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SECTION 6. Metallurgy and energy.

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PHOTOCURRENT AND PHOTOVOLTAGE UNDER INFLUENCE OF THE SOLAR CELL THICKNESS

Abstract: *A theoretical study of a parallel vertical junction silicon solar cell under a multi-spectral illumination in static regime has been done under impact of the thickness of this solar cell. Based on the diffusion-recombination equation, the expression of excess minority carrier density in the base was established according to the thickness. Photocurrent density and photovoltage are then deduced. The objective of this work is to show the effects of solar cell thickness on these electrical parameters.*

Key words: *photocurrent density, photovoltage, thickness, Vertical junction.*

Language: *English*

Citation: Dieme N, Sane M, Barro IF (2015) PHOTOCURRENT AND PHOTOVOLTAGE UNDER INFLUENCE OF THE SOLAR CELL THICKNESS. ISJ Theoretical & Applied Science 07 (27): 1-6.

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1. Introduction

The vertical junction solar cell is manufactured by an alternative junction base -emitter-base-emitter. Both sides have the same thickness [1]. The incident rays simultaneously touch the base, the junction and the emitter. Each base and emitter is bordered by an aluminum collector as shown in the following figure1.

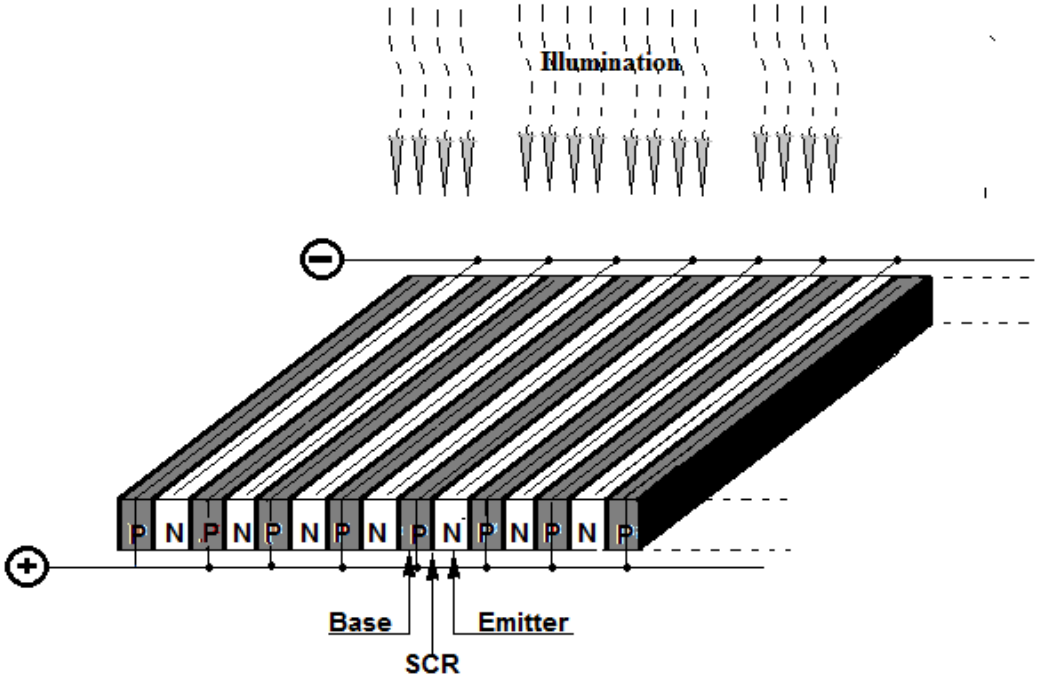

Figure 1 - Parallel vertical junction solar cell.

The bases are interconnected by a connecting wire to define the positive electrode and the emitters are connected together to form the negative electrode. The aim of this work is to investigate the influence of The thickness of the solar cell on electrical parameters such as photocurrent and photovoltage. Knowing the evolution of these two quantities based on the thickness is a good indicator for us to comment on the impact on the performance of solar cells.

2. Mathematical study

2.1. Hypotheses

We assume that the following hypotheses are satisfied.

The solar cell is illuminated along the z axis.

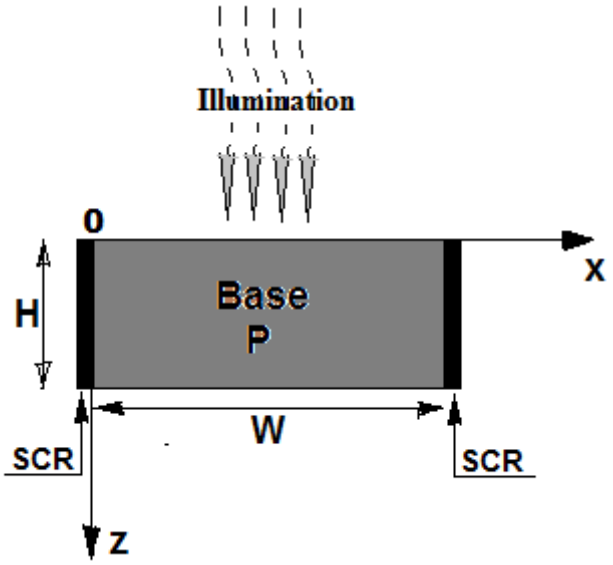

Figure 2 - Base of parallel vertical junction solar cell (thickness: H; width:W =0,03cm).

- The contribution of the emitter is neglected.
- Illumination is made with polychromatic light in steady state, and is considered to be uniform on the z = 0 plane.
- There is no electric field without space charge regions.

2.2. Density of minority charge carriers

When the solar cell is illuminated, there are simultaneously three major phenomena that happen: generation, diffusion and recombination.

These phenomena are described by the diffusion-recombination equation obtained with:

$$\frac{\partial^2 n(x)}{\partial x^2} - \frac{n(x)}{L^2} = -\frac{G(z)}{D} \qquad (1)$$

D is the diffusion constant and is related to the operating temperature through the relation [2], [3]

$$D = \mu . \frac{K}{q} . T \qquad (2)$$

with q as the elementary charge, k the Boltzmann constant and T temperature.

G(z) is the carrier generation rate at the depth z in the base and can be written as

$$G(z) = \sum a_i e^{-b\,i\,z} \qquad (3)$$

a_i and b_i are obtained from the tabulated values of AM1.5 solar illumination spectrum and the dependence of the absorption coefficient of silicon with illumination wavelength.

n(x), L, τ, and μ are respectively the density of the excess minority carriers, the diffusion length, lifetime and mobility.

The solution to the equation (1) is:

$$n(x) = A\sinh(\frac{x}{L}) + B\cosh(\frac{x}{L}) + \sum \frac{a_i}{D} L^2 e^{-biz} \qquad (4)$$

Coefficients A and B are determined through the following boundary conditions:

at the junction (x=0):

$$\left.\frac{\partial n(x)}{\partial x}\right|_{x=0} = \frac{S_f}{D} n(0) \quad (5)$$

This boundary condition introduces a parameter S_f which is called recombination velocity at the junction; Sf determines the flow of the charge carriers through the junction and is directly related to the operating point of the solar cell. The higher Sf is, the higher the current density will be.

in the middle of the base (x=W/2) [5]:

$$\left.\frac{\partial n(x)}{\partial x}\right|_{x=\frac{w}{2}} = 0 \quad (6)$$

Equation 8 illustrates the fact that excess carrier concentration reaches its maximum value in the middle of the base due to the presence of junction on both sides of the base along x axis (figure 1).

2.3. Photocurrent density

The photocurrent Jph is obtained from the following relation given that there is no drift current [5]:

$$J_{ph} = 2qD\left.\frac{\partial n(x)}{\partial x}\right|_{x=0} \quad (7)$$

2.4. Photo-voltage

The photo-voltage derives from the Boltzmann relation [6]:

$$V_{ph} = \frac{k.T}{q} \cdot \ln\left(N_B \cdot \frac{n(0)}{n_i^2} + 1\right) \quad (8)$$

with

$$n_i = A_n.T^{\frac{3}{2}}.\exp\left(\frac{Eg}{2KT}\right) \quad (9)$$

n_i refers to the intrinsic concentration of minority carriers in the base,

A_n is a specific constant of the material (**A_n=3.87x10^{16}** for silicon)

N_B is the base doping concentration in impurity atoms

Eg is the energy gap; it is given by [3]; [4]:

$$Eg = Eg_0 - \frac{a.T^2}{b+T} \quad (10)$$

(Eg_0=1.170 eV; a=4.9 10^{-4} eV.K^{-2}; b=655K for silicon)

3. Results and discussion

In this section of our work, we present the results obtained from simulations.

3.1. Photocurrent density

The figure3 and Figure4 show the impact of the solar cell thickness on the photocurrent density.

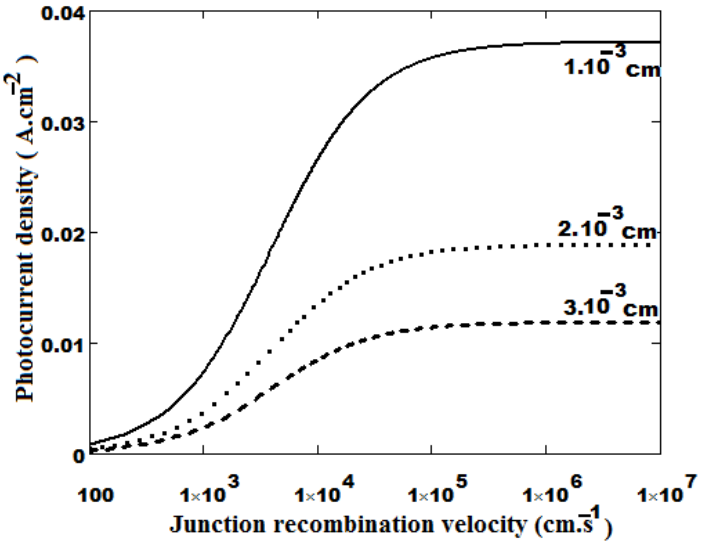

Figure 3 - Photocurrent density versus junction recombination velocity. T=300K

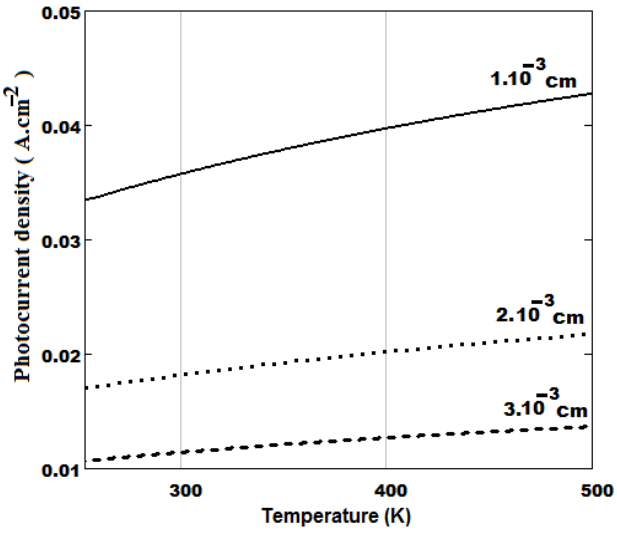

Figure 4 - Photocurrent density versus temperature Sf=10^{5}cm.

La figure3 shows the evolution of the photocurrent density versus junction recombination velocity for various values of solar cell thickness. It can be seen that the photocurrent increase with the junction recombination velocity. The recombination velocity at the junction reflects the stream of carriers crossing the junction [7]. For higher Sf, the carrier flow through the junction increases so that the generated photocurrent also increases: the solar cell operates near short circuit [10].

It can also be seen that the increase in the solar cell thickness causes a decrease in the photocurrent density. This same Remark is noticed in the figure5 that shows the profile of the photocurrent density versus temperature for various values of the solar cell thickness. In this figure we note that photocurrent density increases as operating temperature increase [8], [9].

3.2. Photovoltage

The figure5 and Figure6 show the impact of the solar cell thickness on the photocurrent density.

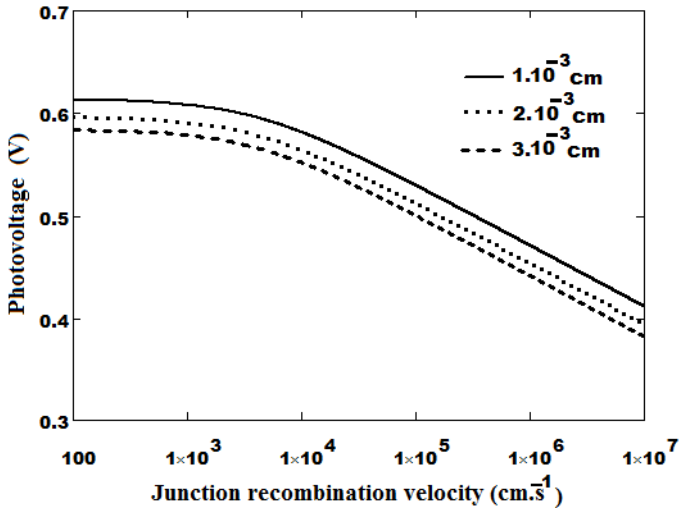

Figure 5 - Photovoltage versus junction recombination velocity T=300K.

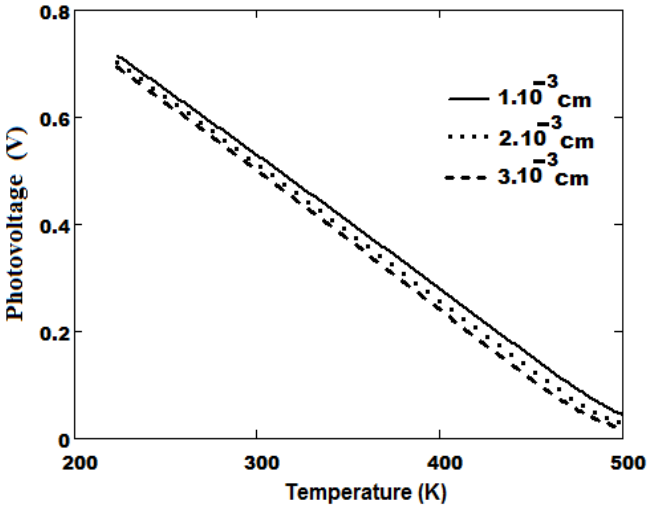

Figure 6 - Photovoltage versus temperature Sf=10^5cm.

For lower junction recombination velocities, carriers flow through the junction is neglectable since carriers are stored across the junction: the photovoltage is at the maximum value (open-circuit voltage) [10]. For increasing Sf value, carriers flow through the junction increase and the stored charge cross the junction leading to a decrease of the photvoltage [7]. This decrease is all the more important than solar cell thickness is high. This simple remark is observed in the figure6. In this figure we note that photvoltage decreases as operating temperature increase [8], [9].

3.3. Characteistc current-voltage

Figure 7 shows the evolution of photocurrent density for different values of the solar cell thickness and in relation to photo-tension.

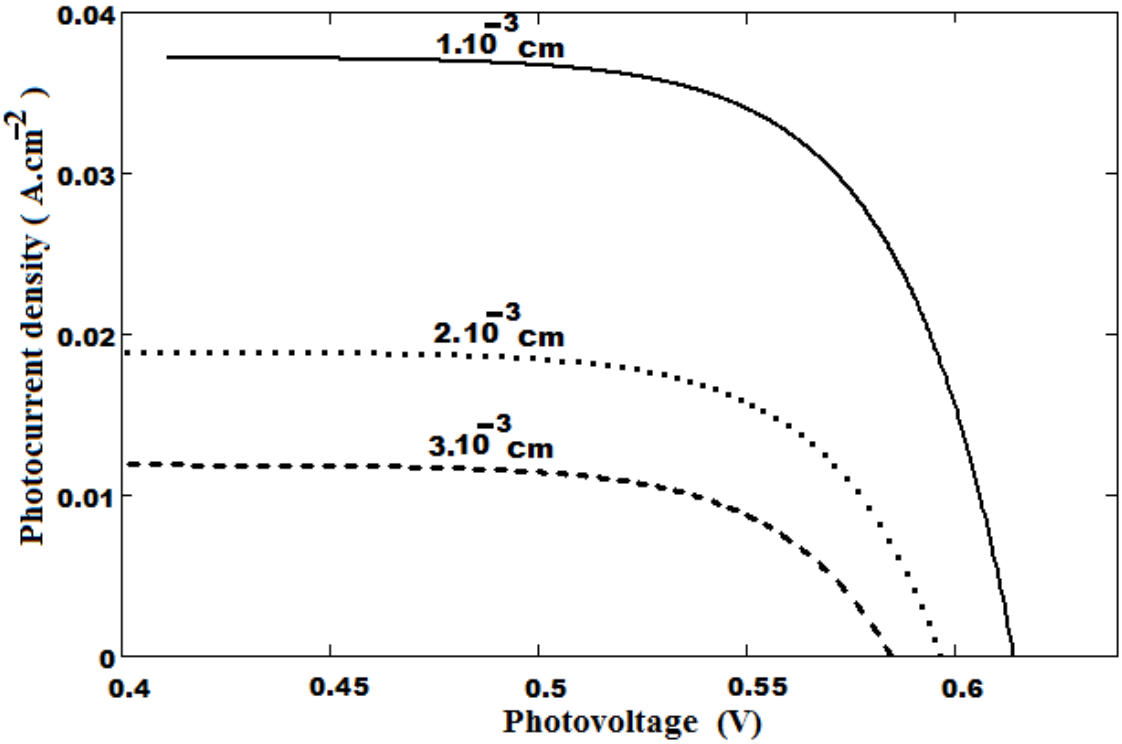

Figure 7 - Photocurrent density versus photovoltage.

Figure 7 shows that when photo-courant is maximized, photo-tension nears the zero level and vice versa. It can be noted that this figure perfectly confirms variation of the two physical quantities (photovoltage and photocurrent) in relation to solar cell thickness.

Indeed the increase in thickness increases defects in structuring and traps center for

photogenerated electrons. Moreover high thickness increases rate imperfection of the junction. All these malfunctions are the reals causes of the decrease of photocurrent and photovoltage.

It can also be seen that when there is an increase in thickness of $\Delta H = 10^{-3}$cm, photovoltage can decrease by almost 3% while photocurrent can decrease by about 49%.

4. Conclusion

A theoretical study of a vertical junction solar cell has been presented. Electrical parameters such as photocurrent density, photovoltage, have been determined and we showed the effects of solar cell. This study exhibit the fact that photocurrent density and photovoltage depend on solar cell thickness. An increase in the thickness of $\Delta H = 10^{-3}$cm can prompt a decrease in photovoltage of almost 3% and a decrease in photocurrent of about 49%. We can estimate that high solar cell thickness decreases performance solar panels. This study can be confirmed by studying the power under the influence of thickness.

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SECTION 12. Geology. Anthropology. Archaeology.

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ABOUT INNOVATIVE FEATURES OF RESEARCH OF TYPICAL ETHNODEMOGRAPHIC CHARACTERISTICS OF GANJABASAR REGION

Abstract: *As you know, Ganja is one of the oldest cities in the Caucasus. In this scientific work have been researched the main features of research of local ethnodemographic features of Ganja and the whole Ganjabasar region.*

Key words: *Azerbaijan, Ganja, ethnodemography, innovative scientific methods.*

Language: *English*

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Introduction

Ganja city is the motherland of the great poets and philosophers as Mahsati Ganjavi (XI-XII centuries), Nizami Ganjavi (XII century) and others. Ganjabasar region is an area of Ganja city and around territory. This part of Azerbaijan is one of the main regions. The economic life of modern families in Azerbaijan is diversified and has rich historical roots. Farming, cattle-breeding, hunting, fishing, vegetable-growing, silkworm-breeding and bee-keeping and handicrafts have been playing the principal role in the economic life of nation over centuries, while fertile lands, favorable natural conditions and various natural riches created broad opportunities for the development of the said branches of agriculture. It is known that the economic life of families is closely linked to the production of material values. Rural population makes a particular contribution to this. In Azerbaijan, with the area of 86,600 square kilometers, there are 60 towns, 125 suburban settlements, 61 regions and around 4, 300 villages. Large families continued to exist in Azerbaijan, also in Ganjabasar region, which situated in the western part of country till 1930s.

