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Contents

Содержание

UDK 539.4

Factors Affecting the Operational Reliability of Main Pipelines during the Transportation of Gas and Oil

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Key words and phrases: defects; destruction; gas and oil pipelines; pipeline transport; strength.

Abstract. The article deals with the reasons for the destruction of gas and oil pipelines. Emphasis is placed on the consequences of the destruction of pipelines with hydrocarbons. The zone of environmentally hazardous impact on the environment can extend up to several kilometers from the place of destruction of the pipeline. Unfavorable operating conditions of pipelines are listed, which include: different natural and climatic conditions, natural obstacles, a wide range of types and mechanical characteristics of soils, the aggressive influence of the components of petroleum products, the appearance of additional external factors on the pipe. The article considers the case when the stressed state of the pipe throughout its cross section reaches the limit of plastic resistance, which leads to a loss of bearing capacity of the pipe and its destruction.

Introduction

Pipeline transport is one of the successfully developing segments of the country's economy due to the most economical ways of transporting gaseous and liquid products to consumers over long distances (hundreds and thousands of kilometers) with minimal losses of hydrocarbons or other products.

It is known [1] that the destruction of gas pipelines is too dangerous. The zone of environmentally hazardous impact can extend up to several kilometers from the place of destruction of the pipeline.

Formulation of the problem

With the destruction of gas pipelines, a particular danger is associated with the likelihood of gas contamination of adjacent territories and settlements of people. At the same time, the formation of an explosive mixture of gas and air is possible. The process of ignition of transported products can also begin. The risks of their penetration into large reservoirs are not excluded. This is known [1], for example, that only 1 ton of spilled oil creates an oil film with an area

of 18 km^2 on the surface of water bodies. In such cases, the full restoration of the ecological balance requires a whole range of restoration work, which is associated with high material costs.

Research methods

Due to the impact of a wide range of loads on the main gas and oil pipelines (**MGOP**) with high internal pressure, the working conditions of the metal of the pipe walls are very different from the working conditions of the metal in other structures. The operational reliability of the MGOP depends on the mechanical stresses in the pipe wall. These stresses are caused by the influence of the internal working pressure of oil (gas), the corrosive effects of the surrounding soil and electrochemical processes.

Operating experience

Operation of the pipeline is carried out in various natural and climatic conditions. The metal of the same pipeline works both at sub-zero temperatures in the northern regions of the country, and at plus – in the south. In addition to the calculated elastic deformations, pipe metal can also be subjected to plastic deformation, for example, when it crosses various natural obstacles (water barriers, swamps, mountains, lakes, etc.) [1–2]. A wide range of types and mechanical characteristics of soils have a spectrum of external force effects on the pipeline throughout its length, changing the stress-strain state of the metal.

Depending on the climatic conditions, the metal of the pipes is operated in a wide range of temperatures (30…40 °C in summer and up to –15…–20 °C in winter). In the northern latitudes, maintenance and repair of pipelines in winter are carried out at temperatures up to –40 °C.

During the life cycle of pipelines (most often this depreciation period lasts more than 30 years), the pipe metal is almost constantly working in a complex stress state (biaxial stress-strain state).

The main defects (stress concentrators) of pipelines: burrs and scratches oriented along the forming pipe.

The experimental studies presented in [1] helped to determine the change in the circular deformations of the outer surface from the internal pressure in a pipe with different ovality.

At an internal pressure in the pipe equal to 1 MPa, local deformations can cause the fluidity of the metal at a sufficiently low value of average stresses in the pipe metal. The maximum value of local deformation is about 0.6 % at a pressure of 5.5 MPa. Then the increase in deformation ends and the pipe in the cross-section becomes cylindrical in shape.

Consider an axisymmetric problem in which the conditions of Huber-Mises plasticity and incompressibility of the material are used. Consider the propagation of plastic zones of the pipe material in a simplified calculation with an increase in internal pressure. The pipe material is considered to be ideal elastoplastic. At what maximum internal pressure of gas (oil) on the outer surface of the pipe there will be a zone of elastic deformation of the material that does not lead to its destruction?

To analyze the stress state of the pipe, we need to know the formulas for the three main (normal) stresses. These stresses are determined from the solution of the Lahme problem in the absence of external pressure [2]:

$$\sigma_r = p_a \frac{a^2}{b^2 - a^2}\left(1 - \frac{b^2}{r^2}\right),\ \sigma_\Theta = p_a \frac{a^2}{b^2 - a^2}\left(1 + \frac{b^2}{r^2}\right),\ \sigma_z = v(\sigma_r + \sigma_\Theta),$$

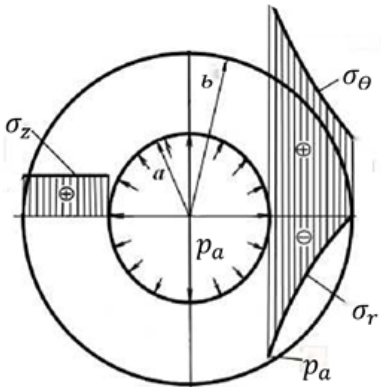

Fig. 1. Distribution of stresses in the pipe

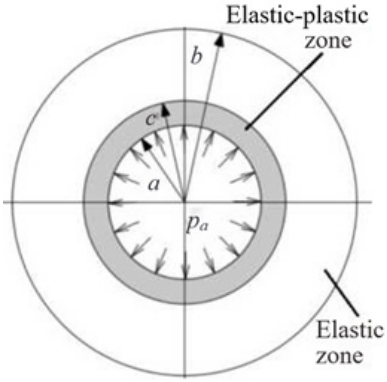

Fig. 2. Elastic-plastic and elastic zones in the pipe wall

where p_a is the internal pressure, and a, b is the inner and outer radius of the pipe.

Analysis of formulas (1) shows that the most dangerous point is located on the inner surface of the pipe at $r = a$.

For a simplified analysis of the pressure distribution in the pipe wall, the Poisson coefficient is taken to be 0.5. In case of elastic and elastic-plastic deformation of pipe material $\sigma_z = 0{,}5(\sigma_r + \sigma_\Theta)$.

If the internal pressure in the pipe increases, then the material on the inner surface of the pipe is first plastically deformed. Then, with an increase in internal pressure, the plasticity zone will begin to increase, approaching the outer surface of the pipe (Fig. 2).

Formulas (1) can be used to determine the stresses in the elastic zone of the pipe, but in the elastic-plastic zone σ_r and σ_Θ are calculated by formulas (2):

$$\sigma_r = -p_a + \frac{2}{\sqrt{3}}\,\sigma_т \ln\frac{r}{a},\ \sigma_\Theta = \sigma_r + \frac{2}{\sqrt{3}}\,\sigma_т,\ (\sigma_\Theta - \sigma_r) = \frac{2}{\sqrt{3}}\,\sigma_т,$$

where the Huber-Mises plasticity condition is also given in a cylindrical coordinate system for the case of plane deformation.

Using formulas (1) and (2), it is possible to determine the radius c (Fig. 2) of the cylindrical boundary surface that separates the elastic and plastic zone.

Results and discussion

For example, for a thin-walled pipe (cylinder) with parameters a = 0,95 m, b = 1,0 m, $\sigma_т$ = 230 Мпа, the plastic state of the material on the outer surface of the pipe reaches at internal pressure p_a = 13,6 MPa.

Elastic-plastic deformations in this case extend to the entire thickness of the pipe. The stress state in the material reaches the limit of plastic resistance, which leads to the exhaustion of the bearing capacity of the pipe. The material, according to the Prandtl diagram, in the entire volume of the pipe deforms elastoplastically, the Huber-Mises plasticity condition is also fulfilled for it.

With a further increase in internal pressure, the pipe will collapse.

Conclusion

The operational reliability of the main gas and oil pipelines decreases with time. Several factors (external and internal) discussed in the article affect the safety of oil and gas transportation. All the variety of the action of the considered loads leads to a change in the stress-strain state of the material in the pipe. Knowing the mechanisms that lead to the limit of the bearing capacity of the pipeline, it is possible to propose technologies to improve the safety of oil and gas transportation and reduce the level of dangerous impact of hydrocarbons on the environment.

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Факторы, влияющие на эксплуатационную надежность магистральных трубопроводов при транспортировке газа и нефти

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Ключевые слова и фразы: газопровод; дефекты; прочность; разрушение; трубопроводный транспорт.

Аннотация. В статье рассматриваются причины разрушения газо- и нефтепроводов. Акцент делается на последствиях разрушения трубопроводов с углеводородами. Зона экологически опасного воздействия на окружающую среду может простираться до нескольких километров от места разрушения трубопровода. Перечислены неблагоприятные условия эксплуатации трубопроводов, к которым относятся: различные природно-климатические условия, естественные препятствия, широкий спектр типов и механических характеристик грунтов, агрессивное воздействие компонентов нефтепродуктов, появление дополнительных внешних факторов на трубе. В статье рассматривается случай, когда напряженное состояние трубы по всему ее поперечному сечению достигает предела пластического сопротивления, что приводит к потере несущей способности трубы и ее разрушению.

UDK 005.591.1

Improvement of Methods for Monitoring the Processes of Guarantee Support of Manufactured Products at Enterprises of the Military-Industrial Complex Using the Example of JSC “Bryansk Automobile Plant”

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Key words and phrases: defense products; effectiveness; efficiency; feedback; improvement; monitoring; operational control; quality; warranty support.

Abstract. The article presents a method for increasing the efficiency of monitoring the processes of warranty support of manufactured products at defense industry enterprises in order to unconditionally fulfill the requirements of GOST RV 0015-703-2019. The analysis of the applied methods of assessing the effectiveness of the process is carried out and a method of operational monitoring of quality management processes based on the use of the graphical tool “complex dependency diagram” is proposed. Thanks to the application of the proposed technique, the root causes have been identified that most affect the level of defectiveness of products. The directions of influence to increase the efficiency of the measures being developed (without increasing the expended resources) are determined and the results of approbation of the proposed methodology at a machine-building enterprise are presented.

