses are: rapid heating for quenching, rapid cooling in the region of martensitic transformation, a complex configuration of a product with abrupt transitions, and a significant time gap between quenching and tempering operations.

Defect control at OOO Tekhmash Plant. During inspection control, the quality of work of the production and control apparatus is monitored. It is carried out by a special commission and employees authorized by the head of the Quality Control Department or higher officials. Items handed over by production personnel and accepted by the relevant employees of the Quality Control Department are subject to control. If a defect is found in individual parts, blanks or other products of labor, the entire batch is subject to re-inspection. The purpose of this control is to discipline both production and control personnel and increase their responsibility for product quality. Inspection control is also used in selective observation of the operation of machines at the consumer's site in order to identify defects in production, design, technology and violations of the rules of technical operation.

Visual inspection is an external examination of an item or product labor, as a result of which deviations from the requirements recorded in technical documents are revealed (external cracks,

shells, increased roughness, excessive protrusions, concavities, dents, defects in color, installation, shape distortion, etc.).

During geometric control, the compliance of the dimensions of blanks, parts, installation bases and other elements with the dimensions established in technical documents (drawings, standards, technical conditions), as well as in accordance with standards is checked. This type of control prevails in mechanical engineering.

In laboratory analysis, the internal properties and parameters of objects and products of labor are revealed, which cannot be detected visually or without their destruction. The most important point - making a decision on the non-compliance of the product with the requirements and the termination of its operation or functioning - should be specially noted and scientifically substantiated in technology. The foundation of this decision is pre-assembled statistical material.

Diagnostic technologies must be tested in advance, they cannot contain unreasonable requirements in the form of "no types of defects are allowed", must work only proactively, reliably recognize a pre-emergency situation, and in no way allow emergency operation of products. The main thing is not the calculation of the size of defects (defectometry), but the determination of the residual life of the test object, the degree of risk of its operation.

The number of detected defects in the forging for 2020 is shown in Table 2, and in Figure 3 the constructed Pareto chart for the identified defects for 2020, the expected number of defects in 2021 is given in Table 3, and the constructed Pareto chart in Figure 4

Table 2 - Characteristics of defects identified in the machines of LLC Plant "Techmash" (2020) (pieces)

The name of the defects revealed in the sold machines	The number of detected defects in the sold machines	Accumulated share of detected defects	Total number of detected defects (cumulative percentage)
Bearing failure	17/8	38%	38%
Jammed rotation discs	9/5	20%	58%
Violation of the part hardening technology	5/3	11%	69%
Frame deformation	4/4	9%	78%
Crack Disc	3/3	6%	84%
Other	7/8	16%	100%
Total	45/11	100 %	

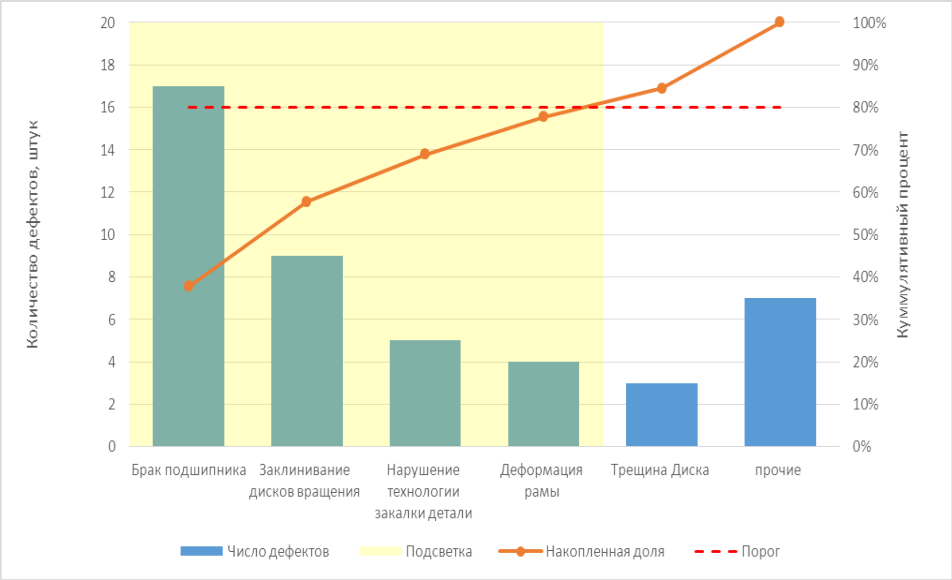


Figure 4-Diagram of defects in products manufactured by LLC "Plant" Techmash "for 2020

Table 4 - Characteristics of defects detected in machines (2021) (pieces) (expected)

The name of the defects revealed in the sold machines	The number of detected defects in the sold machines	Accumulated share of detected defects	Total number of detected defects (cumulative percentage)
Jammed rotation discs	4/4	38%	38%
Violation of the part hardening technology	3/3	20%	58%
Frame deformation	2/3	11%	69%
Wheel axle deformation	2/2	6%	84%
Crack Disc	1/1		
Other	1/1	16%	100%
Total	13/14	100 %	

Their experience in applying statistical methods of quality control using the Pareto chart has confirmed their effectiveness for the development of measures by enterprises in order to significantly improve the quality of their products, guaranteeing their consumers safety and its relevance.

The software developed by the authors for processing the results of statistical methods of quality control using the Pareto diagram creates the basis for their reliability and guarantees enterprises to ensure their import substitution competitiveness with their products.

The protection of domestic consumers of import-substituting products from falsified and counterfeit, which was introduced by the Ministry of Industry and Trade of the Russian Federation with mandatory marking with identification means and monitoring the turnover of imported products, made it possible to reduce its market share by 10% and return almost 400 billion rubles to the budget of the Russian Federation. But the struggle for the quality of domestic import-substituting products has not become less acute, forcing manufacturers to strictly comply with the requirements of GOSTs and technical regulations. Their experience of using statistical methods of quality control using the Pareto chart for the implementation of these very tasks is presented below based on the results of the studies performed.LLC Plant "Techmash" was founded in 2004. in the town of Shakhty, Rostov region. Today it is an actively developing enterprise in the engineering industry. It is engaged in the production of continuous transport machines (conveyor and conveyor equipment), agricultural tillage equipment, equipment for transportation, storage and processing of grain products (elevators, sugar factories), shaped pipes. Our equipment is designed for agriculture and various industries: food, processing, metallurgy, mining, etc.

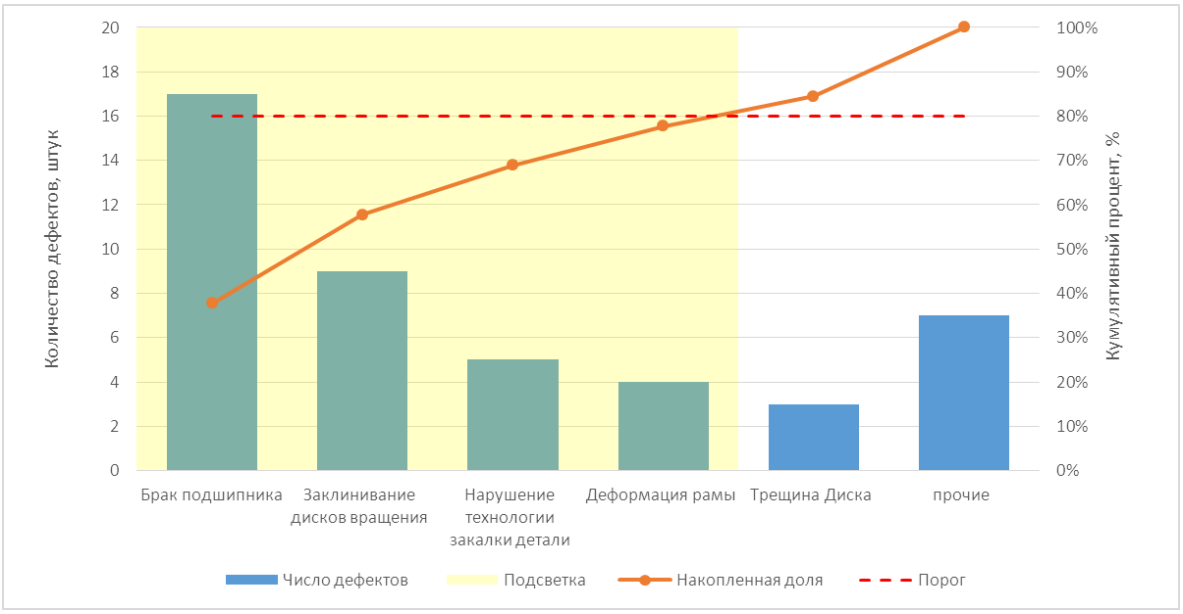


Figure 5 -Diagram for defects in products manufactured by Tekhmash Plant LLC (for 2021) (expected)

The main principle of the Tekhmash Plant LLC is the production of high quality machinery and equipment that meets modern requirements; an individual approach to solving non-standard tasks of the customer.

Since 2005, OOO Plant Tekhmash has been one of the major suppliers of components for the assembly of combines of OAO KZ Rostselmash with a delivery volume of 20-30 thousand parts per month. In 2020. the activity of the enterprise was expanded: a line for the production (rolling) of straight-seam steel shaped pipes was launched.

Currently, the production facilities of the enterprise are:

- more than 60 pieces of equipment (including those with numerical and digital control);

- more than 6000 sq. m. production area;

Employees of Tekhmash Plant LLC are professionals in their field: high-class engineers and designers, technical specialists.

The plant is working on the creation of new models of tillage machines, modernization of the manufactured equipment, in close cooperation with the leading agricultural enterprises in the south of Russia.

The buildings in which the enterprise is located meet the technical and technological requirements. Technological requirements contribute to the creation of such production conditions that allow the placement of technological equipment, ensure the promotion of materials and equipment during its installation and dismantling. Technological requirements cover the issues of strength, durability and fire safety of buildings.

The workshops of the enterprise are located in a two-storey building. There is a mechanical workshop, a workshop for welding structures, as well as a warehouse for finished products and a warehouse for raw materials and auxiliary materials.

The organizational structure of management is shown in Figure 6.

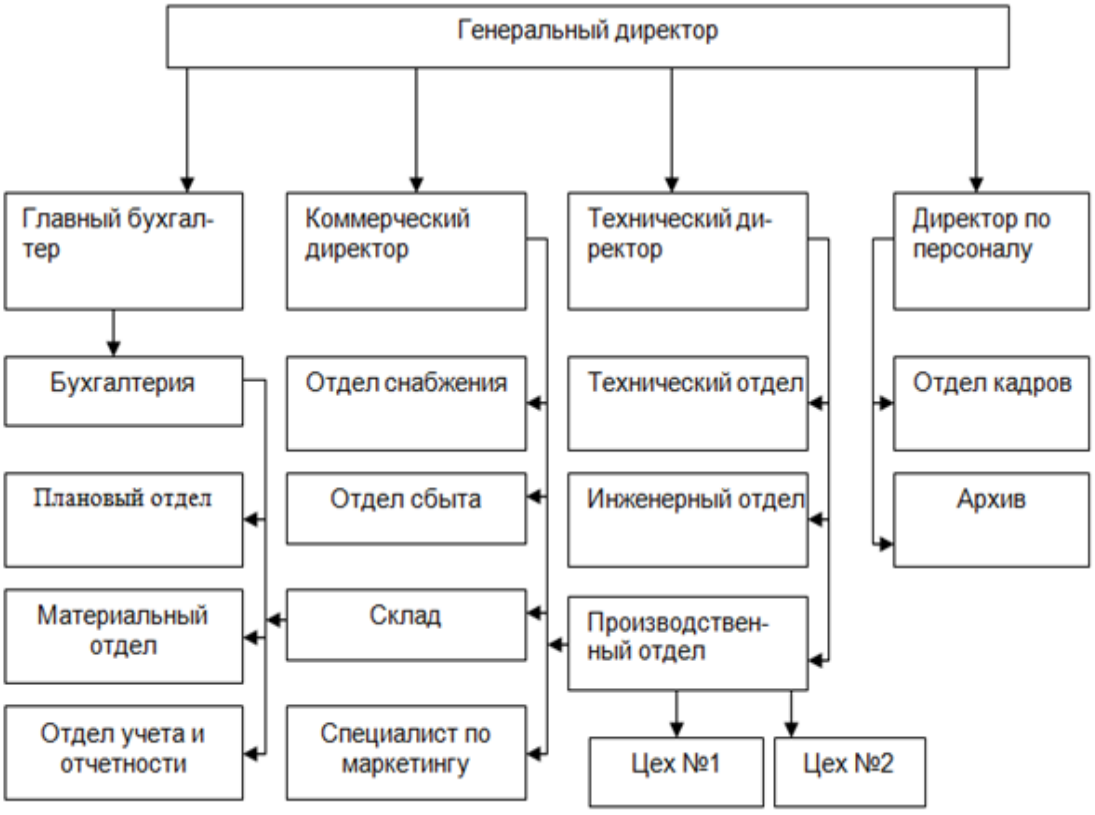


Figure 6 - Organizational structure of management of LLC Plant "Techmash"

The general director is the main responsible person of the enterprise and is responsible for making the overwhelming majority of decisions on the functioning of the company.

The chief accountant is an official of the enterprise who ensures the organization of accounting, control and recording on the accounting accounts of all business operations carried out by the enterprise, institution, provision of operational information, preparation of financial statements in due time, implementation, together with other divisions and services, of economic analysis of the financial and economic activities of the enterprise its development.

Procurement manager - an employee who supplies the company with products. He belongs to leadership positions.

Technological Department - This is the unit responsible for the technological resources of the company.

Personnel department - a set of specialized divisions in the structure of the enterprise (with officials employed in them - managers, specialists, technical personnel), designed to manage the personnel of the enterprise.

Marketer Is a specialist who studies market supply and demand for certain goods and services.

Operators of CNC machines - control of the processing of parts, control of the operation of the machine, correction of control programs.

Tokar - machine operator, specialist in turning business - cutting rotating workpieces orrotating cutting tool, for the processing of wood, metal, plastic, etc.

Milling machine- a worker, a specialist in work on a milling machine, a specialist in the processing of various materials: metal, wood, plastic. This profession is one of the leading blue-collar occupations in mechanical engineering and metalworking.

The plant produces continuous transport machines (conveyor and conveyor equipment), agricultural tillage equipment, equipment for the transportation, storage and processing of grain products (elevators, HPP, sugar factories), shaped pipes.Figure 7 shows the range of products manufactured.

Figure 7 - Double-row disc harrow

Figure 8- Four-row disc harrow

Figure 9- Garden disc harrow BDS

Figure 10 - KPO cultivators

RFigure 11 -Universal stubble cultivator

Figure 12 - Binary-share plow

Figure 13 - Inter-row cultivator

Figure 14 - Hoe rotary harrow BMR

Figure 15 - Disc shredder DM

Characteristics of the model shown in Figure 15

Disc harrows PM are intended for traditional and minimal main and pre-sowing soil cultivation for grain, industrial and fodder crops, refreshing soddy meadows and stubble cultivation.

In one pass, the Harrow crushes and embeds plant residues of the predecessor and weeds into the soil, creates a loosened and leveled soil layer, and embeds the applied fertilizers.

Each disc has the ability to adjust the angle of attack and the working width of the disc. At the same time, the disk plays the role of a plowshare and a blade, which contributes to a better turnover of the cut layer, its crumbling, as well as a decrease in the required tractive effort of the tractor. The absence of disc batteries with a single axis in the design allows the PM to work in wet weather on lands with a large amount of plant residues, as well as on lands with any amount of weeds, while winding on the disc axis and dense clogging of the rows of discs is excluded. There is no need to use scrapers in the design, since the disc self-cleaning occurs during operation.

PM is of particular value in areas of a small area and difficult terrain, where high maneuverability of the machine is required.

The version for orchards and vineyards allows in one type to combine three implements that differ in the width of the processed strip in increments of 275 mm.

Table 5 shows the technical characteristics of the disc harrow

Table 5- Technical characteristics of the disc harrow

Names	Units	The values
Type of		Trailed
Productivity per 8 hour shift	ha	30
Working speed	km / h	8-15
Transport speed	km / h	No more than 25
Soil moisture	%	Up to 35
Capture width	mm	3200
Weight	Kg	2600
Dimensions (edit)		
- width	mm	3200
-height	mm	1350
- length	mm	2550
Number of cutting units in one row	PCS.	8(7)
Cutting units total	PCS	30
Number of rows	PCS.	4
Diameter of working bodies	mm.	560
Distance between discs	mm	400
Distance between rows of discs	mm	700
The angle of attack of the discs	hail	0 to 30
Working depth	cm	Up to 15

Figure 16 shows the Cutting unit.

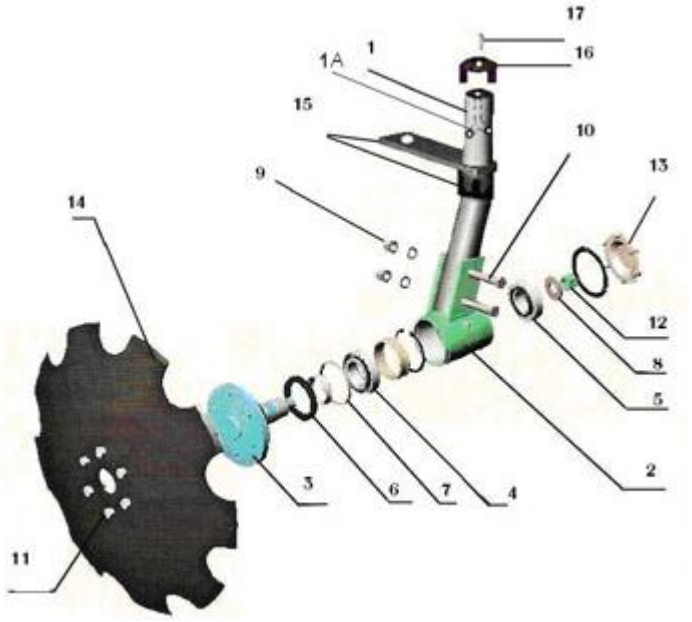


Figure 16 - Cutting unit

The cutting unit is designed for cutting, splitting and turning the layer. It is the main working body of the tool (Figure 16). Consists of a rack 1, to which the bearing unit is attached with two bolts with nuts 9.10. The bearing unit consists of a bearing housing 2 with a grease nipple, bearings 4.5, collar 6, axle 3.

The bearings are adjusted through a washer 8, a castellated nut 12, which is secured with a cotter pin. The body is protected from dirt by a cover 13. The cutting disc 14 with a diameter of 560 mm is attached to the axle by six bolts 11.

The stand is welded to a sleeve with a slewing bar 15 to reduce the load by a transverse seam. The stand in the upper part has three through holes 1A for additional lubrication, which is carried out through the threaded hole for bolt 17. All bearing assemblies are filled with Litol 24 grease.