The composition of large families included 3-4-generation families with the joint living of several brothers on the basis of agnate kindred relations. All members of families of such sort lived together and worked for a single economy. Head of the family was the family's man, "ata" (the father), after whose death the leading role in the family went over to his elder son. Other men of a family were subordinated by him. He also settled matters related to the properties of his family. Particular position and role in such family belonged to "beyuk ana", "agbirchek" (the elder mother). She controlled performance of homework [1].

Materials and methods

The article's objective is to eliminate this gap, analyze changes in family life of rural population in Ganjabasar region since then, directions of development, important features of rites and peculiarities, and study modern family life-related processes in rural locations on the basis of materials obtained in rural parts of this region.

For this purpose, there were settled the following tasks:

- On the basis of statistical and field ethnographic materials, there were specified, more accurately than before, principal and regional peculiarities of modern family life of the population of rural parts of Ganjabasar region
- There were identified typical peculiarities of family life of modern population of Ganjabasar;

- There were studied the type, structure, numerical composition and inter-family relations of a modern rural family;
- Ethnographically, there were studied functions of a family and the system of kindred relations;
- There were studied changes and local peculiarities of spiritual life of families;
- There were studied traditional and new peculiarities of a marriage, a wedding, the upbringing of children in family, and funeral rites;
- There were identified customs similar to that of other nations, including new customs, rites and habits in modern family life.

Certainly, large families existed historically and had had deep roots and definite frames in Ganjabasar, also in a whole Azerbaijan prior to the first quarter of the 20th century; more exactly, they comprised a large family, inside which several smaller families who had concluded marriage contract, and their children, parents and so on lived. So, the existence of monogamy in large families, under the father's full domination, did not mean yet establishment of an economically independent monogamous family in the conditions of those times. Development of production force had not yet reached a level, under which a separate small family consisting of a husband and a wife could manage the family economy independently. At a time when labor productivity was insufficient to meet demands of members of the community in full, the only economic unit could be a patriarchal family consisting of representatives of 4 to 5 generations only on the father's side, and their wives and children. All members of families were subordinate to the father only [3]. In researchers' opinion, large families give continuation to human life, e.g. such families usually consist of three or, for rare exception, four generations under the condition that the number of descendants increases within the entire family. The head of a large family settled all relations within the family [2; 3]. The economic function of a large family was based upon instruments of labor and production of goods that it privately owned. The main regulator of a large family was its head: man-father.

Large families, with all features mentioned above, are subdivided into the following several kinds: a branchy patriarchal family, a branchy fraternal family, and one-sided integrated family of relatives. From historical point, patriarchal families are most ancient of them all. There were a lot of survivals in the way of life of a patriarchal family in Azerbaijan at the end of the 19th century, in the beginning of the 20th century and even in early years of the Soviet power. In families of such kind, orphan children were brought up under care of uncle-the brother of the father or the mother. Properties inside the family were distributed in accordance with the Islamic law. The share of boys was bigger than that of girls. The family head gave the widow woman 1/8 of the dowry that she had brought in accordance with the terms of marriage contract [3-7]. In the ethnography, establishment of the form of a large patriarchal family is related to the formation of private property and transition, as a result of decision by the father's kin, to a primitive rural commune. This means that a tribe with the blood relationship was substituted by a patriarchal family. It goes without saying that such a family was an economic cell; its members jointly produced goods and used everything together [1].

Conclusion and Recommendations

Property of a family was the indivisible property of all its members. The development of capitalist relations in villages in Ganjabasar, also in a territory of Azerbaijan, the conduct of agrarian reforms and, finally, the politics of collectivization caused division of large families and, as a consequence, establishment of patronymic clans. In modern villages, such patronymic names as kok, ushagy, nasil, evlari, tirya, nasil odjagy, tayora, toryamya, agroba, etc. mean kindred relations while myahlya, tyaryaf, shenlik, oba, etc. mean neighborhood relations. Demographic processes also influence upon the composition of families. The number of Azerbaijan's population was equivalent to 2,861,000 in 1917, 2,314,000 in 1926, 3,205,000 in 1939, 3,698,000 in 1959, 5,117,000 in 1970, 6,028,000 in 1979, and 7,038,000 in 1989. Rural population plays particular role in the creation of material values in Azerbaijan. The share of rural population in total number of Azerbaijan's population was 76% in 1913, 76.8% in 1917, 71% in 1926, 64% in 1939, 52% in 1959, 50% in 1970, 57% in 1979, and 47% in 1989. Common indications of family relations and structure of Ganja city and Ganjabasar's families resemble the structure of families of other nations of the world. However, a series of local specific peculiarities as well as peculiarities of national rites and customs distinguish Azerbaijani families from other. Establishment of appropriate conditions for economic independence in agricultural regions provides the independent life of members of agricultural families.

Availability of every family's opportunities for construction of living houses for young families at a personal or supplementary plot brings to an increase of the number of nuclear families and, as a consequence, the number of small families increases. Heading families of such sort is primarily the father, i.e. the house's man. The specific features of nuclear families are displayed through interrelations, norms of behavior and respect for the elders in a family. The composition of generations in modern families includes those having one marriage contract (individually incomplete, simple families), those who

have not married, mothers and children, widowers, widows and divorced persons. The complex family includes those having two or more marriage contracts (the complete family), marriages concluded by widowers or widows (the incomplete family) as well as families with several marriage contracts. The number of small families, which are typical for Azerbaijan, is 58.7% and 65.1% in urban localities and rural localities, respectively, of total number of families. According to the minority custom, the younger son remains to live in the father's house. Other children living outside the family continue to keep relations with the parents no matter whether they live. Examination and exploration of family-related modern issues illustrate that the structure of families and direction of family relations are displayed in various spheres of family life, such as social and professional composition of and the number of rural families; incomes, expenditures, living conditions, and regulation of material and spiritual life of rural families. A specific feature of families is reflected in the issues of democratization, inter-family relations, economic works, reproduction, upbringing of children, etc. Playing a principal role in a family is proportionate division of labor, legal equality of men and women, the conclusion of a marriage in conformity with the state laws, and the conduct of the wedding ritual. National customs are getting updated, developed and sophisticated. As is known, the number of families in Azerbaijan was 32,789 in 1925, 770,900 in 1959, 956,700 in 1970, 1,102,700 in 1979 and 1,381,400 in 1989. Noteworthy is that most developed rural families comprise specialists and persons of different social and professional composition. Therefore, public and economic changes in the community influence upon families as well. Birth, upbringing, economic, material-economic and other functions are specific peculiarities of rural families. Kindred relations regulate the Azerbaijani system of kinship and it-describing terms. Marriage and family rituals and customs are getting renovated and updated, with their local specific peculiarities preserved. In the studied period, monogamous marriages were the main form of marriage in Azerbaijan. The number of such marriage forms as levirate, sororate, "beshikkyartmya", and "bash-basha" was quite insignificant while the number of marriages between cousins was essential. The number of girls who have not married increases because the outflow of the youth from villages has increase due to economic and spiritual discrepancy. Apart from traditional customs, there were developed new customs related to the wedding ritual. However, some traditional customs, for instance, "bashlyk" have been preserved in certain regions in a modified form. Currently, folk holidays of families are celebrated at state level. In the Soviet era, religious holidays were celebrated voluntarily, not at state level. For this reason, rituals related to such holidays were observed inside families. In addition, families started celebrating calendar and professional holidays. It is known that development of education contributes to an increase of the education level of members of families; education, economic activity, and family relations play definite role in the cultural life of rural families. Naturally, all public achievements in the sphere of moral progress, and development and formation of a personality find their reflection in a family.

It should be noted that the Soviet rule had existed in Azerbaijan in 1922-1991; the economy of Azerbaijan had been developing under the Soviets for 70 years; the cultural level of the population had increased as well. Hence, on the eve of the breakdown of the USSR, in Azerbaijan, due to the accumulated economic, scientific-technical and cultural potential, there was created the basis for an independent existence of the Republic. The Communist Party of Azerbaijan was liquidated in the course of its 23rd, extraordinary congress on September 14, 1991. Azerbaijan regained its independence on October 18, 1991. Since then, the independent Azerbaijani state has gained successes in the field of independent domestic and foreign policy. The number of Azerbaijan's population in those years was 8,141,400, including 50.8% and 49.2% as urban population and rural population, respectively, and 3,988,300 (49.9%) as men and 4,152,600 (51%) as women. Development of market-oriented economy influenced upon a family as well. In Azerbaijan, there were formed bases of new political and socioeconomic relations: an Azerbaijani family started being formed in accordance with these bases. All processes in the community historically penetrated family life. In this regard, the period of 1990s occupies a considerable place. It is known that the 20th century was contradictory, diverse for the Azerbaijani nation. For example, in 1920, 19,000 square kilometers of Azerbaijan's land were seceded from Azerbaijan and passed to Armenia. World War I, the foreign military intervention, the civil war, discords between the Armenians and the Azerbaijanis and, as a result, the genocide of Azerbaijanis and the repressions of the 1930s had led to a decrease of the number of Azerbaijan's population by 387,000 – from 2,339,200 to 1,952,200 (16.6%); in the years of the Great Patriotic War, the number of Azerbaijan's population had decreased by 17.4%: from 3,274,000 in 1940 to 2,705,600 in 1945; as a consequence, the number of population had got restored only in 1955. Contributing, to a certain extent, to this were the 150,000 Azerbaijanis who had been expelled from Armenia in 1948-1953. Starting from 1988, the undeclared aggressive war of Armenia against our nation and country has caused a significant deterioration of family-life relations in Azerbaijan. In 1988-1989, on the eve of disintegration of the USSR,

230,000 Azerbaijanis-residents of Armenia were expelled from that country. More than 50,000 Mesheti Turks – refugees from Central Asia and Kazakhstan – arrived in Azerbaijan in 1990.

In 1992-1993, the Armenians occupied Azerbaijan's 7 regions bordering Nagorno Karabakh. Thus, with the number of Azerbaijanis ousted from Armenia in consideration, more than 1 million Azerbaijanis have become refugees and internally displaced persons in their native country. Noteworthy is that 20,000 people were killed and the same number of people were injured, 8,434 people became invalids, and more than 5,000 were taken prisoners, hostages or missed. In 1990-1994, Armenian armed forces occupied a total of Azerbaijan's 14 regions and 834 villages with the total area of 17,300 square kilometers, i.e. 20% of the territory of the Azerbaijan Republic. Around 700,000 Azerbaijanis were forced to live places of their residence in Nagorno Karabakh and adjacent areas. As a result of the occupation, Azerbaijan suffered damaged estimated at $60 billion. Note that 188,540 families became homeless and lost their properties; of internally displaced persons, 54.15% and 45.85% live in urban localities and rural localities, respectively. According to the 2000 statistical data by the State Commission of the State Committee for refugees and internally displaced persons, "in the occupied territories of the Azerbaijan Republic, there were destructed around 6,000 agricultural and industrial facilities, 102,000 living houses, 4,366 social-cultural objects, 7,000 public buildings, 693 secondary schools, 855 preschool institutions, 695 hospitals and other medical institutions, 10 mosques, 1 bridge, 368 clubs, 927 libraries, 85 school museums, 464 museums and historical monuments, 6 state theaters, 800 kilometers of railways and motorways, 15,000 kilometers of electric and gas mains, and 2,300 kilometers of water pipelines of regional importance". In the occupied areas, the Armenian separatists took over 31 mosques, 9 historical palaces, 1 million hectares of agricultural lands, 250,000 hectares of forests, and 200 Paleontological, regional monuments [2-7]. In Azerbaijan, 4,514 families were killed for their fight for motherland, and there are 4,395 orphan children, 41 national heroes, and 988 freed hostages. "The State Reward over solution of the problem of refugees and internally displaced persons" established in accordance with Decree #895 of the President of the Azerbaijan Republic on September 17, 1998 was designated to defend the rights of refugees and internally displaced persons, and conduct consequent measures over their accommodation, rehabilitation, repatriation, social security, etc. In Azerbaijan, there are 72,951 veterans of the Karabakh war. The families of invalids and those killed at war every year are supplied with modern living residences and cars by the Ministry. Solution of social problems in Azerbaijan is under permanent control of the state, which increases care of people with low incomes from year to year. Expenditures related to social security are provided annually from state budget. The state builds private houses for refugees and internally displaced persons and improves their living conditions. The level of education of Azerbaijan's population has increased considerably over the years of independence. In 2000, the literacy rate of population over 15 was 98.8%. In the years of independence, there have been significant achievements in industries, construction, transport, trade, economy and services. Indeed, around 50 million Azerbaijanis live around the globe. Of them, 9 million live in Azerbaijan; 30 million live in Iran while the rest live in Turkey, Russia, Germany, Iraq, Saudi Arabia, the UK, Indonesia, Georgia, Kazakhstan, Uzbekistan, France, Japan and other countries [2]. In 1999, the number of households in Ganjabasar was 382,499, but in a whole Azerbaijan was 1,687,582. The number of population of these households was 7,953,438. The number of households with 1 member was 130,589, 2 members-138,709, 3 members-213,644, 4 members-350,136, 5 members-348,327, 6 members-230,931, 7 members-111,113, 8 members-65,567, 9 members-38,150, and 10 or more members-62,416, with the number of the latter's members of 741,057. Of households, 46% and 54% lived in rural places and urban places, respectively, the number of their members was 49% in rural places and 51% in urban places. Four-member families prevailed in urban places while 5-member families prevailed in rural places.

Marriage provided a considerable impact on birth rate in Azerbaijan in 1999. In those years, the annual number of marriages and divorces was around 57,000 and 8,000, respectively. The number of woman in fertile age was 2,311,000. In the beginning of 2009, there were 1,887,800 families in the Azerbaijan Republic, including 1,083,600 in urban places and 804,200 in rural places. The number of one-member families was 109,000 in towns and 37,100 in villages [3]. The number of members of a family averaged 4.7, with the figure equivalent to 4.4 in towns and 5.1 in villages. As of early 2009, there lived 4,358,300 men (49%) and 4,338,600 women (51%) in Azerbaijan. The number of women in fertile age was 2,694,929 or 59.4% of total number of female population. In 2008, the number of births and deaths in Azerbaijan was 12,086 and 52,710, respectively. The natural increase was 99,376. In 2008, in Azerbaijan, there were registered 79,964 marriages and 7,933 divorces. As of early 2009, operational in Azerbaijan were 752 hospitals, 1,695 ambulatory-polyclinic institutions, and 912 antenatal clinics and children's polyclinics. Working for these institutions were 32,500 physicians and 62,500 nurses [2]. In 2008, the number of economically active population was

4,318,200. Of them, the number of employed persons was 4,056,000 (93.9% of total) and the number of unemployed persons was 262,200.

The number of those receiving the unemployment grant was 2,109, including 1,350 men and 758 women. Total incomes of population reached to 4,047.3 million manats and 20,058.2 million manats in 2000 and 2008, respectively, while the expenditures of population in the said years were 3,272.2 million manats and 15,309.8 million manats, respectively. In 2009, 163,409 families received the purposeful state social aid [1]. Specialists and persons of different social and professional composition live in modern families. Therefore, socioeconomic changes in the community influence upon families as well. Occupying a significant position in the economic life are the financial provision of every member of a family, common needs of family members, homework, economic works, division of labor among family members, etc. The economic function of family lays down its material ground. Family budget is provided at the expense of earnings of its members, various state grants, and incomes obtained from personal plots. Women play a particular role in all spheres of domestic family life and sociopolitical life in Azerbaijan. They work equally with men in all fields of economy, science, culture and public life. The availability of developed economic, scientific-technical and cultural potential in Azerbaijan has established grounds for the existence of Azerbaijan as a fully independent state. Indeed, Azerbaijan lives as an independent state today. In the future it is necessary to continue the main ethnodemographic researches about Ganja and Ganjabasar region.

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SECTION 34. Tourism.

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TOURISM INDUSTRY OF THE REPUBLIC OF KAZAKHSTAN: CURRENT STATUS AND DEVELOPMENT TRENDS

Abstract: *The article presents the results of a study of the current condition and development trends of the tourism industry in Kazakhstan. The authors' conclusions are based on an analysis of official statistics and complemented with the results of a survey of managers of tourist companies and individual entrepreneurs of Astana. The study identified "problem areas" in the development of tourism, SWOT-analysis of the tourism industry condition of Republic of Kazakhstan.*

Key words: *tourism industry, outbound tourism, inbound tourism, domestic tourism, accommodations, transportation system, travel agents, tour operators, tourism product, infrastructure*.

Language: *English*

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Tourism is one of the most dynamic sectors of the economy. The rapid development of tourism in the advanced countries of the world in current decades mainly due to the growth in labor productivity as a result of scientific and technical progress, improving the material well-being and improving their quality of life. Tourist business is stimulated the development of other sectors of the economy: construction, trade, agriculture, consumer goods, communications, etc. According to the World Tourism Organization of the United Nations, in 2012 the number of tourists in the world surpassed 1 billion. The US Travel Association says that every 35 foreign visitors in the country provide for the creation of one workplace [1]. The growth in the number of tourist arrivals is quite influential: over the last 10 years the number of trips abroad in the world has doubled.

Start of independence of Kazakhstan is characterized by the rapid development of international tourism. In connection with the advent of the possibility of free travel abroad during this period develops mainly outbound tourism, which accounts largely advanced inbound and outbound tourism collectively. The period witnessed a significant increase in the number of tourist companies. So, until 1991 tourism in Kazakhstan engaged in 3 companies: Kazakh Republican Council for Tourism and Excursions, Intourist, Sputnik. But in 1994 the country had 589 registered tourist organizations. The share of tourism in GDP in this period was in 1991 - 0.03%, in 1992 - 0.09%, in 1993 - 0.06%, in 1994 - 0.08% [2, p. 37].

Extensive development of tourism in the country made it necessary to adopt a number of important pieces of law. However, in the early to mid-90s it was concluded 7 international agreements on cooperation in tourism between Kazakhstan and countries such as Iran, Pakistan, Moldova, Uzbekistan, Kyrgyzstan, Hungary, as well as an agreement on cooperation in the field of tourism with the CIS.

In the late 90s following events which were held for the formation of the tourism industry in Kazakhstan:

1. Decree of the President of RK "On State Program of the Republic of Kazakhstan" Revival of historical centers of the Silk Road, preservation and

successive development of the culture of Turkic states, the development of tourism infrastructure "[3]

2. A National Company "Silk Road-Kazakhstan"

3. Kazakhstan presented tourist firms at the International Tourism Exchange in Berlin.

4. State management of tourism transferred to the Ministry of Transport, Communications and Tourism of the Republic of Kazakhstan

5. Adoption of the interdepartmental program of activities of embassies of Kazakhstan for development in the tourism [4, p. 35]

6. According to with program were signed international agreements on cooperation in tourism between Kazakhstan and China, Turkey, Bulgaria

7. At later Kazakhstan Tourist Association, was transformed into the Agency for Tourism and Sport of Kazakhstan and the first was presented at the Tourism Fair in London

In 2000-2003, it implements a plan of measures to promote the tourist image of Kazakhstan. So, in order to attract foreign and domestic investment in the industry, resolution was accepted by the Government of the Republic of Kazakhstan "On the organization of the annual International Festival of the Silk Road - Kazakhstan in Almaty city" [5]. In addition, the experiment introduced to simplify visa procedures at the airports of Astana and Almaty. The list of countries included 22 countries. They also signed international agreements on cooperation in the field of tourism between the Government of the Republic of Kazakhstan and Lithuania, Kyrgyzstan, Tajikistan, Uzbekistan, Russia.