All enterprises of the military-industrial complex (**MIC**) involved in the fulfillment of the state defense order in accordance with the requirements of GOST RV 0015-002-2020 “Quality management systems. General requirements "are obliged to constantly monitor, measure, analyze and evaluate the effectiveness of processes at all stages of the life cycle of defense products (**DPs**), including the analysis should be made of data on claims for products and data on the implementation of improvements during operation associated with the elimination of structural and production defects and the cost of rework [1].

The complex of measures from the moment of detecting a defect to the implementation of measures to eliminate the causes that caused the defect is described in more detail in GOST RV 0015-703-2019 “Procedure for filing and satisfying claims” [2].

In an established batch production, when all design and technological documentation is developed and approved, and the company’s ability to produce products that meet the established requirements is confirmed by positive test results of pilot batches (samples) of

products, the main type assurance activity of, is the stages of production and operation. At the same time, the operation stage provides information (feedback) about the quality level of the manufactured products, and it is laid down at the production stage.

Therefore, in order to meet the GOST requirements and make prompt management decisions, defense industry enterprises need an effective system for monitoring nonconformities in manufactured products that are detected by the consumer.

Due to the huge amount of data, their analysis is done using statistical methods. At the same time, the resources of any enterprise are limited and methods are needed that allow making management decisions that have high efficiency with the lowest costs. The most common method used is the Pareto principle. However, if the analysis of the data set is incorrect, then the truth is distorted. The operation of the principle depends on the completeness and degree of reliability of the information that a person processes to make decisions. At the same time, many stringent requirements of military standards are additionally imposed on the defense industry enterprises, in connection with which the problem of “loss of control” arises.

In the multilevel vertically integrated structures of industrial enterprises producing defense products, the management apparatus sees only aggregated (generalized) data from the analysis of the enterprise's activities. Because of this, there is a high probability of disregarding criteria with critical values with a relatively high assessment of the criterion of a higher level due to the rest of its constituent factors. Therefore, monitoring techniques are needed to see the current state of the entire controlled multi-level system of a vertically integrated structure.

In 2016, Bryansk Automobile Plant JSC became part of the vertically integrated structure of the Almaz-Antey Aerospace Defense Concern JSC, which manufactures products for the defense industry of the Russian Federation.

Starting from 2019, the assessment of the private indicator Kd is the complex coefficient of defectiveness of the manufacturer's products, at all enterprises that are part of the vertically integrated structure of JSC Concern VKO Almaz-Antey is carried out in accordance with ST IS CONCERN VKO 02.1-102- 2019 Quality management system. Assessment of a comprehensive indicator of the effectiveness of the quality and reliability management system of defense products manufacturers” [3] and is determined by the formula:

$$K_{dj}(R) = \frac{r_{prj}(P) + r_{ej}(R)}{N_{prj}(P) + N_{ej}(R)} = \frac{r_{prj}(P)}{N_{prj}(P)} a_{prj}(P) + \frac{r_{ej}(R)}{N_{ej}(R)} a_{ej}(R), \quad (1)$$

where $K_{dj}(R)$ is a complex coefficient of product rejection in the reporting year; $r_{prj}(P)$ and $r_{ej}(R)$ are the number of defects recorded on products of the j-type DP at the stages of life cycle “production” in the year preceding the reporting year (P) and “operation” in the reporting year (R); $N_{prj}(P)$ and $N_{ej}(R)$ are the number of products of the j-th type DP that are in production and in operation during the previous and current reporting years; $a_{prj}(P)$ and $a_{ej}(R)$ are the weighting coefficients of the life cycle stages of products of the j-th type “production” and “operation”, respectively, defined as:

$$a_{prj}(P) = \frac{N_{prj}(P)}{N_{prj}(P) + N_{ej}(R)}, \quad (2)$$

$$a_{ej}(R) = \frac{N_{ej}(R)}{N_{prj}(P) + N_{ej}(R)}. \quad (3)$$

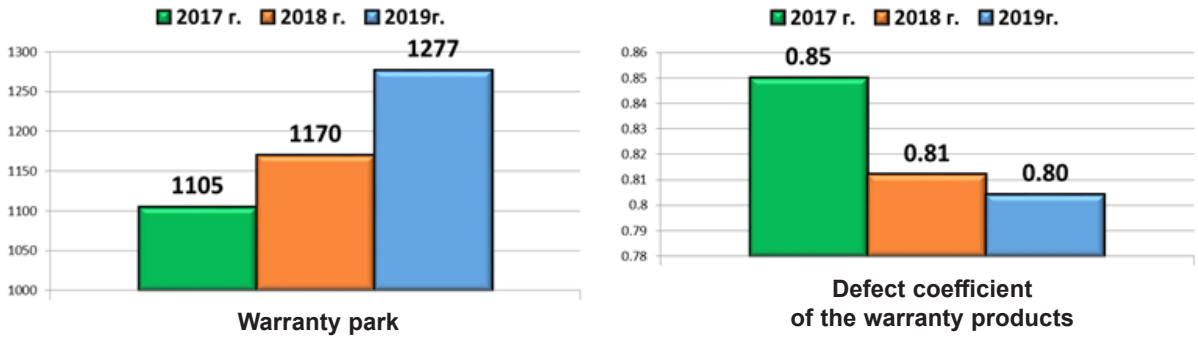

Fig. 1. Warranty park and defect coefficient of BAZ JSC products for 2017-2019

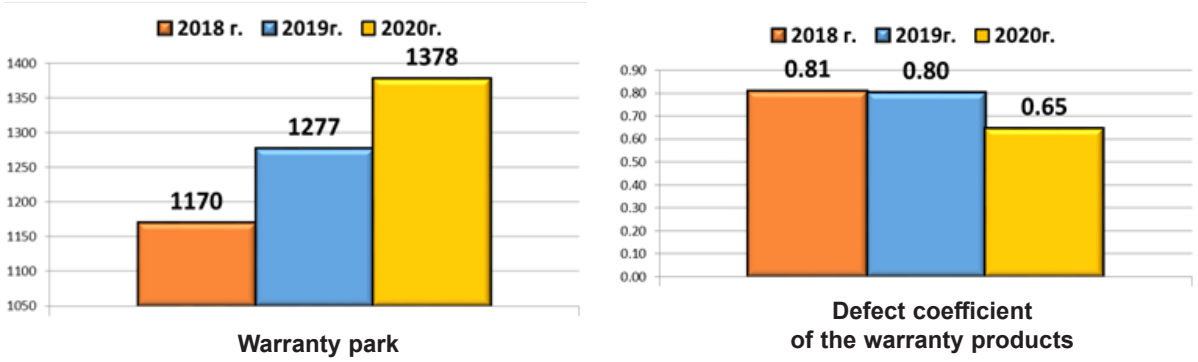

Fig. 2. Warranty park and defect coefficient of BAZ JSC products for 2018-2020

Based on the regression analysis of statistical information on indicators of defectiveness of DP products, a reference value was determined $K_{dre}(R)$:

$$K_d(R) < K_{dre}(R) = 1.0. \quad (4)$$

Assessment of the level of product defectiveness at JSC “BAZ” in the period 2017–2019 calculated by the formula (1) shows the compliance with the established required value and stable improvement (Fig. 1).

However, in the period 2017–2019, the improvement of this indicator is 1–4 %, which indicates the low efficiency of the measures taken to reduce the level of defectiveness and the insufficiency of the resources available at the enterprise (material, human, informational, etc.) to ensure the quality of the products or their irrational use.

In 2019, BAZ JSC tested a methodology for operational monitoring of quality management processes based on the use of a graphical quality management tool “complex dependency diagram” [4; 5].

Using the method of operational monitoring, the analysis identified the root causes (inconsistencies in systems and assemblies, both purchased and of own production), most affecting the level of defectiveness of products of BAZ JSC, and accordingly, the directions of priority management actions were determined.

The implementation of measures aimed at preventing the occurrence of inconsistencies that most affect the level of defectiveness of products of BAZ JSC as a whole (while maintaining

the dynamics of growth in the number of products that are within the manufacturer's warranty obligations and without increasing the costs of the enterprise), gave a multiple increase in the percentage of improvement in the indicator, calculated by the formula (1) – the complex coefficient of defectiveness of products of JSC "BAZ" in 2020, in comparison with the previous periods (Fig. 2).

The facts stated in the article indicate a high degree of effectiveness of the proposed methodology for operational monitoring of quality management processes. Thus, it becomes possible to unconditionally fulfill all the requirements of military standards and solve the problem of 'loss of control" in the field of quality.

At the same time, the application of the proposed methodology at all stages of the life cycle of manufactured products contributes to an abrupt increase in the level of quality of products (and, as a consequence, to a reduction in the enterprise's costs for eliminating defects), and also enables the enterprise to reach the level of world leaders in the field of quality of offered goods and services, without increasing the cost of manufactured products.

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Совершенствование методов мониторинга процессов гарантийного сопровождения выпускаемой продукции на предприятиях оборонно-промышленного комплекса на примере АО «Брянский автомобильный завод»

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Ключевые слова и фразы: гарантийное сопровождение; качество; мониторинг; обратная связь; оборонная продукция; оперативный контроль; результативность; улучшение; эффективность.

Аннотация. В статье представлен способ повышения эффективности мониторинга процессов гарантийного сопровождения выпускаемой продукции на предприятиях ОПК с целью безусловного выполнения требований ГОСТ РВ 0015-703-2019. Проведен анализ

применяемых методов оценки результативности процесса и предложена методика оперативного мониторинга процессов управления качеством, основанная на использовании графического инструмента «Комплексная диаграмма зависимостей». Благодаря применению предложенной методики выявлены корневые причины, наиболее влияющие на уровень дефектности изделий. Определены направления воздействия для повышения эффективности разрабатываемых мероприятий (без увеличения затрачиваемых ресурсов) и представлены результаты апробации предложенной методики на машиностроительном предприятии.

UDK 621.396.621

Repression Coefficient as Common Energetic Criteria of Repression During Radio-Location Systems Comparison

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Key words and phrases: impulse; noise; power; radio-location system; repression coefficient; signal.