Organization and implementation of technical quality control is one of the constituent elements of the quality management system at the stages of production and sales of products.

The process of interaction of production factors at an enterprise, aimed at converting raw materials (materials) into finished products suitable for consumption or for further processing, forms a production process or production. The main requirements for the quality of products are established by state standards. They set out the requirements for the main parameters and dimensions, the quality of surface treatment, and the design of products. The standards regulate: grades of alloys used for manufacturing. Recommended metal grades as the base coat, base metal and coating thickness; parameters of product surface roughness. The standards contain requirements for strength, set out the principles of acceptance. Defects in appearance, the degree of their admissibility in products are indicated, depending on the type of quantity, size, location of defects and on the total surface area of the product.

The standards also set out the acceptance rules and test methods. They standardize the requirements for packaging, labeling, transportation and storage of finished products.

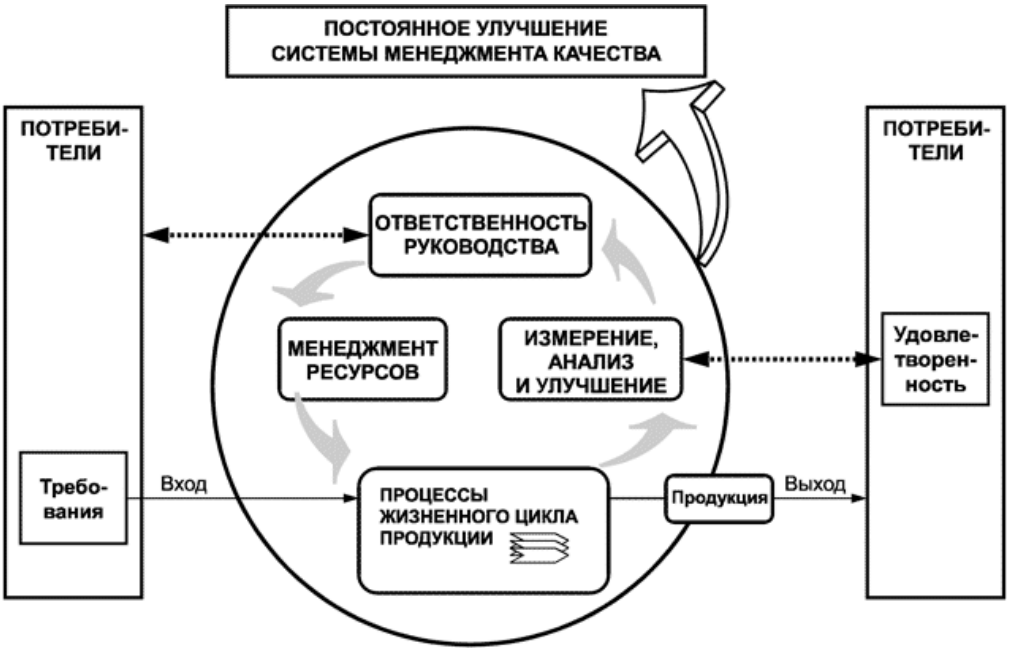


Figure 17 - Process model

As can be seen from the process model, there is a constant improvement in product quality due to the requirements of consumers and the responsibility of management. Products go through all stages of the life cycle and are constantly improving quality due to corrective actions as a result of found discrepancies, which are identified by the quality service. If the product does not satisfy customers, then it is measured, analyzed and improved to meet customer requirements.

Management system of OOO Plant "Techmash", which includes a quality management system based on the requirements of ISO 9001: 2015, an environmental management system based on the requirements of ISO 14001-2004 and an occupational health and safety management system (SMPZiB), based on the requirements of OHSAS 18001-2007 was developed and implemented in 2008. The integrated management system is presented in Figure 18.

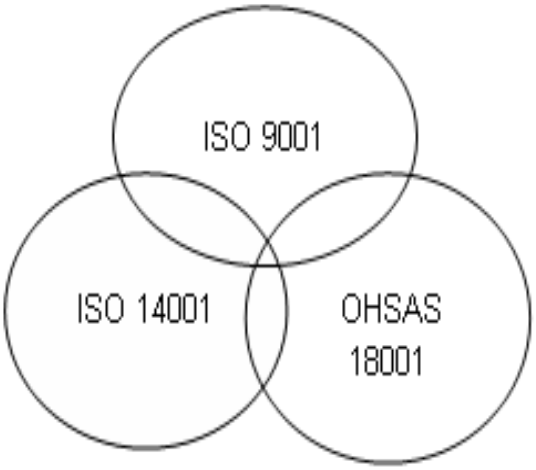


Figure 18 - Integrated management system

The similarity of the structures with the requirements that make up the QMS makes it possible to highlight certain common elements of these management systems:

common elements: a representative of the QMS management; responsibility of management; QMS policy; resource management; QMS guide;

uniform processes: analysis of the QMS by the management; decision making and action by senior management; planning, development and implementation of measures of a strategic nature in the field of meeting customer requirements; design

and development; purchases; production and service;

uniform procedures: control of documents and records; internal audit of the QMS; monitoring and measuring processes.

Certification of the QMS for compliance with the requirements of international standards makes it possible to increase the competitiveness of the organization, to assure the interested parties in the effectiveness of the organization's solution to the problems of environmental and industrial safety of the relevant industries, problems of labor protection and safety.

In order to inform employees about the established requirements and planned activities within the QMS of the plant, documentation has been developed and applied. Documentation management is carried out in accordance with STO SMK 1-04-2011 "Document Management".

The structure of the QMS documentation consists of 4 levels. Level 1 contains documents:

quality, environmental, and occupational health and safety policies, quality, environmental and occupational health and safety objectives statements;

programs;

QMS guide; Level 2 contains documents:

documented procedures, the need for which is established by ISO 9001 and the procedures required by ISO 14001 and OHSAS 18001 - STO ISM (STO SMK, STO SEM, STO SMPZiB);

external regulatory and technical documentation (GOST R, GOST, OST, TU, etc.).

Level 3 contains documents:

provisions on structural divisions;

job descriptions;

work instructions, TI (technological instruction), PTI (production and technical instruction), IOT (labor protection instruction);

TU, developed by OOO Plant "Techmash", and other internal regulatory and technical documentation developed in accordance with ESKD (Unified System for Design Documentation) and ESTD (Unified System for Technological Documentation);

organizational and administrative documents on QMS issues.

Level 4 contains the records required to demonstrate compliance with the QMS requirements, as well as records of the results achieved.

QMS Manual - this document containing a description of the scope of the QMS, a general description of the elements of the occupational health and safety management system, environmental management system, quality management system and their integration, as well as

documented procedures required by ISO 9001, ISO 14001, OHSAS 18001.

The QMS Guidelines are used internally by Tekhmash Plant LLC in order to ensure the effective functioning of quality management systems in accordance with the requirements of ISO 9001, ISO 14001, OHSAS 18001 and to present the QMS to all interested parties outside Tekhmash Plant LLC.

The QMS manual is developed by the USM, signed by a representative of the management and approved by the managing director general of Tekhmash Plant LLC.

The control copy of the QMS Manual is kept in the USM. Recorded copies are issued in accordance with the "List of holders of the" QMS Manual ", are registered and managed in accordance with STOSMK 1-04-2011

"Document Management". Access to the electronic version of the document is provided by posting the Company's QMS Manual on the website of LLC Plant "Techmash".

When replacing, adding or deleting individual requirements, a change is made to the Quality Management Manual.

When making changes, the same procedures and rules are applied that are used in the development of the QMS Manual. Changes made to the text are highlighted in italics. After each changed or new section, subsection, paragraph, subparagraph, the annexes give in brackets the information about the introduced change (changes) in bold italics, indicating its number (numbers).

The main goal is to manufacture products that meet the requirements and expectations of consumers, in safe and accident-free conditions for personnel and all interested parties with an acceptable impact on the environment.

Basic principles of OOO Plant "Techmash":

all accidents and accidents can be prevented;

no work should start if it cannot be done safely;

admission to work at HIFs only for persons of appropriate qualifications;

leadership leadership;

personal responsibility;

systematic approach to management;

partnership with all stakeholders;

risk management approach;

rational use of resources;

staff involvement and ongoing training;

continuous improvement.

The management of OOO Plant "Techmash" undertakes the following obligations:

to ensure continuous improvement and increase in the effectiveness of the integrated management system of OOO Plant "Techmash" in the field of labor protection, industrial safety, ecology, quality in accordance with the requirements of OHSAS 18001; ISO 14001, ISO 9001, legal and other requirements applicable to the company's activities;

comply with the requirements of the integrated management system of LLC

Tekhmash plant, as well as legislative and other requirements related to products, environmental aspects and risks of the Company in the field of labor protection and industrial safety;

ensure the creation of safe and accident-free working conditions aimed at preventing accidents, incidents, industrial injuries and deteriorating health of workers;

provide conditions for the safe operation of hazardous production facilities to reduce the risk of accidents at hazardous facilities;

consult with employees and their representatives on labor protection and industrial safety;

prevent negative impact on the environment.

The management of OOO Plant "Techmash" assumes responsibility for the implementation of the Policy and providing the necessary resources for the effective functioning of the integrated management system.

All personnel of the company are involved in the implementation of the policy, and each employee must understand how his actions can affect:

own safety and health;

safety and health of others;

industrial safety;

product quality;

environment.

Product monitoring and measurement includes:

incoming control of raw materials and materials;

quality control and product testing during production (operational control);

operational control;

acceptance control;

final control of finished products (for the construction site);

quality assurance control during intrashop transportation, storage and shipment.

Incoming control - checking the quality of raw materials and auxiliary materials entering production. Constant analysis of the quality of supplied raw materials and materials allows you to influence the production of supplier enterprises, seeking to improve quality.

Control measures or other activities necessary to ensure the compliance of purchased products with the requirements specified in the purchase information are defined in STO SMK 5-11.

Product quality control during the production process includes all types of product control and testing carried out during the technological process (operational control).

Compliance with production technology is a prerequisite and basis for ensuring the desired quality of manufactured products.

Control over compliance with technological discipline is multi-stage and is subdivided into:

continuous;

periodic;

extraordinary

A brief description of the types of control over the observance of technological discipline is given in Table 6

Monitoring and measurement of technological processes is carried out as a result of operational control and control over the execution of technological discipline.

Operational control of the production technology is carried out by the technological personnel of the shops and the personnel of the Quality Control Department.

Table 6 - Characteristics of control types

Control type	Step number	Control performer	Periodicity	Control scope
Continuous	I	1. Worker, foreman, inspector of quality control department	During the shift	Execution of operations at workplaces in accordance with technological documentation and control scheme.
Continuous	II	1. Shift supervisor, shift production foreman and QCD foreman, senior production foreman, site manager	During the shift	Compliance with production technology, product quality and materials used, knowledge of ND and TD in 1-2 workers.
		3. Head of the department and quality control department, production foreman and quality control department foreman.	Weekly	Product quality analysis.
Periodic	III	Subdivision commission (shop floor)	Once a month according to the schedule	In accordance with the requirements of clause 6.3. real service station
Periodic	IV	Society Commission	1 time per month according to the schedule	In accordance with the requirements of clause 6.3.1.2 of this STO

Extraordinary	V	Commission appointed by the top management of the Company	As directed by the top management of the Company	In accordance with the requirements of section 6.4 of this STO

During operational control, compliance with the requirements of technological instructions, standards, technical conditions and other regulatory documents is checked in accordance with the control scheme for production technology and product quality, then - a control scheme that ensures continuous control at all stages of production.

The results of operational control are recorded by the quality control department controller or a shop worker (in the case of self-control) in the logs or other documentation specified in the technological instructions and the control scheme.

Records based on the results of operational control are kept in accordance with STO SMK 1-03 and must contain the results achieved or evidence of the activities performed.

The control of the first stage is carried out by workers, foremen, quality control department inspectors.

Control is carried out directly at the workplace during the shift. The results of the control are recorded in journals, passports, protocols. Records based on the results of technology control are kept in accordance with STO SMK1-03.

Control of the second stage is carried out by senior and shift production foremen, foremen of quality control department, heads of divisions and quality control department. Control is carried out on a shift / weekly basis.

In the process of control at the second stage, the personnel are checked for compliance with the production technology, the quality of products and materials used, the knowledge of the requirements of ND and TD is checked.

Periodic control provides for the third and fourth stages.

The third stage is carried out by the commission of the production unit (workshop).

The control is carried out once a month according to the schedule approved by the head of the unit by the commission consisting of:

chairman - deputy head of the shop (chief specialist);

members - the head of the audited area;

representatives of quality control department, laboratories in the direction, technological service. By the decision of the chairman - representatives of mechanical / electrical / energy services.

Based on the results of the commission's work, an order is issued for the division, which reflects:

All identified inconsistencies with an indication of the timing of their elimination and executors.

By the decision of the chairman of the commission, for discrepancies affecting the effectiveness of the quality management system, design documents are developed in accordance with STO SMK 5-05.

The preparation of the commission's work schedule and orders based on the results of inspections is carried out by the deputy head of the workshop.

The assignment of responsibilities for the performance of this work to another manager is formalized by an order for the unit

The fourth stage is carried out by the Commission of the Society.

Control is carried out once a month in one of the divisions. The results of the control are documented by an act, which is signed by the members of the commission and approved by the chief engineer. The preparation of a schedule for checking compliance with the production technology by the Company's commission and acts based on their results is carried out by the technological service. Based on the identified inconsistencies, measures are developed to eliminate them with an indication of the deadlines for elimination and performers. The chairman of the commission determines from the number of identified inconsistencies items that require the determination of the causes of the occurrence and the development of corrective actions to eliminate them. The head of the audited unit is responsible for the development of corrective actions, the development of corrective actions is drawn up as an appendix to the act in the form of a table and sent: the original to the chairman of the commission, copies: to the Deputy Chief Engineer for Technology to the Chief of the Company's Technical Department no later than 15 days after the receipt of the act. One copy is kept in the unit along with the Act.

Control over the implementation of measures to eliminate the identified inconsistencies and corrective actions is carried out at meetings on quality with the heads of departments with a note in the minutes of the meeting.

The heads of departments provide information on the implementation of measures to eliminate the identified inconsistencies and corrective actions for belonging to the TU / TO RMK (copies of protocols, letters).

The fifth stage - extraordinary control, is carried out at the direction of the management of the Company.

The basis for an extraordinary control over the observance of the production technology are inconsistencies identified in the technological process that require a collective solution by specialists from different departments (for example, mass production of inappropriate products).

The Commission is headed by the Chief Engineer. The composition of the commission includes: the head of the technical department of the Company, the main specialists in the areas, at the request of the chairman, other persons may also be involved in the commission.

The results of the check are documented by the order of the General Director of OOO Zavod Tekhmash.

Control over the implementation of measures to eliminate the identified inconsistencies and corrective actions is carried out by members of the commission and belonging to the TU / TO RMK.

Acceptance control of products is carried out by employees of the quality control department of the corresponding workshop, workshop employees leading the technological process, if it is provided for by the control scheme, in order to obtain evidence that the products have passed and withstood all the prescribed types of control and tests. For acceptance control, the results of testing samples (samples) are used, as well as measurement and visual inspection of the appearance and quality of the surface.

Acceptance of products is drawn up by employees of the Quality Control Department (in divisions transferred to self-control - the performer of the technological process) and is registered in the forms of records of the established sample provided for this redistribution (passport, technological map, invoice, entry in the journal, shelf sheet).

During the final control, a product conformity assessment is carried out, through which the manufacturing unit ensures and declares that the controlled product meets the requirements applicable to it. For final control, products are presented that are manufactured in accordance with the requirements of ND and TD, agreements (contracts), which have passed all types of control and tests with positive results.

The documents for the presentation of products to the Quality Control Department for final control are in-house invoices, cards for finished products, reports of production operations and other documents specified in the technological instructions.

In case of positive results of all types of control and testing of finished product parameters for compliance with the requirements of ND and TD, agreements (contracts) and the conditions of the order, the control master or responsible for control gives permission for the shipment of products with the registration of the established technological documentation.

The products are not entitled to be sent to the consumer until the procedures provided for by the control schemes and regulatory documents are completed, with satisfactory results obtained, and until the relevant data and documentation are presented for certification.

In the event that any nonconformity is revealed during product control, the control master, or the person responsible for control, takes measures to organize the elimination of the nonconformity. Further actions with such products are carried out in accordance with STO SMK 5-15-12 "Management of non-conforming products".

The procedure for quality assurance control during intrashop transportation, storage and shipment is carried out in accordance with the production instructions of the units carrying out loading and unloading, storage, packaging and delivery of products in accordance with regulatory documents and contract terms.

Similar to the requirements of ISO 9001-2015 clause 8.1. requirements are indicated:

“The organization should plan, implement the measurement, monitoring, analysis, improvement processes necessary to:

proof of compliance with product requirements;

establishing the conformity of the quality management system;

continuous increase in the effectiveness of the QMS.

This work should introduce the definition of important methods, as well as statistical methods, the extent of their application. "

The stability of the production technology, as well as the quality characteristics of metal products, is controlled by analyzing the value of the in-melt heterogeneity according to OST 14-1-34-90, as well as by comparing the control sample with their key values formulated from the original sample.

The initial data (profile, steel grade, size, sample size, its representativeness, homogeneity) must meet the requirements of OST14-1-34-90.

Compliance of the quality degree of each batch of melt with the conditions of the standards is guaranteed by the production technology, float post-operational control of the technological process, and the acceptance quantity for each quality attribute.

The stability of production technology, product quality indicators are controlled by examining the degree of intra-melt heterogeneity according to OST 14-1-34-90, comparing the main sample with their initial values determined from the base sample.

The adoption of a conclusion on the coincidence of the controlled parameters with the conditions of these standards, technical requirements is carried out by comparing the calculated values of quality features with acceptance figures.

The stability of the quality of the metal melting over time is assessed by comparing the average values, as well as the variances of the degrees of quality, data for the control period (according to the quality control systems of raw materials, technological processes, materials, product quality), with their basic values determined for a specific input sample.

The variances, as well as the average value of the

characteristics in the supplied period, have no right to differ from the main ones by 5% of the degree of significance. An additional criterion for the stability of quality indicators is the degree of in-melt heterogeneity, which is determined by the magnitude of the swing according to OST 14-1-34-90.

Using table 7, an assessment of the existing quality management system at the enterprise is presented.