The Government of the Republic of Kazakhstan ministries and departments were accepted specific measures aimed to promote the tourism industry and the promotion of entrepreneurship in the field of tourism. In particular, the Guide is designed on a simplified tax regime for individuals engaged in entrepreneurial activities; provided incentives for value-added tax on tourist-excursion services, the right of registration of foreign citizens has been delegated to a variety of hotels. However, the National Bank of Kazakhstan considered the liberation of hotels from the mandatory sale of export proceeds; it was willing to receive foreign currency in cash when working with clients in the five- and four-star hotels. As results of these measures taken in 2004-2006 there was a steady development of the tourism industry in our country, as well as the positive trend of attracting investment in tourism.

However, these measures were not enough for the development of infrastructure and encourage investment in the tourism industry. For example, out of the total investments in the country's infrastructure, for the activities of tourist organizations were attracted only 139 million tenge in 2004, 242 million tenge - in 2005 and 48.3 million tenge - in 2006.

New impetus to the development of the tourist industry has given recognition in the tourism industry as one of the priority sectors of the seven cluster initiatives. As part of the development of the tourist cluster were identified priority areas for the development of tourism. For instance, for business tourism, eco tourism, cultural tourism, educational, and extreme forms of tourism. In this regard, the Resolution of the Government of the Republic of Kazakhstan "On approval of the plans for the creation and development of pilot clusters in priority sectors of the economy", based on which the plan of the creation and development of the pilot cluster "Tourism" in Almaty and Almaty region [6].

At present, the legal basis of tourism in Kazakhstan are: the Law "On tourist activity in the Republic of Kazakhstan" [7] The concept of development of tourism in the Republic of Kazakhstan, the State program of tourism development in the Republic of Kazakhstan for 2007-2011 "State program for accelerated industrial-innovative development the Republic of Kazakhstan for 2010-2014, the Concept of development of the tourism industry of the Republic of Kazakhstan until 2020 [8]. The tourist industry in Kazakhstan on an equal basis with financial instruments is also stimulated through legislation. One popular steps in this direction is the abolition of state licensing of travel agencies, which became operational from the beginning of 2012. In addition, the basic documents of the legal framework in the field of tourism are: the Civil Code of RK Law "About bases of tourist activity in the Republic of Kazakhstan", the Law "On Protection of Consumer Rights", the Law "On Standardization", "On certification of products and services", Resolution of the Government of the Republic of Kazakhstan "On licensing of international tourist activity", Government Resolution "The rules of hotel services in Kazakhstan".

But, despite the measures taken so far, Kazakhstan virtually unknown in the world as a tourist destination. Currently, the share of tourism in the formation of the national income is only 1%. The tourist attraction of the country is estimated as low. For example, according to the World Economic Forum "Travel and Tourism: Competitiveness 2013", Kazakhstan among 139 countries ranked only 88th place [9]. It is also significant that according to the annual ranking of the World Tourism Organization, "World Tourism Barometer" 2010, Kazakhstan was not included in the list of the top five top ten countries.

Table 1

Dynamics of the number of tourists in the Republic of Kazakhstan in 2009-2013.

Years	Domestic tourism	Outbound tourism	Inbound tourism
the number of people			
2009	174 940	261 070	37 937
2010	122 216	193 951	31 246
2011	157 988	261 709	39 640
2012	189 502	375 923	36 096
2013	186 351	388 108	30 240
2013/2009	+11411	+127038	-7697
change in percent			
2009			
2010	69,9	74,3	82,4
2011	129,3	135,0	126,9
2012	120,0	143,6	91,1
2013	98,3	103,2	83,8
2013/2009	106,5	148,7	79,7

Nowadays, Kazakhstan is developing steadily only outbound tourism (table 1). But in terms of the development of its own economy outbound tourism can not serve indicators for successful development of the tourist segments. After all, in any country, the level of development of the tourist industry is measured by indicators of inbound and domestic tourism. As according to official statistics, the number of tourists entering the country in 2009-2013, fell to 20.3% [10, p. 353]. The major objectives of the visits to Kazakhstan are: business and professional tourism – 54.2% of the visitors; leisure and recreational tourism - 38.4%; visiting to friends and relatives - 4%; commercial purposes (shop tours) - 2.1%; other purposes, including the treatment and the pilgrimage - 1.3% of visitors. This means that the structure of the in our republic soon dominate business and professional trips.

The length of stay of foreign tourists is on average 3 days. This tourist in Kazakhstan a day spends about 75-85 US dollars. Whereas according to the World Tourism Organization, overseas tourist spends approximately 250-350 US dollars per day [11]. It is clear that the country will not be able to increase tourist attraction, while the majority of visitors will visit it on working visits and not for holidays.

Table 2

The dynamics of the tourism industry of Kazakhstan in 2009-2013.

Indicators	Year					Change from 2013 to 2009,%
	2009	2010	2011	2012	2013	
The number of served in the placements, people	1 801 087	1 544 506	2 548 868	2 845 832	3 026 227	168,0
The number of serviced by tourist firms, people	473 947	347 413	459 337	601 521	604 699	127,6
Scope of works (services), thousand tenge	15 439 066	11 424 444	14 730 718	15 142 092	17 674 698	114,4
The number of accommodation facilities, units	528	562	677	692	598	113,3

In accordance with table 2, all indicators of the tourist industry is experiencing steady growth. At the same time the highest growth rates are characteristic of the number of served tourists in places of accommodation. In 2009, in one place for accommodation in the middle serviced 3411 people, in 2013 the figure was 5060 people. Despite the increase in occupancy placements usually filled only one-fifth of hotel rooms. Low hotel occupancy is related primarily to higher prices for accommodation, which in turn makes the unpopular Kazakhstan in the eyes of foreign tourists.

The whole country tourist firms served in 2009 473947 people. By the beginning of 2014 their number increased by 130752 people, which is an increase of 27.6%. In this regard, an increase in the volume of work performed. The greatest volume of works and services recorded in 2013, and the lowest - in 2010. At the same time, increasing revenues from the sale of tourist firms vouchers, but especially a sharp rise in income accounts for 2012 and 2013. Overall, in 2009-2013, growth in revenues from the sale of tourist firms permits was 61.2%. To some extent this is due to the cost of permits. Thus, the rising cost of permits in 2010 (61 thousand tenge) compared to the previous year by 57% helped reduce the activity of the citizens of Kazakhstan in the domestic and foreign tourism. A decrease in the average cost of travel in 2011 (46.22 thousand tenge) led to an increase in tourist activity in all directions.

The main suppliers of tourist services in our country are tourist firms and individual entrepreneurs who have a license for tourist activity. They are collaborate with more than 80 countries in the world.

Table 3

Companies and individual entrepreneurs engaged in tourism activities, units.

Indicators	Year					Changes from 2013 to 2009	
	2009	2010	2011	2012	2013	(+,-)	%
Number of tourist firms	1163	1203	1252	1567	1720	557	147,8
The number of private entrepreneurs in the tourism sector	64	73	98	117	136	72	more than 2.1time
The number of individual entrepreneurs engaged in tourist accommodation	621	664	787	936	1106	485	178,1

According to table 3, for the period from 2009 to 2013 the number of tourist agencies in the country increased by 557 units or 47.8%. While the number of individual entrepreneurs engaged in tourism activities increased by more than 2 times. According to we can see wich tourism activity is becoming more attractive for small businesses. But most of the entrepreneurs engaged in tourist accommodation. In recent years their number has increased by 78.1%. The share of individual entrepreneurs engaged in tourist accommodation, the total number of entrepreneurs in 2009-2013 ranged from 89% - 91%.

According to experts, the effective development of tourism in Kazakhstan is largely hampered by a lack of state regulation of tourism development and underdeveloped infrastructure. According to Figure 1, the first level of infrastructure - tourism management - represented by institutions for the management of tourism sector of the economy. The first is the republican legislative and executive management bodies: the Parliament and the Government of the Republic of Kazakhstan. Despite the fact that the Parliament, which is composed of the Senate and the Majilis, no tourism-oriented structural units, Parliament engaged in legislative activity in this area.

Committee of Tourism Industry of the Ministry of Industry and New Technologies defines the strategic directions of development of tourism in Kazakhstan. He manages 14 regional governments, which have the structure of tourism, physical culture and sports. Information: independent regional tourism management operate in Akmola, Almaty, Mangistau and South Kazakhstan regions, as well as in the city of Almaty. Independent departments of tourism development in the management of businesses operate in five regions - Aktobe, Atyrau, Zhambyl, Kyzylorda and North Kazakhstan. Office of Tourism of Pavlodar region in 2014 was transformed into Department of Tourism Regional Office business. However, still not resolved the issue of establishing independent departments for the development of tourism in the respective offices of the West Kazakhstan, Kostanay and Karaganda regions where tourism issues by specialists of related departments. In particular, in the Kostanai region tourism functions are removed from the control of physical culture and sports, and to transfer the management of business without releasing regular units of Tourism. In addition, the tourism authorities are absent at the district level or at the level of cities of regional subordination, which can be considered as a drawback of the existing system of tourism management.

We mean, also we need to help for strengthening of the role of social tourism associations. Because these include, particular, the Tourist Board of the Government of the Republic of Kazakhstan, which is an advisory body in our country [12].

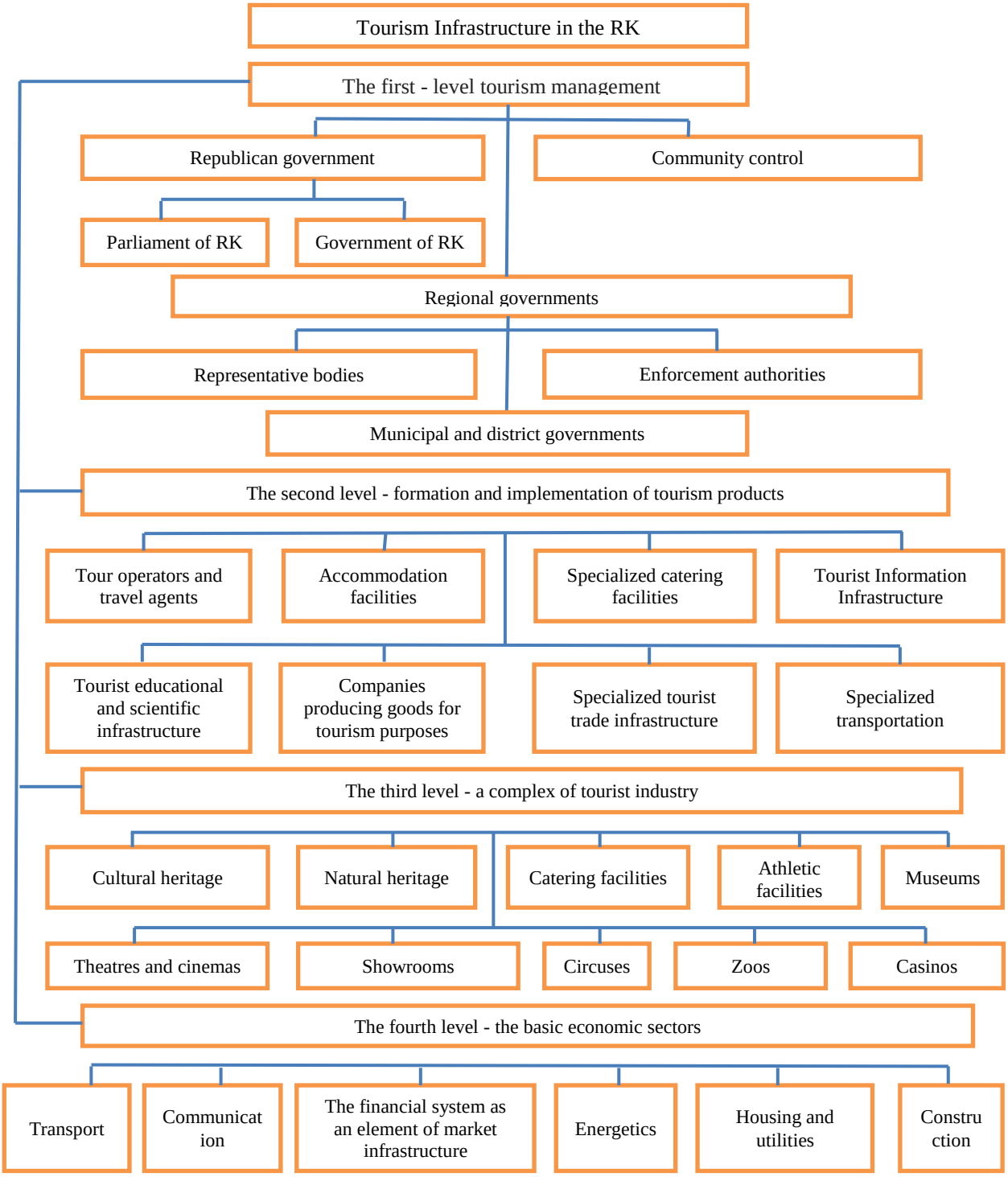

Figure 1 - Tourism infrastructure in the Republic of Kazakhstan.

In additional, an active role in the development of tourism plays Kazakhstan Tourist Association, established in 1999. It is a non-profit and non-governmental organization, which consists of: Kazakhstan Association of Hotels and Restaurants, tourist, insurance, airlines, universities and the media. Representatives of the Association are located in the cities of Almaty, Astana, Aktau, Ust-Kamenogorsk, Shymkent, Moscow and Tashkent.

The second level of tourism infrastructure of Kazakhstan - the company that developed and implemented a tourist product. First of all, the tour operators and travel agents. The number of tour operators in Kazakhstan is not known because there is the national register of tour operators, although this

type of business activities subject to licensing. In respect of travel agents has changed for the better. So, in early 2012 entered into force on additions and amendments to the Law "On tourist activity", according to which canceled the licensing of travel agencies [13]. In the same year the Kazakhstan Tourist Association decided to create a unified register of travel agents of RK. To the information: single register of travel agents is an electronic database of enterprises and individual entrepreneurs engaged in travel agency activities. In the case of a contract of compulsory liability insurance travel agent is required to provide information to the Committee of the tourism industry of the Ministry of Industry and New Technologies of the persons carrying out tourist activities.

The formation and implementation of the tourism product of considerable importance is the tourist educational and scientific infrastructure of Kazakhstan. This infrastructure is represented by the 28th universities that are training managers of tourism. So, each year the country produced about 900 specialists with higher and about 400 specialists with secondary vocational education, which is totally inadequate [14].

However, the essential role played by specialized tourist information infrastructure, which nowadays is in its infancy. In particular, there is no tourist registry and cadastre. So far it is not known exactly how many monuments in the country's historic cultural and natural heritage sites or tourist destination. If there is no such official document, travel companies and individual tourists to learn about it the more impossible. The existing register of tourist routes and trails conducted formally and can not replace a tourist registry and cadastre [15]. However, the information vacuum on their own trying to make up for the Kazakhstan Tourist Association, which was launched 2 projects. So, since 2005, it operates a so-called eco-tourism center - information resource center that collects offers of travel agencies, separate guest houses. The second project, launched in 2012, is an information center in Almaty, the visitor center, which provides information about the tour is that you can visit in the city.

At the third level of tourism infrastructure are the objects of cultural and natural heritage, which is rich in the republic. The UNESCO World Heritage List includes three Kazakh object that is 0.3% of the total. This 2 properties are included in the list of cultural criteria, and one of them is recognized as a masterpiece of human genius. And the object 1 is enabled by natural criteria. These objects include the Mausoleum of Khoja Ahmed Yasawi, Petroglyphs within the Archaeological Landscape of Tamgaly, Saryarka, Naurzum and Korgalzhyn reserve. At the same time, another 12 facilities should be included in addition to the World Heritage List [16, p. 50].

The fourth level of tourism infrastructure is a basic sectors of the economy, among which the most important is the transport system.

Table 4

The dynamics of the carriage of passengers by mode of transport, mln. people.

Types of transport	Years					Changes from 2013 to 2009,%
	2009	2010	2011	2012	2013	
Intercity						
including:						
- bus	12,8	12,3	15,5	17,8	18,7	146,1
- rail	10,9	12,1	13,1	16,4	20,1	184,4
- air	1,8	2,2	2,6	2,8	3,0	166,7
International						
including:						
- bus	1,1	1,1	1,1	1,4	1,5	136,4
- rail	4,5	4,1	3,7	3,9	4,3	95,6
- air	1,0	1,2	1,5	1,7	2,0	More than 2

According to the data of Table 4, transportation of tourists in the country by air, road and rail. The vast majority of tourist companies provides both the citizens of Kazakhstan sending and reception of foreign citizens, as well as domestic tourism. In intrarepublican message priority it is for bus and train connections [17, p. 16]. On international routes, the main type of tourist movement is rail transport. In recent years, under international post this kind of transport carried more than 4 million people. However, in terms of traffic growth in the first place there is air communication.

It should be noted that along with the domestic airlines engaged in international transport carriers in other countries. Republic has air links with many countries of the world, and therefore for foreign airlines operating between Europe and Southeast Asia, transit air routes in Kazakhstan are extremely

profitable. We can say that the air transport of the republic is the only component of infrastructure in tourism industry, which is at the proper level. The main carrier is the "Air-Kazakhstan". Perhaps this is why foreign tourists often use the services of air transport. Their number is 94.7% of the total number of foreign tourists. Rail prefer to use 3.3% of tourists traveling by bus and about 0.4% of the tourists. The first place in tourism industry taken is the air transport (74.4%), followed by - coaches (14.8%), in third place - railway transport (9.9%) and in last place - other land agents (0.9%) [18, p. 29].

Table 5

SWOT-analysis of the tourism industry condition of Republic of Kazakhstan.

Strengths	Weakness
1. Rich natural and cultural heritage of the Republic	1. Low share of tourism in gross domestic product
2. Strengthening the role of social tourism associations	2. A significant predominance in the structure of tourist activity of outbound tourism
3. Revitalization of the Kazakhstan Tourist Association	3. Inconsistency most placements with international standards on price, service and other factors
4. Proclamation of the tourist industry as a priority direction of the economy	4. The moral and physical deterioration of tourism infrastructure
5. Activation of the government to reform the transport infrastructure	5. Poor quality of services of tourist companies and individual entrepreneurs
6. In general, the normative-legal base of tourism	6. The low demand for graduates due to lack of skills and knowledge in specific specializations
7. The rich tourist and recreational potential	7. Underdevelopment specialist Tourism information infrastructure
8. Have enough employment potential of the republic	8. The low competitiveness of domestic carriers due to the lack of development service and unreliability
	9. Lack of state support for the development of domestic tourism
Opportunities	Threats
1. Increase of employment, which is especially important for the development of regions	1. Inadequate condition of roads of national and regional importance
2. The stable growth of the country's income	2. Lack of tourist Registry and Cadastre
3. Improving the institutional infrastructure through the establishment of regional offices of tourism	3. Almost no modern and comfortable buses, which does not allow to maintain a high level of tourist services
4. Creating a modern multifunctional tourist centers of world-class	4. Low volume of attracted investments in tourism and unstable rates of growth
5. The creation and development of public-private partnership in the field of tourism	5. The non-recognition of tourist activity as a priority by the local authorities
6. The revival of investment activity in the regions	6. Political and administrative aspects of the development of the tourism industry
7. Imaginary reality of Kazakhstan in the field of tourism	7. The lack of attractiveness of tourism industry of Kazakhstan for foreign investment
8. Implementation of the Concept of development of tourism industry of Kazakhstan till 2020	8. The lack of a common information base for attracting potential investors
9. The use of international experience in the development of the tourism industry	9. Lack of development tools supporting the effective management of investments (project financing, tax incentives, unsecured long-term financing)

Analysis of the current situation shows that there is a whole set of problems, because of which the tourist industry in Kazakhstan may reach a stable level of development. These problems have repeatedly voiced by representatives of the government and various experts. The main obstacles to the development of the tourism industry in Kazakhstan are the following: low volume of attracted investments in tourism and unstable rates of their growth; the lack of attractiveness of tourism industry of Kazakhstan for foreign investment; multi-layered nature of the unsatisfactory state of tourism infrastructure; the system of professional training in the tourism and service; political and administrative

aspects of the development of the tourism industry; insufficiently favorable business climate; the non-recognition of tourist activity as a priority by the local government; insufficient financial resources allocated for the promotion of domestic tourism; poor quality of services provided.