Abstract. In this paper, repression coefficient definition and its further usage as common energetic criteria of different purposes radio-location systems repression masking signals quality estimation is described. Special attention is paid to the repression coefficient finding methods of coherent and incoherent radio-location systems comparison in the case of noises actions. As the result of work conclusions about radio-location systems noises efficiency are made.

The purpose of the study is connected with radio-location systems with accumulating before detecting (further they will call as coherent) and with accumulating after detecting (further they will call as incoherent) noises efficiency researching by means of their repression coefficient finding. As for the base sources for my work they are connected with radio-electronic warfare in the whole and with radio-location systems radio-electronic repression in particular, to be more exact [2; 5; 6]. This work is devoted to actual problem because today repression coefficient finding methods of coherent and incoherent radio-location systems comparison in radio-location systems radio-electronic repression process plays not last roll in radio-electronic warfare in the whole.

Repression coefficient k_r is a quantitative characteristic of defined radio-electronic device (**RED**) repression by one of noise signals energetic efficiency.

Even in the very beginning period of k_r usage as energetic criteria there were some paradoxes in some types of radio-location station (**RLS**) repression by the same noise signal efficiency estimation. So as for usual impulse incoherent RLS and RLS working with difficult signals equivalent in probe signal energy and distance selection capability repression the values of repression coefficient differ from each other. To be more exact, for RLS working with difficult signals $k_{r\,dif}$ value is in compression coefficient k_c times bigger than for usual impulse incoherent RLS [1]:

$$k_{r\,dif} = k_r k_c, \tag{1}$$

where k_c is a compression coefficient equal to signal base d, $k_c = d$.

Difficulties and misunderstandings of k_r theoretic estimation were really strong in connection with new generation RLS appearance – impulse-coherent, holographic and etc. So k_r usage

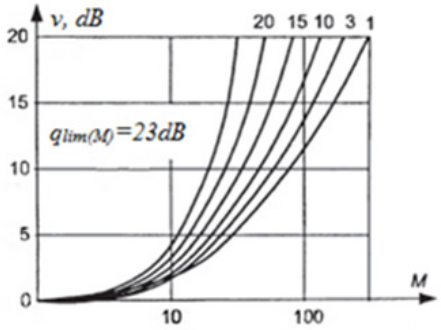

Fig. 1. v = v(M, q_{lim}(M)) relationship

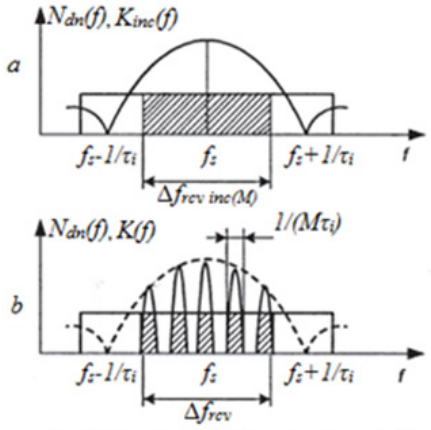

Fig. 2. Incoherent (a) and coherent (b) RLS receiving devices

advantages and disadvantages objective analysis practical necessity appeared as radio-electronic repression (**RER**) efficiency energetic criteria. Moreover, it is necessary to find possible mistaken ways of theoretical and practical k_r definition. But as for primary task it is necessary to find k_r usage rules of practical calculations connected with RER equality usage [1].

So all of the equalities compare the finding methods of coherent and incoherent radio-location systems can be found from the following considerations.

Comparison of (17) from [3] and (9) from [4] shows that incoherent RLS repression coefficient is in M/αd(M) times bigger than coherent RLS repression coefficient

$$v = kr_{inc}/kr = M/\alpha_{d(M)}. \quad (2)$$

$v = v(M, q_{lim}(M))$ relationship is shown in Fig. 1.

As it follows from Fig. 1, v coefficient value increasing with pack M impulses quantity value increasing.

From the first view some kind of paradox is coming: non-ideal incoherent RLS repression coefficient is much bigger than coherent RLS one, optimal system working without any losses. This paradox is connected with repression coefficient finding specialties [6].

Let's consider that both of RLS are repressed by direct noise with constant spectral density of N_{dn}.

Fig. 2 show incoherent and coherent RLS receiver (**RCV**) frequency characteristics, respectively. Both of the RLS are equivalent in energetic sense and repressed by direct noise with spectral density of N_{dn} [7].

A it if follows form Fig. 2 and (11) from [3] and (8) from [4], coherent RLS equivalent bandwidth is much less (in M times) than incoherent one Δfrcv = $\Delta fr_{cv\ inc(M)}/M$. That's why noise power coming through incoherent RLS RCV is in M times bigger. Taking into account incoherent RLS energetic losses according to (2) incoherent RLS repression coefficient is in $M/\alpha_{d(M)}$ times bigger than coherent one. But energetic active noises station (**ANS**) potential required for incoherent RLS repression will be less than for coherent RLS with the same energetic parameters.

Energetic potential required for coherent RLS repression can be found from RER equality:

$$(P_n G_n) = B_{kr}(\Delta f_{dn}/\Delta f_{rcv}), \quad (3)$$

where B is a not really important coefficient for our case.

From (11), (17) from [3] and (2) from [4] it follows that:

$$(P_n G_n) = B(2M/q_{lim(M)})^*(\Delta f_{dn}\tau_i). \quad (4)$$

For incoherent RLS required energetic potential is defined with help of (3) and (4):

$$(P_n G_n)_{inc} = B(2M/(\alpha_{d(M)} q_{lim(M)}))^*(\Delta f_{dn}\tau_i). \quad (5)$$

From (4) and (5) equality for energetic potentials $(P_n G_n)$inc and $(P_n G_n)$ relation follows

$$\eta = (P_n G_n)_{inc}/(P_n G_n) = 1/\alpha_{d(M)}. \quad (6)$$

As $\alpha_{d(M)} \geq 1$ from (6) we can get:

$$(P_n G_n)_{inc} < (P_n G_n). \quad (7)$$

Consequently for incoherent RLS repression it is required fewer ANS energetic potential than in case of coherent processing RLS repression. It leads to the fact that it's more difficult to repress coherent RLS than incoherent one [7].

As the result RLS noises efficiency comparative research demonstrates the following.

1. Repression coefficient cannot be taken as common energetic criteria of different purposes RLS repression masking signals quality estimation. With the help of kr value it is impossible to find RLS noise-immunity. In other words, if one type RLS repression coefficient will be bigger than for other type RLS it doesn't mean that first RLS will have better noise-immunity than second one in case of the same input noises.

2. For defined pare of RLS and ANS with help of repression coefficient it's possible to find noises optimal parameters with help of "minimal repression coefficient" criteria. But it's important to say that one RLS found noises optimal parameters can be not optimal for other RLS repression.

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Коэффициент подавления как обобщенный энергетический критерий подавления при сравнении радиолокационных систем

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Ключевые слова и фразы: импульс; коэффициент подавления; мощность; помеха; радиолокационная система; сигнал.

Аннотация. В данной работе рассматривается понятие коэффициента подавления и его дальнейшее использование в качестве обобщенного энергетического критерия, способного оценивать качество маскирующего сигнала по подавлению радиолокационных систем различного назначения. Особое внимание уделено сравнению методики определения коэффициента подавления радиолокационных систем с додетекторным и последетекторным накоплением в условиях действия помех. В результате работы сформулированы выводы об эффективности воздействия помех на радиолокационные системы.

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Trends and Tools in Theory and Practice of Knowledge Management

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Key words and phrases: management tools; organizational culture; knowledge management; explicit and implicit knowledge.

Abstract. In the difficult conditions of an unpredictable external environment caused by the information revolution, theorists and practitioners are looking for new management tools that can not only respond to external influences, but are innovative, flexible and effective. The purpose of the article is to analyze the existing tools in the organization's knowledge management. The research hypothesis is as follows: in a knowledge-based economy, management objects become more complex, which requires transformation of both management itself and new management tools. The study used the methods of comparative and systems analysis and synthesis, the provisions of cybernetics, the theory of organization and management. Flexible balanced social management tools can be effective when taking into account the contextual parameters and characteristics of management objects. As a result of the study, the hypothesis was confirmed. The features of the influence of organizational culture in the knowledge management system are revealed.

The conditions in which all countries live today are a catalyst for rethinking the established ideas about the factors and conditions for the effective operation of organizations. The external environment changes continuously and chaotically. Preliminary data indicate that world production in the amount of at least 98 % of GDP is functioning under the blockade; countries that form the bulk of world GDP are excluded from normal reproduction. The European economic zone is losing its unity before our very eyes [1, p. 7].

All organizations have to constantly and adequately respond to threats and challenges, regardless of the type of activity, size and form of ownership. What kind of management tools should be used to not only eliminate visible hazards, but also to confidently move towards the intended goals in an uncertain, rapidly changing environment? Should we fight, with what threats and in what ways? All these issues are on the agenda of modern management.

The information revolution has become a point of no return to traditional management tools and methods. It gave birth to a new social cluster based on intellectualization, which is the basis of the information society. The complexity of managing an organization is associated not only with the turbulence and uncertainty of the external environment, but also with the

increasing complexity and dynamism of the elements of the control object itself. According to the fundamental law of cybernetics – the law of requisite variety formulated by W.R. Ashby, it is impossible to create a simple control system that will effectively control a complex object. Consequently, the control system must first of all have sufficient intelligence to effectively perform its functions.

The elements of the control object become more complex not only quantitatively, but also qualitatively. For the management of knowledge, intellectual and social capital, organizational culture, emotional intelligence and other objects in the organization, they require constant harmonious development from the management subject, and not just training. The knowledge economy is full of contradictions and conflicts for the management of an organization. So, for example, the conflict in the use and accumulation of knowledge, clairvoyantly declared by the scientist March J. in the last century is still the subject of close study [2, p. 73]. Limitations of the learning process in the context of knowledge management (inertia of experience and balancing competing goals) [3, p. 95] also requires close attention in the control action.