Table 7 - Assessment of the existing quality management system at the enterprise according to the standard GOST R 9001-2015

Clause of the standard	Name	Note
Clause 5.2.	Improving quality policy	The organization has
P. 6.3	Change planning	Implemented in accordance with standard
Section 8.1	Planning and managing activities during the stages of the product life cycle and services	Carried out in accordance with the standard
Section 8.3	Design and development of products and services	Implemented in accordance with standard
Section 8.4	Management of externally supplied processes, products and services	Carried out in accordance with the standard
Section 8.5	Production of products and provision of services	Implemented in accordance with standard
Section 9.1	Monitoring, measurement, analysis and grade	Held, but not enough
Section 9.2	Internal audit	There are gaps in the organization of the internal audit system
Section 9.3	Management review	There are problems in the system Quality control

Table 8 - Criteria for assessing the effectiveness of management systems based on the results of internal audit

Criteria for evaluation	Balls
Requirements are met in full	9-10
Requirements are met, no discrepancies have been identified, but there are comments	6-8
Requirements are met, no more than 5 inconsistencies and / or no more than 3 recurring inconsistencies are identified	3-5
Requirements are largely not met, more than 5 nonconformities identified and / or more than 3 recurring nonconformities	1-2

Thus, the organization has different control and quality control methods. But the following shortcomings were also identified, such as monitoring, measurement, analysis and assessment is carried out in incomplete compliance with the stated requirements; there are deficiencies in the organization of the internal audit system; There are problems in the quality control system.

In general, the work of the QMS can be assessed as good, since requirements are met, but there are The presented analysis by the management of the IMS does not include the entire completeness of information on the operation of management systems: incomplete input information, taking into account the results of the internal audit and the implementation of corrective actions based on the results of the external audit;

there is no complete information on conformity assessment, based on the results of interaction with external stakeholders, including complaints; The presented analysis by the management of the QMS does not include the entire completeness of information on the functioning of management systems: incomplete input information, taking into account the results of internal audit and the implementation of corrective actions based on the results of external audit; there is no complete information on conformity assessment, based on the results of interaction with external

stakeholders, including complaints; there is no information on the QMS of the branches, on the effectiveness of the functioning of processes, the status of corrective and preventive measures.
The nonconformities identified above must be corrected by the organization in accordance with the requirements of the standard for corrective action, including the assessment of the causes of the nonconformities and measures to prevent their recurrence.
nonconformities should be documented in a corrective action plan and sent to the auditor within 90 days for assessment. If the corrective actions are assessed as satisfactory, they will be reviewed during the next scheduled audit.
At the enterprise, it is advisable to introduce a quality management system based on the standards of the ISO 9001: 2015 series. This will allow:
means, methods, goals of management to focus on quality;
bring a plan of action at the enterprise (record keeping, fulfillment of requirements, organization of work of departments and services);
accurately assign powers and responsibilities, regulate interaction between different departments and specialists;
create new requirements for the design of quality documentation (rules, instructions, regulations, regulations);
determine the requirements for important processes affecting the QMS, formalize these requirements in the form of documented procedures (enterprise standards, methods, etc.);
focus on preventing errors, adjustments and deviations from the established requirements of the standard;
continuous improvement of the quality of the organization's products, the quality of the activities of all personnel of the organization, to reduce losses and reduce the cost of production;
to increase the responsibility of all personnel for the results of work;
reduce non-production costs of time and materials, identify services where material losses occur, including for reworking products and loss of time;
to raise the image of the enterprise;
increase the investment attractiveness of the organization;
to increase the profitability of the enterprise;
ensure the fulfillment of customer requirements and improve the guarantees for them;
the presence of a quality management system, confirmed by a certificate, is a confirmation of the organization's competence.
Identified problems in the organization of the quality management system in the organization. Hence, in this section, recommendations will be offered for improving and implementing the quality management system of the new ISO standard at the enterprise. Recommendations for improving the quality management system are presented in the form of table 9.

Table 9 - Recommendations for improving the QMS

Item No.	Recommendations
Clause 5.2.	Update the quality policy. Modernize the QMS manual to include the scope of the system and a description of all enterprise processes.
P. 6.3	Update planning of changes. Amend the document "Document Management", which includes a description of: - management of external and internal regulatory documents, including Regulations, STP, technological instructions, operating instructions, labor protection instructions, regulations on divisions, job descriptions. Expand the documented procedure "Records Management", in which to identify the types of records for the QMS, to determine the place, terms of their storage and withdrawal.
Section 8.1	Modernize the planning and management of activities at the stages of the life cycle of products and services. Improve the Quality Policy, establish a procedure for its dissemination to interested parties (personnel, external interested parties, including the public, suppliers and consumers of products). Determine the procedure for changing goals in the field of MC. Change the procedure for setting the Quality Objectives, according to which the documented objectives should be adjusted for each department.
Section 8.3	Improve the design of products and services. Upgrade and maintain the instrumentation management procedure.

Section 8.4	Improve the management system for processes, products and services supplied by external suppliers: 1. In order to improve the planning process, develop a quality planning procedure. 2. Update measures to improve product quality. Improve the procedure for analyzing questionnaires, according to the assessment of satisfaction consumers.
Section 8.5	Improve production and service delivery. Develop a procedure that describes the process for managing nonconforming products. Correct the document describing the storage conditions for finished products. The responsibility and authority in the QMS should remain the same, with their entry into the Regulations on divisions, job and work instructions. Bring to the attention of the personnel against signature. Reappoint a representative of the company's management and define his main responsibilities and authorities in the QMS in accordance with the new standard. Taking into account the number of personnel of the enterprise, it is recommended to appoint a group of responsible specialists consisting of at least 5 people to develop and further maintain the System in an effective state. Determine the requirements for the competence of personnel in accordance with the requirements of the QMS. Appoint representatives and improve the position for personnel in the QMS, including their rights, duties and responsibilities). Include in the training programs topics related to the requirements of the transition to the new international standard ISO 9001: 2015.
Section 9.1	Improve monitoring, measurement, analysis and estimates.
Section 9.2	Correct deficiencies and improve the internal audit of the organization
Section 9.3	Conduct management reviews on a periodic basis. 1. Improve the procedure for conducting an analysis of the QMS by top management. 2. Establish more stringent criteria for senior management review in accordance with ISO9001-2015 requirements.

OOO Plant "Techmash" is a leader in the supply of a number of types of metal products for construction and construction. The plant constantly improves the effectiveness of the QMS through the application of policies, goals in the field of occupational health, data analysis, as well as safety, quality, ecology, audit results, corrective, preventive actions, and analysis of the QMS.

At the largest enterprises, such as OOO Zavod "Techmash", quality, ecology, and labor safety are inseparable parts of management. Management systems are becoming more and more essential for enterprises seeking to become globally competitive. QMS certification for compliance with international standards gives the opportunity to increase the competitive advantages of the enterprise, to prove to the interested parties in the effective solution by the enterprise of the problems of environmental, industrial safety of these industries, problems of labor protection, as well as safety measures.

Table 10 - Analysis of changes in ISO 9001: 2015

ISO 9001: 2008	ISO 9001: 2015
0. Introduction	0. Introduction
1 area of use	1 area of use
2. Normative references	2. Normative references
3 Terms and definitions	3 Terms and definitions
4. Quality management system	4. Organization environment
5. Responsibilities of the parties	5. Leadership
6. Resource management	6. Planning
7. Product release	7. Means of support
8 measurement, analysis and improvement	8. Activities at the stages of the life cycle of products and services

	9. Performance evaluation
	10. Improvement

Comparison of the old and new standard shows the following data:

applications remained the same (approval sheets);

the content of the sections has changed (1 Scope. 2 Normative references. 3 Terms and definitions. 4 General provisions. 5 Planning internal audits. 6 Sequence of work during internal audit. 7 Responsibility.) - as you can see the volume of these sections has decreased. The additional procedures were reduced, thus, the goal was to simplify the internal audit procedures in order to more quickly identify the root causes of problems and develop corrective actions.

As part of the transition to the new version of the ISO 9001-2015 standard, OOO Plant "Techmash" should pay attention to the following aspects in the field of documentation:

ISO 9001-2015 no longer differentiates between the terms “document” and “record”, instead the term “documented information” is used.

The new version of the standard no longer uses the terms “documented procedure” and “quality manual”; in the version of the ISO 9001: 2008 standard, the requirements for the storage and protection of documented information are not clearly indicated; in the new version of the ISO 9001-2015 standard, these requirements were explained in more detail.

Thus, at the present time, a quality management system (QMS) has been implemented and documented at OOO Plant "Techmash" in accordance with the requirements of the ISO 9001: 2015 standard. The QMS is maintained in working order and is constantly being improved.

Let us dwell in more detail on the consideration of the documented information management process, implemented at OOO Plant "Techmash", as part of the transition to the new version of the ISO 9001-2015 standard. Currently, the documented information of OOO Plant "Techmash" includes a Quality Manual, procedures, reporting forms / instructions, and records. Internal documented information of the organization includes the following types of documents:

level 1 - documented Mission, Vision, Quality Policy and Objectives, Quality Manual;

level 2 - organization standards, regulations, job descriptions;

level 3 - documents on planning, implementation and management of QMS processes;

level 4 - records.

In OOO Plant "Techmash" there are three types of internal documented information:

Documented information registered with the quality control service and having registered registered copies (Quality manual, organization standards, regulations). Management of this documented information is carried out in accordance with clause 5.1.1 ISO 9001-2015;

Documented information related to the field of activity of a particular structural unit and stored in it. Management of this documented information is carried out in accordance with clause 7.5.3.2 ISO 9001-2015;

Freely circulated documented information, i.e. the effect of copies of which is equivalent to the original document (Quality Policy, regulations). This documented information is not subject to change, is canceled by order or order, and is also replaced by a new document.

The requirements of the internal documented information of the quality management system should not contradict the requirements of external regulatory documents. External documented information includes regulatory and legal documents developed by external organizations, the requirements of which relate to the scope of the QMS of LLC Plant "Techmash". Requirements in external documented information are mandatory. The external documented information of the QMS OOO Plant "Techmash" includes the following types of documents: laws, regulatory and legal documents of the President and the Government of the Russian Federation, regulatory acts of federal executive bodies of the Russian Federation, constituent entities of the Russian Federation and local governments (basic level).

In conclusion, we can draw conclusions on improving the quality management system to the requirements of the new ISO 9001: 2015 standard at the enterprise:

identification of problems, the elimination of which will contribute to compliance with the new requirements of the standard;

it is recommended to appoint a group of responsible persons of up to 5 people from the enterprise (department for management and quality control of the QMS) to improve the QMS for compliance with the requirements of the new standard;

appoint the Deputy General Director for Quality as the responsible manager of the transition to ISO 9001: 2015 in the organization;

change the responsibilities of quality control personnel;

develop a plan for improving the QMS at the enterprise;

improvement of the QMS documentation;

analysis of proposals for improving the QMS;

elimination of inconsistencies with the new standard;

ensuring that all personnel who affect the results of the organization are trained in the new requirements of the standard;

definitions of organizational knowledge;

production of internal audit;

analysis of activities by senior management;

preparation for a certified audit;

certification at the enterprise.

As the analysis of the current standard has shown, LLC Plant Tekhmash has a problem in identifying the root cause and developing corrective actions for inconsistencies in the organization detected in the divisions. Therefore, it is proposed to improve the existing quality management system from the standpoint of improving the procedure for conducting internal audit of QMS documentation.

It is proposed to leave the supporting documentation the same - the Manual on the Integrated Management System in the Field of Occupational Health and Safety, Ecology and Quality of LLC Plant "Techmash", Regulation on the Management of Management Systems, but it is proposed to update them, that is, to sign by the date of the present.

Three years are given to implement all the requirements of ISO 9001-2015. During this transition period, certification can be carried out on both the 2008 version and the new version.

Quality Management System Improvement Program:

stage one - organizational;

stage two - introduction of elements of the new version of the standard;

stage three - conducting internal audits of the quality system, control of the work performed.

To perform the stages of improvement, it is necessary to create the necessary conditions in the organizational structure, as well as in the resource and methodological ones.

Persons who will be responsible for the organization and implementation of work to improve the quality management system should be delegates to top and middle management. It is necessary to outline the goals, objectives, basic principles of the new quality management system for all personnel. The lack of explanatory conversations and training can lead to a decrease in results, in this regard, it is important to involve all personnel in the process of improving the QMS.

Table 10 - Schedule for improving the quality management system

Name of the event	Number of days	Responsibility for implementation and control	Deadlines
Creation of a working group	3	First Deputy General Director - Quality Director	4/3/2022 - 04/05/2022
Work planning	5	Quality advice	04/06/2022 - 04/10/2022
Preparation and holding of meetings for the assessment of the QMS	5	Service chief Quality control, chief engineer	04/11/2022 - 04/15/2022
Customer and customer satisfaction surveys	7	Assistant General public relations director	04/16/2022 - 04/22/2022
Analysis customer needs, staff, suppliers, etc.	3	Head of Quality Control Service, PRK	04/23/2022 - 04/25/2022
Analysis of the current QMS	4	Quality Director, Head of Control Service quality, chief engineer	04/26/2022 - 04/29/2022
Analysis of suggestions for improvement	3	Head of Quality Control Service, Chief Engineer	04/30/2022 - 2.05.2022
Improving the plan for monitoring and analysis of changes	5	Head of Quality Control Service	05/03/2022 - 05/07/2022
Modernization of the plan for Responding to possible risks	3	Head of Quality Control Service	05/08/2022 - 05/10/2022

Planning Achieving quality objectives	5	Head of Quality Control Service, BSMK	05/11/2022 - 05/15/2022
Identifying suitable resources	5	Service chief Quality control, BSMK	05/16/2022 - 05/20/2022
Conducting training on a new quality standard	7	HR Director, Head of Service quality control	05/21/2022 - 06/27/2022
Analysis of activities with leadership side	4	Director of quality	05/28/2022 - 06/31/2022
Internal audits	14	Head of Quality Control Service, BSMK, at Support from the specialists of LLC "Audit-Optim-K"	1.06.2022 - 06/14/2022
Eliminate inconsistencies	8	Head of Quality Control Service	06/15/2022 - 06/22/2022
Preparing for a certification audit	10	Quality Director, Head of Quality Department, LLC specialists "Audit-Optim-K"	06/23/2022 - 2.07.2022
IMS certification in accordance with the requirements of ISO9001: 2015	14	Representatives of the group's certification company Bureau Veritas (accompanied by an audit by LLC specialists "Audit-Optim-K"	07/03/2022 - 07/16/2022

Measures to improve the quality management system are very laborious and take a lot of time to implement all stages. The role of preparation and conduct is assigned to top and middle management. The CEO is the main responsible person for the implementation of the implementation of the new improved quality management system. He gives assignments to responsible persons for the implementation of the modernization of the QMS and monitors its implementation, moreover, the responsibility for the progress of the process is assigned to the Deputy General Director for Quality, who reports to the General Director on the progress of the procedures.

Table 11 - Plan for the improvement of internal regulatory documents in accordance with the requirements of ISO 9001: 2015

Title of the document	ISO section	Type or form of the document	Responsible for development	Completion date
Start order The process of improving the QMS and the distribution of responsibility for the improvement procedure QMS	Clause 5.2	Order	QMS management representative	April2022 April2022
Changes to the provisions on divisions, officials instructions, in the instruction "On the procedure for concluding and monitoring the execution of contracts"	P. 6.3	Changes to the regulations Schedule of those responsible for QMS development Changes to instructions	Head of the department of organizational work Head of HR Department Head of Legal Department Representative QMS manuals	

Regulation "Planning in the QMS" based on the ISO 9001-2015 standard	Section 8.1	Regulations	QMS management representative Head of Economic Planning Department	April 2022
Suggestions for Inclusion in quality objectives	Section 8.3	Suggestions for purposes	Representatives for divisions	April - May 2022
Regulation "Management of nonconforming products"	Section 8.4	Regulations	Head of Resource Planning and Product Quality Department QMS management representative	May 2022
Quality Strategic Objectives	Section 8.5	Strategic Objectives	Representative QMS guidelines	May - June 2022
Regulation "QMS Guidelines" based on the new ISO standard 9001-2015	Section 9.1	Regulations	QMS management representative	June 2022
Lists of records by each unit	Section 9.2	Lists	Leaders subdivisions	June 2022
Change Completion Order QMS documentation in accordance with ISO 9001-2015	Section 9.3	Order	General manager	June - July 2022

This plan is approved by the general director of the enterprise. Improving the qualifications of personnel for an enterprise that has embarked on the road of improving quality should be a continuous process, therefore, in the process of improving the QMS, the personnel of the organization must undergo additional training. A long-term personnel training program is created by the personnel training service with the cooperation of specialists from other companies, and is approved directly by the general director of the base enterprise. The program must be provided with all the necessary resources. All employees are required to undergo training at the enterprise according to various training programs. The training involves both the personnel of the enterprise, including third-party specialists.

The leadership stimulates the development of personnel qualifications by introducing additional allowances in wages, for the direct acquisition of professional skills in those areas of activity that are officially declared by the authorities as "unmet needs." A list of the skills and abilities that the company needs, the means of proof of their acquisition, as well as their percentage of the salary increment, is compiled annually, and is also brought to the attention of the organization's personnel. The indicated markup reaches up to 30%. Each staff member needs to have a personal development plan. The passage of training is taken into account during the current certification of managers and specialists.

To increase efficiency, different benefits should be used on quality management, reminders for employees, engineering and technical personnel on the quality system. These guidelines disclose the goals, objectives of the enterprise in the field of quality, the structure of the QMS, the responsibilities and rights of personnel in solving problems in the field of quality. For the formation of such benefits, both employees of the enterprise and third-party specialists are mobilized.

Certain needs and expectations of consumers must be accompanied by the QMS, implemented at all stages of its improvement.

Attention should be paid on setting the expectations of consumers as well as other interested parties. Taking into account such expectations in the QMS allows us to provide hope for a guarantee that it will not in any way become obsolete in the near future. This makes it possible to take, maintain a leading position in its own market area. To assess these expectations, one should use or make forecasts of the development of consumer needs and educational services.

The document "Mission, policy, goals and objectives in the field of quality" is the main document of the quality management system, since it establishes the main objectives of the enterprise in a concentrated form, gives a clear idea of its mission, its long-term goals and positioning itself in the market. Improving the quality management system is a complex of works that affects various aspects of the enterprise and its subsystem - the strategic management subsystem, the production subsystem, the logistics subsystem, personnel management, internal communications, document flow, etc. In this regard, improving the QMS is a rather difficult, lengthy and laborious task. And it consists of several stages.

Process maps have been developed for each department, division and department of the enterprise and are presented in the form of table 12.