The data in table 5 demonstrate that the transformation of tourism into a major independent sector of the economy of Kazakhstan is possible if we will be make efficient infrastructure. Also, the most serious obstacles to the development of tourism is the problem of training, improvement of the system of state support, and weak positioning in the international market. The solution of these problems in the short term, will allow Kazakhstan to develop tourism more dynamic and to enter the international market with its unique product.

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JSC «KAZPOST» NATIONAL POSTAL OPERATORS: OF REFORMS TO STRATEGIC DEVELOPMENT

Abstract: *The article presents the results of a study of reform in the postal industry and the current state of the Republic of Kazakhstan. Also results of activity «Kazpost» as the national postal operator. The authors' conclusions are based on an analysis of official statistical numbers and results of policies of the company. The results SWOT-analysis allowed to develop a set of measures to improve the company's strategy for the short and medium term.*

Key words: *postal service, postal services, postal savings system, postal administration, development strategy.*

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АО "КАЗПОЧТА" КАК НАЦИОНАЛЬНЫЙ ОПЕРАТОР ПОЧТОВОЙ СВЯЗИ: ОТ РЕФОРМ К СТРАТЕГИЧЕСКОМУ РАЗВИТИЮ

Аннотация: *В статье представлены результаты исследования реформирования почтовой отрасли РК и современного состояния АО "Казпочта" как национального оператора почтовой связи. Выводы авторов основаны на анализе официальной отчетности и стратегий развития компании. Проведенный SWOT-анализ позволил разработать комплекс мер по совершенствованию стратегий развития компании на краткосрочный и среднесрочный периоды.*

Ключевые слова: *почтовая связь, почтовые услуги, почтово-сберегательная система, почтовая администрация, стратегия развития*

В Казахстане, взявшем курс на индустриально-инновационное развитие экономики, развитие инфокоммуникационных технологий и почтовой связи является одним из важных приоритетов. И для этого есть все предпосылки. Так, в стране наблюдается значительный рост количества Интернет-пользователей, интенсивно развивается электронная коммерция, растет количество услуг и потребителей услуг "е-правительства". Вместе с тем, в республике ощущается потребность в предоставлении качественных финансовых услуг населению и бизнесу, особенно в сельской местности, где кроме почты не представлены никакие другие структуры. Учитывая уникальное географическое положение Казахстана между Китаем, Юго-Восточной Азией и Европой, растет потребность в транспортно-логистических услугах как внутри страны, так и со стороны международного бизнеса. Постоянно растут объемы пересылаемых посылок, что связано с бурным развитием торговли через Интернет и по каталогам. Именно поэтому дистанционная торговля становится одним из перспективных направлений развития почтового бизнеса. Увеличение объемов корпоративной корреспонденции и рекламных рассылок еще раз демонстрирует потенциальные возможности традиционной почты.

Казахстан стал первой страной на постсоветском пространстве, принявшей за основу почтово-сберегательную модель ведущих стран мира, эффективность которой подтверждается зарубежным опытом и достигнутыми положительными результатами отечественного оператора почты за последние годы развития. По такому же пути развивают почтовую отрасль страны СНГ и Балтии. В соответствии с Законом РК "О почте" АО "Казпочта" как Национальный оператор почты является проводником государственной политики по развитию в стране почтово-сберегательной системы. Тем не менее, несмотря на то, что Компания предоставляет все банковские услуги, за исключением кредитования, главной ее миссией остается предоставление качественных услуг почтовой связи. Однако географические и экономико-демографические особенности Казахстана, включая большую протяженность территории, низкую и неравномерную плотность населения, отдаленность населенных пунктов друг от друга, а также невысокая платежеспособность сельского населения, негативно влияют на перспективы развития почтовых услуг в Казахстане.

В рейтинге качества работы национальных компаний РК за 2013 год АО "Казпочта" входит в последнюю пятерку компаний. Компания проигрывает конкуренцию на внутреннем рынке ведущим мировым почтовым агентам, не обеспечивает оперативности обработки корреспонденции и посылок, имеет тарифы, превышающие тарифы частных курьерских организаций. Согласно оценке исследовательного агентства "Рейтинг.kz", несмотря на достаточно высокие финансовые вложения со стороны государства, на сегодняшний день деятельность национальных компаний не является эффективной. В этом смысле АО "Казпочта" не является исключением. Практически все национальные компании стремятся в первую очередь к увеличению прибыли через удорожание тарифов. В то время как необходима смена парадигмы их развития, когда во главу угла должны быть поставлены интересы поддержания социальной стабильности и повышения социальной ответственности.

АО "Казпочта" является почтово-сберегательной системой с разветвленной сервисной сетью отделений связи по всей территории Республики Казахстан. Следует отметить, что казахстанская почта имеет давние исторические традиции. Так, согласно архивным данным, в 1860 году открылось первое почтовое отделение связи в г. Верный (г. Алматы), вскоре преобразованное в почтово-телеграфную контору. К 1883 году конторе подчинялось 14 почтовых отделений связи. На обширной территории дореволюционного Казахстана насчитывалось примерно 250 почтово-телеграфных предприятий. Общая протяженность конно-почтовых трактов составляла около 20 тыс. км. Первая мировая война подорвала почтовое хозяйство Российской империи, а за годы гражданской войны и интервенции хозяйство пришло в полный упадок.

Советское правительство предприняло ряд мер, направленных на восстановление почтовой связи. В начале 20-х годов XX века почтово-телеграфное управление (г. Оренбург) было преобразовано в Киргизский почтово-телеграфный округ, который в 1925 году переименовали в Казахское областное управление связи Наркомата почт и телеграфов СССР. Была учреждена должность сельского письмоносца, организована кольцевая конная почта, в городах конная перевозка почты заменялась автомобильной, стали использоваться ведомственные катера и железнодорожный транспорт. В 1929 году первая почтовая авиалиния связала города Алма-Ату и Ташкент. В 1930 году в Казахстане насчитывалось 1250 почтово-телеграфных предприятий, а протяженность почтовых трактов достигла 42 тыс. км. К 1940 году количество предприятий связи в республике возросло до 1987, было механизировано более 20 тыс. км почтовых трактов. В годы Великой Отечественной войны почтовая служба обеспечивала связь в армии и тылу, а также между фронтом и тылом. Особые трудности были связаны с тем, что большое количество квалифицированных связистов было призвано в армию.

В 1946 году Уполномоченный Народного Комиссариата связи СССР был переименован в Уполномоченного Министерства связи СССР при Совете Министров Казахской ССР. В 1954 году на его основе было организовано Министерство связи Казахской ССР. С середины 60-х годов в Казахстане функционировало более 4000 отделений связи с полным спектром почтовых услуг. Основная часть доходов почтовой связи обеспечивалась за счет доставки пенсий и предоставления телеграфно-телефонных услуг [1].

Резкое изменение ситуации в отрасли произошло после приобретения Казахстаном независимости и суверенитета. Либерализация цен и нарушение стройной системы почтовой связи бывшего Советского Союза повлекло за собой уменьшение количества почтовых отправлений и сокращение отделений связи по всей республике. В 1993 году произошло разделение почтовой и электрической связи. Услуги телекоммуникаций были переданы вновь созданному республиканскому государственному предприятию коммуникаций (впоследствии –

ОАО "Казахтелеком"), а почтовые услуги оставлены за Службой почтовой связи. Позднее республиканское государственное предприятие почтовой связи было преобразовано в ОАО "Казпочта" при Министерстве транспорта и коммуникаций со 100% участием государства [2]. В 2000 году Компания зарегистрировала новый Устав в форме открытого акционерного общества, а в 2004 году ОАО "Казпочта" было перерегистрировано в АО "Казпочта" [3].

Программа развития почтовой отрасли и формирования почтово-сберегательной системы на 2000-2003 годы положила начало созданию в Казахстане почтово-сберегательной системы на базе розничной сети отделений почтовой связи. Реформирование казахстанской почтовой отрасли осуществлялось в 2 этапа. На первом этапе планировались становление почтово-сберегательной системы, модернизация почтовой сети и компьютерное перевооружение почты. На втором этапе предполагалось завершить компьютерное и программное перевооружение, создание общереспубликанской информационной сети и системы электронной торговли, расширение спектра услуг и продуктов [4]. В результате проведенной реформы Казахстан стал первым государством на территории СНГ, разработавшим почтово-сберегательную систему. Учредителем АО "Казпочта" является Правительство РК. В 2006 году государственный пакет акций Компании был передан АО "Фонд национального благосостояния "Самрук-Казына".

В 2006 году АО "Казпочта" получило лицензию на осуществление трансфер-агентской деятельности на рынке ценных бумаг. В этом же году в г. Алматы было создано предприятие "Электронпост.kz" по предоставлению услуг информационной логистики. В 2008 году АО "Казпочта" открыло дочернее предприятие "Kazpost GmbH" в Германии для осуществления функций логистики, каталожной торговли, сбора и пересылки почтовой корреспонденции из Германии в Казахстан. В 2012 году в г. Астана было открыто первое в Казахстане круглосуточное отделение "Post-24". Отделение оказывает почтовые и финансовые услуги, обслуживая сотрудников более 30 министерств, ведомств, государственных холдингов, национальных компаний и жителей столицы [5].

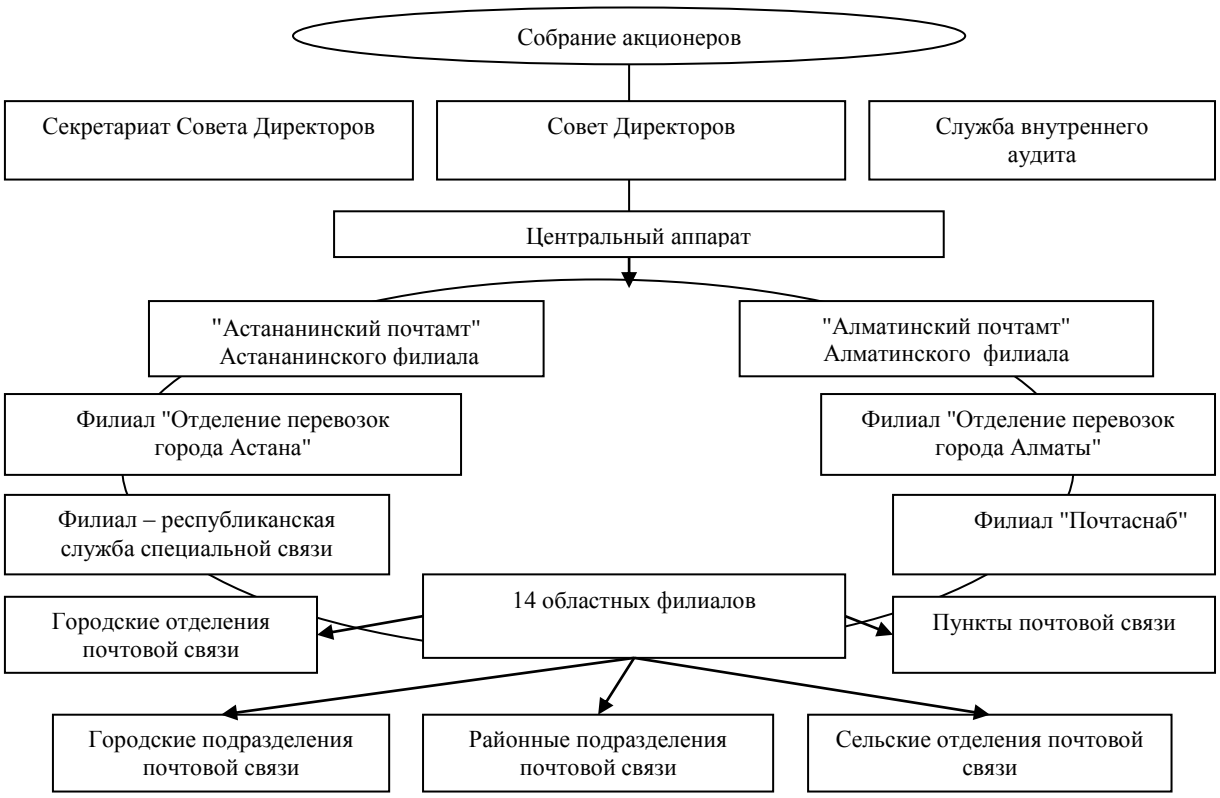

Рисунок 1 - Структурная и филиальная сеть АО "Казпочта"

Начиная с 2012 года АО "Казпочта" является проводников национальной инвестиционной программы "Народное IPO", предоставляя брокерские и транс-агентские услуги. В 2012

году Всемирный почтовый союз вручил Компании сертификат о присвоении казахстанскому оператору почтовой связи уровня "B" ("серебряный" уровень) за управление качеством и как знак признания эффективности проводимых реформ.

Современная модель казахстанской почты включает черты небанковского финансового учреждения, оказывающего широкий спектр услуг – почтовых, агентских и банковских. Помимо традиционных видов услуг динамично развиваются новые направления деятельности: валютно-обменные операции, прием депозитов населения, операции на рынке ценных бумаг, инкассация и перевозка денег и ценностей, агентские услуги для пенсионных фондов и страховых компаний по привлечению клиентов и заключению договоров, курьерская служба EMS Kazpost. Разработаны и внедряются современные почтовые продукты - Direct-Mail, Direct-Marketing, гибридная почта.

Деятельность АО "Казпочта" как национального оператора почтовой связи РК заключается в предоставлении клиентам полного спектра современных качественных почтовых, финансовых и логистических услуг на всей территории республики. Структурная и филиальная сеть Компании представлена на рисунке 1.

В соответствии с данными таблицы 1, в 2013 году доходы АО "Казпочта" составили 30489 млн. тенге, что ниже запланированного уровня на 6,3%. За трехлетний период доходы Компании выросли на 28,5%, а расходы – на 33,8%. Превышение расходной части над доходами связано с существенным ростом общих и административных расходов, а также увеличением себестоимости продукции (услуг). Более высокие темпы роста расходов по сравнению с темпами роста доходов отразились на чистом доходе Компании. Наиболее низкий показатель чистого дохода зафиксирован в 2013 году [6, с. 23]. Следует заметить, что в этом году Компания планировала сокращение чистой прибыли до 266,6 млн. тенге, однако фактические данные оказались равными 164,5 млн. тенге, т.е. ниже запланированного уровня на 38,3%.

Таблица 1

Динамика основных экономических показателей АО "Казпочта", млн. тенге.

Показатели	Год			Изменения 2013 г. к 2011 г.	
	2011	2012	2013	(+,-)	%
Общие доходы	23723,0	27014,0	30489,0	6766,0	128,5
Общие расходы	22709,0	25949,0	30377,0	7668,0	133,8
Доля в доходах/расходах организаций, учитываемых по методу долевого участия	-3,0	0,8	0,0	-3,0	-
Расходы по корпоративному подоходному налогу	203,9	119,4	357,1	153,2	175,1
Чистый доход/убыток	806,5	945,8	164,5	-642,0	20,4

Доходы АО "Казпочта" формируются из доходов от оказания почтовых, финансовых и агентских услуг. Доходы от всех видов услуг имеют устойчивую тенденцию роста. За последние три года доходы от оказания почтовых услуг увеличились на 29,3%. Это общедоступные услуги почтовой связи, услуги по пересылке регистрируемых почтовых отправлений, услуги ускоренной и курьерской почты, распространение печатных изданий по подписке и их реализация, реализация филателистической продукции, а также иные услуги почтовой связи. На рынке почтово-курьерских услуг доля АО "Казпочта" превышает 60%. Остальная часть рынка приходится на частные курьерские компании, численность которых достигла 50. Несмотря на рост доходов Компании от оказания почтовых услуг, запланированный уровень не был достигнут. В первую очередь это связано с тем, что снизились весовые категории посылок, передаваемых для отправки компаниями дистанционной торговли.

Меньшими темпами увеличивались доходы от оказания финансовых услуг. К финансовым услугам Компании относятся услуги по доставке пенсионных выплат и социальных пособий, осуществление лизинговой деятельности, прием депозитов, кассовые и переводные операции, организация обменных операций с иностранной валютой, предоставление кредитов и т.д. При этом запланированные показатели по финансовым услугам не были достигнуты. Такое произошло в связи с невыполнением плана по выплате заработной платы в результате перехода части клиентов на зарплатные проекты в банках второго уровня с кредитным лимитом.

Наиболее высокие темпы роста доходов характерны для агентских услуг. За период с 2011

по 2013 годы они выросли более чем в 3 раза. Однако в структуре доходов Компании они занимают незначительную часть (рисунок 2). Половина доходов АО "Казпочта" формируется за счет оказания почтовых услуг, 45,8% доходов приносят финансовые услуги и 4,1% доходов – агентские услуги.

Рисунок 2 – Динамика структуры доходов АО "Казпочта", %.

В общем объеме почтовых услуг наибольшую долю (около 60%) составляют периодические почтовые издания. Причем их доля имеет тенденцию к уменьшению. Письменная корреспонденция составляет примерно пятую часть почтовых услуг и приносит Компании третью часть доходов от этого вида услуг. Но наиболее выгодной услугой является пересылка посылок. Так, составляя в общем объеме почтовых услуг всего лишь 1,2%, эта услуга формирует четвертую часть доходов от этих услуг. Кроме того, для АО "Казпочта" весьма прибыльной является услуга ускоренной почты. К примеру, в 2011-2013 годах данный вид услуги в общем объеме почтовых услуг не превышал 0,1%, а приносил Компании около десятой части доходов.

По сравнению с почтовыми услугами финансовые услуги Компании увеличивались меньшими темпами. Кроме того, стала снижаться доля доходов этих услуг в общих доходах АО "Казпочта". Основную часть финансовых услуг составляют услуги по выплате пенсий и пособий, приему платежей, денежным переводам. Несмотря на то, что услуги по приему платежей за последние три года увеличились на 45,9%, а число принятых платежей превысило 55 млн. единиц, запланированные показатели не были выполнены. Это связано с тем, что банки второго уровня и АО "Казахтелеком" расширили собственную сеть терминалов самообслуживания, получили развитие такие альтернативные платежные системы как "Киви", "Касса 24", "Авангард Plat" и другие. Наибольшую часть доходов от оказания финансовых услуг Компания получает от выплаты пенсий и приема платежей, которые формируют около 78% доходов от этих услуг.