The necessary conditions for the company's success are its competence in generating unique knowledge and transforming it into innovation. Knowledge is a valuable product, its specific characteristics significantly distinguish it from all other types of goods in market conditions, for example, “knowledge can directly and freely move in space in real time, be located simultaneously in many places and be used simultaneously by different subjects, in contrast to knowledge of monetary assets is not depreciated as a result of inflation” [4, p. 123].

Knowledge begins in people’s heads, as a result of mental activity, and those who are alienated from a person turn into information. It is intellectual capital in the knowledge economy that is a valuable resource that provides a competitive advantage.

The importance of the fronts that determine the direction of development of knowledge management theory, presented in the analytical study of domestic authors [5, p. 19] are presented as follows: organizational learning, knowledge transfer – 41.57 %; obtaining new knowledge, using accumulated knowledge – 35.96 %; the absorption capacity of the firm in relation to knowledge – 11.24 %; ambidexterity (balance in the use of one's own and acquired knowledge) – 11.24 %.

With the emergence of the concept of knowledge management for more than thirty years, many researchers have been intensively looking for effects in the field of codified knowledge, information technology; today we are talking about digitalization. However, the inconsistency in the research results forced scientists to look for new meanings in knowledge management [6]. Consideration of knowledge management went from technological, through social, to cognitive and philosophical aspects. A striking example of this is the study by Hans-Jürgen Engelbrecht [7] in which the author asserts that knowledge is accumulated not for its own sake, but for a specific purpose, and this goal is to increase human happiness.

At the end of the last century, the effectiveness of the application of knowledge management theory lay in the field of explicit knowledge and information technology. However, practice has proven that despite the success of the use of information technology in some firms, they can fail in others [8]. One of the reasons for their failure was the fact that firms lacked a knowledge-driven organizational culture.

Social technologies in knowledge management are taking up an increasing number of studies. Non-formalized knowledge of an organization is a significant development potential, turning it into formalized, explicit knowledge is a difficult management task. Scientists and practitioners strongly argue that much of the knowledge in organizations is hidden. Unlike

explicit knowledge, which can be stored in external stores and is visible, implicit knowledge, in fact, is in the consciousness of the knower. Unique knowledge in the heads of staff, shared values and ideals, personal beliefs, points of view, opinions, know-how, skills, competencies are complex intangible objects of management.

Organizational culture can be an effective tool in dealing with these complex intangible assets. At its core, organizational culture can be viewed as a product of group tacit knowledge that forms the consciousness of the organization. Its dual nature lies in the fact that it controls the behavior of personnel, but at the same time is formed under the influence of their behavior. Organizational culture management in knowledge management is of great scientific and practical interest. Culture shapes the processes by which new organizational knowledge is created, codified and disseminated.

Scientists Suppiah, Sandhu in an empirical study [9] presented interesting findings about the influence of organizational culture on implicit knowledge exchange. The results of the study showed that only clan culture (according to the Cameron-Quinn typology), which is characterized by a team approach and high employee commitment to the organization, is more conducive to the tacit exchange of knowledge. Most negatively influenced by a culture of hierarchy, which encouraged the use of standard operating procedures and best practices and had multiple levels of vertical and horizontal silos. Another type of culture that hinders the exchange of knowledge turned out to be a market culture in which competitiveness and productivity are the main values.

Organizational culture regulates two important areas in terms of knowledge management: willingness to cooperate and trust between employees. In organizations where knowledge is perceived as a source of power, prestige, or potential career development, the exchange of knowledge will be ineffective, which means that it is the responsibility of leadership to recognize the promotion of values such as setting common goals and open communication. Why should the relationship between employer and employee be changed and the development of values such as dialogue, partnership and cooperation. Foreign and domestic researchers agree that trust affects the volume of knowledge exchange between people [10]. An organizational culture focused on effective knowledge management encourages employees to question established practices and seek new opportunities. The development of conditions for freedom of opinion and acceptance of mistakes supports this attitude. Another important aspect of organizational culture is ensuring employee autonomy, as this increases motivation and engagement. Culture can influence knowledge management in different ways. The perceived concrete values of the organization can lead to both favorable and unfavorable behavior, for example, positive desire and motivation to share knowledge, mutual trust between staff positively affects knowledge management. On the other hand, negative competition and reluctance to share knowledge are among the factors that negatively affect knowledge management.

Using the method of meta-analysis, the empirical research conducted by Gang Liu, Eric Tsui, Aino Kianto – scientists from Hong Kong, China and Finland [11] demonstrated the relationship between an organizational culture favorable for knowledge and organizational effectiveness, taking into account the influence of contextual factors, such as national culture, economy and industry.

Scientists will not develop ready-made templates, schemes, instructions for management for managing complex objects, the target component of which is a person, but understanding the contextual parameters and the uniqueness of each organization, adopting concepts and trends, the control effect will be more harmonious if the organization's management itself is ready to development.

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Тенденции и инструменты в теории и практике управления знаниями

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Ключевые слова и фразы: инструменты управления; организационная культура; управление знаниями; явные и неявные знания.

Аннотация. В сложных условиях непредсказуемой внешней среды, вызванных информационной революцией, теоретики и практики заняты поиском новых инструментов управления, не только способных реагировать на внешние воздействия, но инновационных, гибких и эффективных. Целью статьи является анализ существующих инструментов в управлении знаниями организации. Гипотеза исследования заключается в следующем: в условиях экономики, основанной на знаниях, объекты управления усложняются, что требует трансформации как самого менеджмента, так и новых инструментов управления. В

исследовании применены методы сравнительного и системного анализа и синтеза, положений кибернетики, теории организации и менеджмента. Гибкие сбалансированные социальные инструменты управления могут быть эффективными при учете контекстуальных параметров и особенностей объектов управления. В результате исследования гипотеза подтверждена. Выявлены особенности влияния организационной культуры в системе управления знаниями.

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The Impact of Climate Change on Cocoa Production in Côte d'Ivoire

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Key words and phrases: economic impact; climate change; cocoa production; Cote d'Ivoire.

Abstract. An assessment of the production of cocoa over the past decades is given. According to statistics, from 1980 to 2005, cocoa production grew and increased by 625 %. The highest rate was recorded in 2012. In Côte d'Ivoire, production increased from 400,000 tons in 2004 to almost 1,400,000 tons in 2012. The main problems associated with the production of cocoa due to climate change in recent decades and in the coming years are identified.

As a result of the study, it was found that global warming leads to changes in the distribution of precipitation, and also dries up rivers, melting glaciers where water masses are retreating. Over the past 25 years, the number of floods and droughts has doubled. In addition, yields and livestock productivity declined due to heatwaves and floods. The increasing frequency and intensity of climate risks pose a significant threat to the production of certain products, such as cocoa, which is the backbone of the Côte d'Ivoire economy. The reduction in cocoa production will have a negative impact on the economy of Côte d'Ivoire.

The experience of introducing a risk management system as an essential element of the quality management system of an industrial enterprise using the example of the MCC Group (OJSC Magnitogorsk Iron and Steel Works, OJSC MMK) is informative for studying from the point of view of not only the methodology and principles of work, but the results achieved.

Introduction

In a report released on October 19, 2021, the World Meteorological Organization (**WMO**) showed that the evolution of the precipitation regime, the rise in temperatures and the increase in extreme climatic phenomena have worsened the socio-economic and health crisis of the continent. In Glasgow the United Nations Climate Change Conference (COP26) "Africa needs decisive collective action rather than more encouraging words" was held [1]. The report indicated dramatic consequences of global warming in Africa. According to the 2015 Climate Change Vulnerability Index, seven of the ten countries most at risk from climate change are in

Africa. Africa was put on the “red list”. However, we can already feel the consequences of global warming in Africa, affecting health, livelihoods, food production, water availability and supply, global security, agriculture and food and finally on ecosystems.

The cultivation of the cocoa tree is done in a hot and humid climate, a regular rainfall, and requires a lot of shade and tall trees that come to protect it. In Côte d’Ivoire, the climate is tropical, with a dry season from December to February, and a rainy season from April to October, due to the African monsoon.

Precipitation is more abundant on the coast, where it ranges from 1,500 to 2,500 millimeters per year, while in the interior areas it is generally less intense, and ranges from 1,200 to 1,500 mm, even if it reaches 2,000 mm in the small western mountainous area.

Location of the study area

Agriculture, which is one of the engines of the Ivorian economy, depends heavily on climatic hazards. Today, cocoa production, of which Côte d’Ivoire is the world’s largest producer and exporter, accounts for about a third of export earnings and over 10 % of tax revenue. This activity provides direct and indirect income to nearly 5 million people. However, the sector will also suffer the effects of climate change, in particular the increase in temperature, which risks making the land more arid and less fertile. This will force many farmers to move their plantations to higher altitude areas where temperatures will be more favorable for growing cocoa.

Materials and methods

This study required the use of statistical data on cocoa production in Côte d’Ivoire and covering the period 2004–2014 taken from the magazine PERSPECTIVE MONDE “Educational tool on major world trends since 2000” [2].

As can be seen from the diagram, over the decades when there were not enough threats to climate change, production followed an increasing rate, on the other hand if the situation persists, we will observe a drop in production.