Table 12 - Process map

Process name	Responsible for the process	Purpose of the process
Financial management	Head of Financial Department	Planning, analysis and control of budget execution of the need for financial resources for the implementation of production, investment and social programs
Delivery process	Sales Manager	Delivery of finished products of the enterprise in the appropriate volume and within the appropriate time frame
Accounting	Deputy chief accountant	Formation of complete and reliable reporting on activities and its property status, to monitor compliance with the legislation of the Russian Federation in the implementation of business transactions and their feasibility, the presence and movement of property and obligations in accordance with the approved standards.
Management review	Director of quality	Assessment of the effectiveness of the QMS
Production of products	Technical Director	Implementation of planned indicators
Product control and analysis	Head of Quality Control Department	Conducting timely product control in accordance with the inspection schedule and in accordance with approved methods
Delivery of products by transport	Head of Operations Service	Ensuring the fulfillment of the transportation plan, timely delivery and cleaning of wagons to loading and unloading fronts.
Providing the enterprise with the necessary technical documentation for the work	Chief technologist	Ensuring compliance of technical documentation with design solutions, actual conditions, development of prospects for the development of work and related activities and proposals
Business management of the enterprise	Head economist	Organization of planning and analysis of economic activities of the enterprise

The top management of the enterprise must ensure that the quality objectives, including those necessary to fulfill the requirements for the product, have been established in the relevant departments and at their respective levels. Quality objectives should be measurable and consistent with the quality policy.

Objectives are the objectives of the organization to improve the quality of work, expressed numerically.

Since, when implementing a QMS, the organization also distinguishes processes that describe the work of the organization, then we can say that quality objectives are set with reference to the corresponding processes.

Monitoring and changing processes, documenting processes This procedure is necessary in order to be able to assess the level system development and its impact on the economic performance of the enterprise. In order to draw conclusions about the functioning of the QMS, it is necessary to first measure the effectiveness of each process, and document each process, measure and document the processes. Table 13 presents the monitoring and measurement of QMS processes.

Table 13 - System of indicators for measuring QMS processes

Process	Target	Result	Indicators for evaluating the process and its result (performance criteria)	Who measures, frequency of assessment
Compliance with the requirements of the QMS	Execution of the production plan	Achieving 100% of the result	Compliance of QMS processes	Head of Quality Control Service
Taking corrective action	Lack of marriage	Achieving 100% of the result	Number of corrective actions	Head of Quality Control Service
Execution of applications for the production of products on time	Achievement of planned targets	Achieving 100% of the result	Amount of processed orders	Head of Quality Control Service
Implementation of the grade plan	Achievement product grades	Achieving 100% of the result	Number of product varieties	Head of Quality Control Service

To improve the quality management system in the organization for compliance with the requirements of ISO 9001-2015, an improvement in the internal audit of the QMS is required. To maintain the quality management system (QMS) of the enterprise in working order and to continuously improve the efficiency of its functioning, it is necessary to constantly improve and improve all the processes of the organization. When identifying priority areas for improvement, it is important to leverage the benefits of the internal audit process. Internal audit is the main tool for assessing the effectiveness of the use of the quality management system. ISO 19011 defines audit as a systematic, independent and documented process for obtaining audit evidence and evaluating it objectively in order to determine the extent to which agreed audit evaluation criteria have been met. The requirement to conduct internal audits of the quality management system is contained in clause 9.2 of the GOST R ISO 9001-2015 standard. The internal audit process refers to measurement processes.

Internal audits (checks) of the QMS are usually carried out by the organization itself or on its behalf for internal purposes and can serve as the basis for a declaration of compliance of the internal quality management system with the requirements of international quality standards. In this regard, the development of internal audit as an integral part of the internal control system is primarily due to the need for continuous operational control of activities for effective management.

Internal audit of the management system allows you to solve the following tasks:

analysis and elimination of the causes of the identified inconsistencies;

confirmation of the compliance of the organization's activities and its results in the management system with the established requirements;

assessment of the effectiveness of a functioning management system;

preventing the appearance of quality problems;

establishing the degree of understanding of the personnel of the goals, objectives and requirements described by the documents of the management system;

confirmation of the implementation of corrective and preventive actions and identification of ways to further improve the quality management system.

The organization and planning of internal audit is the allocation of responsibility and authority for the implementation of internal audit in the organization.

The organization's management ensures the independent conduct of internal audit and analysis of the QMS. Owners, participants and interacting in the process of internal audit and its stages are reflected in the matrix of responsibility (table 14).

Table 14 – Matrix of distribution of responsibility by stages of the procedure "Internal audit of management systems"

Responsible persons / Stages	Managing director	Leadership Representative	Technical Director	USM	OSMiS	Audit Team Leader	Head of the audited unit
1 Development of a draft annual program of internal audits of the IMS	AND	WITH	WITH	V	V	AND	
2 Approval of the annual program	AND	R	R	WITH	WITH	AND	AND
3 Preparation of internal audit plans				V	V	AND	
4 Approval of internal audit plans		R	R	WITH	WITH		AND
5 Preparing information on audited units and holding a meeting with audit team leaders				V	V	AND	WITH
6 Preparing the audit team				WITH	WITH	V	WITH
7 Conducting a preliminary meeting in the auditee						V	WITH
8 Collection and verification of information				AND		V	WITH
9 Conduct a closing meeting						V	WITH
10 Registration of audit results				AND		V	AND
11 Development by the correction / design department				WITH	WITH	AND	V
12 Assessment of CA for sufficiency				V	V	AND	AND
13 Performing correction / CD						AND	V
14 Checking the execution of CD		AND	AND	WITH	WITH	V	WITH
15 Assessment of the effectiveness of CA		AND	AND	AND	AND	V	AND
16 Analysis of the results of audits and the implementation of the IMS internal audit program at the end of the year	AND	AND	AND	V	V	AND	AND

Legend:
R responsibility for making a decision;
V responsibility for implementation;
WITH responsibility for assistance;
AND receiving the information.

Suggestions and recommendations on the organization and conduct of internal audit contribute to improving the efficiency of the internal audit process and the internal control system as a whole. Improving the effectiveness of internal audit largely depends on the correct organization of its work. Internal audit provides audit evidence. It is important that the evidence obtained is objective, as it can influence decisions regarding the achievement of the goals and objectives of the enterprise as a whole and its divisions. Also, during the internal audit, errors and inconsistencies are revealed that can affect customer satisfaction. With regard to the internal audit process, the following inconsistencies were identified: the audit of the technical control department was not carried out and is not included in the audit program.

The division is highlighted in the organizational structure of the enterprise, and the current procedure for conducting internal audits provides for an audit of each division at least once a year. The qualifications of internal auditors have not been confirmed. Submitted certificate of training for the course "Internal Audit" (attended a theoretical course) was without any positive results of this training (testing).

Table 15 - Measures to improve the internal audit of the QMS in the organization

Disadvantages of conducting internal audits of the QMS	Measures to improve internal audits of the QMS
Lack of competence of the audit team	Revise the register of internal auditors, train new auditors, organize quarterly round tables, replenish the library with specialized literature on quality assessment.
Lack of motivation for the audit team	Increasing the motivation of the audit group of the enterprise due to additional priming based on the results of work
Changes to requirements for internal audit in accordance with GOST R ISO 9001 version 2015	Improving documentation
The audit of the technical control department has not been carried out and is not included in the audit program. The division is highlighted in the organizational structure of the enterprise, and the current procedure for conducting internal audits provides for an audit of each division at least once a year.	Conduct an audit of the technical control department with inclusion in the internal audit program
There is no evidence by which to assess the extent to which planned activities have been completed	Implement evidence for assessing the degree planned internal audit activities

Based on the results of the analysis of the QMS by senior management, it was noted that more than half of the selected improvement areas planned for 2019 were not implemented for subjective reasons. There is also no evidence by which to assess the extent to which the planned activities have been completed. There is a psychological problem at the enterprise: the staff is “afraid of the audit”. In addition, auditors included in the register of auditors of the enterprise quite often refuse to conduct an audit, referring to their employment. In this regard, the audit group is not formed, and the audit is carried out by one person, as a rule, a QMS specialist.

Improving the IA process should start with analyzing existing problems and identifying the causes of their occurrence using modern quality tools. The brainstorming method has identified many sub-causes for each root cause.

As a result of the analysis, the most probable and significant reasons for the low quality of IA were identified: insufficient competence of the audit team, lack of motivation for the audit team, imperfection of the standard for internal audits.

Based on the results of the analysis of the IA process, the following priority areas for improving the process have been developed: improving the qualifications and competence of internal auditors, increasing the motivation of the audit group of the enterprise, improving documentation. Taking into account the identified reasons and priority areas, corrective measures were developed that made it possible to improve the IA process, bring it to a new important level.

As part of increasing the competence of the audit team, a methodology for assessing the competence of internal auditors has been developed, which presents a scoring assessment of competence (Table 16).

Table 16 - Criteria for assessing the competence of internal auditors

P / p No.	Requirement	Criteria for evaluation	Points
1	Education	Higher	3
		Secondary special	1
		Average and below	0
2	work experience	More than 5 years	3
		1 to 5 years old	1
		Less than 1 year	0
3	Special training in the basics and principles of quality management	There is	2
		No	0

4	Special training in internal audit of quality management systems	There is	5
		No	0
5	Experience in conducting QMS audits	More than 5 audits	5
		1 to 5 audits	1
		No	0

Employees with higher education in the areas of "Quality Management" and "Standardization, Certification" receive 10 points. The score for the internal auditor is at least 9. The score for the chief auditor is at least 12. The internal auditor must participate in at least one full audit per year, and the head of the audit team must participate in at least 3 audits per year.

This technique allows you to select auditors in the most objective way, which, in turn, will affect the improvement of the IA quality. It is proposed to develop a document "Auditor's Passport", which will record information on the competence of internal auditors. In addition, the following recommendations were given to improve the competence of auditors: revise the register of internal auditors, train new auditors, organize quarterly round tables, and replenish the library with specialized literature on quality assessment. To increase the motivation of internal auditors, a remuneration system for auditors has been introduced.

As part of improving the standard on internal audits, the IA management procedure was improved, the forms of documents were brought to a single form. As a result of the design, a block diagram of the internal audit of the organization's management systems was developed. The items "Type and serial number of the audit", "Time of the audit in place", "Basis", "Send the audit report" have been added to the internal audit program. Clauses have been added to the internal audit report

"Base", “Recommendations”, “Audit Criteria”. Developed by measures to improve the internal audit process make it possible to rationally use the resources of the enterprise for the performance of checking the state of the QMS, have a positive impact on the efficiency of the organization's processes, which guarantees an increase in the quality of products.

Normative and organizational - legal documents regulating the process:

GOST R ISO 19011;

regulations on the quality management department;

job description of the head of the quality management department;

instruction on the activities of the head of the group of the quality management system;

instruction on the activities of internal auditors for the quality management system;

instructions on the activities of the management representative - responsible for the quality management system;

instruction on the activities of structural units authorized for quality.

Development of a document for the coordination of work at the enterprise "Regulations on the definition and management of risks of the organization." The purpose of this document is to develop recommendations for the implementation of techniques and methods for identifying risks, to determine their application for analyzing, reducing and eliminating risks.

The section should contain the following points:

what is included in the procedure for assessing and managing risks that are associated with a direct impact on the quality of products or services;

the composition of the working group, as well as the group of responsible persons;

creation of a risk assessment system (identification, analysis, risk reduction) and critical control points;

responsibility for managing the risk analysis procedure;

determination of powers in the working group;

determination of risk assessment methods, risk management methods;

assessment of the results of the work of the working group - defining the scope of identification and analysis of risks associated with the quality of products or services.

Table 17 - Risk assessment

Risk type	Cause	Risk severity assessment	Estimating the likelihood of occurrence	Risk type	Adjustment of activities
Technological risk	Decrease in production volumes	2	2	2	Compliance with the requirements of project documentation.

Commercial and procurement risks	Refusal of suppliers to conclude contracts.	1	1	3	Diversification of production by expanding the number of ready-to-use technologies and types of products.
Risk buyer's refusal from the products he received (return)	Non-compliance of products with quality requirements.	1	1	2	Horizontal integration, i.e. agreements with competitors on a kind of Separation of spheres of influence.
Transport risk	Difficulty getting insurance casco and cargo	1	1	3	Choosing a reliable insurance company.
Technical risks	Problems in the supply of technical materials, low qualifications of workers	2	2	2	Professional development of personnel through education, on-the-job training, efficiency applications for purchase of technical components.
HR risks	Wrong directions in the choice of personnel policy.	1	2	1	Modernization of internal control systems, a program for building staff loyalty.
Risks in making management decisions	Incorrect construction long-term and short-term tasks for development enterprises	2	1	2	Adjustment of strategic objectives based on identified development problems

Table 18 - Scale for assessing the likelihood of risk occurrence

1	Low probability, problem may occur approximately once a year
2	Medium chance, problem may occur approximately once a month
3	High probability, the problem may occur approximately once a week
4	Part of normal practice, the problem comes up all the time
5	To a certain extent, it increases the cost of resources for the execution of the process, but does not affect its output
6	Significantly increases the cost of resources for the execution of the process or somehow worsens the characteristics of the output of the process
7	Significantly degrades the output characteristics of the process
8	Prevents the normal functioning of the process

Table 19 - Type of risk

1	Unacceptable risk - the process must be changed to reduce the risk
2	Significant risk - the process should include actions to monitor the implementation of this risk and respond to it
3	Minor risk - the risk needs minor adjustments to eliminate it

Upon completion of the work on identification, assessment and risk management, the final documents should be agreed upon:

table "Identification and assessment of risks";

risk assessment matrix;

register of acceptable, justified, unacceptable risks;

creation of documents on critical and significant risks.

It is necessary to work according to the same methodology for calculating risks with the involvement of the same specialists. This is important to get comparable bottom line results.

Applying the risk analysis methodology, the audit can be carried out as follows:

The head of the department (authorized for quality) identifies potential nonconformities, conducts a risk assessment (drawing up a protocol), and conducts a plan and implementation of actions in order to reduce risks.

The objectives of the auditor when conducting a risk-based audit is to determine:

whether potential nonconformities have been taken into account;

whether the possible consequences are indicated in the correct size;

the correctness of the assessment of the severity of the consequences;

whether the cause of the possible non-compliance has been identified;

the scope of measures to reduce the risk;

implementation of planned activities;

the effectiveness of these activities;

whether the results are taken into account in the processes, instructions.

Modernization (bringing the organization to meet the requirements) of the QMS in accordance with ISO 9001-2015 is determined by the competence of the company that provides consulting and conducts all preparatory work for certification in the organization. Various details prior to certification work in an organization can significantly reduce the capital cost of implementing a QMS. You can specify the following major one-time expenses for the organization. A general description of possible works and an approximate cost ratio of cost items are shown in Table 20.

Table 20 - One-time costs for quality management system improvement and ISO certification

Cost item name	Amount, thousand rubles	Share,%
Internal auditor training	135	13.22
Survey of the organization to obtain recommendations for the implementation of the new standard ISO 9001-2015 quality management system	42	4.11
Improvement of mandatory documents of the quality management system (for ISO 9001 - quality policy, quality manual, six mandatory documented procedures), change of additional (not mandatory according to the standard) QMS documents	110	10.77
Organization of an advisory body in the field of quality	22	2.15
Customer and customer satisfaction surveys	eighteen	1.76
Training of employees on changes in the organization and new documents of the system	33	3.23
Internal audit of the quality management system	77	7.54
Elimination of remarks identified at the stage of internal audit	88	8.61
Preparing for a certification audit	56	5.48
Certification audit	440	43.09
Total	1021	100

The current costs here will also include the opportunity costs, somehow lost profit (revenue, alternative income, etc.) that may arise from an alternative investment of funds. The main items of current expenses accompanying the processes of maintaining the QMS in working order in order to prolong the validity of the certificate are shown in Table 21.

Table 21 - Current expenses of the organization associated with the extension of the validity period of the certificate of conformity to the standard

Cost item name	Amount, thousand rubles	Share,%
Internal audits of the quality management system (at least once a year)	250	25
Training of certified internal auditors	100	ten
Professional development of personnel (training) on quality management issues	50	5
Supervisory audits of the quality management system	600	60
Total	1000	100

Total costs for implementation will amount to 1,021 thousand rubles, then the current costs for the operation of the QMS system will be 1,000 thousand rubles. in year.

If the costs of the QMS are established by direct calculation, then the calculation of the "benefits" from improvement, certification of the quality management system is not so obvious, and also not simple. The difficulty is compounded by the implicit nature of most of the positive effects of improving QMS. For an approximate calculation of the magnitude of such effects at the stage of justification, it is necessary to use expert probabilistic estimates of the possible consequences of improving the system.

Table 22 shows the main directions of obtaining economic benefits when improving the QMS.

Table 22 - Economic effects of improving the QMS

Economic effect type	Effect source
Profit growth proportional to the increase in sales volumes	Expanding long-term relationships with consumers
Savings on fixed costs, proportional to their share in the cost structure and growth in sales volumes	Increased demand from consumers
Reducing total running costs	Optimization of business costs
Relative increase in revenues while maintaining the same level of operating costs	Optimization of processes in the organization by searching for internal reserves

Thus, in general, economic feasibility is understood as a positive reduced cash flow from the moment of investment in the QMS until the moment in the future - the horizon for planning work in the field of quality.

The project was created to carry out improvements in accordance with the ISO 9001-2015 standard.

Goals:

successful implementation of ISO9001-2015 improvement;

increasing the efficiency of the QMS;

bringing the system into compliance with the requirements of ISO 9001-2015 for passing internal and external audits.

Internal improvement work includes:

work planning;

creation of a Working Group;

performance of work according to the work schedule;

control over the timing and quality of work.

The result of the economic effect is very significant when a new standard is introduced into the work of the enterprise's QMS. Improving the QMS will improve all areas of the organization's activities and, in particular, the quality of products, which is so necessary for consumers. As you know, the Pareto diagram can be, in particular, used to develop recommendations for optimizing production and economic activities. To solve all kinds of problems associated with the appearance of defects, equipment malfunctions, an increase in the time from the release of a batch of products to its sale, the presence of unsold products in the warehouse, the receipt of complaints, a Pareto chart is used.

The construction of a Pareto chart begins with the classification of emerging problems according to individual factors (for example, problems related to marriage; problems related to the operation of equipment or performers, etc.) Then the collection and analysis of statistical material for each factor follows

in order to find out which ones. of these factors are prevalent in solving problems.

With regard to the construction and use of a Pareto chart, the following can be recommended:

- it is advisable to use different classifications and make a lot of Pareto diagrams. The essence of the problem can be grasped by observing the phenomenon from different points of view, so it is important to try different ways of classifying data until a few, but essential factors are identified, which, in fact, is the purpose of Pareto analysis;

-the group of factors "other" should not constitute a large percentage. A large percentage of this group indicates that the objects of observation are classified incorrectly and too many objects fell into one group, which means that a different classification principle should be used;

- if the data can be represented in monetary terms, it is best to show this on the vertical axes of the Pareto chart. If the existing problem cannot be estimated in monetary terms, the study itself may be ineffective, since costs are an important measurement criterion in management;

- if an undesirable factor can be eliminated with a simple solution, this should be done immediately, no matter how insignificant it may be. Since the Pareto chart is regarded as an effective means of solving problems, only a few essential reasons should be considered. However, the elimination of a relatively unimportant cause in a simple way can serve as an example of an effective solution to the problem, and the acquired experience, information and moral satisfaction can have a beneficial effect on the further procedure for solving problems;

- one should not miss the opportunity to draw up a Pareto chart for reasons.