В течение 2011-2013 годов Компания целенаправленно проводила политику наращивания своих активов. В этот период их рост составил 6275,14 млн. тенге или 29,8%. Собственный капитал был увеличен на 2294821 тыс. тенге или на 24,9% (рисунок 3). Это произошло за счет роста уставного капитала и фонда ценных бумаг, предназначенных для реализации.

Очевидно, что необходимость в собственном капитале обусловлена требованиями самофинансирования предприятия. Однако финансирование деятельности Компании только за счет собственных средств не всегда выгодно. Поэтому привлекая заемные средства, оно может повысить рентабельность собственного капитала [7, с. 98]. Одним из источников привлекаемых средств являются вклады населения. Однако ожидавшегося увеличения вкладов населения не произошло. Наоборот, в течение трех лет объемы вкладов клиентов уменьшились на 32768 тыс. тенге или на 24%. Вклады клиентов включают вклады до востребования, текущие счета клиентов и срочные вклады. Среди них большую часть (около 80%) составляют вклады до востребования (счета пенсий и пособий).

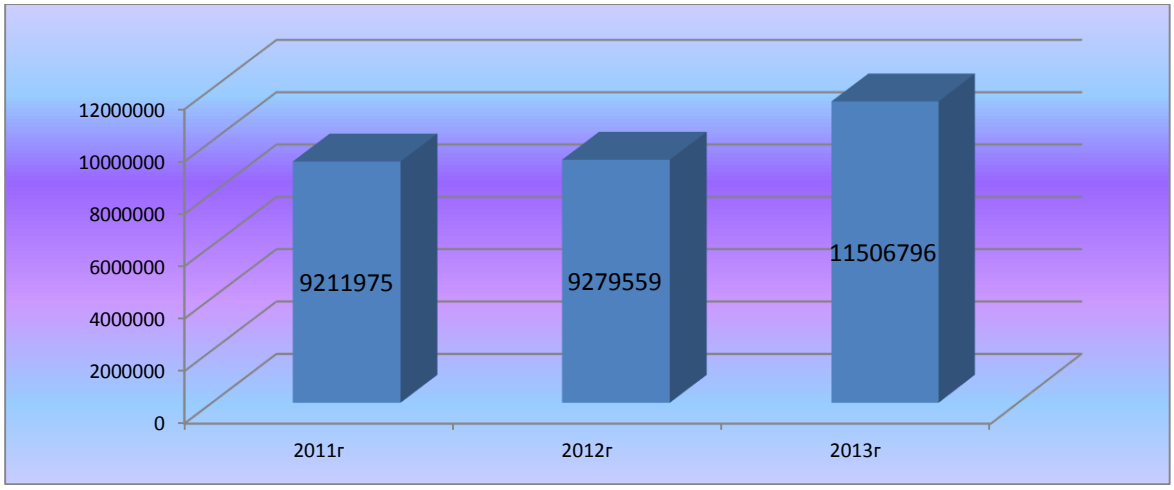

Рисунок 3 - Динамика собственного капитала АО "Казпочта", тыс. тенге.

Другим источником привлекаемых со стороны средств являются займы финансовых учреждений (таблица 2). Займы финансовых учреждений имеют устойчивую тенденцию роста и за три года увеличились в 2,5 раза. В 2013 году основными заемщиками АО "Казпочта" являлись Исламский Банк Ал Хилал, Исламский Банк Развития, Позитив Банк и Дойче Банк. Так, в мае 2013 года Компания получила необеспеченный займ от АО "Исламский Банк «Ал Хилал" в размере 1000 млн. тенге в рамках кредитной линии. Заем предназначался для финансирования капитальных затрат. Кроме того, в этом году Компания заложила основные средства на сумму 114289 тыс. тенге в качестве обеспечения по займу, предоставленному Исламским банком развития. Также был размещен долгосрочный депозит в "Альянс Банке" в качестве обеспечения по займу Исламского банка развития. В 2013 году АО "Казпочта" был привлечен очередной транш от АО "Банк Позитив Казахстан" на сумму 274 млн. тенге. Целевым назначением займа является финансирование капитальных затрат.

Таблица 2

Займы финансовых учреждений в 2013 году

Учреждение	Эфф. процентная ставка	Срок погашения	Валюта	Сумма
Исламский Банк Ал Хилал	7,35-8,42	Апрель 2017 г.	Тенге	2343808
Исламский Банк Развития	6,0	Июнь 2019 г.	СДР	868922
Позитив Банк	9,23	Март 2017 г.	Тенге	231135
Дойче Банк	8,99	Ноябрь 2013 г.	Евро	3635

Очевидно, что АО "Казпочта" имеет большую зависимость от внешних инвесторов, что может негативно отразиться на финансовом состоянии Компании. Расчет коэффициента финансовой зависимости показал, что он превышает нормативное значение, тем самым подтверждая зависимость АО "Казпочта" от кредиторов (таблица 3).

Таблица 3

Структура пассивов (обязательств) АО "Казпочта".

Показатель	Уровень показателя			
	2011г	2012г	2013г	Изменения 2013г к 2011г
Удельный вес собственного капитала в общей валюте баланса (коэффициент финансовой автономности предприятия), %	23,0	20,1	23,4	0,4
Удельный вес заемного капитала (коэффициент финансовой зависимости), %	77,0	79,9	76,6	-0,4
В том числе:				
- долгосрочного	5,2	7,2	8,0	2,8
- краткосрочного	71,9	72,8	68,6	-3,3
Коэффициент финансового риска (плечо финансового рычага)	3,4	4,0	3,3	-0,1

Коэффициент финансового риска имеет важнейшее значение для хозяйственной деятельности любого предприятия, поскольку позволяет оценить его финансовую устойчивость. Он представляет собой отношение привлеченных средств к собственному капиталу и дает возможность понять, какое количество средств, что были привлечены Компанией, приходится на единицу собственных средств. Оптимальное значение показателя составляет 0,5 [8, с. 135]. По данным АО "Казпочта" коэффициент финансового риска нестабилен, а его уменьшение в 2013 году незначительно и не может быть свидетельством возрастания финансовой устойчивости предприятия. Следует отметить, что чем выше уровень коэффициента финансовой автономности, а также чем ниже уровень коэффициента финансовой зависимости и коэффициента финансового риска, тем устойчивее финансовое состояние предприятия. Отсюда ясно, что финансовое состояние АО "Казпочта" является неустойчивым.

На современном этапе развития АО "Казпочта" рассматривает свою деятельность как часть реализации общей Стратегии инновационного развития Республики Казахстан и интеграции экономики страны в мировую экономическую систему, а ее почтового сегмента – в глобальную почтовую сеть. Бенчмаркетинг европейских и азиатских почтовых операторов позволяет утверждать, что видение будущего АО "Казпочта" соответствует стратегиям ведущих почтовых операторов мира (таблица 4). При этом большинство мировых почтовых операторов руководствуются в своей деятельности такими приоритетными понятиями, как "надежность и повышение качества" (почта Швейцарии), "доверие и доступность" (почта Японии), "развитие, инновации, эффективность и гибкость" (почта Италии) и "соответствие требованиям клиентов" (почта Великобритании) [9, с. 25]. Это говорит о том, что стратегическая политика АО "Казпочта" не противоречит мировой тенденции модернизации и расширения почтового бизнеса.

Таблица 4

Услуги почтово-сберегательных систем почтовых администраций отдельных стран мира.

Услуги	Страны								
	Германия	Швейцария	Франция	Япония	Россия	Украина	Узбекистан	Киргизия	Казахстан
Почтовые услуги									
Филателия	+	+	+	+	+	+	+	+	+
Консигнация, товары-почтой	+	+	+	+	+	+			+
Услуги почтовой прямой рекламы	+	+	+	+	+	+			+
Финансовые услуги									
Почтовые денежные переводы (внутренние и международные)	+	+	+	+	+	+	+	+	+
РКО	+	+	+	+					+
Депозиты	+	+	+	+					+
Платежные карточки	+	+	+	+					+
Прием платежей	+	+	+	+	+	+		+	+
Брокерские услуги	+	+	+	+					+
Агентские услуги									
Услуги по агентским договорам	+	+	+	+	+	+	+	+	+

С целью улучшения финансовых позиций Компания разработывает планы развития на краткосрочные периоды. Так, стратегия развития АО "Казпочта" на 2011-2015 годы основана на концепции "трехмерной сети" услуг – физических, электронных и финансовых. С целью реализации этой стратегии были определены цели, показанные на рисунке 4.

Намеченные цели по модернизации, оптимизации, автоматизации бизнес-процессов в Компании являются частью общей инновационной концепции развития государственных компаний, реализуемой ФНБ "Самрук-Казына". Каждая компания государственного холдинга "Самрук-Казына" взяла на себя обязательство направлять на инновации не менее 10% чистой прибыли [10, с. 26]. В сегменте почтовых услуг Компания предполагает увеличить объем письменной корреспонденции до 4,4 млрд. тенге, освоить третью часть рынка по доставке рекламных материалов, занять лидерские позиции в сегменте ускоренной экспресс- и курьерской доставки. Вместе с тем, АО "Казпочта" планирует стать одним из первых в сегменте "посылочные отправления", стать главным партнером для предприятий дистанционной торговли и интернет-торговли. Особое внимание Компания концентрирует на деятельности, связанной с обслуживанием сельского населения. Также она собирается занять лидерские позиции в сегментах "райцентр" и "село" с предоставлением своих традиционных услуг, стать "выбором № 1" на уровне райцентра и села для страховых компаний и микрокредитных организаций.

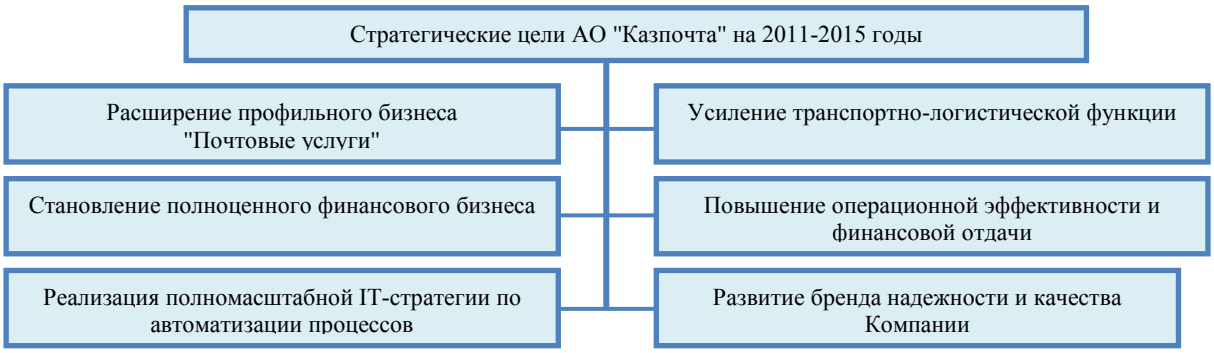

Рисунок 4 – Основные цели АО "Казпочта" в рамках реализации стратегии развития на 2011-2015 годы.

Очевидно, что достижение целевых индикаторов возможно при реализации инвестиционных проектов. Например, в 2011 году на реализацию 8 проектов было выделено 1632387 тыс. тенге. Все проекты были направлены на модернизацию и обновление производственных фондов. Кроме того, 10 млрд. тенге выделено на осуществление следующих проектов: создание филиала "EMS-Kazpost", "Мобильный Postman", поддержание в рабочем состоянии производственных активов и прочих основных средств.

Анализ производственно-хозяйственной деятельности АО "Казпочта", а также изучение его внешней и внутренней среды позволили провести SWOT-анализ деятельности Компании (таблица 5). Анализ сильных и слабых сторон, угроз и возможностей показывает состояние АО "Казпочта" на рынке в стратегическом аспекте.

Необходимо отметить, что разрабатывая планы развития на краткосрочный и долгосрочный периоды руководство АО "Казпочта" учитывает опыт ведущих Почтовых Администраций. В частности, для мировой почтовой отрасли как составной части мировой экономики основными концепциями успешного и стабильного развития выступают диверсификация и инновации. Указанные тенденции вместе с ключевыми концепциями успешного развития легли в основу разработанной Стратегии развития АО "Казпочта" до 2022 года [11]. Считается, что данная стратегия исправит отдельные недостатки, бессистемность планов развития Компании предыдущих лет. Однако принятая Стратегия должна стать не догмой, а канвой, позволяющей добиться намеченных целей и в тоже время дающей возможность своевременно вносить изменения и коррективы в программные документы АО "Казпочта" на краткосрочный и текущий периоды.

Нисколько не принижая роль и значение названной стратегии, считаем, что АО "Казпочта" следует разработать стратегию развития на краткосрочный период с учетом следующих предложений:

- разработка стратегии минимизации расходов, направленной на поиск возможностей по уменьшению издержек и сокращению затрат на неприбыльное производство. Но такая стратегия должна иметь кратковременный характер;
- в условиях наблюдающегося спада традиционных отправлений необходимо продолжение работы по поиску новых рыночных сегментов и проведению реструктуризации

бизнеса. Это позволит диверсифицировать пакет бизнесов и выстроить востребованную на рынке модель услуг;

- разработка комплекса мер по повышению эффективности финансово-хозяйственной деятельности Компании. Эти меры должны быть направлены на уменьшение размера текущих финансовых обязательств предприятия в краткосрочном периоде и на увеличение объемов денежных активов, которые обеспечивают срочное погашение этих обязательств. При этом следует стремиться к обеспечению баланса денежных активов и краткосрочных финансовых обязательств;

- требуется пересмотреть финансовую стратегию, учитывая тот факт, что с капиталами краткосрочного использования необходима постоянная оперативная работа, направленная на контроль над их своевременным возвратом и привлечением в оборот других капиталов;

- в доходах Компании доминируют поступления от продаж низкорентабельных услуг. В то время как высоко рентабельные услуги (EMS, КГПО, спецсвязь, Direct Mail, зарплатные проекты) остаются прерогативой конкурентов. В связи с чем необходимо пересмотреть маркетинговую стратегию Компании;

- внедрение новых инфокоммуникационных технологий не только в производственный процесс, но и в систему управления;

Таблица 5

SWOT-анализ деятельности АО "Казпочта".

Сильные стороны	*Слабые стороны*
1. Максимальный охват территории страны благодаря созданию широкой почтовой сети	1. Незавершенная технологическая модернизация и высокий износ основных фондов
2. Широкий ассортимент оказываемых услуг	2. Низкая эффективность управления затратами
3. Конкурентные цены, особенно в сегменте EMS	3. Низкая операционная эффективность
4. Отрегулированный процесс предоставления традиционных услуг, что связано со зрелостью отрасли, сложившимся опытом	4. Высокие расходы на содержание филиальной сети
5. Постоянный поток клиентов, получающих услуги	5. Высокая текучесть кадров
6. Налаженные связи с зарубежными почтовыми администрациями и Всемирным почтовым союзом	6. Недостаточный уровень квалификации производственного персонала
7. Статус Национального оператора почты как государственного института и законодательно закрепленный механизм гарантирования сохранности вкладов населения	7. Высокая конкуренция на городском уровне и высокозатратная деятельность на сельском уровне, связанная с текущим содержанием распределенных производственных фондов по масштабной почтовой сети
Возможности	*Угрозы*
1. Использование социальной значимости Национального оператора почтовой связи	1. Отсутствие компенсации убытков от универсальных услуг почтовой связи
2. Эффективное использование трехмерной сети (физическая, электронная, финансовая)	2. Конкуренция на высокодоходных сегментах, особенно в банковском сегменте
3. Государственная поддержка	3. Убытки по предоставлению услуг, тарифы на которые регулируются государством
4. Участие в международных почтовых организациях для обеспечения неразрывности всемирного почтового пространства путем соблюдения параметров качества	4. Низкий уровень оплаты труда по сравнению с коммерческими курьерскими компаниями и банками вызывает отток профессиональных кадров, что ухудшает качество предоставляемых услуг
5. Удобное географическое положение республики, использование транзитного потенциала	5. Развитие современных технологий и появление альтернативных средств связи негативно влияет на снижение спроса потребителей на почтовые услуги
6. Внедрение инновационных технологий и технических средств самообслуживания	
7. Диверсификация деятельности (расширение спектра услуг и клиентских рынков)	
8. Доверие клиентов	

- продолжение модернизации существующих и внедрение новых технологий. Технологическая политика должна строиться на расширении инновационных подходов, реинжиниринге процессов от разработки продуктов и услуг до выхода на рынок;

- охват доступным востребованным сервисом сельских населенных пунктов. Это государственные услуги, услуги по осуществлению заказов товаров по каталогам, страхование, брокерские услуги, кредитование, бронирование, покупка авиа- и железнодорожных билетов и прочие виды услуг. При этом Компания может действовать самостоятельно или в качестве агента других компаний;

- повышение доли эффективных услуг, подтвердивших коммерческую привлекательность. В частности, продвижение прямых почтовых рассылок рекламы; разработка целевого портфеля таких продуктов, как письма, посылки; модернизация работы сети филиалов и предложение рынку дифференцированных продуктов;

- создание логистической организации, которая будет заниматься аутсорсингом или оказанием логистических услуг; создание по опыту Японии при АО "Казпочта" банковской организации с целью развития сектора финансовых услуг;

- реализация проекта по созданию виртуальных бизнес-организаций, где АО "Казпочта" может выступить в качестве управляющей компании. Расширение сотрудничества с организациями, использующими методы сетевого маркетинга, с интернет-магазинами с целью оказания курьерских и иных услуг.

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	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.179	
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SECTION 30. Philosophy.

PURPOSES AND VALUES OF EDUCATION OF V.V. ROZANOV AND PHILOSOPHY OF AGRARIAN POLICY

Abstract: *The article is devoted to the philosophical analysis of value bases of Russian education in the context of the challenges facing agriculture. It is shown that the ideas of Russian philosophical thought are the basis of the national educational paradigm in terms of reforming. The value system determines the success of today's higher education reform and agricultural industry. The need is stressed to use the original ideas of Russian philosophers in educational practice. The article is of interest to researchers in the field of educational philosophy and axiology.*

Key words: *educational philosophy, axiology, Russian philosophy, values education, agricultural policy.*

Language: *Russian*

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ЦЕЛИ И ЦЕННОСТИ ОБРАЗОВАНИЯ В.В. РОЗАНОВА И ФИЛОСОФИЯ АГРАРНОЙ ПОЛИТИКИ

Аннотация: *Статья посвящена философскому анализу ценностных основ российского образования в контексте задач, стоящих перед сельским хозяйством. Показано, что идеи русской философской мысли являются основой отечественной образовательной парадигмы в условиях реформирования. Система ценностей определяет сегодняшний успех реформы высшего образования и сельскохозяйственной отрасли. Подчеркивается необходимость использования оригинальных идей русских философов в образовательной практике. Статья представляет интерес для исследователей в области философии образования и аксиологии.*

Ключевые слова: *философия образования, аксиология, русская философия, ценности образования, аграрная политика.*

Введение.

Затрагивая самым непосредственным образом сферу агропромышленного комплекса, реформа высшего профессионального образования сталкивается с проблемой ценностного содержания проводимых изменений. Недостаточная позитивная динамика развития российского сельского хозяйства побуждает к активизации извечного философского вопроса «что делать?», не ставшего менее актуальным со времен Н.Г. Чернышевского. Цель нашего исследования состоит в анализе наиболее значимых идей представителей русской философии в лице одного из самых оригинальных ученых и публицистов В.В. Розанова относительно целей и ценностей образования, которые могли составить основу аксиологии образования в условиях разрушения прежних ценностей и становления новой культуры аграрного труда. Люди, занимающиеся сельским трудом, являются носителями особых ценностей: любовь к земле, малой родине, ответственность перед земляками, верность традициям и культурному наследию страны. Актуальность темы исследования определяется значимостью формирования аксилогической парадигмы образования в период интенсивного реформирования всех ступеней образовательной системы, включая профессиональную подготовку бакалавров и магистров для сельского хозяйства. Научная новизна исследования определяется

недостаточной разработанностью ценностной проблематики в области философии образования, которая сама как область научного исследования является еще новой. В процессе изучения проблемы нами были применены методы теоретического анализа.