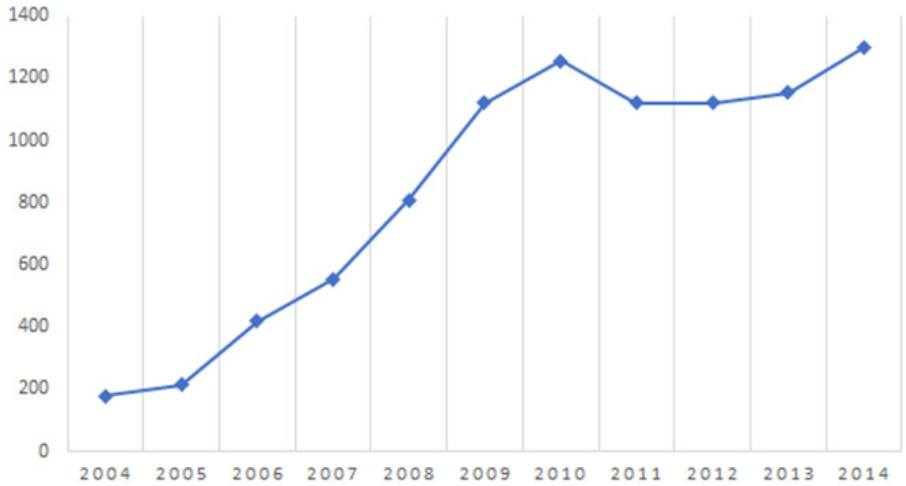

Fig. 1. Evolution of cocoa production in thousands of tonnes in Cote d’Ivoire (2004–2014)

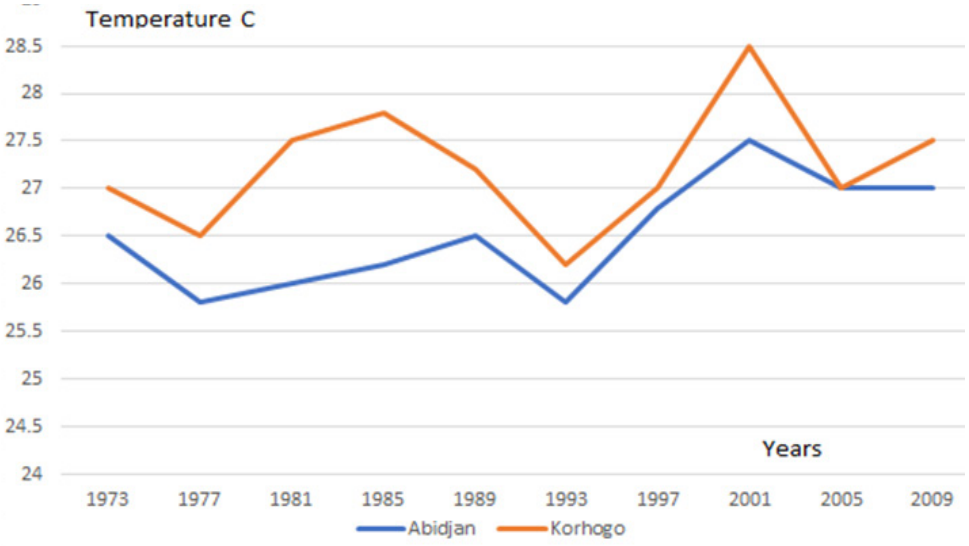

Fig. 2. Evolution of the Average Air Temperature from 1961 to 2010 in Abidjan (south) Korhogo (north)

The threat of climate change on cocoa cultivation

Cocoa cultivation is only possible in areas where temperature, rainfall and humidity remain constant throughout the year. On the planet, only tropical forests meet these climatic conditions. Cocoa plantations (or cocoa trees) can only exist at 20 °C below and above the equator, which is why Côte d'Ivoire is the leading producer with 42 % of world production [3].

Only in 2014, the Intergovernmental Panel on Climate Change (**IPCC**) announced in a climate report that these equatorial countries will see their annual temperatures increase by 2.1 ° C in 2050. This climate change will be harmful to cocoa plants, which will suffer more from lack of moisture than from rising temperature. To compensate for this lack of humidity in the air, the crops will have to be moved 300 meters in altitude.

Graphical analysis of the Average Air Temperature from 1961 to 2010 in Côte d'Ivoire

The interannual average temperature for the decade 1973–2009 varied from 25 to 28 °C in the north of Côte d'Ivoire (Korhogo) and from 24 to 27 °C in the south (Abidjan) (Fig. 2). The decade 1990–1999 recorded a general increase in the interannual average temperature in the entire eastern half of the country varying between 27 and 28 °C while in the western half it remained relatively low ranging from 24 to 26 °C. In general, the temperature has remained above normal since 1978 and this seems to confirm Piche's evaporation results [4].

Since 2015, Cote d'Ivoire has observed an increase in temperature which sometimes reaches 32 ° C in the southern region, and even hotter in the northern region around 33 °C, this can be explained on the one hand by the increase in solar energy on the ground, and on the other hand by the action of greenhouse gases.

Results

The annual mean temperature fluctuates from year to year but the linear regression applied

to the data from 1961 to 2010 gives a steady increase with a rate absolute 1.6 °C over the past 50 years. If the current trend continues, the projection over a century would give an average temperature rise of 3.2 °C in Côte d'Ivoire.

First, there is no doubt that global warming is causing meteorological changes. Even stronger heat waves are to be feared, with intense droughts what could be the cause of the drop in cocoa production in Côte d'Ivoire and in the next 10 years. Global warming brings changes in the distribution of precipitation, but also dries up the rivers, melts the glaciers where the water masses recede. Floods and droughts have doubled in the past 25 years. In addition, food yields and livestock productivity have decreased due to heat waves and floods. If Côte d'Ivoire faces the decline in cocoa production, this will have an influence on the production of chocolate worldwide.

Conclusions

The consequences of climate change will worsen. Global warming has caused temperatures to rise about 1 °C above pre-industrial levels. The countries of the tropical zone of Africa like Côte d'Ivoire will be the most affected.

It is important to remember that no list of consequences of climate change can be exhaustive. It is very likely that heat waves will become more frequent and longer and that extreme precipitation events will become more intense and frequent in many regions. The oceans will continue to warm and acidify and the global water level will continue to rise. All of these will, and are already beginning to have, devastating consequences on human lives.

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Влияние изменения климата на производство какао в Кот-д'Ивуаре

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Ключевые слова и фразы: изменение климата; Кот-д'Ивуар; производство какао; экономическое влияние.

Аннотация. Дана оценка производства какао в Кот-д'Ивуаре за последние десятилетия. По статистике с 1980 по 2005 гг. производство какао росло и увеличилось на 625 %. Самый высокий показатель был зафиксирован в 2012 г. В Кот-д'Ивуаре производство выросло с 400 000 тонн в 2004 г. до почти 1 400 000 тонн в 2012 г. Выявлены основные проблемы, связанные с производством какао вследствие изменения климата в последние десятилетия, дана оценка на ближайшие годы. В результате проведенного исследования установлено, что глобальное потепление приводит к изменениям в распределении осадков, а также иссушает реки, приводит к таянию ледников. За последние 25 лет количество наводнений и засух увеличилось вдвое. Кроме того, урожайность и продуктивность животноводства снизились из-за периодов засухи и наводнений. Возрастающая частота и интенсивность климатических рисков представляют значительную угрозу для производства определенных продуктов, таких как какао, которое является основой экономики Кот-д'Ивуара. Сокращение производства какао будет иметь отрицательные последствия для экономики Кот-д'Ивуара.

UDK 338

Socioeconomic Adaptation of Chinese Immigrants in the USA

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Key words and phrases: USA immigrant policy; economics; Chinese immigrants; national culture.

Abstract. The object of research in this work is the social and economic assimilation of immigrants, and the subject is the history of the Chinese community in America. This article analyzes the sources to explain the role of various factors in social formation, including those that affect the acceptance of immigrants by local communities on the example of the Chinese diaspora. It was found that mainly legal, economic and cultural administration affects the attitude towards national minorities.

Chinese immigrant community in the USA is doubtlessly recognized as one of the most successful and fast growing ethnic communities. This article covers periods from the history of Chinese immigrants in the USA. The process of socioeconomic adaptation of the immigrants can be divided into two stages: the stage of exclusion; the stage of acceptance.

Exclusion

In the mid-19th century the huge immigrant flow accompanied the Gold Rush and finally contributed to the permanent settlement of the Chinese in California. By 1860 Chinese made about 90 % of all labor force involved in the construction of the first transcontinental railroad. At that time Chinese diaspora representatives worked not only for plantations and factories, but also started and developed their small business. However, this period is affiliated with the rise in anti-Chinese sentiment. This tendency was caused by several factors:

1) economic crisis and increase of economic competition (against the background of a decrease in the number of work places, the economic growth of Chinese immigrants became an annoying factor);

2) due to the ignorance or insufficient knowledge of the English language, Chinese immigrants lead a rather separated lifestyle within the Chinatowns;

3) residents of Chinatowns tried to minimize contacts with the authorities and with the external society and treated them as a potential source of danger;

4) Chinatowns caused discontent among citizens due to unsanitary conditions.

Moreover, the first anti-Chinese laws that were introduced by the USA date back to this period. It should be noted that the US Supreme Court declared these laws to be the act in violation of the Constitution. With regard to the discussion of immigrant issues at the highest level, on July 28, 1868, the US and Chinese authorities signed the Burlinghame-Sewad Treaty,

Table 1. The growth of the Chinese diaspora

Year	The amount of people
1960	236,000
1970	435,000
1980	894,000

which emphasized the need to recognize human rights to move to another country and provided the privileges of entry and residence for Chinese people in the United States. At the same time, the treaty did not give the Chinese the right to obtain US citizenship and did not abolish the laws against Chinese immigrants that had already been introduced in certain states.

The economic recession which began in 1873 and the economic crisis of 1876 influenced the strengthening of the anti-Chinese movement, and in 1876–1877 more and more cases of ethnic violence were recorded. The concern of the potential danger of the Chinese for the white population due to the impossibility of their assimilation was expressed on the Congress session on the 'Chinese problem', at the same Congress session was emphasized the necessity of the Burlinghame-Sewad Treaty revision.

Meanwhile the rights of Chinese immigrants continued to reduce, new taxes were imposed. What is more, employment of Chinese diaspora representatives became a criminal offence. Later in California the Chinese were deprived of the entrepreneurial ability, mass anti- Chinese demonstrations were allowed, public schools became inaccessible to Chinese immigrants' descendants. The 'Beijing Treaty' signed in 1880 allowed the government of the United States to suspend the immigration from China.

A peculiar feature of this stage was imposing of chauvinistic laws that limited the rights of representatives of the Chinese diaspora in the USA. During this period following laws were issued: prohibition the return to the USA of Chinese who travelled abroad (Scott Law-1888), obligation of Chinese immigrants to register, while those who did not pass it were subjected to deportation (the Giri law-1892), etc.