In a rectangular coordinate system, equal segments corresponding to the factors under consideration are laid along the abscissa axis, and the value of their contribution to the problem being solved along the ordinate axis. In this case, the order of the factors is such that the influence of each subsequent factor located on the abscissa decreases in comparison with the previous factor (or a group of factors). The result is a chart whose bars correspond to the individual factors that are causing the problem, and the height of the bars decreases from left to right. Then a cumulative curve is constructed based on this diagram.

Building a Pareto chart in Excel consists of the following steps.

Suppose we have activity data.

The data is not ordered, therefore, first of all, let's sort the data in descending order of profit and the number of defects.

To do this, select the table and select in the tab bar Data -> Sort and Filter -> Sort:

Additionally, we added several columns to the table:

- Increasing profit percentage,% - each product is summed up with the previous one and the total share in the profit is shown;
- Efficiency ratio - in this case 80% (according to the Pareto rule);
- Highlighting criterion - the main defects will be highlighted in the final diagram, we indicate a value obviously greater than 1**...**

Now let's transform the graph into a more convenient form. Select the row "Increasing percentage of the number of defects,%" and transfer it to the secondary axis (right-click on the row, select Format data series -> Row parameters -> Along auxiliary axis)

We will also change the chart type for this series to a regular line chart (right-click on the series, select Change chart type for the series)

Further, we carry out similar actions for the "Coefficient" series, which we transfer to the auxiliary axis and make it a horizontal line.

Let's add highlighting to the diagram, which shows which specific product groups bring the main profit. Select the row

"Highlight" and transfer it to the secondary axis. Set the side gap to 0 - right-click on the row, select Format Data Series -> Row Parameters -> Side Gap

We customize the chart at our discretion and get the final look of the Pareto chart in Excel. But in this program, the author identified errors, not accuracy and coincidence, which distorted the final results and did not allow them to be used, although the Pareto diagram made it possible to distribute the efforts of researchers to resolve emerging problems and establish the main factors with which research should be started in order to achieve effective results.

Let's clarify the stages of solving the problem of constructing a Pareto chart in Excel, namely:

Stage 1. First you need to decide:

what problems need to be investigated (eg defective products, money losses, accidents);

what data needs to be collected and how to classify them (for example, by the types of defects, by the place of their occurrence, by processes, by machines, by workers, by technological reasons, by equipment, by measurement methods and measuring instruments used; not common signs are combined under the general heading "other");

determine the method and period of data collection.

Stage 2. Development of a checklist for data registration with a list of the types of information collected.

Step 3. Filling out the data registration sheet and calculating the totals.

Stage 4. Development of a table for checking the data with columns for the totals for each checked feature separately, the accumulated sum of the number of defects, percent of the total and accumulated interest (table 23).

Stage 5. Arrangement of the data obtained for each checked attribute, in order of importance and filling in the table (table 23).

Table 23 Results of registration of data by types of defects for the construction of a Pareto chart.

Types of defects	Number of defects	Accumulated number of defects	The percentage of the number of defects for each feature to the total amount	Cumulative percentage,%
Deformation	104	104	52	52
Scratches	41	146	21	73
Sinks	twenty	166	ten	83
Cracks	ten	176	5	88
Stains	6	182	3	91
The gap	4	186	2	93
Other	fourteen	200	7	100
Total	200	-		

The group "others" should be placed in the last line regardless of its numerical values, since it is a set of characteristics, the numerical result for each of which is less than the smallest value obtained for the characteristic highlighted in a separate line.

Stage 6. Drawing horizontal and vertical axes.

The vertical axis contains percentages, and the horizontal axis contains intervals according to the number of controlled characteristics.

The horizontal axis is divided into intervals in accordance with the number of monitored features.

Stage 7. Building a bar chart.

Stage 8... Drawing a cumulative curve (Pareto curve)

Step 9. Drawing on the diagram of all designations and inscriptions concerning the diagram (name, marking of numerical values on the axes, the name of the controlled item, the name of the diagrammer), and data (the period of information collection, the object of research and the place of its conduct, the total number of objects of control).

After identifying the problem by building a Pareto chart based on the research results, it is important to determine the causes of their occurrence. This is necessary to solve it. When using a Pareto chart to identify performance and causes, the most common method is ABC analysis.

The essence of ABC analysis in this context is to identify three groups that have three levels of importance for quality management:

1. Group A - the most important, significant problems, causes, defects. Relative percentage of group A in the total number of defects (causes)

usually ranges from 60 to 80%. Accordingly, the elimination of the causes of group A has a high priority, and the related activities are the highest efficiency;

2. group B - reasons that in total have no more than 20%;

3. group C - the most numerous, but at the same time the least significant causes and problems.

ABC analysis allows you to reasonably determine the priorities of work on project quality management. Adjustment to the Pareto chart software

1. Step The cumulative percentage cannot be more than 100.

2. The step for the right ordinate axis is selected (set) equal to only 10%.

3. The step for the left ordinate is determined by the step specified for the right ordinate, namely, equal to 10%. And their number for the left ordinate axis is set by 10 equal values. But these values, that is, the step, is taken scaled, namely, 1: 1, 1: 2, 1: 5, 1:10 or 1: 1, 2: 1, 5: 1, 10: 1 and the number 10 multiplied by the selected value for the step of the left ordinate axis is formed for the defect, the value of which is the largest. If, for example, 77, then the nearest number is 100. Since the step will be 10. And this corresponds to the scaling requirements, namely, 1: 1. And this procedure is strictly regulated, so, for example, if this number is 20, then in this case the step will be 2. If the value is 40, then the step will be 5. Although it is allowed to use a scale of 1: 4 or 4: 1, but it is better do not use them. Scaling is an important point in the formation of an algorithm and design of a software product for building a Pareto diagram. The abscissa axis is formed by the number of detected defects, but preferably no more than 10, and is formatted with the A4 sheet width. At the same time, authors can choose a book or landscape format. But in any case, the abscissa axis is formed along the width of the sheet. Another condition that must be met when constructing a Pareto chart is that the value of other defects, taken out in their total number, must be less than or equal to it. The formation of the ordinate axis encounters difficulties if the step needs to be set less than 1.0, that is, 0.2 or 0.5 - the software product in this case does not form the axis using the specified step, it may be

necessary to use the step designation as 2, or 5 , but we could not check this version.

The program for the improved construction of the Pareto diagram for statistical research for the purpose of product quality control is designed to solve all kinds of problems associated with the appearance of defects, equipment malfunctions, an increase in the time from the release of a batch of products to its sale, the presence of unsold products in the warehouse, the receipt of complaints, etc.

The construction of a Pareto chart begins with the classification of emerging problems according to individual factors (for example, problems related to marriage; problems related to the operation of equipment or performers, etc.). This is followed by the collection and analysis of statistical material in order to identify the prevailing factors (i.e., factors with the most numerous manifestations).

With regard to the construction and use of a Pareto chart, the following can be recommended:

- it is advisable to use different classifications and for each of them draw up your own Pareto chart;

- the specific weight of the group of factors "other" should not exceed 10% of the total number of manifestations;

- it is possible to use the Pareto chart in the case when the frequencies of the manifestations of factors are replaced by monetary amounts (for example, the values of the lost profit);

- if an undesirable factor can be eliminated with a simple solution, this must be done immediately, no matter how insignificant it may be;

- the opportunity to draw up a Pareto chart should not be missed due to the manifestation of negative factors...

In a rectangular coordinate system, equal segments corresponding to the factors under consideration are laid along the abscissa axis, and the number of their manifestations along the ordinate axis. In this case, the order of the factors is such that the influence of each subsequent factor occupying a place on the abscissa does not increase in comparison with the previous factor. The result is a diagram, the columns of which correspond to the factors under study, and the heights of the columns decrease in a non-strict sense. Then a cumulative curve is constructed based on this diagram.

The Pareto chart allows you to identify the most significant factors, which makes it possible to rationally distribute efforts to resolve problems caused by the negative influence of factors. These efforts should be aimed, first of all, at limiting the manifestation of the prevailing factors (in the following diagram, they correspond to the green columns).

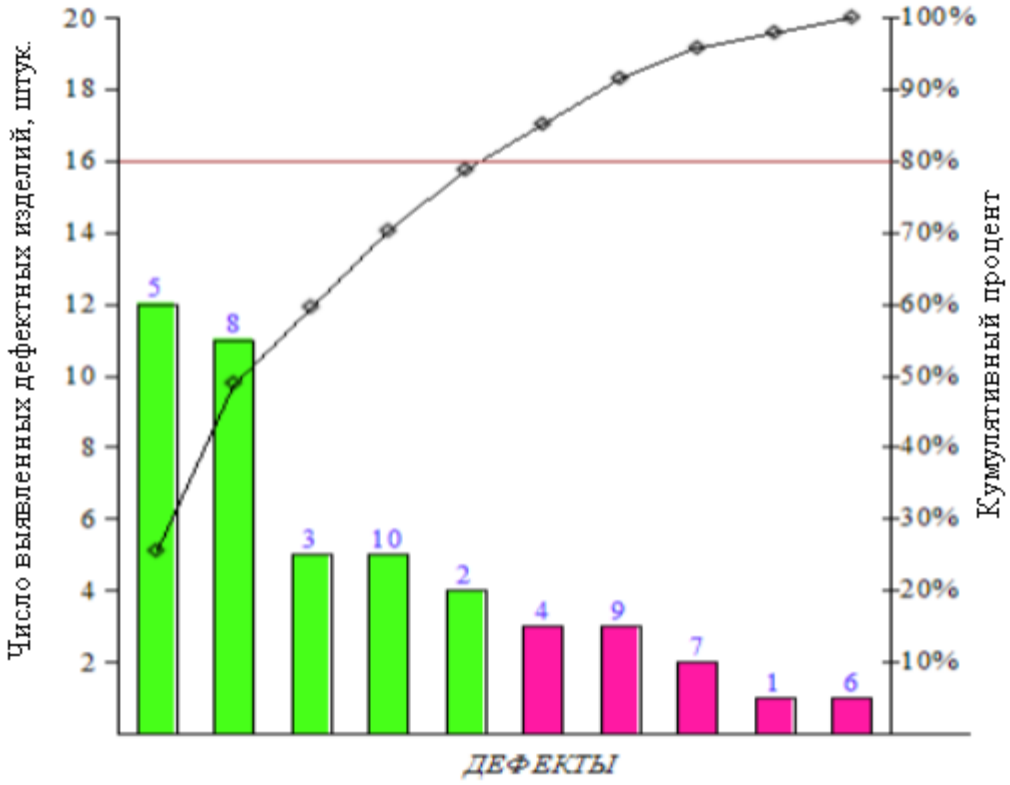


Figure 20. Example of calculation for 10 defects.

On the algorithm for constructing a Pareto chart.

Let the study of a certain batch of products show the presence of defects in it, while the i-th defect was detected once. It is required to build a Pareto diagram based on these data. The algorithm for solving the problem is described below. $np_j j = 1, 2, \dots, n.$

I. We sequentially calculate the values $\tau_j = \sum_{i=1}^{n} sign\left(1 + sign(p_i - p_j)\right), j = 1, 2, \dots, n;$

$$\eta_j = 1 + \tau_j - \sum_{i=1}^{n}\left(1 - \left(sign(\tau_i - \tau_j)\right)^2\right) sign(1 + sign(i - j)), j = 1, 2, \dots, n;$$

$$x_j = \sum_{i=1}^{n} p_i(1 - (sign(\eta_i - j))^2), j = 1, 2, \dots, n.$$

Each of the numbers of defect detections occurs in sequences and the same number of times; in this case, the Quantity is the number of the value in the sequence (in this case, the implication $x_1, x_2, \dots, x_n p_1, p_2, \dots, p_n x_1 \geq x_2 \geq \dots \geq x_n . \eta_j p_j x_1, x_2, \dots, x_n,\ j = 1, 2, \dots, n 1 \leq i < j \leq n,$ $p_i = p_j \Rightarrow \eta_i < \eta_j$).

II. We build on the plane a rectangular Cartesian coordinate system with one horizontal and two vertical axes. In this case, the vertical axes are depicted as equal vectors perpendicular to the "vector" of the horizontal axis (hereinafter referred to as GO) and plotted from some two points on the GO, which are sufficiently distant from each other. All columns of the Pareto chart will be located between the vertical axes and adjoin the GO from above. Let us describe the position of these columns on the GO. We will proceed from the fact that: a) the width of each column and the width of the gap between any two adjacent columns are equal to the same number b) the width of each of the two gaps - between the left vertical axis (hereinafter - LVO) and the first column, as well as between -th column and right vertical axis (RVO) - equal to. Let us take the points of intersection of the air defense and air defense with the HE, respectively, as zero and one on the HE. $n\varepsilon; \frac{\varepsilon}{2} n\varepsilon + (n-1)\varepsilon + 2 \cdot \frac{\varepsilon}{2} 2n\varepsilon = 1 \Rightarrow \varepsilon = \frac{1}{2n} . \left[\frac{\varepsilon}{2} + 2(j-1)\varepsilon, \frac{3\varepsilon}{2} + 2(j-1)\varepsilon\right] = \left[\frac{1}{4n} + \frac{j-1}{n}, \frac{3}{4n} + \frac{j-1}{n}\right], [\frac{4j-3}{4n}, \frac{4j-1}{4n}] j = 1, 2, \dots, n.$

III. We divide the segment of the air defense from its beginning (that is, from the common point of HE and air defense) to some point at the top of the air defense (say, one or two centimeters from the end of the air defense) into 10 equal parts. Near these divisions to the right of the air defense, we successively place the inscriptions 10% (at the bottom, not counting the beginning of the air defense, division), 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100% (at upper division). The procedure for choosing a scale on the LHO and plotting divisions on it is determined by the value (see item I). For this purpose, we calculate the following values: x_1

$$l = 10^{-[-lgx_1]-2},$$

$$t = \{-lgx_1\}, q = \begin{cases} 10l \ for \ t < lg2 \\ 5l \ for \ lg2 \leq t < lg5 \\ 2l \ for \ t \geq lg5 \end{cases}$$

(here, as usual, there is an integer part, and a fractional part of a number.There are four possible cases.$[x]\{x\} - x$).

1) We put ten divisions on the LWO opposite the divisions 10%, 20%, ..., 100% on the air defense. Next to these divisions by LVO and to the left of it, we indicate the numbers, respectively. $x_1 \geq 6. q, 2q, \dots, 10q$

2) We put five divisions on the LWO opposite to the divisions 20%, 40%, 60%, 80%, 100% on the air defense. Next to these divisions (on the LVO; to the left of it) we indicate the numbers 1,2,3,4,5, respectively.$3 \leq x_1 \leq 5$.

3) We put two divisions on the LWO opposite to the divisions 50%, 100% on the air defense. Next to these divisions (on the LVO; to the left of it) we indicate the numbers 1,2, respectively.$x_1 = 2$.

4) We put one division on the LPO opposite to the 100% division on the AA. Next to this division (on the LVO to the left of it) we indicate the number 1. $x_1 = 1$.

Note that the numbers around the LVO will always be positive integers.

IV. We build the columns of the Pareto chart. Taking into account the conclusion obtained in Section II, it remains only to determine their heights. Each of the defects has its own column, namely, the ith defect corresponds to the column with a number (see item I; we emphasize that the columns of the Pareto chart are always arranged in the order of non-increasing their heights). For each let us agree to call the unit of height the length of the segment [10%, 20%] of the air defense. From the content of clause III it follows that regardless of the value of the th column of the Pareto chart will be such units. This column must be labeled with the name of the defect with a number, $n\eta_j, j = 1, 2, \dots, n 1 \leq j \leq n\theta_{\eta_j} = j. x_1\, x_k / q\ \theta_k k = 1, 2, \dots, n.$

V. Having calculated the accumulated number of defects and the proportional values, we plot points with coordinates on the diagram (they lie on the vertical symmetry axes of the diagram's columns. The ordinates of these points are expressed in units of height). Connecting successively, we get a broken line (in this case, it is desirable to depict the points with circles of small radius). In addition, we connect the vertical axes with a horizontal line segment at the 80% mark on the air defense. The broken line and the segment should be depicted in different colors, for example, brown and yellow, respectively. We put (turns out to be a non-negative integer, less than) Introducing another notation, we set a number that

always satisfies the inequalities.Color the first columns of the Pareto diagram in the third (for example, green) color, and the rest of its columns in the fourth (say, red) color. The share of defects $S_k = \sum_{j=1}^{k} x_j\ y_k = \frac{10S_k}{S_n}\ , A_k\left(\frac{2k-1}{2n}, y_k\right), k = 1, 2, \dots, nA_kA_km = \sum_{k=1}^{n} sign(1 + sign(8 - y_k))\ mn.\ y_0 = 0, r = (2m + 1 + sign(16 - (2S_n)^{-1} - y_m - y_{m+1}))/2, 1 \le r \le n.r$

Vi. In conclusion, we note the advantages of the algorithm proposed in this paper in comparison with some other algorithms for constructing a Pareto diagram known to its authors.

a) This algorithm uses formulas containing the values of the function, which greatly simplifies the calculation procedure.$signx,$

b) In all possible cases, the air defense contains only divisions 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%, i.e. there are no divisions going beyond the limits of the range 0% 100% (and after all, the presence of such excessive divisions makes no sense for a Pareto chart).÷

c) The choice of the scale on the BOP meets the following highly desirable requirements: c1) the largest of the columns of the Pareto chart does not exceed the 100% mark on the BOP; c2) opposite this mark on the LHO there is a mark corresponding to the smallest possible (subject to c1)) number of defects, a multiple of two and (or) five.

d) In all cases, only divisions corresponding to whole numbers are applied to the LWO.

Thus, the software guarantees the researcher to obtain objective results for making informed decisions. Proof of the eligibility of using the program is confirmed by the research carried out on the analysis of the results of the activities of LLC Plant "Techmash" to identify the causes of defects in manufactured products for 2020-2021, and to develop measures to significantly reduce them. In the production process of any product, it is impossible to obtain all products of the same quality, that is, the parameters of various units of products fluctuate within certain limits. This fluctuation is caused by a complex of random and systematic reasons that operate in the production process and determine the errors of this technological process. If the fluctuation of parameters is within acceptable limits (within tolerance),

The quality of the manufactured products at the enterprise LLC Plant "Techmash" is determined by the quality of the initial products, the degree of equipment tuning, compliance with the technological regimes. In order to timely identify defects and the causes that caused it, it is necessary to carry out systematic control of product parameters, to receive and process data on controlled parameters. Using the methods of analyzing the causes of defects and defects in manufactured products and developing measures to prevent them, it is possible to find a solution to the occurrence of problems in the production process, for example, the cause of the appearance of defects.