Результаты исследования.

Государственная программа развития сельского хозяйства на 2013-2020гг., утвержденная Постановлением Правительства РФ 3717 от 14 июля 2012 года предполагает, что профессионалы высшей квалификации, подготовленные аграрными вузами страны, будут в полной мере соответствовать высоким требованиям времени в условиях конкуренции с европейскими товаропроизводителями. Согласно Доктрине продовольственной безопасности РФ субъекты АПК должны производить не менее 80% продуктов питания на российской территории. Актуальное импортозамещение товаров, вопросы органического сельскохозяйственного производства, инновационные направления сельскохозяйственной деятельности, проблемы защиты сельскохозяйственных товаропроизводителей и внутреннего регионального продовольственного рынка от экспансии зарубежных аграрных предпринимателей и импорта сельскохозяйственного сырья и продовольствия составляют частные вопросы новой философии аграрной политики. Сегодня обозначены как основные проблемы, так и пути их решения, которые тесно связаны с аграрной политикой государства: модернизация сельских хозяйств и повышение за счет этого их доходности, устойчивое развитие сельских территорий, привлечение молодых специалистов в сферу аграрного производства. Особое место в социально – экономическом преобразовании сельскохозяйственного производства занимает деятельность крестьянских (фермерских) хозяйств страны. Сегодня можно наблюдать положительную динамику производства некоторых видов сельскохозяйственной продукции фермерскими хозяйствами. В этих условиях особенно важно определить цель и назначение гуманитарного образования, без которого невозможно сформировать гармоничную личность профессионала, даже самой высокой квалификации[5].

Исследователи А.А. Фанненштиль, В.В. Щербинин указывают на специфические особенности АПК: низкая концентрация производства в сельской местности, недостаток рабочих мест, отсутствие разнообразия специальностей и, как следствие, монополизм работодателей. При этом исследователями отмечается невысокий уровень мобильности сельских жителей, а также то, что особенности менталитета селян проявляются в осторожности и консерватизме. Следовательно, только долговременная работа с выпускниками школ из сельских районов, помощь в профессиональном самоопределении поможет сделать осознанный выбор профессии аграрного профиля[6]. Цели и ценности в системе мировоззрения будущих студентов определяют то направление послевузовской деятельности, которое выбирают будущие специалисты высшей квалификации. Это представляется особенно важным в ситуации, когда выпускники устраиваются на работу не по специальности, обозначенной в дипломе. Их принуждают к этому различного рода социально – экономические причины: отсутствие отдельного жилья, невысокий уровень зарплаты, неразвитость в сельской местности современной сферы развлечений. Поэтому молодой специалист с высшим образованием, для которого значительной ценностью выступает сельская местность – «малая родина», где он родился и вырос, где живут его близкие и друзья, все же выбирает благоустроенную городскую жизнь с работой не по специальности[7; 8]. Прагматизм Д. Дьюи, составляющий основу западного образования, трактует цели и ценности образования с точки зрения пользы. Проблема определения четких ориентиров направленности молодежи на приобретение сельскохозяйственного образования, повышение привлекательности сельскохозяйственных профессий является актуальной также для европейских вузов и колледжей[9; 10].

Одним из традиционных подходов в гуманитарных науках выступает обращение к личности субъекта, системе ее ценностных предпочтений. Философия, сохраняя теоретическую основу и являясь методологическим основанием современного образования, приобретает прикладной аспект, приближаясь к нуждам общества. Хотя аксиологическая составляющая никогда не покидала сферу философии, с наступлением XXIв. об аксиологии и философии образования стали говорить с большим воодушевлением, чему свидетельство многочисленные монографии и диссертационные исследования последних десятилетий. Начала философии образования в России, которой сегодня отводится одна из ключевых ролей в деле интенсификации социально – экономического развития страны, были положены в конце XIXв. философско – публицистическими трудами педагогов К. Д. Ушинского («Человек как предмет воспитания. Опыт педагогической антропологии», 1868—1869) с идеями народности воспитания и

образования и П.Ф. Каптерева («Новая русская педагогия, ее главнейшие направления и деятели», 1897) с индивидуализацией воспитания и обучения. В частности, П.Ф. Каптереву в 1915г. министром народного просвещения П.Н. Игнатьевым было поручено подготовить реформу российского образования. Религиозный философ В.В. Розанов и философ-неокантианец С.И. Гессен могут быть по праву отнесены к основателям российской философии образования, благодаря своим выдающимся работам, где мы находим осмысление духовных национальных ценностей, отражение вопросов обучения и воспитания с аксиологической точки зрения. Следует отметить, что хотя В.В. Розанов не создал стройную систему ценностей образования, однако в работах, касающихся вопросов гимназического или университетского обучения, выразил как глубокое понимание проблем российской образовательной системы и менталитета граждан, так и обозначил области применения философии образования. Изданная в 1923г. работа С.И. Гессена «Основы педагогики. Введение в прикладную философию» отражает многие положения целей и ценностей образования, высказанные ранее как В.В. Розановым, так и другими учеными того времени. В первую очередь это касается нравственного воспитания и понимания сущности личности[2]. Позднее С.И Гессен, рассматривая сущность послереволюционных изменений подхода к воспитанию человека, отмечает в статье «Судьба коммунистического идеала образования» (1933) непреложимость предлагаемого идеала воспитания к реальной жизни, его текучесть, многоликость и неустойчивость[1].

Спустя столетие после первой публикации труды В.В. Розанова стали доступны для широкого круга исследователей. О.В. Долженко (1995), В.М. Розин (1996), А.Н. Николюкин (2001), В.А.Фатеев, Д.А.Кравцов (2002), Р.А Барзукаева (2004), И.В.Горина (2009), Е.В. Свирская (2012) в монографиях и диссертационных исследованиях, посвященных философскому наследию В.В. Розанова, показали традиционность связи философии и образования как источника интеллектуального и духовного прогресса. Обратимся к анализу работы В.В. Розанова «Сумерки просвещения» (1893), изданной в 1899г. В предисловии В.В. Розанов отмечает, что темой его внимания является не столько русская школа, сколько почва, на которой стоит эта школа, «…не имеющая за себя других аргументов, кроме подражательности и традиции». «Забыта именно философія воспитанія; не приняты во вниманіе такъ сказать геологическіе пласты, коихъ поверхностную пленку «назема» мы поэтому такъ безуспѣшно пашемъ»[3, с.1]. Заметим, что философ не отрицает, что существует дидактика и педагогика как ремесло или искусство и эта система работает, обеспечивая определенный уровень образования, но его авторская позиция состоит в акцентировании философии воспитания и образования, как базиса, отсутствие которого приводит к неэффективности всей системы образования в целом. С.С. Розанов всегда стремился сделать свою жизнь осмысленной и направленной на благие цели. Будучи студентом третьего курса университета будущий самобытный ученый написал одну из своих первых работ «Цель человеческой жизни» (1892), где отмечает, что в рамках сознательного существования человека вопрос о цели является одним из самых первостепенных. В традициях русской философии С.С.Розанов подчеркивает, что идея цели представляет собой внутренний и субъективный акт, который посредством деятельности воплощается в действительности. Качество цели это нечто совершенное и не подлежащее изменению, где идеальная полнота является логической необходимостью для всякой цели[4].

Беспокоясь не без основания о судьбе российского просвещения, В.В. Розанов ставит вопросы о том, чему и как учить и какими должны быть те, кто берет на себя ответственную миссию обучения и образования человека. Отвечая насущным требованиям сегодняшней подготовки профессионала высшей квалификации для аграрного сектора экономики это должен быть человек с устойчивой патриотической направленностью, четкой гражданской позицией, пришедший, скорее всего, от земли и с детства впитавший в себя любовь к родному краю.

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SECTION 7. Mechanics and machine construction.

THE PREDICTION OF USING MSW LANDFILL AS A BASE OF CONSTRUCTIONS

***Abstract**: The article describes the prediction of landfill settlement carried out by numerical simulations based on the stress-strain state of the underlying soil for the future using of the landfill as a base of structure. Settlement was calculated for landfills, which based on loam, clay and sand. For the first time was proposed to take into account the soil,which lies in the base of municipal solid waste landfill as the one of the main components of the landfill.*

***Key words**: settlement, municipal solid waste, landfill, compression.*

***Language**: Russian*

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ПРОГНОЗИРОВАНИЕ ИСПОЛЬЗОВАНИЯ ПОЛИГОНОВ ТБО В КАЧЕСТВЕ ОСНОВАНИЯ СООРУЖЕНИЯ

***Аннотация**: Прогнозирование осадки полигонов твердых бытовых отходов осуществлялось с помощью численного моделирования с учетом напряженно-деформированного состояния подстилающего грунтового массива для использования полигона в качестве основания сооружения. Осадка рассчитана для полигонов, в основе которых суглинок, глинистые и песчаные грунты. В работе впервые предлагается учитывать грунт основания полигона, являющийся одним из основных составляющих полигона.*

***Ключевые слова**: осадка, твердые бытовые отходы, полигон ТБО, компрессия.*

Актуальность работы. Украина занимает одно из первых мест в мире по количеству бытового мусора на душу населения. Под полигоны твердых бытовых отходов (ТБО) и свалки отведено свыше 160 тыс. га земель. В Украине ежегодно образуется более 10 млн. т отходов, из которых более чем 90 % попадает на полигоны. Общее количество санкционированных полигонов и свалок в Украине – около 700. Наибольшие площади под полигоны отведены в Днепропетровской области (140 га), Донецкой области (330 га), Одесской области (195 га), Запорожской области (153 га) и Луганской области (129 га). После закрытия полигона или свалки остаются огромные площади земель, которые не используются. В связи с постоянным увеличением объемов отходов и, как следствие, увеличение площадей, отводимых под полигоны, а также с интенсивным ростом городов и необходимостью отвода новых земель под строительство, остро встает вопрос об устойчивости полигонов и их возможном использовании в дальнейшем как основания для инженерных сооружений.

Полигоны представляют собой очень сложные системы, в которых множество процессов протекают одновременно. Образования свалочного газа меняет давление газа и жидкости в теле полигона, которое может повлиять на пористость, общее напряжение, что в свою очередь вызывает деформации, в первую очередь осадки. Эти деформации негативно влияют на целостность любой структуры, построенной на основе закрытой свалки.

Непредвиденные осадки в конечном счете приводят к ряду проблем, таких как образование трещин в покрывающем слое, повреждения систем сбора газа и жидкостей и дренажных систем, оползней, приводящих к катастрофическим последствиям и вызывают

разрушение конструкций и даже гибель людей [2].

После закрытия полигона возможно его использование в качестве основы для сооружений и конструкций, в частности спортивных площадок, заповедников, автостоянок, промышленных парков, мест отдыха и т. д. Такая ситуация ставит перед учеными задачу по оценке и прогнозированию устойчивости свалки в качестве основы сооружений.

Анализ литературных источников показал, что экспериментальные методики оценки устойчивости свалки являются затратными и эффективны только для конкретных условий. Например, метод обратного анализа базируется на учете свойств уже разрушенных свалок, и не является удовлетворительным для других в связи с отличием состава отходов, природных условий, свойств слоев и подстилающего грунтового массива. В свою очередь с помощью лабораторных анализов не удается отобразить условия полигона, в том числе захватить в одном образце все слои и учесть их геотехнические и физико-механические свойства. Поэтому для учета наряжено-деформированного состояния слоев полигона и подстилающего грунтового массива и его характеристик целесообразно применять математическое моделирование.

Математические модели, прогнозирующие осадку можно разделить на реологические модели, эмпирические модели, модели, базирующиеся на механике грунтов и модели, учитывающие биодеградацию.

Парк Г.И. и Ли С.Р. предложили модель осадки, учитывающей зависимую от времени биодеградацию отходов. Предполагается, что скорость осадки выражается через множество осадок, прямо пропорциональную количеству твердых веществ, которые разлагаются. Растворения органических материалов определяется с использованием уравнения кинетики первого порядка. Сумма двух условий дает общую деформацию сжатия. Однако, определение кинетических коэффициентов или констант гидролиза, а также их изменение в условиях окружающей среды является очень сложным [9].

Эмпирические модели пытаются имитировать общее поведение отходов путем корректировки эмпирических параметров для конкретного участка. Для аппроксимации в основном используются следующие математические функции: логарифмическая функция, степенная функция ползучести и гиперболическая функция осадки.

Маркес А. разработал составляющую реологическую модель для учета первичных и вторичных механизмов сжатия, которые руководствуются реологическими параметрами, учитывающимися при деградации отходов. Первичная компрессия называется «мгновенной компрессией», которая не зависит от времени. Это основано на наблюдении, что соответствующий процесс является линейным для кривых, коэффициент пористости которых является функцией логарифма приложенного напряжения [4].

Общей чертой этих и других моделей является то, что они учитывают только твердые бытовые отходы, их поведение и свойства, пренебрегая такой важной составляющей полигона, как грунты, лежащие в его основе. Именно от типа, прочности, геотехнических свойств подстилающего грунта зависит устойчивость полигона, поскольку наибольшую нагрузку испытывает именно он. Основываясь на наблюдениях крутых склонов свалок, которые остаются стабильными, можно сделать вывод, что основное внимание при анализе устойчивости полигона должно быть уделено материалам, которые лежат в основе ТБО. В настоящее время этот вопрос не изучен.

Для прогнозирования оценки устойчивости полигона предлагается изучение его осадки с обязательным исследованием напряженно-деформированного состояния подстилающего грунтового основания, которое моделируется с учетом поэтапной нагрузки каждого слоя отходами. Это позволит оценить возможность использования полигона в качестве основы здания или конструкции с учетом типа грунта.

Цель работы – установление зависимости осадки закрытого полигона ТБО от подстилающих грунтов для прогнозирования возможности использования его в качестве основания сооружения.

МАТЕРИАЛЫ И РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ. Для прогнозирования осадки закрытого полигона ТБО при его использовании в качестве основания дорожного покрытия было проведено математическое моделирование. Покрывающий и подстилающий слои моделировались с помощью модели Кулона-Мора [3]. При этом тело полигона моделировалось слабым грунтом с учетом ползучести, использовалась модель Soft Soil Creep (SSC). В настоящее время данная модель наиболее полно описывает такие свойства слабого грунта, как зависящую от напряжения жесткость, а также вторичную компрессию с учетом ползучести .

Полная объемная деформация ε_v, вызванная ростом значения эффективных напряжений с начального значения p_0' до p' за период времени t_c+ t' , выражается в виде суммы упругой составляющей ε_v^e и вязкопластической составляющей ε_v^{vp}. Вязкопластическая составляющая состоит из деформации во время

консолидации $\varepsilon_v^{vp}{}_c$ и после консолидации $\varepsilon_v^{vp}{}_{ac}$. Связь между деформациями выражается в следующем виде:

$$\varepsilon_v = \varepsilon_v^e + \varepsilon_v^{vp}{}_c + \varepsilon_v^{vp}{}_{ac}, \quad (1)$$

где ε_v - полная объемная деформация; ε_v^e - упругая составляющая деформации; ε_v^{vp} - вязкопластическая составляющая деформации во время консолидации; $\varepsilon_v^{vp}{}_{ac}$ - вязкопластическая составляющая деформации после завершения консолидации.

$$\varepsilon_v^e = \kappa^* \ln\left(\frac{p'}{p_0'}\right); \quad (2)$$

$$\varepsilon_v^{vp}{}_c = (\lambda^* - \kappa^*) \ln\left(\frac{p_{pc}'}{p_0'}\right); \quad (3)$$

$$\varepsilon_v^{vp}{}_{ac} = \mu^* \ln\left(\frac{\tau_c + t'}{\tau_c}\right), \quad (4)$$

где κ^* - модифицированный коэффициент набухания; λ^* - модифицированный коэффициент компрессии (сжатия); μ^* - модифицированный коэффициент ползучести; t_c – время окончания первичной консолидации; t – время, прошедшее с начала загрузки полигона; τ_c – время консолидации; p_0' – начальное эффективное напряжение; p' – эффективное напряжение; p_{pc}' – эффективное преконсолидационное напряжение [10, с. 699].

Отношение параметров модели к международно-нормированным параметрам следующее:

$$\mu^* = \frac{C_\alpha}{2{,}3(1+e_0)};\ \lambda^* = \frac{C_c}{2{,}3(1+e_0)};\ \kappa^* = \frac{2C_s}{2{,}3(1+e_0)}, \quad (5)$$

где C_c – коэффициент компрессии; C_s – коэффициент набухания; C_α – коэффициент ползучести.

Эквивалентное напряжение выражается с помощью формулы:

$$p_p^{eq} = p' + \frac{q^2}{M^2(p'+c\cdot ctg\varphi)}, \quad (6)$$

где c – сцепление; φ – угол внутреннего трения; q – напряжение; p' - преконсолидационное напряжение; $p_p{}^{eq}$ - эквивалентное преконсолидационное изотропное напряжение; M – коэффициент, который определяется по формуле:

$$M = 3\sqrt{\frac{(1-K_0^{nc})^2}{(1+2K_0^{nc})^2} + \frac{(1-K_0^{nc})(1-2\nu_{ur})\left(\frac{\lambda^*}{\kappa^*}-1\right)}{(1+2K_0^{nc})(1-2\nu_{ur})\frac{\lambda^*}{\kappa^*} - (1-K_0^{nc})(1+\nu_{ur})}}, \quad (7)$$

где ν_{ur} – коэффициент Пуассона; $K_0{}^{nc}$ – коэффициент бокового напряжения при нормальной консолидации.

Гидродинамические аспекты проблемы состоят в учете фильтрационных сил, действующих на скелет грунтовой среды, и параметров взаимодействия жидкой и твердой фаз грунта (давления, напряжения и пористости) в процессе консолидации. В предположении безвихревого течения фильтрационного потока и распределения сил сопротивления равномерно по сечению элемента используется обобщеный закон Дарси и уравнение неразрывности. Принимается, что сжимаемость скелета и поровой жидкости мала, что приводит к линейной зависимости пористости грунта от давления.

Взаимодействие скелета грунта и жидкости характеризуется объемной силой, пропорциональной градиенту напора. Тогда при совместном действии на скелет грунта фильтрационных и гравитационных сил напряженное состояние определяется из уравнений равновесия элементов грунтовой области, которые получены путем проецирования приложенных сил на оси координат. Уравнения дополняются начальными и граничными условиями.

Полигон, для которого было проведено моделирование, состоит из десяти слоев отходов, толщина каждого слоя 3 м. Осадка определялась с учетом пошагового нагружения полигона спустя 30 лет после его закрытия. Для численного решения задачи использовался метод конечных элементов. Расчетная область покрывалась треугольными элементами (рис.1).