The methods of interaction between the US government and Chinese immigrants were dictated by the need to limit the number of migrants in order to resolve the problems of heightened economic competition. That is why the state mainly applied measures of political and economic infringement aimed at ousting, as it was then believed, the "yellow danger" outside the state.

Acceptance

On December 17, 1943, the United States Congress imposed a law that repealed all laws that dealt with the expulsion and deportation of Chinese people. This marked the beginning of the acceptance stage. Radical changes aimed at liberalizing legislation as part of public liberalization and the struggle for civil rights have led to the successful integration of the Chinese diaspora into American society. The Table demonstrates the growth of the representatives of Chinese diaspora during the first decades of new immigrant's policy in the USA.

Currently, the level of education of the Chinese part of the American population is quite high. Representatives of this group of the population are considered financially secure, they can often be found in the fields of programming and entrepreneurship.

All these positive changes are a consequence of a well-built system of measures for the economic and social adaptation of migrants, which finally took its shape by the end of the 20th century. Nevertheless, the assimilation of the Chinese diaspora did not lead to the loss of a unified system of values and traditions.

In conclusion, the USA is the nation of immigrants; they are the strength of the country and stimulate the culture and add to the society. Although, it was considered that Chinese immigrants took away jobs and did not share the values of the American society, the history has proved the opposite.

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Социально-экономическая адаптация китайских иммигрантов в США

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Ключевые слова и фразы: иммиграционная политика США; китайские иммигранты; национальная культура; экономика.

Аннотация. Объектом исследования в данной работе является социальная и экономическая ассимиляции иммигрантов, а предметом – история китайской общины в Америке. В этой статье производится анализ источников с целью объяснения роли различных факторов в социальном формировании, таких как факторы, влияющие на принятие иммигрантов местными сообществами на примере китайской диаспоры. Было обнаружено, что в основном правовое, экономическое и культурное администрирование влияют на отношение к национальным меньшинствам.

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Prospects for the Development and Commercialization of Space Tourism in the Russian Federation

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Key words and phrases: innovation; promotion; strategy; loyalty program; clients; space tourism.

Abstract. Space tourism is a modern area of tourism; it is a global industry and highly profitable business. The space tourism industry is growing rapidly; in the modern world, space tourism is one of the most promising and intensively developing sectors of the world economy. The article examines the potential and prospects for the development of space tourism on the territory of the Russian Federation. Positive and negative factors affecting the spread and development of space tourism are analyzed. The purpose of the study is to study the prospects for the development of space tourism in Russia and assess the possibilities of commercialization. Space tourism is at the very beginning of its development. The study of this industry is especially important today, because experts predict high profitability. However, the development of space tourism is complicated by high costs and the inability to guarantee complete safety on board.

Introduction

In the field of modern Russian tourism, space tourism being a relatively new direction is gradually but quite actively developing; it includes private flights into space or near-Earth orbit for entertainment or research purposes.

The main global players in this market are the United States, Russia, China and the European Union, which are developing large projects focused on a full-scale study of the nearest planets of the solar system. Despite the presence of super-powerful powers on the world market, there are not so many organizations that provide such an original type of service.

The most promising company is VirginGalactic. In 2017, the company sold about 800 tickets to the first space tourists worth $ 250,000.

China is also quite active in the area of space tourism, with several private rocket companies operating, such as LandSpace, OneSpace, LinkSpace and ExPace.

In Russia, the development of a reusable spacecraft for suborbital flights is carried out by the private company Cosmokurs. The reusable complex developed Kosmokursy for suborbital flights of tourists consists of a rocket weighing 80 tons and the spacecraft weighing 7 tons. The main components of the fuel for the rocket will be oxygen and alcohol, the accompanying component is nitrogen. The possibility of jet landing of the ship capsule due to its engines is being considered. The company expects to conduct up to 115 launches per year by 2030, that is, two launches per week. According to preliminary estimates, the project will become profitable within about 7–10 years from the beginning of the first tourist flights.

Space tourism on the territory of the Russian Federation today is at the initial stage of becoming an effective and separate tourist destination. Despite the problems, this is a promising and rapidly developing direction with high potential profitability. As a result, its development is now particularly important.

The study aims to explore the possibilities of space tourism development in Russia, analyze ways of commercialization and determine the most promising areas of space tourism.

Results and discussion

Russia's place in the development of space tourism is significant. Flights on Russian ships are cheaper than on foreign ships. Currently, they are being carried out on the Russian segment of the ISS with the help of Soyuz ships. The preparation of future tourists takes place in Schelkovo in Star Town. Flights are organized by cooperating Roscosmos and Space Adventures.

According to Roscosmos experts, the development of tourism in space will bring the company several hundred thousand dollars annually. In a report published in 2017, forecasts were announced according to which you should grow by almost 2 times by 2030.

The Russian company Kosmokurs is also engaged in the creation of a reusable space complex. It is planned that it will consist of a reusable launch vehicle and a reusable spacecraft. With the help of the latter, the tourist will be able to visit the altitude of the orbit of Gagarin's flight. Six people will be able to take part in a trip worth $200–250 thousand at the same time. The flight itself will take 15 minutes, of which in zero gravity – 5–6 minutes. The launch of the complex is scheduled for 2025.

Currently, there are various space tourism programmes, each of which has its own characteristics and corresponding flight costs. In view of the growing popularity of space tourism, we assume that every year the list of programs will be replenished due to the increasing exploration of space, the conduct of various tests of the devices being developed, which provides greater accessibility and feasibility for a certain category of the population of the various countries of the type of tourism in question. In view of the growing popularity of space tourism, it is assumed that one of the promising areas of development is the creation of space infrastructure for travelers. The implementation of this direction has already been announced by OrionSpan, which plans to open the world's first space hotel in Earth orbit with the corresponding launch into orbit of one module, which can accommodate six people, including two crew members with a cost of accommodation of 12 days of $9.5 million, including the cost of three-month pre-flight preparation.

Soon, the space tourism product in Russia can be formed from the following services.

1. Orbit flight: space tourism service includes the entire cycle of pre-flight preparation, transportation to and from the ISS and a weekly stay at the station. Cost: $20 million – $40 million. The service can be used at any time (but the queue of space tourists and the launch

schedule should be taken into account).

2. Spacewalk: outside the International Space Station for 2–3 hours. The cost of $ 15 million for going into space and $ 20 million for flying to the ISS. The service can be used in the next 2–3 years.

3. Deep Space Expeditions (**DSE**) Alpha: A space tourism service flies around the moon at about 100 km from the surface. It is assumed that a space tourist will spend up to 14 days on the ISS and 5.5 days in flight to and around the moon. Estimated cost: $ 100 million. The service may become available in the next 5–10 years.

4. Suborbital flight: space shuttle flight at an altitude of about 100 km. During a short trip, a space tourist will have time to look at the Earth from space and experience weightlessness. Approximate cost: $ 102 thousand.

As digital innovations in the field of space tourism, the creation of space "drones" is considered, which will conduct tours along a clearly defined route. Its difference from existing and developed models is the absence of the pilot and the delegation of his functions to the robot. This technology is currently being implemented in the automotive industry. Of course, when implementing this system, due attention should be paid to safety.

For all the attractiveness of space tourism, companies sending passengers into space cannot guarantee the absolute safety of people on board. According to statistics, 1 out of 100 spacecraft crashes. Now, space flights are available only to a limited number of the world's population. However, this situation can be compared with air travel. A few decades ago, flights were available to a wealthy class of people. Now this can be used by any average person. Today, one can distinguish the most significant problems that prevent the development of space tourism.

1. A limited number of companies that have the ability to send tourists to space. There is also a high threshold for technological entry into this industry, as a result of high competition.

2. Focus business on units of customers who can afford similar travel.

3. Features of physical training of clients. Space tourism in the near future will be available only to physically trained and healthy tourists.

Separately, it is worth highlighting the lack of legal regulation of space tourism. To date, many aspects of space tourism are only mentioned in passing, and the term "space tourist" is absent from international acts. Accordingly, while in space, the tourist is not immune from any emergency situations, and his safety is virtually not ensured by anything other than a contract concluded with the company (possibly insurance). In addition, the question arises as to which State should ensure the safety of a tourist who is in outer space, given that, in accordance with international legal norms, the field of space is the universal heritage of mankind, that is, it does not belong to any particular State. At present, the problem of detailed regulation of space tourism arises, which will certainly be done in the future, since we are now witnessing the active development of this area.

However, despite global problems, according to experts, in the near future the development of tourist flights into space will lead to the improvement of aerospace technologies. The decrease in the cost of technological equipment will lead to the influx of new market participants, and this in turn will reduce the prices for the flights themselves, which are carried out not only for entertainment, but also for research purposes, as well as reduce the time of the flight itself.

Conclusion

Having analyzed the general situation of space tourism, the following conclusions can be drawn:

- space tourism is rapidly gaining popularity and is a relevant activity;
- the main market participants of this type of tourism are the USA, Russia, China, and the European Union.

Space tourism is a great high-profit business. The main emphasis in which is due to the desire to know a certain category of the population of the planet near-Earth space, the search for completely new, extreme sensations.

Despite some challenges, space tourism had great prospects for development. It is now that special attention should be paid to its formation and continue to improve technology for sending people into space. This will entail the development of the space research sector. In conclusion, space tourism in Russia is a new and rapidly developing area with large investments and high potential profitability.

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Перспективы развития и коммерциализации космического туризма на территории Российской Федерации

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Ключевые слова и фразы: инвестиции; космический туризм; перспективы; потенциал; цифровизация.

Аннотация. Космический туризм – ультрасовременное направление туризма, это мировая индустрия и высокоприбыльный бизнес. Индустрия космического туризма растет быстрыми темпами, в современном мире космический туризм – это одна из наиболее перспективных и интенсивно развивающихся отраслей мирового хозяйства. В статье исследуется потенциал и перспективы развития космического туризма на территории Россий-

ской Федерации. Анализируются положительные и отрицательные факторы, влияющие на распространение и развитие космического туризма. Цели исследования – изучить перспективы развития космического туризма на территории России и оценить возможности коммерциализации. Космический туризм находится в самом начале своего становления. Изучение данной отрасли на сегодня особенно актуально, т.к. специалисты прогнозируют высокую доходность. Однако развитие космического туризма осложнено высокими затратами и невозможностью гарантировать полную безопасность на борту.