Defect - each individual non-conformity of products with the requirements established by the regulatory documentation.

A defect can exist at every stage of the product life cycle.

Providing free approaches to the controlled parts at the design stage eliminates the need to modify the design of products for testing.

Based on the analysis of design stresses, the results of static and dynamic tests, as well as statistics of failures during operation of equipment samples of similar design, the designer must determine which highly loaded parts and assemblies are subject to NDT during operation, where are the places of possible occurrence of fatigue cracks on them and control zones ...

The designer must indicate the methods and means of NDT, including the devices for built-in flaw detection of objects, the ability to control which must be provided in the planned volume. If it is not possible to use known methods and controls, new ones should be developed and recommended.

The designer must develop technical documentation for flaw detection, including a list of controlled objects and schemes for placing them on the product, recommended methods, means and technology of control, criteria for rejection, the sequence of testing, the procedure for introducing control under the operating conditions of the product and the subsequent expansion of its volume. In addition, the duration and necessary labor costs for preparation and execution of control operations should be determined.

Work to ensure the manufacturability of products and the creation of technical documentation for flaw detection is carried out by the designer together with specialists in flaw detection, production and operation of machines - objects of control. Due to mistakes made at the design stage by the designer, defects arise in products.

The largest number of defects detected by NDT methods at Techmash LLC occurs at the stage of product manufacturing.

Consider metallurgical defects that are formed during the smelting of ingots or casting parts. The most common metallurgical defects are: shrinkage and gas pockets, cracks and inclusions.

Shrinkage cavities are a cavity formed as a result of a decrease in the volume of liquid metal when it solidifies. The reason for the formation of such a defect is a decrease in the volume of the metal during solidification.

Gas cavities are rounded cavities with a diameter of 1 ... 3 mm and more with a smooth shiny surface. The main reasons for the occurrence may be: low gas permeability of the mold and rods; poor handling of refrigerators, etc.

Cracks - These are discontinuities in the form of metal breaks. The formation of cracks in a continuous ingot is associated with stresses arising in the process of its formation, and is due to the reduced strength and plasticity of the metal in different temperature ranges.

Inclusions are of two kinds and origin: the inclusion of non-metallic particles trapped in the metal from the outside (slag, refractory, sand, graphite) and metallic inclusions (ferroalloys, sunken pieces of bars or marking bows, etc.)

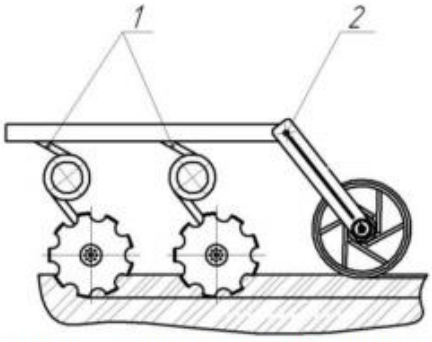
Formation of defects in the products of LLC Plant "Techmash" may arise due to a number of reasons related to the control of the process. The main factor affecting the omission of defects is the qualification, certification and training of personnel, as well as the conscientious performance of the NDT operator's work.

The most common type of defects is cracks in die-forged parts. A crack is a clear (transparent) discontinuity that runs along or through grain boundaries. Typically, cracks are caused by local overstressing of the metal during stamping or other shaping operations, or as a result of heat treatment. It is customary to subdivide cracks of such a group into longitudinal, shearing, internal and transverse cracks.

Let us consider the example of a Hoe a rotary harrow BMR, which has the largest number of defects.

The unit is designed for continuous and inter-row processing of any crops, cereals, soybeans, row crops, tobacco, vegetables, etc. Moreover, this tool is especially effective in regions where there is a lack of moisture for moisture conservation. It is used for combating weeds, incorporating crop residues into the soil.

The most common defect in this harrow is disc wedging (Figure 21).



1 – дисковые рабочие органы на индиви-
дуальных спиральных стойках; 2 – каток

Figure 21 - Schematic representation of an ICBM in profile

Jamming of the rotating disc occurs due to the failure of the bearing assembly. This is due to the fact that low-quality bearings are used for the manufacture of a disk working body. The way out of this situation can be the purchase of higher quality bearings.

The second most common defect is deformation and fractures of disks and bearing parts of metal structures. This is due to poor-quality metal processing in the process of manufacturing the part.

A defect on the surface of metal and metal products, accompanying during their heat treatment, is the formation of a decarburized layer due to the burnout of part of the carbon when the metal is heated for subsequent quenching. Decarburization of the metal surface can take place both at the stages of rolling, preparation of metal for upsetting, and during heat treatment to the appropriate strength class of finished parts. Decarburization and scale formation significantly reduces the mechanical properties in the surface layers of the metal, the surface becomes susceptible to the formation of scratches, scoring, scratches during rolling, calibration, upsetting, and thread breakage is possible during mechanical tests. The use of protective atmospheres during heating would significantly reduce the likelihood of the formation of a decarburized layer.

During heat treatment of rod parts, especially with a rod length of more than ten diameters, product warpage and distortion of the geometric dimensions of the thread are possible. It is possible to exclude such a defect only by using isothermal quenching in more viscous quenching media.

Quenching cracks in a deformed metal can appear during quenching as a result of the occurrence of high stresses of structural transformation and temperature stresses. Quench cracks usually have an irregular wandering path on the surface of the fastener. The main reasons for the appearance of temperature stresses are: rapid heating for quenching, rapid cooling in the region of martensitic transformation, a complex configuration of a product with abrupt transitions, and a significant time gap between quenching and tempering operations.

Defect control at OOO Plant Tekhmash. It is carried out by a special commission and employees

authorized by the head of the quality control department or higher managers.

Input (preliminary) control is carried out before the start of the technological process of processing or assembling items. Its purpose is to identify and eliminate the causes of marriage (poor quality of objects and tools, etc.) and thereby prevent it. This includes inspection of materials, workpieces or parts prior to processing or assembly, inspection of fixtures and measuring instruments, and inspection of setup. During the setup control, the first copies of the parts processed after the equipment setup are checked. Based on the results of this check, a decision is made whether to continue working or whether it is necessary to readjust the equipment.

During intermediate (interoperational) control, the quality of performance of individual operations (operational control) or their group (group control) is checked. Its purpose is to identify defects in the course of the technological process and, thereby, prevent labor costs for processing defective parts in subsequent operations, especially in labor-intensive and expensive ones.

During acceptance (final) control, finished workpieces, parts, assembly units of the machine are checked after the last (final) operation in this workshop, before delivery to the warehouse, or before transferring them to the next workshop, or before shipment to the consumer. Its purpose is to prevent the transfer of substandard products to the consumer.

Active control is understood as control in which quality is checked during the technological process, and the results of the control are used for the current regulation of the process. This includes monitoring the quality indicators of objects and regulating the technological process using mechanical and automatic devices built into the main equipment (indicators, pyrometers, measuring heads, etc.) and allowing control of the necessary parameters of parts or modes during processing. Active control should also include statistical regulation of technological processes, the foundations of the organization of which are discussed in the next paragraph.

Passive control includes all types of control in which quality is detected only after the end of the technological process, and operational intervention in the process is carried out after the discovery of the unsuitability of the product. This should also include checking parts with the help of technical devices that determine the actual level of their quality after manufacturing (control and sorting machines for balls and rollers for bearings, pistons, piston rings, pins and other cylindrical parts).

The number of detected defects in the forging for 2020 is shown in Table 6 and in Figure 28, the constructed Pareto chart for the identified defects for 2020, the expected number of defects in 2021 is given in Table 7, and the constructed Pareto chart in Figure 22

Table 24. -Characteristics of product defects at Tekhmash Plant LLC for 2020

The name of the defects revealed in the sold machines	The number of detected defects in the sold machines	Accumulated share of detected defects	Total number of detected defects (cumulative percentage)
Bearing failure	17	38%	38%
Jammed rotation discs	9	20%	58%
Violation of the part hardening technology	5	11%	69%
Frame deformation	4	9%	78%
Crack Disc	3	6%	84%
Other	7	16%	100%
Total	45	100 %	

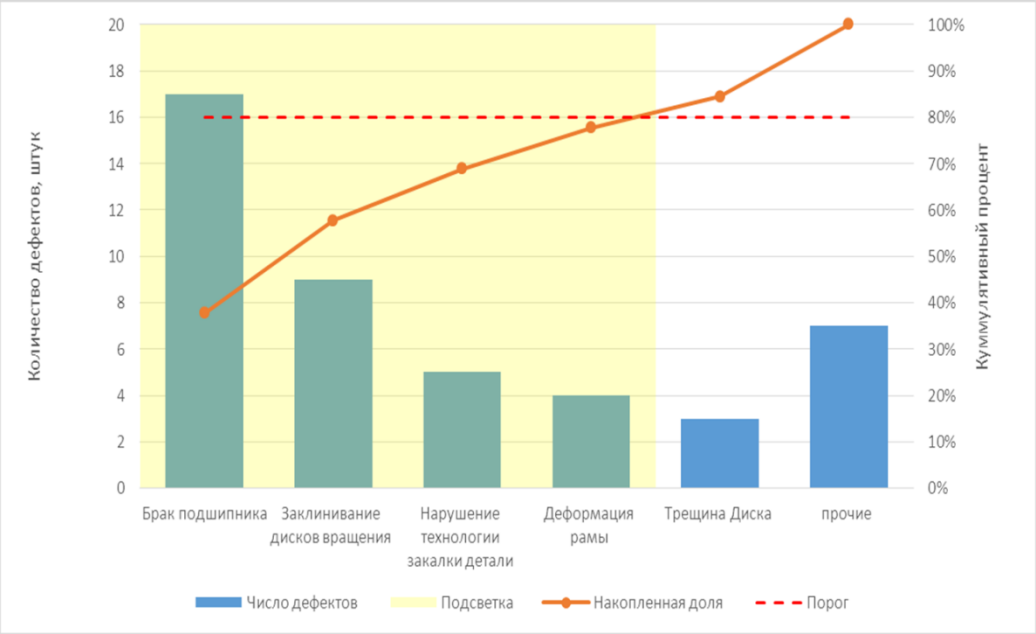


Figure 22 - Pareto chart and cumulative curve characterizing product defects identified in 2020 at LLC Plant "Techmash"

Table 25 Characteristics of product defects at Tekhmash Plant LLC for 2021 (expected)

The name of the defects revealed in the sold machines	The number of detected defects in the sold machines	Accumulated share of detected defects	Total number of detected defects
Jammed rotation discs	4	38%	38%
Violation of the part hardening technology	3	twenty%	58%
Frame deformation	2	eleven%	69%
Wheel axle deformation	2	6%	84%
Crack Disc	1		
Other	1	16%	100%
Total	13	100 %	

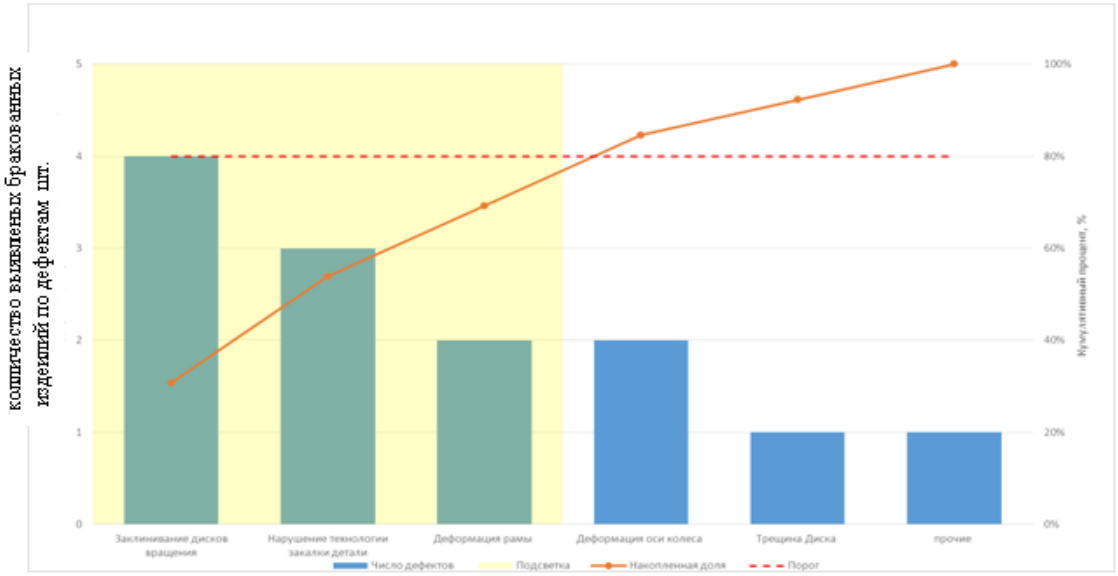


Figure 23 -Pareto chart and cumulative curve characterizing product defects identified in 2021 (expected) at LLC Plant "Techmash"

Measures to reduce the production of defective products at LLC Plant "Tekhmash". The main tasks of the control service of LLC Plant "Techmash" are: systematically, timely and efficiently control the quality of incoming materials and products, technological (installation) work, the quality of manufactured products, the technical condition of products during operation using the necessary methods and means of control in accordance with the requirement valid documentation; to prevent the transfer of defective products for subsequent technological operations or handing over to the customer; to contribute to the improvement of the quality of design, technological, installation, repair and other works; make acceptance of the performed operations and work with the registration of the necessary technical documentation and participate in the delivery of materials and products to the customer;

Control and diagnostic operations should be considered as the most important technological redistribution, ensuring quality, with all the following conclusions. The effectiveness of the final result - long-term performance of objects at minimal cost - largely depends on the correct choice of NDT. As an example, we can cite the method of testing large-diameter pipes using hydraulic presses, which is still used today, for which it is necessary to build special workshops and multi-ton test equipment. At the same time, an automated ultrasonic flaw detector allows detecting defects with greater reliability than hydrotesting, while the cost of testing is reduced by hundreds of times. Test algorithms should be formed by diagnostic technology in order to determine what and how should be applied.

It can be argued that there is not a single infallible control method. Unforeseen operating conditions may occur, therefore, diagnostic technologies should be "redundant" in relation to the use of a set of NDT methods and techniques that are different in physical essence, which would complement each other to ensure maximum product quality assurance.

The technology should provide for a range of different designs of control and diagnostic devices - from manual to automated execution with a rational combination of their use in the processes of production, testing and operation of facilities. It should have a library of algorithms and diagnostic programs executed in relation to specific products, operations and tasks of detecting defects.

The most important point - making a decision on the non-compliance of the product with the requirements and the termination of its operation or functioning - should be specially noted and scientifically substantiated in technology. The foundation of this decision is pre-assembled statistical material.

Diagnostic technologies must be tested in advance, they cannot contain unreasonable requirements in the form of "no types of defects are allowed", must work only proactively, reliably recognize a pre-emergency situation, in no way allow emergency operation of products. The main thing is not the calculation of the size of defects (defectometry), but the determination of the residual life of the test object, the degree of risk of its operation.

Organization and implementation of technical quality control is one of the constituent elements of the quality management system at the stages of production and sale of these products. The process of interaction of production factors at an enterprise, aimed at converting raw materials (materials) into finished products suitable for consumption or for further processing, forms a production process or production.

The quality of the manufactured products at the enterprise LLC Plant "Techmash" is determined by the quality of the initial products, the degree of equipment tuning, compliance with the technological regimes. In order to timely identify defects and the causes that caused it, it is necessary to carry out systematic control of product parameters, to receive and process data on controlled parameters. Using the methods of analyzing the causes of defects and defects in manufactured products and developing measures to prevent them, it is possible to find a solution to the occurrence of problems in the production process, for example, the cause of the appearance of defects.

Conclusion

The quality is "written by nature" to be at all times in the epicenter of scientific and amateurish reflections. The problem of ensuring the quality of activities is not just universal, relevant, it is strategic.

Today, and even more so tomorrow, it is important to implement one of the defining principle of production efficiency - the manufacturer produces exactly what is needed not only for domestic, but also for foreign consumers, and solving the problem of increasing the efficiency and competitiveness of the economy, and ultimately the quality of life, is impossible without implementation of a well-thought-out and competent industrial policy, in which innovations based on digital production and quality should become the priority areas of the state's economic policy (figure).

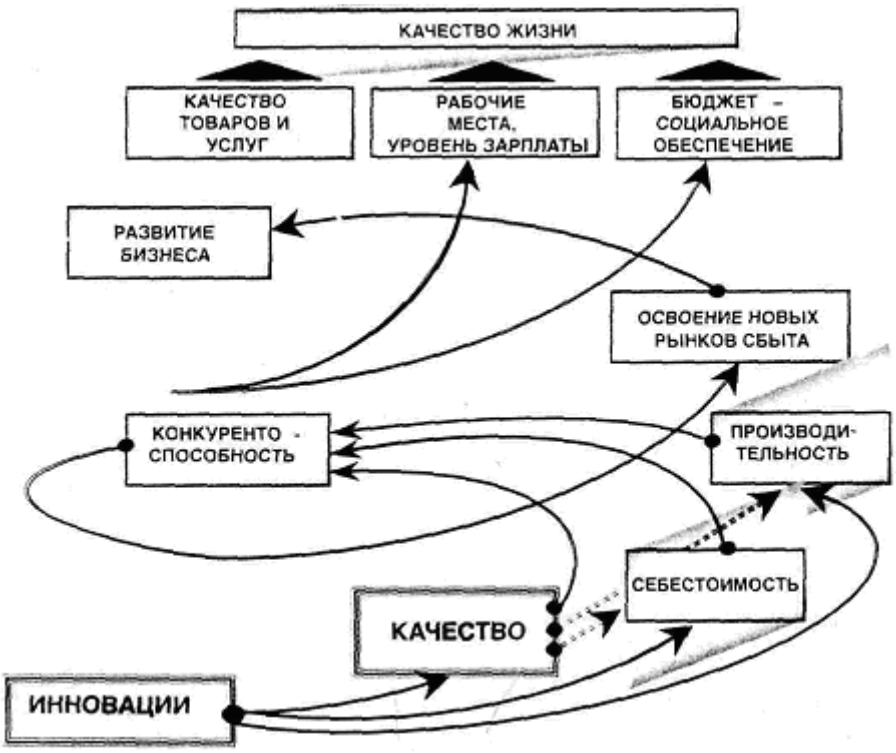


Figure 24 Innovation and quality - the road to high living standards

The problems of improving the quality and competitiveness of materials and products at the present stage of development of the Russian economy are becoming increasingly important. As the experience of advanced countries that at one time emerged from such crises (the United States in the 30s, Japan, Germany in the post-war period, and later South Korea and some other countries) shows, in all cases, the basis for industrial policy and recovery economy, a strategy was put in place to improve the quality, competitiveness of products, which would be able to conquer both domestic and foreign sales markets. All the other components of the reform - economic, financial, credit, administrative - were subordinated to this main goal.