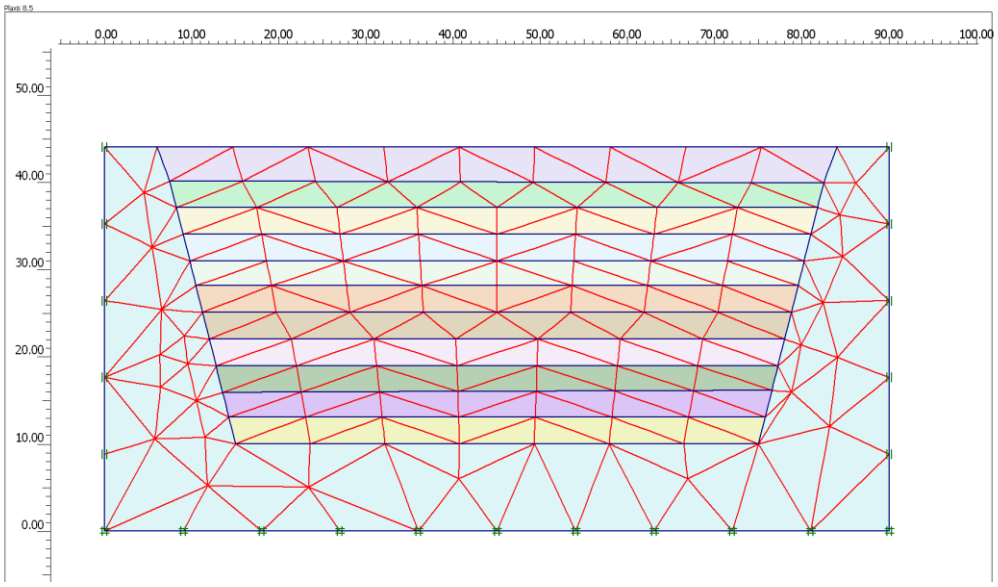

Рисунок 1 – Расчетная область полигона.

Были рассчитаны 3 варианта осадки полигона при условии разных подстилающих слоев грунта: глина, суглинок и песок. Параметры подстилающих грунтов, которые принимались при моделировании, представлены в таблице 1.

Таблица 1

Параметры подстилающих грунтов, которые принимались при моделировании.

Параметр	Песок	Суглинок	Глина
Модуль деформации, E_{ref}	18000	10000	9000
Коэффициент Пуассона, ν	0,34	0,34	0,34
Удельный вес грунта, γ_{unsat}	18,0	13	19,0
Удельный вес водонасыщенного грунта, γ_{sat}	20,7	14,6	21,8
Коэффициент фильтрации в горизонтальном направлении, k_x	0,5	0,006	0,004
Коэффициент фильтрации в вертикальном направлении, k_y	0,5	0,006	0,004
Сцепление, c	2	13	17
Угол внутреннего трения, φ	31	14	13

Деформированная сетка полигона с песчаным грунтом основания представлена на рис.2. Вертикальные деформации полигона с песчаным грунтом основания представлены на рис.3. В результате численного расчета установлено, что максимальная вертикальная деформация составила 4,95 м.

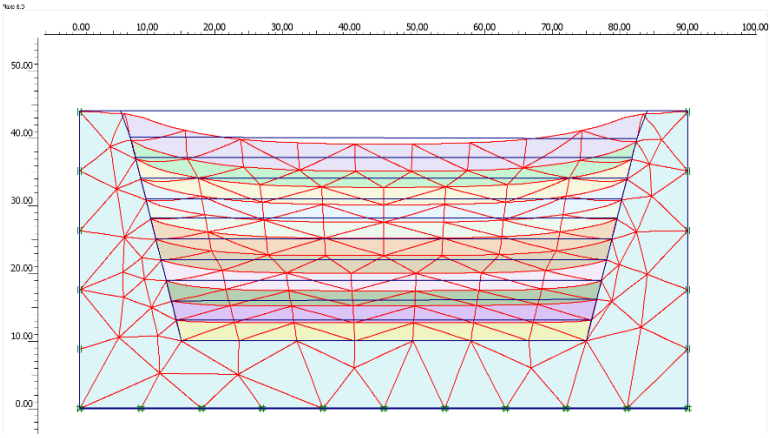

Рисунок 2 – Деформированная стека полигона с песчаным грунтом основания.

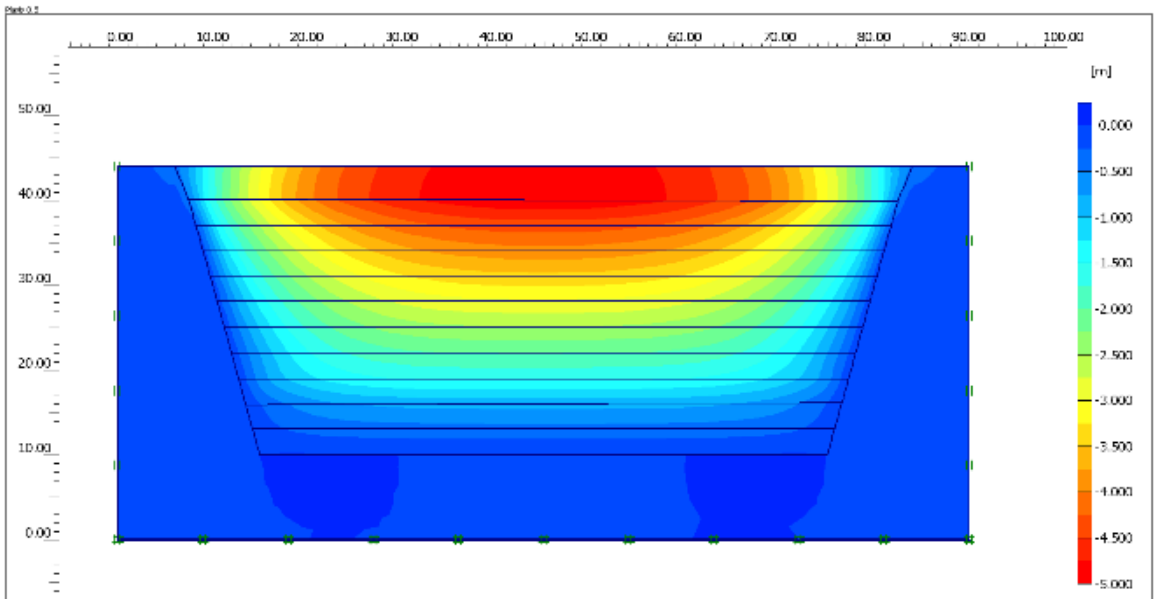

Рисунок 3 - Вертикальные деформации полигона с песчаным грунтом основания.

Если подстилающий грунт – глина (рис.4), то можно наблюдать, что достигаются значительно меньшие деформации (3,83 м).

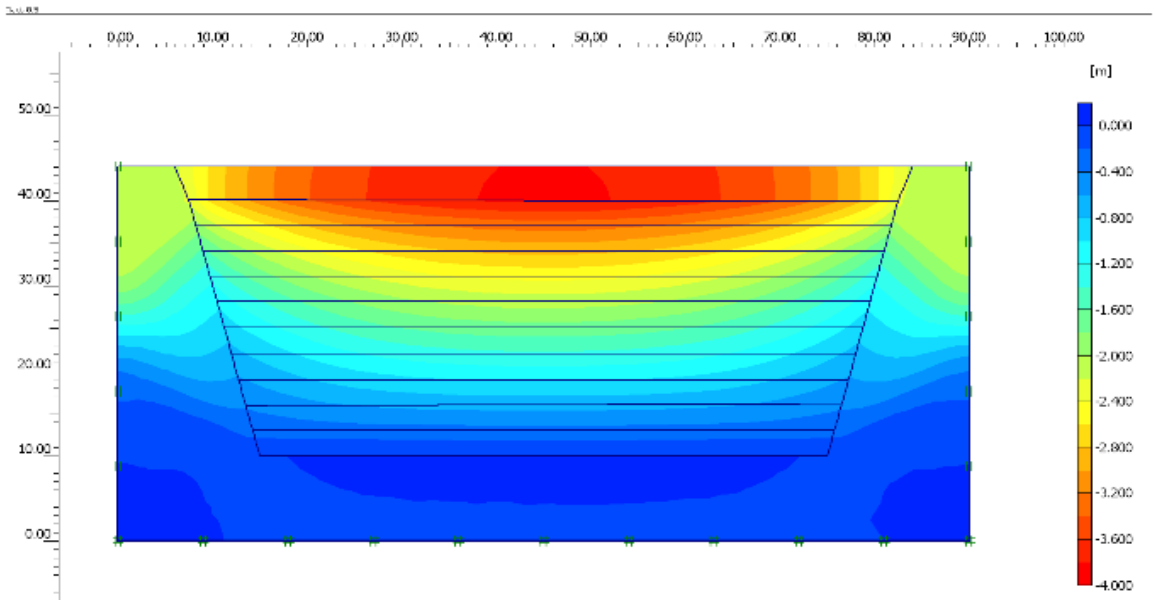

Рисунок 4 - Вертикальные деформации полигона с глинистым грунтом основания.

Также был проведен расчет осадки с суглинком в качестве подстилающего слоя, максимальная вертикальная деформация составила 4,47 м.

В результате проведенных исследований установлено, что при одинаковых характеристиках отходов осадка полигона с глинистым грунтом основания на 23% меньше, чем у полигона с песчаным грунтом основания и на 14% меньше чем с суглинком, в качестве грунта основания полигона.

Выводы:

Из проведенных исследований следует:

1) закрытые полигоны занимают огромные площади, поэтому при их закрытии возникает необходимость их использования в качестве оснований различных сооружений, что невозможно без достоверного прогноза их устойчивости;

2) впервые предложено учитывать при расчете устойчивости полигона подстилающий

грунт, так как он является одним из основных условий при формировании осадки;

3) разработана эффективная методика расчета осадки полигона ТБО, основанная на численном моделировании напряженно-деформированного состояния полигона и подстилающего грунта с использованием моделей SSC для полигона и Кулона-Мора для грунтового основания с применением метода конечны элементов;

4) в результате численного решения установлено, что при одинаковых условиях полигона, если подстилающий слой представлен глиной, то достигаются значительно меньшие осадки по сравнению с более слабым грунтом (на 23% меньше, чем с песком и на 14% меньше, чем с суглинком в качестве основания), что доказывает, что при прогнозировании осадки полигона для его использования в качестве основания сооружения, необходимо учитывать подстилающий грунтовый массив.

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SECTION 29. Literature. Folklore. Translation Studies.

POETIC CHARACTER AND ITS SPECIFIC FEATURES

Abstract*: The impact of the Eastern literature to the poetry of the Uzbek academician poet Gafur Gulam has been learnt by this article. Through the model of the analyses of poems by the poet poetic character and its specific features have been observed. And also the scientific-theoretical opinions on the specific depiction style and approach, scenic ideas concerning to the Eastern poetry, which have been ahead for formulation the individual style of Gafur Gulam to be talked.*

Key words*: Poetry, lyric feeling, sense, philosophical pithiness, inheritance, figurativeness, simplicity, coherency, motive, fairy tale, oral epic, blessing, scolding, proverb, parable, sayings, lyric character, outlook, style, cross impact, individuality, authentic ideal, literary-depictive means, idea, content.*

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I. Introduction

It's known that the creative works of the ancestors and their literary heritage played an important role for the perfect development of every talented person. Learning creative experience of mentors, continuing their traditions gives the artist the opportunity of affecting the development of literature of his time.

The representatives of the XXth century Uzbek literature like Fitrat, Choolpon, Qodiriy, Oybek, Shaykhzoda, H. Olimjon considered Uzbek literature as the organic continuation of the eastern literature. That's why they have learnt the creative artworks of the thinkers of the east, continued their traditions according to their particular creative way. These ideas are also concerned to the famous poet and academic Gafur Gulam. The creative works of ancestors have taken an important role for becoming famous poet, skilful writer, outstanding translator and academic. Gafur Gulam has profoundly translated into Uzbek the samples of many artworks of the representatives of the Farsi- Tajik literature like Abu Abdullo Rudaki, Shaykh Muslihiddin Sadiy, Abdurahmon Jomi, Mirzo Abdulqodir Bedil, Abulqosim Lohutiy, Mirzo Tursunzoda.

The poet from his youth time till the end of his life has perfectly learnt the creative artworks of the famous thinkers of the East, used and developed their traditions creatively.

II. Cross-impact and mutuality

The creative heritage of Gafur Gulam has been formulated and developed based on the impact of many authors of the Eastern literature and their valuable creative artworks which have been left by them. The elegance of human feelings, liked by people, deep sincerity in Rudakiy's, heroic spirit, epic scale in Firdavsi's, the great sense in the poems of Hofiz, encircle the universe phenomena as the scale of space in the Nizomi's, deep pithiness, edifying ness in Sadi's, enormity in Jomi's has been immersed into the essence of creative heritage of Gafur Gulam. He followed by the logically clear philosophical thoughts, livid lyrics of Bedil. He expressed his wise thoughts under the impressions of philosophical sayings of Omar Khayyom. He has been influenced on playful tunes of Fuzuli, has got lyric heat from the poet Alisher Navoi.

One of the particular features of creativity of Gafur Gulam are his deep respect to the classical Eastern literature. Gafur Gulam has been true in this feeling and immersed it into the contents of his artworks in different genre during the time of his creative activity. The following words of the scholar on literature A. Haytmetov proofed our thoughts: *"Gafur Gulam considered Uzbek literature, particularly, its classical part as the part of the general eastern literature and he appreciated*

learning the history of Uzbek literature in this way"[9].

Gafur Gulam wrote the names of great Eastern poets with respect in his poems, he stated that they were the most skilled and their creative work was a great experimental source for him. Sometimes he capably used specific features of Eastern poets' style for expressing philosophic-aesthetic views in his poems. He used the views about Navoi and Bedil in his poem "Sarhisob" ("Closing stages") on creating metaphor

Navoi baytiday to'lqinli yoshlik,
Bedilning sh'eriday falsafiy umr,
Vaznu qofiyasi mustahkam hayot
Roman o'qilganday o'tib bormoqda,
Etagi qo'llardan ketib bormoqda [4]

(Meaning of the poetry extract:
Waving youth time as Navoi's verse,
Philosophic life as Bedil's ode,
The lasting life as to line and rhyme
Having passed as a read novel,
Its hem is running away from their hand.)

In this poem Gafur Gulam was able to provide literary clearness by comparing the intensity specific for the youth to Navoi's poems, philosophical thoughts specific for the adults to Bedil's poems. The depiction of forever unchangeable rules of life as the line and rhyme of the poem, and the passing life as reading novel is an unexpected poetic discovery. The couplets like "There will be thousands of "Shohnoma" (Shahname) in our life", "There is some agonize in the ligament as Firdavsi's couplet", "It seemed as if Bedil's gazal in a poem", "It's worth to writing oral epic "Thousands of Shahname" with blood", ""Hamsa" for love and loyalty which was written by Jomiy", "Eternal bay of Navoi", " It would be good if I wrote the lyrics of peaceful time for my nation as Hofiz's gazals" and other clearly proofed Gafur Gulam's admire, love and aspiration to the Eastern poets

III. Character and specific features in the poems of the poet

While talking about the impact of the Eastern literature to the creative work of Gafur Gulam it could be good to note his attitude to the creativity of Omar Khayyam. Gafur Gulam was not only the person who knew his poems by heart, who had strong memory and understood Omar Khayyam's poetry deeply, but he was the person who felt the sense of word art deep in his heart and also well educated person who had eternal love for the Eastern literature deep in his soul. The influence of the treasure of Omar Khayyam to the poetry of Gafur Gulam to be observed through existence of spirit concerned to Khayyam in the literarily interpretation of life and person and also making philosophic-aesthetic conclusions. The most characters created by Gafur Gulam existed the influence of creativity of Omar Khayyam. It is not suprising if the treasure of Omar Khayyam as the other Eastern classical poets played as the role of master class in the creative activity of Gafur Gulam.

There are lots of poems among the creative work of Omar Khayyam depicted the dream of seeing the people in freedom. He wished to see not only the parts of people but seeing all the humanity in freedom and peace. While determining the person's peaceful life with his satiety and peaceful place, at first he appeared as a tolerant person, second as an attentive person who evaluated the time with the level of attitude to an ordinary people:

Kimningki bor esa bir burda noni,
O'ziga yarasha uy-oshiyoni,
Na birov unga qul, na u birovga,
Ayt, shod yashayversin, xushdir zamoni [2]

(Meaning of poetry extract:
If anyone has a peace of bread,
Suitable house and homeland,
Neither anyone slave for nor he is for,
Let him live with joy, in his happy time.)

In the poem,"The sunlight is equal to all nation" to be observed the interpretation of the close views to these ideas.

Har bir ozod kishining
O'z fikri, o'z ishonchi.
Jumla insonlarga xos
Kitobi va tayanchi.
Na birovni qul qilur,
Na birovga bo'lur qul.
Hamma odam yoru do'st,
Qayg'usiz yorug' ko'ngil [6]
(The meaning of the poetry extract:
It's an own hope, it's an own thought,
Of an each free person.
It's a book and support,
Peculiar to all people.
Neither anyone slave,
Nor a slave by himself.
All people are friends,
It's a bright soul freed from sorrow.)

Both of these poems through the interpretation of the notion liberty and freedom there are presented interactive harmony and individuality. For Umar Khayyom the main term of happiness for the members of the society is their free living conditions. As to Umar Khayyom if there is a piece of bread and house for living, it could be enough proof for his free living. With the help of the expression "a piece of bread" in the poem created the synecdoche and it means that there is enough materiality which endow with human's needs. As for lyric hero of Gafur Gulam, all people's friendship and not being a slave guaranteed the happiest and free life of human. There

is depicted that people could be free and independent if he has his own thoughts and belief. Here the views of Gafur Gulam depicted not only harmoniously with the ideas of Khayyom but the views of the poet are depicted more wider and deeper connecting with enlightenment and belief which served peaceful and free living of people without trouble. The word "book" in the poem, which caused to appear the art synecdoche, expressed that meaning.

IV. Imaginatively interpretation and depiction skill

The creativity of Gafur Gulam is worth to value of his unrepeated artistic depiction. Academic B. Nazarov wrote about his artworks as following; "The philosophy of life, the philosophy of dear and appreciate its sense covered all the creative life of the poet and it appears with its whole beauty in the depiction of the poetic characters" [1]. The sway of Omar Khayyom on creative work of Gafur Gulam one can notice in his creativeness on depicting specific imaginative expressions. The imaginative thought in his couplet as "Bulbulning ko'ziday nol to'garakka, Bir butun koinot sig'a oladi" ("Insoniyat proframmasi"- "The program of the mankind") (Meaning: The whole world can go in, the zero circle as nightingale's eye), can be noticed the influence on the following couplets of Omar Khayyom: "To'garak jahonni uzuk deb bilsak, Shaksiz uning ko'zi – gavhari ham biz". (Meaning: If we consider the whole world as a ring, undoubtedly, we are its eye – pearl). When Omar Khayyom depicted the world as a ring and the mankind as its eye pearl, through the imaginative power of Gafur Gulam the whole world could go in the zero circle like a nightingale's eye. In actual fact, each creator of East is a mentor and learner to each other.