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Assessment of the Economic Impact in the Implementation of Investment Projects

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Key words and phrases: economic effect; investments; foreign investments; investment; investment potential.

Abstract. The article deals with the analysis of the implementation of investment projects as a possible assessment of the increase in economic effect. Using the analysis of the basic principles and approaches of international practice to the assessment of economic effects, the main vectors of development of foreign investment in the Russian economy are identified. The article substantiates the advantages of foreign investment, providing an economic effect. All this made it possible to conclude the effectiveness of this process and its promising development.

Today, in a rapidly developing world economy, investment projects have great potential for growth and expansion not only international, but also national markets. The question of the economic efficiency of companies, and the economic effect in particular, is especially acute. The economic effect as an absolute economic result today is most in demand in the system of economic efficiency. Issues of additional profit, increased volumes and minimization of material and labor costs determine its value. It is the determination of the ratio of the economic effect and the costs of achieving it that determines the economic efficiency of companies. In this regard, many of the world's largest companies are striving to expand their business by means of entering the markets of individual countries. As for Russia, the country's market is of interest to large companies with its volumes and high growth rates, also do not forget about the attractiveness of the markets of the regions of Russia. Many international companies are already operating in the territory, including such as Auchan, Metro Cash and Kerry, Toyota Motor, Volkswagen Group, JV. T.I. Russia, FMSM, IKEA House and a number of others.

Each foreign company has its own goals and motives in the decision to enter the Russian market. One can distinguish the following reasons for companies entering the Russian market:

- achieving economies of scale (mainly for knowledge-intensive industries);
- entering new markets in a globalized economy;
- lowering costs through cheaper lab our and the transfer/opening of new industries.

The Russian economy is characterized by constant growth and has a wide development potential, which cannot but attract foreign companies. However, the Russian economy has many specific features and difficulties, so it is not possible for foreign companies to use similar methods of entering the market as for other countries and the strategy of foreign economic

activity requires adaptation to the Russian market.

Before entering the Russian market, foreign companies should study such factors as:

- the current status and specificity of activities in a particular industry;
- peculiarities of the country's legislation and local acts applicable to a specific area of activity;
- the market situation and the attitude of consumers within the industry;
- specifics of the operation of the production and trade activities of the industry.

Given these factors, companies need to revise or adapt their market conquest strategy, organizational and management structure, company value system, and others.

To improve the efficiency of doing business, companies need to adapt their internal factors to the external conditions of the Russian market [3].

Each company has its own strategy, its own conditions and its own path to enter the Russian market, so it is impossible to identify a common list of restrictions and opportunities that will be universal for all companies wishing to enter the market. However, as a result of a study of the activities of international companies in the Russian market, Russian scientists identify a number of problems that foreign companies most often face starting their activities in Russia [4].

In the course of research into companies such as Nabisco, Procter & Gamble, Philip Morris, Gillette and others, A.R. Gatin identified the following logical barriers when entering the Russian market.

- Analysis of social and cultural needs of consumers in the Russian market: companies need to create completely new and unique products for the Russian market that meet the interests of local consumers when entering the market.
- The slow and cautious nature of investment: the experience of successful international companies in the Russian market does not recommend immediately opening full-scale production. This is due to the adverse investment climate in the country, namely, the level of corruption, bureaucracy, crime and political instability.
- The inability to deliver products everywhere: foreign companies should take into account the geographical features of Russia. If the company wants to deliver products to all districts of Russia, it needs several branches and many distributors.
- Low solvency of the population: the level of solvency of Russian consumers is often lower than the level of solvency of consumers of other countries of the company's work.
- High level of competition and monopoly risk.
- Peculiarities of the country's legislative framework: some laws/standards limit the development of the industry, and therefore all its producers.
- Limited resources: due to the low level of competitiveness of some industries, the demand for resources also falls, which leads to their annual reduction [2].

Also, V.A. Eremkin, V.V. Rybalkin discussed the issues of restrictions of the Russian market. The authors highlighted barriers in the market of high-tech products. They divide all barriers into four subgroups: exogenous, microeconomic mechanisms, endogenous and macroeconomic barriers. The first group includes institutional and cost barriers and barriers to product differentiation. The group of microeconomic factors included barriers created by competitive firms. The next group included problems caused by the low level of personnel qualifications and lack of awareness of the work of know-how and protection of intellectual property, and others. The extreme group of authors included barriers related to innovation and R&D, low level of attractiveness of investments and their inaccessibility [1].

Despite a number of barriers and restrictions on the Russian market, many international companies successfully start and actively develop their activities in Russia.

Thus, it can be emphasized that for foreign companies the Russian market remains not only attractive, but also quite difficult. However, there are many variations in overcoming barriers, as a result of which organizations have great potential for growth in the continuously evolving markets of Russia.

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Экономический эффект при преодолении ограничений российского рынка

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Ключевые слова и фразы: барьеры; ограничения; российский рынок; экономический эффект.

Аннотация. Статья посвящена анализу современного российского рынка, а также выявлению ограничений при выходе компаний на российский рынок, преодоление которых позволит увеличить экономический эффект и экономическую эффективность компаний. При помощи анализа основных факторов российского рынка выявлены основные закономерные барьеры при выходе на российский рынок. В материале статьи представлена их специфика, сделан вывод о возможности их преодоления для успешного экономического развития и повышения экономической эффективности.

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The Economic Aspect of the Russian Energy Diplomacy in Latin America

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Key words and phrases: "de-Americanization"; energy cooperation; energy diplomacy; Latin America.

Abstract. The purpose of the study is to define the current state of the Russian-Latin American energy cooperation as a line of international economic activities. The objectives are to determine the main trends of the Russian-Latin American energy cooperation; to periodise it. It is hypothesized that the economic aspect of the Russian-Latin American energy cooperation largely correlates with its political counterpart throughout all of its stages. The research methods are theoretical and empirical methods, including scientific generalization, system analysis, deductive synthesis, logical analysis. Mathematical and statistical research methods were also used over the course of the study. As a result of the study a four-stage periodization of the Russian-Latin American energy cooperation is proposed. A number of threats and opportunities for its development are defined.

The energy industry is a complex field of international cooperation that simultaneously covers areas such as economics, high technologies, and national interests. The latter is especially true for the Russian Federation, with its economy becoming increasingly more dependent on the carbon-based sector of the Russian energy industry.

With the global energy transition happening alongside the various "turbulences" on the international stage, the Russian economy faces a unique challenge. Facilitating energy cooperation with non-CIS countries may be a possible solution to this challenge, one that involves a unique political/economic tool as its key element: energy diplomacy.

As a term, energy diplomacy has several definitions. In the course of this study, the following interpretation of this concept will be used: energy diplomacy means the implementation of foreign energy policy with the help of official representatives at various levels [1].

The development of Russian energy diplomacy in Latin America has a number of prerequisites and trends that need to be addressed. For the most part, they correspond to the general tendencies of the Russian-Latin American relations:

- recovery in the 1990s;
- "buildup" (i.e. a positive dynamics) in the 2000s.

From a political point of view, this was caused by the so-called "left turn" of Latin American countries and the "U-turn over the Atlantic" of the Russian Federation – proof of the commitment

of both sides to “de-Americanization” of their foreign policy [2; 4].

At the same time, the Latin American economy experienced economic growth (driven by oil), which, in turn, coincided with the desire of the Russian authorities to update and diversify their foreign economic relations [7].

In general, Russian-Latin American energy cooperation can be divided into four stages.

The first stage is the Soviet one, which lasted from 1930, when the first major oil barter agreement was concluded between Argentina and the USSR, until 1991.

During the Soviet period, Latin American countries received energy development assistance through:

- supply of equipment for power plants;
- technical support from specialists [3].

The second stage was transitional. It ran from 1991 to 1995, after the collapse of the Soviet Union.

Unfortunately, during the transitional stage, there was a sharp deterioration in cooperation between Russia and the countries of Latin America (including Cuba, a key partner in the region), which led to:

- suspension of all projects of the Soviet era;
- lack of significant alternatives in the development [6].

The third stage – the stage of recovery – lasted from 1995 to 2010. In 2010, the Russian Federation achieved a complete and final restoration of bilateral diplomatic relations with all thirty-three countries of the Latin America (and Caribbean) region [8].

The key achievement of the recovery stage was the creation of a legal and regulatory framework for Russian-Latin American energy cooperation. During this period, the following was observed:

- a number of different business events;
- and the growth of activity in the energy markets of Latin America [7].

The last stage is the modern stage, which began in 2010 and continues at the present time.

Basically, the modern stage boils down to:

- consolidation of the results of the previous stages;
- and the establishment of positive dynamics of energy cooperation [5].

In conclusion, it should be said that for the further development of Russian-Latin American energy cooperation (regardless of which energy sectors are selected), it is necessary to consider and, if necessary, revise the priorities of cooperation. This will enable both parties to mitigate risks and seize opportunities in a mutually beneficial way.

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Энергетическая дипломатия России в Латинской Америке: экономический аспект

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Ключевые слова и фразы: «деамериканизация»; Латинская Америка; энергетическая дипломатия; энергетическое сотрудничество.

Аннотация. Цель – определить текущее состояние российско-латиноамериканского энергетического сотрудничества как сферы межгосударственной экономической деятельности. Задачи: выявить основные тенденции развития российско-латиноамериканского энергетического сотрудничества; дать его периодизацию. Гипотеза: несмотря на то, что потенциал сотрудничества не реализован полностью, энергетика является одной из перспективных сфер российско-латиноамериканских отношений. Методы: теоретические и эмпирические, в частности, научное обобщение, системный анализ, дедуктивный синтез, логический анализ. Также в исследовании использовались математические и статистические методы исследования. Результаты: установлена взаимосвязь экономических и политических аспектов отношений Российской Федерации и стран Латинской Америки. Определены основные тенденции развития российско-латиноамериканского энергетического сотрудничества. Предложена четырехэтапная периодизация российско-латиноамериканского энергетического сотрудничества.