The developed software for the formation of the technological process for the production of import-substituted products and the determination of specific reduced costs, which are the sum of current costs (prime cost) and capital investments, commensurate with the standard efficiency factor, taking into account the production program, makes it possible to calculate the static parameters of the technological process of production of import-substituted products when various forms of organization of production.The developed software for calculating cash flows from the operating activities of light industry enterprises based on assessing the degree of implementation and dynamics of production and sales of products, determining the influence of factors on the change in the value of these indicators, identifying on-farm reserves and developing measures for their development, which are aimed at accelerating turnover production and reduction of losses, which guarantees the enterprises of light industry to obtain stable TPE and prevents them from bankruptcy.

Based on the current situation in the economy of our country, in our opinion, no less significant problem in the development of the regional consumer market is the lack of a full-fledged regulatory framework that ensures the functioning of the mechanism of state regulation of the consumer market in the regions. Proceeding from this, it is the state and regional intervention that should correct the situation on the market of domestic products of light industry enterprises in the regions, and thus there will be an opportunity for the development of production of competitive and import-substituting products.

The implementation of the planned measures will lead to covering the deficit for all types of products, will ensure an increase in labor mobility in the Southern Federal District and the North Caucasus Federal District and a reduction in negative processes in the labor market, as well as a stable balance of interests of consumers, employers and municipal, regional and federal branches of government. For the successful implementation of all of the above measures, the interest of the regional authorities in the development of production of competitive and import-substituting products, reduction in prices for components and energy costs and benefits for the transportation of products produced by enterprises in the regions of the Southern Federal District and the North Caucasus Federal District is most necessary.

Therefore, only a stake on innovation, quality, and competitiveness of products and services should be the basis of the industrial policy pursued at all levels yesterday, today and, moreover, tomorrow.

Othe economic effect of work results is limiting, which consists in increasing labor productivity, the level of mechanization of production, lowering the indicators of work in progress and the cost of digital production. An accessible tool for digital production technologists is proposed to rationalize the design of technological processes, which allows an enterprise to form a competitive assortment and predict the maximum income from the production of import-substituting products.

An assortment policy has been developed for the formation of competitive products, taking into account factors affecting consumer demand: compliance with the main fashion trends, taking into account the economic, social and climatic characteristics of the regions of the Southern Federal District and the North Caucasus Federal District, the production of which using modern innovative technological processes, as well as to meet the demand of an elite consumer, with the use of manual labor create the basis for satisfying the demand for footwear for buyers in these regions.

Innovative technological processes have been developed for the production of import-substituting products using modern technological equipment with advanced nanotechnologies, which form the basis for reducing the costs of import-substituting products and ensuring their competitiveness with the products of leading foreign companies, with the possibility of a wide-range production of products not only by type, but also by sex and age. groups, which guarantees her demand in full.

The layouts of technological equipment are proposed, on the basis of which it is possible to form a technological process for the production of import-substituting products with an optimal volume of output, taking into account the production area and the form of organization of digital production.

Software has been developed for calculating cash flows from the operating activities of light industry enterprises based on assessing the degree of implementation and dynamics of production and sales of products, determining the influence of factors on the change in the value of these indicators, identifying on-farm reserves and developing measures for their development, which are aimed at accelerating turnover production and reduction of losses, which guarantees enterprises to obtain stable TEP and prevents them from bankruptcy.

Software has been developed for the formation of the technological process of digital production and the determination of the cost of production of import-substituting products. A computer simulation model has been implemented that describes the dynamics of the process of manufacturing import-substituting products. The proposed methodology and software implemented on this basis can reduce the duration of technological preparation of production and increase, due to the rationalization of the technological process, the specific consumer effect of import-substituted products.

The proposed technique makes it possible to reduce the duration of technological preparation of digital production and reduce the time of expert work while maintaining the required depth and validity of engineering conclusions. The economic effect of the research is expressed in the intellectualization of the technologist's labor with a reduction in time spent on developing the range of manufactured import-substituting products and assessing the efficiency of technological processes in comparison with a typical economic calculation of the total cost of manufacturing such products.

The analysis of the influence of the forms of organization of digital production and manufacturing technology on the cost of import-substituting products is carried out using the example of the technological process of manufacturing popular products, taking into account the shift program. Theoretical dependencies have been obtained to assess the influence of the factor "organization of production" on individual calculation items as a whole and other technical and economic indicators in order to prevent enterprises from bankruptcy.

Thus, all this in aggregate will provide enterprises in the regions of the Southern Federal District and the North Caucasus Federal District with a stable position both in the domestic and in the markets of the near and far abroad. All that is needed is the goodwill and interest of all participants in this process.

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Sanjar Xudoykulovich Mardov
Tashkent Institute of Architecture and Civil Engineering
Teachers of the department of Engineering Graphics and Computer Design

THE PRACTICAL IMPORTANCE OF GRAPHIC PROGRAMS AND THEIR DESCRIPTIONS IN THE DEVELOPMENT OF STUDENT SPACE IMAGINATION IN TEACHING THE SUBJECT OF CONSTRUCTION DRAWING

Abstract*: the course of building drawing at the university is aimed at the formation of the graphic culture of students, as well as the creative potential of the personality. Most effective work in this area, especially in teaching construction drawing, is achieved through the use of modern graphics software. Among the graphics programs in the field of architecture in the field of architecture, ArchiSAD is the most advanced, which is an effective way to illustrate the day of a subject by transitioning to a three-dimensional state of drawings in the eyes of students. Therefore, the practical significance of graphic programs and their descriptions occupy a special place in the coverage of the whole essence of this science.*

Key words*: graphic education, construction drawing, graphic applications, graphics, information and communication, spatial imagination, architecture, drawing, didactics, engineering graphics.*

Language*: English*

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Scopus ASCC*: 1700.*

Introduction

As we know, with the advent of book publishing in Europe in the 1840s, a new phase of reading culture began. Book education has gradually squeezed out all traditional forms of personal communication and laid an important foundation for mass education. At the same time, a new branch of science has emerged that is perfect for us in all respects - didactics, which in turn has formed a new image of the teacher, which in the form of textbooks convenient to teach all the innovations in science.

The emergence and rapid development of information and communication technologies that allow to remember, store, transmit and change information in the history of mankind will lead to the creation of a new educational paradigm of the XXI century - information culture. At the same time, these processes, in turn, increase the possibilities of student learning activities indefinitely and change the role of the educator. It not only conveys knowledge to students, but also serves as a "lottery" in the sea of information, helping them to select the necessary information, understand it logically and use it effectively in their professional activities that meet the competence principles of modern education.

The current stage of development of society requires new requirements for the scientific level and competence of the specialist. In the context of increasing the amount of knowledge provided to students, the reduction of classroom classes leads to further improvement of the educational process. Improving the efficiency of the educational process is one of the main tasks of higher education, which can be solved through the use of modern information technology in the educational process.

Computer graphics tools have radically changed the approach to teaching methodology: visualizing invisible processes and events such as magnetic and electric fields, chemical reactions, etc., allows them to better observe and understand.

The effectiveness of the use of computer technology in education has been scientifically proven

by PF Anisimov, PM Bitsirkin, AV Gololobov, YF Katkhanova, AM Leybov, AV Sobolova, F. Liarokapis.

Computer technology reduces the time required for mechanical repetition in the learning process. For example, instead of writing theoretical explanations of a lesson, students can copy the textbook to data carriers, which saves a certain amount of lesson time. The teacher's guidance and advice will be needed when completing schedule or course work, as well as course and diploma projects. The questions asked by the students are repeated from year to year. If these questions are included in the e-textbook, the time allotted for referrals and counseling will be reduced. If the test written control is organized using modern computer tools rather than the traditional method, it will save another part of the educator's time.

The use of computer technology in the discipline of "Construction Drawing" is developing day by day. The growing demand for computer graphics in recent years requires a more in-depth study of the subject of "Construction Drawing". Observations confirm that the science of computer graphics is being introduced as a new subject for technical directions in higher education. The science of computer graphics is based on the laws of descriptive geometry and engineering graphics. Trained engineers-teachers are required to independently perform design work on computer tools and graphics programs.

However, the above-mentioned research does not focus on the use of graphics programs (ArchiCAD) in construction drawing and their integral connection. In some works, a number of recommendations are given for the use of AutoCAD software in graphic design in construction drawing. To date, the use of this program in the field of construction drawing is not considered an effective tool. There are a number of factors to this:

- ArchiCAD software is mainly suitable for two-dimensional drawings;
- In ArchiCAD program two-dimensional drawings are performed separately (2d and 3d position of the object);
- It will be difficult for all students to understand the drawings drawn separately;
- ArchiCAD requires access to its functional commands to change the existing standard characters;
- The number of standard symbols in ArchiCAD is very small and they are also limited;

Within graphics programs, many programs have features that allow you to draw both 2d drawing and 3d model views at once. But most graphics programs will include state-of-the-art standards, some of which will not be available if some can be modified. This condition causes some inconvenience.

There are some BIM programs that are specifically designed for the construction industry. These are ArchiCAD, Revit, Lira, Grasskoper and others. Of these programs, the ArchiCAD graphics program is the most convenient for explaining topics in the field of construction drawing. The following factors serve as a basis for this:

- ArchiCAD graphics software can work on computers that are not very powerful;
- Light performance of ArchiCAD (works the same in 2d and 3d drawings);
- Create both 2d and 3D drawings in ArchiCAD;
- The commands in the command panel are linked to the construction area;
- Easy to change the parameters of the symbols;
- Availability of the function of conversion of finished 3d models even in 2d case;
- Automatic execution of simple and complex cuts;
- Easy connection of models from elsewhere to the standard library and the ability to change their parameters as standard;
- Possibility to collect the prepared documents in one project album;

No scientific work has been done on the capabilities of the ArchiCAD graphics program and its integral connection with the drawing sciences. Only Russian experts have written a book about the convenience and capabilities of this graphics program. A. L. Lansov, Titov S., N. Malova, A. Dneprov, P. Vasilyev, E. Kustova, O. Ivanova, A. Orlov, K. Gleni, D. Ridder, V.G. Proxorskiy, E. Felistov, G.A. Jadayev described these scientists in detail in his book on the capabilities of the ArchiCAD graphics program.

In higher education institutions where the science of construction drawing is taught, it is possible to see the increasing practical significance of the science by introducing and multiplying computer graphics topics into science programs. Nowadays, science specialists are required to use computer literacy and graphics software. Using computer graphics in educational processes:

- spatial imagination develops;
- mastering rates will be high;
- the duration of memory storage increases;
- develops creative and logical thinking;
- new projects and opportunities for their creation;
- Provides some convenience and facilitation for students in performing graphic work related to construction drawing.

We know that organizing drawing lessons using graphic software and multimedia electronic textbooks has several advantages over teaching in traditional methods. They are:

- The quality of the course is at the desired level;
- Information on the subject is clear and concise;
- Drawings and objects related to science and to be explained are made in front of students with the help of computer graphics;
- will be able to see the 3d model of the constructed building in six views or in four views at once and clearly see the model from different angles;

- the ability to make simple and complex cuts on the finished object and see these cuts at once;

- the ability to explain the lesson in a short time;

- The availability of glossaries for lectures on the topic, sets of assignments, test questions of different levels, terms in science can be used as an aid.

Passing lectures of variable type; training and retraining of teachers depending on the level of special, methodological and ICT competence; It is necessary to develop and apply in the educational process the scientific and methodological basis for the use of multimedia teaching systems of lectures [115, p. 18], which have methods of experiential assessment of the activation of learning activities of students in the report "Multimedia".

Multimedia tools have significantly expanded the visualization of the learning process: the use of models, graphics, colors, sound, video technology. This diversity allows for the modeling of a variety of learning situations, including learning games. In an effort to improve the quality of knowledge of future graduates, engineering graphics teachers strive to use a variety of technologies using a personal computer in learning situations.

During the course of construction drawing, students should draw a drawing on the board on the board and copy it into their notebooks. But often in construction drawing, it is not enough to show a single drawing on the board. In this case, the educator needs to use pre-prepared drawings. In addition, using the animation capabilities of graphics programs, it is important to show the drawings that have not yet been shown on the board, and to leave a deeper imprint on the essence of the topic in the minds of students. This in turn simplifies the explanation of complex topics and increases comprehensibility.

Creating a theme essence using computer graphics has the following advantages:

- Ability to work with several drawings simultaneously using graphics programs;

- simultaneous use of the drawing as a visual material;

- The quality of visual information on the screen is higher than the information on the auditorium board;

- Ability to simultaneously present proof of two-dimensional drawings in three-dimensional drawings;

- Materials for the department of construction drawing are easier to master due to the high visibility of the report;

- the possibility of accurate drawing of symbols in construction drawings;

- The text of the lecture will be complete for students;

- students have a better understanding of the drawings on the topic through 3D models;

- the speed of narration is higher than that of a normal report;

- if any student later has a question, the teacher can easily return to the previous drawing step by step;

- The similarity of the electronic lecture to the traditional lesson increases the interest in it, promotes the development of spatial thinking.

In addition to orthogonal drawings, the use of three-dimensional models of geometric objects and animated rollers helps to engage students emotionally in the process.

According to T.I. Tatarinseva's research, teaching using animation and other graphic information provides the following opportunities:

- increase information retention by 10%;

- increase the reception (understanding) of information by 30%;

- Increases the student's involvement in the learning process;

- Reduces training time by up to 50%;

- The use of images allows to increase the efficiency of the learning process up to 89%;

- Animations significantly improve data perception compared to statistical images.

According to V. Knyazikov, the use of information technology in the educational process implies the following principles:

- expediency (the use of computer technology should be justified in each case, based on methodological and practical needs);

- dynamism (gradual introduction of graphics and other programs throughout the learning process).

The traditional method of teaching using pencil and drawing tools is a thing of the past. In the training process, after obtaining a paper sketch of the studied detail, it is more expedient to create a three-dimensional electronic model of the detail than to make its working drawing on paper in the traditional way. The model obtained in the automated design program allows you to perform working drawings in accordance with the Unified System of Design Documentation of the part (KHYaT) and revise them in accordance with the requirements of international standards.

The use of graphics programs in the study of engineering graphics helps to develop students 'research, enhance students' use of theoretical and practical knowledge. These are the main tasks facing higher education today.

Today, there are many different graphics programs that allow you to create electronic models of plans in construction drawing or a number of construction-related items. BIM and Autodesk, two of the companies that create graphics applications that allow the creation of such models, have taken the lead. Modeling such objects in the engineering graphics sciences helps them to be better understood by students and significantly increases visibility. Demonstration is a very important link, especially for the science of construction drawing.

In the process of developing education, a skilled educator has the opportunity to implement a number of effective objectives, that is, the main assistant is an electronic textbook. The e-textbook is very effective, especially in the field of construction drawing. The reason is that animated videos, electronic posters turn out much better and clearer than the rest of the areas of drawing on topics related to construction. Because the animations on the construction theme are examples of objects that students have seen and encountered throughout their lives, students will find it easier and quicker to understand, which is an important step in achieving the goal set by the educator.

In addition, the e-textbook, prepared using modern computer technology, has a number of advantages, as well as the ability to solve problems that do not depend on the teacher, as well as replacing the traditional printed textbooks that we read. For example, if a teacher asks a question after drawing a diagram explaining a topic during the lesson, the student will not be able to go back to any stage of the drawing, as a result, students' mastery will decrease. In the electronic textbook, animated drawings have the ability to do this, as well as to show a clear view of the drawing.

Advantages of the electronic textbook:

- selection functions of materials;
- View animated materials in the desired speed sequence;
- Easy transition from one material to another;
- Use the textbook at any time and place;
- Simultaneous consolidation of textbook information through video clips;

The introduction of three-dimensional modeling computer technology in the educational process requires a reconsideration of the established traditions of teaching the science of engineering graphics. The most complete, accurate, and visual source of information about an object is its volumetric model. If necessary, design documentation can be submitted on electronic or paper media using it.

According to VA Nikolaev and AD Menshikova: “The main purpose of the three-dimensional system is to reduce time, improve the quality and feasibility of design results, automate documentation, improve the quality of design management. The use of automated design systems (CAD) will free the manufacturer from time-consuming repetitive drawing work, as well as simplify changes in product design.

Today, automated design systems are capable of not only 3D modeling, but also 4D modeling, i.e., parameterization, which significantly expands the scope of use. For example, the AutoCAD system is widely used in the education system: it allows you to effectively conduct training on topics such as connections, views, cuts, cuts, assembly drawings, detailing. In addition, the system allows the development of projects of machines and mechanisms, buildings and structures. We do not always have the ability to demonstrate a particular learning object in a natural way, a virtual demonstration provides such an opportunity.

With the advent of the automated design system, many universities have begun to consider eliminating graphic geometry completely or partially in their curricula. More and more people in the engineering graphics sciences are recognizing the need to look for alternatives to descriptive geometry to develop spatial imagination.

AS Smirnov thinks it's too early to turn off the handheld graphics:

“Because it’s not photographic, it’s conditionally accurate, so it’s much more organic than a computer. The paradox is that hand graphics are humane, free and mobile in content, closer to nature, more environmentally friendly than computer graphics, and therefore something more modern. ”

NV Fedotova: "We believe that with the development of three-dimensional (3D) technology, the geometry of the drawing should be modified, the proportion of hand-drawn drawing should decrease."

In order to increase the effectiveness of education, computer technology should be applied organically to the learning process and traditional methods of learning. The rational introduction of modern computer technologies in the departments of engineering graphics not only combines mechanical, conventional handicrafts in the field of drawing geometry and drawing sciences, but also helps to develop students' creative and cognitive activity. That is, the combination of traditional technologies of graphic training and modern information technologies is an important principle in the learning process.

In all developed and developing countries, the application of an integrated approach to science is still one of the main pressing issues, so the role of computer graphics in the teaching process is changing significantly. Computer graphics is not only a source of learning for students and teachers, but also a basic learning tool. Because computer graphics is becoming a major tool in students ’graphic preparation. The reason is that through computer graphics, the spatial imagination of students is emerging as a key factor in the effective and rapid development. All of this is our main goal, which is to revive the learning process, to motivate students to quickly and perfectly understand the essence of the topic.

In short, the essence of the topics mastered in the science of computer graphics construction drawing can be used as an object of study for electronic drawing, as well as as a tool in teaching the science of drawing geometry and drawing. This means that students from teachers of higher education institutions not only work in an automated design system, but also develop the skills to effectively use the capabilities of these software products in their future careers.