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The Importance of Developing International Trade Relations for the Growth of the Market for Innovative Products

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Key words and phrases: foreign trade; innovative products; foreign economic activity; consumer income; consumer market; demand structure; foreign trade structure.

Abstract. The article reviews the issues about international economic activity, particularly foreign commerce, and the manner in which it can support the investment in innovative products. The goal was to analyse the current trends in foreign trade in Azerbaijan, the dynamics of the volume of innovative products in the country's industry, to identify the relationship between foreign trade and the development of the market for innovative products. In the course of the study, the tasks of identifying the level of satisfaction of the population due to the import of goods, the degree of development of innovative products in medium and small business of the country, determining the priority areas of development of foreign trade in the field of innovative products, etc. were solved. In the course of the study, methods of comparative analysis and grouping of statistical data were applied. In the conclusion of the article, specific directions of the indirect influence of foreign trade on the formation and development of the market for innovative products are given.

Foreign economic ties, particularly foreign investments, contribute not only to the supply of finished goods and services, but also to the stimulation and development of domestic production for innovative and high-tech products, as well as to the opening of international markets. This is very important for countries that have transitioned to a market economy, such as the Republic of Azerbaijan. As a result, Azerbaijan has experienced an increase in foreign trade in recent years, ideal conditions have been created for the development of market structures, and the use of internal and external sources in the development of consumer market segments has been encouraged. It must be highlighted that the republic, which only interacted with three states in 1994, currently has commercial links with 168 countries throughout the world, and its foreign trade turnover in exports has exceeded 12 billion AZN with a surplus. All of this had a huge impact on the growth of the home market, particularly the market for household products. To your understanding, foreign trade satisfied the majority of the consumer market at the turn of

Table 1. Trends in the development of foreign trade in Azerbaijan between 2016 and 2020

Years	USD (m)			
	Turnover	Import	Export	Balance
2016	21 596.6	8 489.1	13 107.5	4 618.4
2017	24 263.8	8 783.3	15 480.5	6 697.2
2018	31 782.7	11 465.9	20 316.8	8 850.9
2019	33 065.3	13 667.5	19 397.8	5 730.3
2020	24 201.1	10 730.7	13 470.4	2 739.7

the century. The share of food products declined to 65–70 %, with the balance falling to non-food categories. In the structure of non-food imports, home products provided an advantage. Changes in the household products market as a result of foreign trade have an impact on the country's demand formation and its alignment with the new system. This factor contributes, on the one hand, to the development of a new structure and source of demand, on the other hand, to an increase in people's living standards as a result of an increase in demand, an expansion of its range, stabilization and even a decrease in prices.

The figures between 2016 and 2020 clearly show good and unfavourable developments. According to these figures, the volume of products turnover in Azerbaijan's foreign trade was highest in 2019, with a minor reduction after that, albeit it still maintained a positive balance. These changes have impacted Azerbaijan's consumer industry, particularly one of its most important segments: the market for innovative products. Before looking at the changes which can be noticed, we believe that it is a great idea to look at the trends in changes in Azerbaijan's foreign trade structure using the data provided in the Table 1.

For many years, the export of oil and the import of food products provided a competitive advantage in international trade. After 2015, the percentage of food products in the structure of imports in Azerbaijan fell to 13 %, and the share of household goods in the structure of imports began to rapidly increase. As a result, the outflow of foreign currency from the country became more acute. Imports from Italy, Germany, China, and other countries accounted for the majority of the outflow of foreign currency from the country due to the rise in home goods imports. It should be highlighted that these countries' positions have been enhanced as a result of increased trade with Azerbaijan. Italy took the lead in 2006 and was able to keep it until the end of 2019. Despite the fact that Germany was ranked 6th in 2006, it was able to move to the 2nd position in 2019 as a consequence of stronger trade and commercial links, the United States moved from the 12th to the 8th position, Thailand from the 30th to the 10th position, Indonesia from the 72nd to the 3rd position, and Japan from the 24th to the 11th position [5].

Furthermore, in recent years, a decreasing trend in foreign trade relations with several countries, including bordering countries, has been noticed. Turkey fell from third place in 2000 to seventh place in 2018, while the Islamic Republic of Iran fell from eighth to 31st place. In the years highlighted, the volume of international commerce with the United Kingdom and Northern Ireland rose from fifth to ninth position, with Ukraine rising from tenth to seventeenth, and Kazakhstan rising from thirteenth to twenty-fifth [5].

The drop in Azerbaijan's foreign trade volume with neighbouring nations was primarily due to a decrease in food imports.

Such significant tasks as ensuring economic security in the country, reducing dependence

on imports, and creating an export-oriented economy should be perceived as normal, according to the requirements of a number of socio-economic programs adopted by degrees of the President of the Republic of Azerbaijan's Decree, including the Strategic Roadmap for the Economic Development of Azerbaijan. As a result, there have been significant advancements in supplying the population's food demands through local production [2]. In a market system, these changes have a significant impact on the creation of supply and demand for new items. On the one hand, a new demand structure is emerging; on the other hand, as competition grows, customers' choices expand and prices fall, resulting in a rise in their financial ability to pay. It is worth mentioning, however, that the aforementioned positive trends are not noticeable in the field of new items for the domestic market.

Meeting the needs of the population through the import of these goods occupies a unique position in Azerbaijan's foreign trade structure, and as a result, the Strategic Map for the Development of Azerbaijan's Economy suggests that a fundamental shift in the supply of non-manufactured and non-exported goods to foreign markets should be made in the coming years.

It is important to remember that foreign commerce entails more than just supplying the populace with a diverse range of products from the household goods sector [4].

International trade has an impact on consumer income as well. As a result, it contributes to the creation of opportunities for home goods manufacturing in the country, as well as the increase of employment and revenue for legitimate businesses and individuals. At the same time, it should be mentioned that imported domestic items (mostly from China and Malaysia) frequently have a negative impact on the family budget and do not fulfil health standards. This is true for most disposable household goods made in China, as well as upholstered furniture made of synthetic materials (evaporation of chemicals in their composition in warm conditions).

As a result, the number of customers of this commodity provided to the country's domestic market has decreased. In the structure of foreign trade, however, the share of items entering Azerbaijan's domestic market from Turkey, Germany, and other countries is expanding, contributing to the strengthening of the consumer market.

To arrange the production of innovative products in our country, we believe that a stimulating environment for small and medium-sized firms, based on long-term interest-free financing, is required. The adoption of this approach can be effective in terms of lowering the domestic market's reliance on imports by creating a stimulating atmosphere for a wide range of innovative items in production units. As a result of direct domestic and foreign investments in arranging the manufacture of innovative products as a subject of a science-intensive sector, our country's output of these products will expand.

It should be noted that, at the moment, the production of innovative products in the industry is carried out in two directions, in accordance with the investments made in our country:

- products that have undergone considerable adjustments and have been re-manufactured;
- products that have been somewhat modified.

However, it should be emphasized with regret that our country generates innovative items in very modest numbers, with the mining and processing industries being the primary beneficiaries. Table 2 shows the results. Unfortunately, among the industries indicated, there are no products associated to the household goods industry.

As can be seen from Table 2, the year 2017 experienced the highest volume of innovative goods by industry. Inventive items were created totally in the manufacturing sector at the same period. Simultaneously, the non-oil sector of industry, particularly the manufacturing of machinery and equipment, plays a vital role in the structure of manufacturing industry. So, over the stipulated time, the average annual proportion of innovative products from machinery and

Table 2. The volume of innovative products by the level of innovativeness and industries in Azerbaijan (AZN thous.)

	2016	2017	2018	2019	2020
Total by industry	883.1	1,117.6	589.7	540.9	383.8
Mining industry	–	–	–	–	183.8
Manufacturing industry	883	1,117.6	589.7	540.9	200.0
Manufacture of machinery and equipment	798.3	462.9	430.0	524.8	167.1
Installation and repair of machinery and equipment	44.1	89.0	32.2	16.1	32.9

equipment manufacture in the total volume of innovative products in the processing sector was 69 percent, showing that machinery and equipment manufacturing in the domestic industry is innovative.

It should be mentioned that overseas commerce has a direct and indirect impact on the formation and growth of the market for innovative products. The indirect impact is different if the direct impact is linked to import-export processes. The following categories, in our opinion, are influenced indirectly by external trade and economic relations:

– identifying innovative ways to better meet market demand for household items;

– look for ways to reach the international market for household items that are produced in excess of domestic demand and meet international standards;

– the likelihood of lower pricing for household items as a result of the national market's expansion;

– in order to specialize in line with the benefits of the international division of labour, establishing circumstances for the development of local potential for the production of household goods based on innovative elements and effective use of the international division of labour advantages.

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Роль развития внешнеторговых связей в развитии рынка инновационных продуктов

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Ключевые слова и фразы: внешнеэкономическая деятельность; внешняя торговля; доходы потребителей; инновационные продукты; потребительский рынок; структура внешней торговли; структура спроса.

Аннотация. В статье рассматриваются вопросы внешнеэкономической деятельности, в частности, внешняя торговля и пути ее инвестиционного обеспечения в сфере инновационных продуктов. Цели: провести анализ современных тенденций внешней торговли в Азербайджане, динамики объема инновационной продукции в промышленности страны; выявить связи между внешней торговлей и развитием рынка инновационных продуктов. В ходе исследования были решены задачи выявления уровня удовлетворенности населения за счет импорта товаров, степень развития инновационной продукции в среднем и малом бизнесе страны, определение приоритетности направлений развития внешнеторговой деятельности в сфере инновационной продукции и т.д. В ходе исследования были применены методы сравнительного анализа и группировки статистических данных. В заключении статьи даны конкретные направления косвенного влияния внешней торговли на формирование и развитие рынка инновационных продуктов.

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