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Nodira Sharifovna Khodjaeva
Tashkent State Transport University
Senior teacher Department of Informatics and Computer Graphics
Tashkent, Uzbekistan

Nasiba Sharifovna Yunusova
Tashkent State Transport University
Doctor of philosophy, assistant professor,
Tashkent, Uzbekistan

SPIRITUAL AND MORAL EDUCATION OF YOUTH IN MAKHALLA

Abstract: *Mahalla, being a model of self-government, carries out educational work, relying on the customs and traditions of the people, on national attitudes. In addition, young people are brought up by the teachings of the mahalla elders, based on the personal example of adults, and the solidarity of the mahalla members.*

Key words: *Makhalla, religious tolerance, national values, multinationality, multiconfessionalism.*

Language: *English*

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Introduction

After Uzbekistan gained state independence, local self-government was an integral part of the entire system of government in the republic. Playing a role in the entire system of government of the Republic of Uzbekistan, local governments are nevertheless authoritative state authorities.

The word that refers to one of the most characteristic personifications of local self-government - "mahalla" - is translated from Arabic as "community", "local community"[9].

In Uzbekistan, the most ancient and unique national democratic institution of citizens' self-government is the makhalla - a unique form of social self-organization of citizens. Thanks to the makhalla in our country, for centuries, special principles of motivating the social and economic behavior of the population, respect for social values, and ethics of relationships have been formed and preserved in our country, which guarantees the unconditional fulfillment of obligations and responsibility to society. All this, coupled with the high level of trust between citizens, which is observed in makhallas, is a necessary condition for the formation of civil society. Based on this, it can be stated that the makhalla is the foundation, the foundation on which a strong civil society is formed in the country. As Max Weber said, traditional and modern elements of society are the "ideal type". [1]

That is why in our country, from the first days of independence, systematic and consistent measures have been taken to strengthen and develop the legal foundations of the makhalla's activities, to strengthen it as an integral part of the social, economic and spiritual life of society, the most important primary link of public self-government, which has a powerful creative potential. Today, there are about 10 thousand citizens' gatherings in the country, in the activities of which almost the entire population of the country is involved.

The importance of the makhalla is increasing in the further deepening of democratic processes. Using this institution as an example, we can also trace the phased implementation in practice of the main principle of large-scale democratic reforms being carried out in our country - "From a strong state to a strong civil society." If at the beginning of independence this institution performed only 2 tasks, today the makhalla performs more than 30 functions

of a socio-economic nature, which were previously within the competence of local government bodies.

Today, a variety of socio-economic issues are being resolved here - solving problems of employment of the population, especially among young people, by creating small, family enterprises and organizing homework, rational and effective use of household plots, issuing benefits to socially vulnerable segments of the population, improving the environmental situation and many others. In other words, life itself has proved that makhalla is an important means of enhancing public participation in decision-making, raising political and legal culture, and legal awareness of citizens.

It preserves and enhances the rich cultural heritage of its ancestors, actively participates in the formation of a strong and healthy family. And the experience gained in Uzbekistan in the development and strengthening of two most important social institutions - "makhalla" - the basis of civil society and "family" - the basic unit of society, is also of interest to the international community [2].

Main part.

Spiritual and moral education of the younger generation in the context of globalization is an important factor in the development of society. The most important events in the life of three generations of an Uzbek family take place with the help and direct participation of the makhalla. Historically, the mahalla has always been and remains an important body in solving various issues related to everyday life, as a traditional self-government body at the street level in cities and villages of Central Asia. The makhalla plays a special role in the spiritual and moral education of young people. “Mahalla is a father and mother for everyone,” says popular wisdom, and today it remains the center of family, household and religious rituals and holidays. [3]

Not only Uzbek families live in the mahalla, but also families of many other nationalities belonging to various religious confessions. Here, the best traditions of Uzbeks are carefully preserved and passed on from generation to generation: respect for the elders, respect for the younger, cultural and religious tolerance. Multinationality, multiconfessionalism is a historically formed, conditioned reality. It was the waved in this regard that became the school of life in all senses, which forms the moral character of a person. Here they rejoice together, the whole world rush to help in difficult times, arrange khashar and help build a house.

People say: “For one child, seven neighbors are parents”, since ancient times the makhalla has been taking an active part in shaping the personality of young people. An individual, based on its scientific and theoretical concepts, can deny the scientific and educational experience that exists. For example, Karl Popper's critical rationalism and F. Nitsche's nihilism. But, the people on these roads do not walk; they are characterized by traditions and enlightenment of their people.

Mahalla is, first of all, a healthy social environment. The public opinion of the makhalla has a very large force of influence, which regulates the behavior and relationships of the members of the makhalla. In this sense, the makhalla, according to the First President of Uzbekistan I.A. Karimov, there is a real school of democracy.

The international scientific and practical "round table" organized in Samarkand by the Makhalla Foundation, the Academy of Public Administration and the Institute for Strategic and Interregional Studies under the President of the Republic of Uzbekistan, the Independent Institute for Monitoring the Formation of Civil Society in cooperation with the Universities of Tsukuba and Waseda (Japan) was dedicated to makhalla issues. It was attended by scientists and experts from Japan, South Korea, Germany, China, USA, Great Britain and other countries, as well as representatives of the parliament, government and public organizations of our country.

Communities in the countryside, communal, street, block, guild organizations of self-government are historically important as hotbeds where the "fire" of personal freedom, publicity, the right to choose, participation in the collective determination of common affairs, etc. was maintained. According to famous scientists Donald S. Carlisle and L. Levitina: “It is in the local community that the power of peoples' freedom lies. Local communities play the same role for the establishment of democracy as elementary schools do for science. They open the way for the people to freedom and teach them how to use this freedom. Without local self-government, a nation can elect a parliament, form a free government, however, it will never acquire the true spirit of freedom. “According to British expert Bernadette Mill, the election of the chairman of the makhalla through elections makes this civic institution more transparent and democratic. “I also see positive changes and growth in your legislation in relation to public institutions. The adoption of the new edition of this law will become a new page in the development of civil institutions; will radically affect the quality of their work and importance in the country” [4].

Bernadette Mill, representative of the London Waltham District Council (UK): - The Mahalla is a completely unique public institution that builds its work in a modern new concept; it is an institution of a new formation.

The makhalla has tremendous opportunities for carrying out ideological work. The makhalla develops such qualities as respect for national values, mercy, upholding the honor and dignity of people and countries [5].

Ideological work in makhallas can be carried out in the following forms: organization of educational

courses; providing assistance to families in need during traditional holidays and events; encouraging talented youth, increasing the activity of women; preventing injustice in the makhalla environment; using the possibilities of the media for educational work; establishing contacts with religious institutions, mosques, joint organization of events; organization of "Family Universities" for parents; improving relations between different generations.

Advertising, organizing various courses, organizing psychological assistance to families, supporting entrepreneurship, using teahouses in educating the population and, above all, young people, monitoring public opinion on makhallas can also be used as means of influence [12]. Thus, the makhalla can turn into a “school” where the ideological education of citizens, especially young people, is carried out. The Action Strategy adopted in 2017 plays an important role in the life of our country. But there is a need to follow some of its instructions more deeply. In particular, the document set out the path of decentralization of state executors. The appeal acknowledged that the decisions taken by government agencies are still highly centralized. In order to address this issue positively, it was declared that "the neighborhood is the light of our society and a mirror of conscience" and "... leaders at all levels must come down and study the problems in the community and find solutions to them, to ensure the results that people feel" instructed [6].

The renewed policy of the new Uzbekistan is also based on such lofty ideals as the promotion of human dignity, the unconditional provision of justice and the rule of law in society.

2020 was a testing period for the people of our country. Nevertheless, we will remember it as a year of significant events in the life of Uzbekistan, a new stage of development. Decisions concerning the life of the country were made in consultation with the people. Wherever he went, the head of our state talked to the people and paid special attention to their desires, interests and problems.

Poverty, which is a characteristic of the economic situation of any individual or social group, means that people are able to meet a certain amount of the minimum needs necessary to maintain life, ability to work and leave offspring. “Poverty” is a relative and ambiguous concept that depends on the general standard of living in a particular society. In our opinion, it is determined separately based on the level of socio-economic development of the country, consumption and income of the people.

In the regions, the first practical work on poverty reduction will be carried out in the form of "makhallabay". Including: Based on the study of the living conditions and social status of each household and family in the makhallas, an initial list and makhalla passports will be formed; by dividing this segment of the population into groups that need direct financial and intangible assistance or whose income can be increased through vocational training and entrepreneurship training, as well as the identification of the necessary resources and measures based on the specifics of the regions [7].

On the basis of the measures taken to ensure employment and social support in the event of a pandemic, each sector leader has established a book to support needy families - "Iron Book" [8].

In 2021, more than a thousand vocational training centers will be established in the makhallas. At the same time, up to 1 million sums will be subsidized to training centers for each person trained in the profession, for which 100 billion sums will be allocated from the budget. Citizens who want to start their own business after completing training courses at vocational training centers will receive subsidies of up to 7 million sums for the purchase of equipment.

Conclusion.

Improving the state youth policy is the upbringing of physically healthy, spiritually and intellectually developed, independent-minded young people devoted to the Motherland with firm views, increasing their social activity in the process of deepening democratic reforms and the development of civil society.

In the rule of law and civil society, the makhalla becomes an effective social environment for solving economic, socio-political, cultural and educational problems in the corresponding territory, as well as in the course of educating people, especially young people, a sense of respect and mercy towards each other, creating atmosphere of friendliness and harmony [11].

And so, the makhalla, being a model of self-government, carries out educational work, relying on the customs and traditions of the people, on national attitudes. In addition, young people are brought up by the teachings of the makhalla elders, based on the personal example of adults, the solidarity of the makhalla members.

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Dilmurod Yuldashevich Turdimurodov
Termez State University
Lecturer, Department of Sports Management
Termez, Uzbekistan
profboks2020@gmail.com

WILLED QUALITIES OF A PERSONALITY AND WAYS OF THEIR FORMATION IN SPORT

Abstract: *The basis of sportsmanship has long been identified three types of athlete training - physical, technical and tactical. In their totality and mutual connection, they ensure the achievement of high sports results. All three types of training are permeated with psychological content, which requires the participation of certain psychological processes - specialized actions, attention, thinking and their high skill. This causes the need for a psychological study of sports activity, and at the same time to develop methodological methods for the formation and development of specific mental functions for it.*

Key words: *personality, volitional qualities, psychological preparation, actions, thinking, sports, formation.*

Language: *Russian*

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ВОЛЕВЫЕ КАЧЕСТВА ЛИЧНОСТИ И ПУТИ ИХ ФОРМИРОВАНИЯ В СПОРТЕ

Аннотация: *Основой спортивного мастерства давно выделяют три вида подготовки спортсмена - физическая, техническая и тактическая. В своей совокупности и взаимной связи они обеспечивают достижение высоких спортивных результатов. Все три вида подготовки пронизаны психологическим содержанием, которое требует участия определенных психологических процессов - специализированных действий, внимания, мышления и их высокого мастерства. Это вызывает необходимость психологического изучения спортивной деятельности, а вместе с тем и разработать методические приемы формирования и развития специфических для нее психических функций.*

Ключевые слова: *личность, волевые качества, психологическая подготовка, действия, мышление, спорт, формирование.*

Введение

Волевая подготовка спортсменов не охватывающих значения психических функций, важность его развития и совершенствования которых все более и более осмысливается тренерами и спортсменами, является как крайняя необходимость условий для успеха в спортивной деятельности. Так в психологии спорта появилась новая проблема - психологическая подготовка спортсмена [1, с. 47].

Сначала психологическую подготовку спортсмена понимали как подготовку спортсмена к следующим значениям. При этом особое внимание обращали на воспитание у спортсмена способности преодолевать негативное эмоциональное состояние, характерное главным образом для периода значение, на формирование у спортсмена наибольшей готовности к максимальным волевым нагрузкам для преодоления трудностей, возникающих в процессе общей борьбы, на возбуждение активного стремления к победе и в связи с этим возникновения у спортсмена чувство уверенности в своих силах [2, с. 410; 3, с. 65].

Было доказано, что психологическая подготовка к следующим значениям является лишь частью общей психологической подготовки спортсмена и ее эффективность в пониженном степени обуславливается успешностью общей психологической подготовки спортсмена.

В связи с этим этапы в спортивной тренировке разделяют на 2 раздела психологической подготовки:

а) общая психологическая подготовку спортсмена;

б) психологическая подготовка спортсмена к следующим соревнованиям.

Эти разделы психологической подготовки взаимосвязаны, однако они отличаются значительными и специальными особенностями, которые необходимо учесть в методике спортивной тренировки [4, с. 22; 5, с. 1350].

Общая психологическая подготовка спортсмена должна быть поставлена в один ряд с физической, технической и тактической подготовкой. Она направлена на решение задач не только спортивного, но и к подготовке их к следующим соревнованиям.

К специальным (с сравнением по физической, технической и тактической подготовке) задачам общей психологической подготовки могут быть отнесены следующие:

1. Воспитание нравственных качеств и свойств личности спортсмена: коллективизма, разносторонних качеств, правильного отношения к спорту и других качеств характера личности, как важная основа успеха в спортивной деятельности.

2. Развитие процессов воздействия, в частоте формирования и совершенствования специальных видов воздействия, таких как "чувство времени", "чувство дистанции" и т.д.

3. Развитие внимания, в частоте его чувства, уверенности, переключение с одного объекта на другой, скорости мобилизации, способности спортсмена противостоять различным препятствиям.

4. Развитие наблюдательности, умение быстро и правильно реагировать по обстоятельству в спортивных соревнованиях.

5. Развитие памяти и воображения, в частоте способностей точно запоминать, быстро и правильно применять тактические приемы и комбинации и т.д.

6. Развитие последовательно - действенного мышления, способности быстро и правильно оценивать ситуацию, принимать эффективные решения и контролировать действия.

7. Развитие способностей мобилизовать эмоции, направленные на решение спортивных задач, способностей управления своими эмоциями в процессе спортивной деятельности.

8. Развитие волевых качеств спортсмена в отношении с требованиями волевой подготовки [6, с. 62; 7, с. 12; 8, с. 76].

Значение общей психологической подготовки спортсмена может быть показана на примере развития психологических особенностей его "спортивной формы".

Участие в соревнованиях требует от спортсмена соответствующей физической, технической, тактической и волевой подготовки и как их следствие, так называемой "спортивной формы" или состояния тренированности. Когда спортсмен находится в нормальной "спортивной форме", его волевые усилия во время соревнований по своим структурным психологическим особенностям направлены на максимальное выявление двигательной энергии в полном отношении с количественными и качественными особенностями производимых и закрепленных в процессе тренировки динамических стереотипов спортивной действия [9, с. 43; 10, с. 382].

Достигнутую в процессе тренировки "спортивную форму" не всегда удается сохранить во время соревнований. В первую очередь это объясняется тем, что забота о поддержке "спортивной формы" участниками соревнований приходится в условиях деятельности, требующих от них максимальных, физических и психических нагрузок.

"Спортивная форма» может быть значительно ослаблена и даже полностью разрушена под влиянием двух видов негативных факторов, которые вызывают отрицательное воздействие на ЦНС в момент соревнований - так называемых стрессов и психологических барьеров.

Важное значение в воспитании соответствующих волевых усилий имеет также соревновательный опыт, который заставляет подавлять соответствующие мысли, концентрировать внимание только на основных спортивных действиях [11, с. 7054; 12, с. 781; 13, с. 1322; 14, с. 65].

Итак, в настоящее время требования задач психологической подготовки спортсмена только интерасамы участия в следующих соревнованиях и связанные с этим недостатком в общей психологической подготовки являются известным тормозом в достижении спортсмена высокого уровня спортивного мастерства. Перед спортсменами и тренерами встает большая задача - научное обоснование и разработка эффективных методов общей психологической подготовки и принятия их на всем протяжении процесса спортивной тренировки в соответствии с ее этапами.

Проблема свободы действия - одна из древних и в то же время еще очень новых, если так можно выразиться, проблем психологии спорта.

С первых лет возникновения психологии спорта отдельные вопросы этой проблемы освещались на страницах научных и специальных спортивных журналов, различные стороны его являлись предметом выявления специалистами. В этом смысле проблема свободы - давняя.

Разработка психологической теории воли на основе изучения практики волевой подготовки и опыта имеет большое значение для освещения пути будущего спортивного совершенствования, для овладения мастерства в спорте [15, с. 43; 16, с. 205].

Все это диктуется необходимостью оглянуться на уже пройденный путь и подвести некоторые выводы о том, что сделано за последние годы при разработках волевой подготовки спортсмена.

Проблема волевой подготовки спортсмена изучается в двух взаимосвязанных аспектах - теоретическом и практическом [17, с 143].

Необходимо отметить, что взаимосвязь этих аспектов обеспечивается коллективным участием в исследованиях психологов, преподавателей спортивных кафедр институтов физической культуры и специалистов-тренеров по видам спорта, физиологов и педагогов [.

Теоретические разработки волевой подготовки. Разработка проблемы волевой подготовки в теоретическом аспекте позволяет создать определенную базу для решения практических вопросов методики волевой подготовки, как внутренней стороны содержания спортивной тренировки.

Исходным для всех будущих исследований в области проблемы волевой подготовки спортсмена, как понимание свободы как функции нормального работающего мозга, как свободы воли как способности принимать решения со знанием дела, ее детерминированности объективных обстоятельств жизни и деятельности людей. Вторым исходным положением является характеристика воли и целостности психической деятельности как деятельности стороны разума и нравственных качеств как регулятора действий и навыков человека.

В общей психологии понятие преодоление и трудность не разделяются. Нельзя определить - считаются ли они синонимами или же каким-то образом дифференцируются. Такое же положение существует и в психологии спорта.

Выводы.

Итак, последовательно, имея в виду условия проявления и развития воли, целенаправленно говорить о преодолении различных степеней тяжести, и иногда имея в виду конкретно их особенности, которые относятся к конкретным препятствиям.

Необходимо, чтобы в процессе обучения и воспитания в спортивной тренировке формировались положительные отношения спортсмена к встрече с препятствиями, и их безусловного преодоления.

Некоторые ученые и тренеры понимают несоответствия как абсолютную категорию. Такое понимание противостоит диалектической сущности данного представления. Несоответствующие возможности спортсмена объективными условиями деятельности - категория относительная и всегда конкретна: меняются возможности спортсмена - снижается и данное несоответствие.

Следовательно, проблемы свободы в психологии спорта заключается в определенных научных результатах методики волевой подготовки спортсмена, в использовании этих объяснений в методических исследованиях и в практике физического воспитания и спортивной деятельности.

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