While Omar Khayyom depicted invaluableness of Wiseman before the ignorance looked like the sky as an overturned basin by the following: "To'nkarilgan jomday ko'rinar osmon, Ostida zabundir kimki bilag'on". (Meaning: The sky can be seen like an overturned basin, under there is depressed wise person.), and Gafur Gulam in his poem "Insoniyat programmasi" ("The program of the mankind") depicted with pride and proudly that before the bigheaded man any eminence is nothing and any ignorance exactly to be failed by expressing as: "Boshi balandligiga ko'kni o'xshatolmayman, Osmon degan nimadir? – To'nkarilgan eski tos" (Meaning: I can't compare his bigheaded to the sky, What is the sky itself? – It's an old overturned basin)

In his poems Omar Khayyom appreciated godly love actively concentrating on the symbolic characters as "may", "boda", "sharob", "kosa", "soqiy" (These words mean "wine", "wine-server"). He depicted true enlightenment and vary inner thoughts of the lyric character. Such kind of traditional characters can be met with in the poems of Gafur Gulom. Poet used these images concentrating on his own time and expressed them in new meaning as appreciating the beauty of life and happy living. Omar Khayyom wrote:

May ichamen, mastlik qilmaymen also,
Qadahdan o'zgacha bo'lmayman balo.
Boda ichishlikdan mening g'arazim –
O'zimga sen kabi qo'ymaslik bino.
(Omar Khayyom. Ruboiylar (Quatrains). P.99)
(Meaning: I drink wine, but I never get drunk,
I'm never dodger different as wineglass
To drink a wine is my self interest –
As I don't want to tend myself like you.)

Above given poem of Khayyom the word *"may" ("wine")* used as metaphor, *"may" ("wine") means* – true love, *"wineglass"* means enlightenment. If we take into consideration that the positive characters of a person enriched when he fell in love, for what purpose the lover drink wine would be clear. So that the meaning of the quatrain could be meant as following: "*How much I fell in love, I fill my soul with true enlightenment. The reason of my love is to keep my humanistic character, not to be tended by myself like others".*

In the poems of Omar Khayyom "may" ("wine") and the images connected with it has been used many times, and through them the ideas *recognition of Trust, self-realization, perceiving the enlightenment* to be valued. It seemed us that these images influenced on the creation of the images "s*oqiy"("wine server"), "may", "sharob" ("wine"), "qadah" ("wineglass")* which are met in the poems of Gafur Gulom. Of course, in the poems of Gafur Gulom the meaning connected with these images stressed on outer sense of life. That means there is appeared an imagination concerning to description the features of *living and struggling, singing the pleasure of life.* But if we carefully observe the poems of Gafur Gulam we can clarify the poems where used the word "may"("wine") and its synonyms, there is also depicted its symbolic meaning.

Gafur Gulom concentrated on the images *"soqiy"("wine-server")* and *"sharob" ("wine")* when he depicted the pictures of his time. In this place these images meant as a symbolic essence. The poet in his poem "*Qutlug' yil tongi" ("Happy year morning")* wrote as following: "Soqiy menga sun qadah, yigirmanchi asrning Ichgan sari kishini hushyor etar sharobin" (V.2. p 224) (Meaqning: "Wine – server give me a wine glass of the twentieth century that makes a man to be attentive while drinking"). On the outer side meaning these couplets can be meant as the feeling appeared while drinking. If we are more attentive, there is found multi-meaning inside the content. One can understand the meaning of the words given in the poem as: "wine-server" – the life, "wineglass" – the life given to a person, "wine" is the time. Therefore, the person

became more careful while living and lessoned learned through their life experience. Especially the man of the XXth century, who passed through the events never heard and seen, should be always thoughtful.

In his poems devoted to the depiction of landscape the poet addressed to the image "wine-server". "Barda ko'rpalarni yelkaga qiyg'och tashlab, Uchib qolgan soqiyday gungurs uhlaydi toklar" (V.2. p.152) (Meaning: The Vine trees are sleeping like a drunken man, who stretched out under blanket in the Bar). The natural and unrepeated depiction of the images in this poem is worth to appreciation. The comparison of Vine trees which are sleeping like a drunken man is the discovery of Gafur Gulom.

Conclusion

It is clear that the influence of Navoi on the creative work of Gafur Gulom is multi edging and it help to enrich and increase the literary creativity of the poet. In many images, depiction styles and means to be observed the influence of traditions of Alisher Navoi. It proofed that he knew the specific features of classical literature very well and used this valuable treasure effectively in his creative work.

Our observations showed that the poet was the outstanding person who gained the knowledge of the secrets of classical treasure very well. The effective usage of the traditions of classic literature in the literary-critical articles, lectures and poems based on clear reviews proofed our thoughts. We hope, it will help to define the sources of creative work of Gafur Gulom and understand his artworks specific features clearly.

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SECTION 30. Philosophy.

MORAL NORMS OF THE ECONOMIC COMPETITIVE

Abstract: *In this article some aspects of the definition of moral norms in economic competitive are considered. The economic ethics pays great attention to the study of the categories of "honesty", "integrity" and "morality" in the conduct of competitive struggle in the business, between producers and consumers.*

Key words: *competitive, competitive struggle, morality, economic ethics, integrity, ethics of businessman.*

Language: *English*

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Institute of competitive between people is manifested in various fields and has a completely different character – "civilized" and "uncivilized" that for economic relations is considered as "fair" and "unfair". If we analyze the competitive in the labor, in the sphere of production, when people are already busy creating material goods or services, and competitive in the field of selling of goods or services the characteristics of such processes of the competitive can have a completely different meaning.

In business, as in any game, the contestants have a choice of building relationships – respect, which may be accompanied by supporting economic strategy to more traditional fights when opponents seek to destroy. In real life competitors can support each other in difficult times and plant the explosives in the car of a competitor. And just as in any game, one goal – to win.

The main requirement of the market process – a clash of economic interests of economic entities – should not lead to the application of methods of competitive, are commonly combined in the concept of "unfair competition". Effective protection against unfair competitive is the basis for the functioning of the market economy.

But when the struggle on a number of circumstances between the actors becomes a struggle without rules then society begins to worry. The presence of preconditions and causes of the existence and spread of unfair competitive shall entail the necessity of state intervention for the purpose of it's weakening and neutralization, as well as creating the conditions for "fair" competitive through the application of measures of economic and non-economic nature that have an indirect impact on overcoming unfair competitive.

At the same time, in the definition of "unfair competitive" refers to the requirements of fairness, reasonableness and fairness. The use of such criteria for evaluating the integrity of competitive is connected with the principle of "good conscience", which traces its origins to the Roman formula "bona fides".

But the actions that contradict the requirements of integrity are impossible to determine without a definition of "good", more familiar when using the word "kind", but it is well known that one side may be good for others to provide a great evil. The concept of fair competitive is directly related to economic justice, moral criteria and values.

It is important to consider that the existing concept of "integrity" and "fairness" is not that other, as a reflection of moral and ethical principles of society, which can sharply differ from each other not only in different times in different countries, but also within one country, for example, among the representatives of different religions.

Links to business practices, integrity, intelligence and fairness in the definition of "unfair competitive" link the actions of the entity only with the ethics of entrepreneurship. Therefore, it is important to figure out whether there is a possibility to combine moral motives and decision making in business. What is more important for the entrepreneur when making decisions of an entrepreneur – moral motives, which do not ensure a profit or profit when making immoral decisions.

The main thing you should pay attention that any other competitive, not only unfair, but even that which is by definition "fair" is inherently intended to limit the dominance of other economic entities on the market achieving the highest results in profit. Any activity of the entrepreneur, aimed at making a profit, is aimed at reducing the profits of other businesses, because the behavior of economic entities – the struggle for money of the consumer and, therefore, causing competitors some damage.

If fair competitive is able to destroy your opponent, it will inevitably cause a reaction leading to the appropriate response for a competitor, leading to the result – the destruction of the initiator of the struggle. It is hard to imagine the war if both sides knew the end of it. It is this war and appears modern market competitive.

Ethics is the study about the moral and reasonable enjoyment of freedom. Freedom is a key precondition for independence. In a totalitarian society the person have no a choice. It is freedom that assumes that people voluntarily make the choice consciously to limit, where appropriate.

In fact, the process of market sales is always a compromise between the seller and the buyer. Market economy, among other things, a unique mechanism that allows competitive to transform personal and selfish interest of a person in a public good.

There are certain moral standards that allows you to find these compromises. Here are some of them [9]:

1) The concept of "service to society", which is due to intra-firm policy commitment of all employees from the president to employees. To serve customers in exchange for a reasonable fee – that's a cornerstone of their worldview. "The prosperity of the manufacturer," wrote Henry Ford, - depends ultimately... from the benefits that it brings to people." [9]

2) As paradoxically, the contempt of money. Money is for the entrepreneur not the goal but rather the means used to achieve this goal. Money is in constant motion, in circulation. The case, currently, entirely thrilling, is the main riches of a businessman. The lack of the cult of money making entrepreneur relaxed, gives him the ability to take reasonable risk.

3) Logically follow from the previous the constant dissatisfaction reached, not fading with the years a healthy of sense of ambition. Business is not only the result but also the process. The businessman, like the writer, it always seems that the Ledger before him. This constant drive for success, the pursuit of increasingly complex and challenging tasks – a kind of "calling card" of Western businessman.

4) Sincerity, honesty, openness. The honesty of the entrepreneur is an immutable attribute of the style business relationships in the West, for the slightest "stain" on the reputation of the businessman can lead to serious financial losses, and often bankruptcy. In the conditions of developed competitive to be honest profitable.

On guard for fair competitive is not only the state but also by the numerous associations of entrepreneurs by trades–unions, guilds, associations, authorized to regulate the activities of its members in the interests of consumers to ensure fair, equitable and ethically healthy business practices. In addition, these associations there is a professional code of honor, describing a number of actions that are recognized by its members as unethical.

5) Pride in your business, regardless of scope and scale. Any business that serves the needs of buyers and income, prestigious. The basis of this approach are high professionalism, confidence in their own ability.

6) This is the principle that success in business should not be achieved at the expense of environmental destruction.

7) The principle "of profit distribution should involve all those who participated in its creation".

Economic ethics acts as the normative basis of economic activity, regulating relations in the sphere of economy, formulating and instituting of moral requirements for all subjects of economic relations. Its main objective is the identification of institutional (framework) limits of participants in the economic process, which play a fundamental role in moralization of market relations in modern society. Unlike individual ethics she turned to the society, sets the guidelines and justifies moral principles of functioning of the economy and in this sense is a programme of the economic order.

In the broad sense of economic ethics is to explain the relationship of economics with morality, the specifics of their relationship. It is well known that the development of production, economic activity objectively contribute to the moral improvement of man. It has long been thought that in the labour force is formed creative power of man, the moral basis of his relationship to the world, to other people. Hard work and honesty were the two main ethical norms, which always accompanied the activities of production and trade and the redistribution of wealth. Without hard work, honesty, integrity, concern for man material production could not exist. At the same time, the development of production, the increasing complexity and scale of human activity, raising the level of engineering and technology has put human need before a full understanding of responsibility, understanding of public duty, of solidarity. A lot depends on the actual economic policy of the state, its regulatory role in the sphere of economic relations. They say: "A healthy economy – healthy habits".

All this self-evident truth. The problem goes to another plane when it comes to modern society of

"free" market relations based on a play of interests, competitive, orientation on profits. This raises the question: what is the relationship between morality in modern economic production, how applicable is the concept of morality to the situation of the market economy in general, modern market, in particular?

The answer to this question can be found already in the writings of the Scottish economist, philosopher and ethics of the XVIII century, one of the founders of modern economic theory, Adam Smith [8]. In its economic model scientist could distinguish two levels of public economic activities: a) activity as it is; b) conditions of activity. In the activity of the enterprise (firm) includes: goals (motives, interests) and means (purchase, sale, advertising, wages, public, political objectives, etc.). To conditions of activity A. Smith attributed: natural, cultural, social conditions, and the "framework conditions" (the constitutional order, laws, economic order, market conditions, competitive rules, market situation, tax law, management).

This differentiation of activity and its conditions allows, according to A. Smith, synchronous implement competitive and morality. The competitive is carried out in the course of business, morality (solidarity, honesty) incorporated in the activity. Morality in the marketplace is protected from competitive so that competitors must abide by the same rules of the game defined by including the "framework conditions". In addition, market competitive, at first, possible only on the basis of consensus; at second, it serves the interests of the consumer (to produce the best products) that, in turn, depends on economic factors – interest of market participants in its activity.

Thus, the basic principles of the economic ethics have been incorporated in economic theory of A. Smith, as a result of the concepts of "activity" and "business environment". A detailed justification of these principles were described in the writings of modern Western scientists and practitioners, in particular, in the work of the German scientist Karl Homann who is rightly considered the founder of modern economic ethics [10]. In his research, the scientist tried to combine liberal economic theory, highlighting the rationale of the economic interest, with the ideas of social market economy, is very popular today in many countries of Western Europe, which form the basis of Christian social teaching.

The main feature of the concept of K. Homann is the development and mainstreaming of the principle of competitive, which is decisive for his entire ethical theory. This principle is subjected to sharp criticism in traditional ethics, Homann felt reasonably consonant with pluralism and democratic procedures in the policy. Referring to the contradiction between the moral consciousness of the entrepreneur and the internal logic of entrepreneurship (how to get profit and to save face), located in the centre of the debate on business ethics, scientist have warned against extremes in this matter. First of all, morality, in his view, should not hinder of the development of the economy. The justice of this provision is not in doubt. Society must remember that excessive moralizing not only avenges defeat in the competitive, but can become a serious obstacle to the development of entrepreneurial activity, erecting barriers to the natural inclination of people to the benefits and leading society to a self-righteous denial of all wealth (as it was in the recent past in the former USSR). Homann rights in that should not build the market only on the basis of development in man is individualistic, selfish motives, leaving aside questions of morality. The solution to this dilemma can be simplified, if the entrepreneur will be free to do business, will focus on professional activities, observing the rules of fair play and following prescribed here laws and regulations, and ethical effort will be made at the stage of formation of these norms, establish a framework of order in the economy at the institutional level. This will not only help to make the economy more "moral", but also to ensure its effectiveness.

Thus, the development of the economic sector, economic competitive, business can not rely on the fundamental categories of morality and ethics. Moral responsibility of modern businessman can lead to the development of fair competitive and saturation of the market with high quality products that meet consumer demand.

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SECTION 30. Philosophy.

EQUAL OPPORTUNITIES AND THE GENDER POLITICS

Abstract: *In this article some questions of the equal opportunities in modern gender politics in Uzbekistan and the CIS countries are considered. In the context of the interdependence of all human rights - civil, political, socio-economic and cultural, when women's rights have become an integral component of all human rights, women are most in need of factual, real, and not just legal equality, the existence of effective mechanisms for protection of their rights and equal opportunities.*

Key words: *gender policy, women's rights, the Republic of Uzbekistan, the CIS countries, the UN, equality of opportunity, the activity of women in all spheres of society, women-entrepreneurs.*

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The goals of the UN as articulated in the Millennium Declaration, and the fulfillment of state plans related to economy and development, require quick motion in the direction of gender equality. Globally, 52% of the working population are women. Therefore, the empowerment of women to participate fully in all spheres and levels of economic activity needed to build a strong economy.

In this context it should be noted that since the late 1990s, there were significant changes both in the CIS and the Central Asia, was rotated problems faced by women. The problems change, new challenges arising from economic, social and political changes. If in the 1990s the main objective was to convey to the people what is gender equality, equal opportunities and what is the role of the state in creating these opportunities.

It should be noted that the history of the movement for gender equality in the CIS began in 1995 with the Fourth World conference on women in Beijing. By the time the CIS states had a relatively high gender base. The rights and guarantees of women were enshrined in law since the Soviet era. And because many of the problems discussed in Beijing, were not clear to the participants from the CIS. For example, ensuring access of girls and women to education, health care, equal pay, etc.

But at the same time on a number of issues were observed discrepancy between the declared and the actual state of affairs. The decade between 1990 and 2000s was a time of serious challenges and changes.

In many countries of the CIS in connection with the crisis and reform of subsidies on health declined, many medical and health facilities were closed. Resulting in virtually no access to primary health care. At the same time, Uzbekistan has been an annual increase in social spending, including on health care, which in 2013 amounted to about 60% of the State budget. However, it is hardly possible to bring similar data for other countries.

A lot of women leaders in the reform period as a result of restructuring of the economy have left their positions and engaged in other activities. In the 2000s was opened a whole layer of problems that lie within the family, the feminization of migration processes.

As a result, today, in some CIS countries have enacted laws to combat violence against women, migration, etc. However, the problem of migration is a complex problem and includes issues like labor, civil and criminal law, ensuring access to health care, etc. The solution to this problem in the first place provides for the legalization of labor migration.

For some CIS countries such as Kyrgyzstan, Tajikistan, Moldova, topical issue of women's rights on land ownership. When in these states in the framework of agrarian reform and the de-collectivization was the distribution of land plots, many women were left without laid them tenure (In Uzbekistan there are more than 1500 women farmers

(from about 64 thousand farms) – the owners of the land.). But it's not just a question of ownership, but in many respects the problem of employment.

Climate change is also one of the growing challenges for the Central Asian countries. So as to affect the climate is impossible, therefore, have to adapt to people. And even though it's not just a question of gender, the role of women in its decision is pivotal, as it depends largely on consumer lifestyles and consumption.

Referring to the gender situation in Uzbekistan there is a notable trend in the strengthening of the position of women in society. Today, women are working fruitfully in the structures of state power, in the fields of economy, science, education, health care, more and more they show their skills in the business sphere. When we consider that about half of the working population are women, then it is easy to imagine the impact of this issue on the social stability, especially employment opportunities, create new jobs.

The activity of the government, public organizations and international institutions aimed at supporting employment through entrepreneurship. During the years of sovereign development the entrepreneurship played a crucial role in the formation of the modern structure of the economy to meet the rapidly changing demand, creating new jobs and rising incomes.

In Uzbekistan, the sector of small and medium enterprises (SMEs) is growing rapidly and is creating new employment opportunities. If at the beginning of independence the share of SMEs in GDP was approximately 1.5%, now – more than 54%. In conditions of economic crisis, SMEs have become the main source of income for women of regions, since many of them have started their job as helping their families. Their activity in the role of entrepreneurs largely depended on the effectiveness of the conditions for doing business in the country. Share of the number of women employed in various sectors of the economy, now accounts for about 48%, including: in industry –28.3%, agriculture – 37%, in education, culture, science – 74%, in health care – 75% [10].

However, it should be noted that the countries of the Eastern Europe and the Central Asia differ significantly in cultural, historical and economic plans. Such countries as Kyrgyzstan and Tajikistan remain the countries with low income. Some countries have huge oil and/or gas resources. In the light of the dramatic differences in income and natural resources and traditional cultures is not quite correct to compare all states in the region and the countries of the Eastern Europe.

Most countries in the region have made considerable progress in increasing women's employment and the development of legislation in the field of gender equality, but equal political and economic opportunities for women have not yet been created.

For example, in Kyrgyzstan, Kazakhstan and Moldova women in Parliament are averaging 25-26%. They already play a significant role, and, nevertheless, it must take additional measures to increase women's representation at the decision making level. The same applies to the involvement of women in economic activity.

Therefore, the empowerment of women to participate fully in all spheres of economic life and at all levels of economic activity needed to build a strong economy, and thus improve the quality of life of people. The objectives of the Millennium development goals in the Millennium Declaration, and the fulfillment of state plans related to economy and development, require quick motion in the direction of gender equality.

Over the last decade, the contribution of women's work in the world growth has exceeded the contribution of a country like China. If the proportion of working women in Japan will increase to the level of the USA, the rate of growth of the Japanese economy will be in 20 years to increase annually by 0.3%. Only by reducing the gap between employment rates of men and women of the Eurozone could increase GDP by 13%, Sweden - 16, US - 9.

Today an increasing role in the economy and the development of the post-Soviet countries played by the private sector. Since 2009, the UN Women in collaboration with the UN Global compact, the largest global initiative in the field of social responsibility of business, which unites more than 8,000 business-structures from more than 135 countries – have developed "principles for the empowerment of women".

These "principles" are suggestions designed to help the private sector focus on key elements related to the promotion of gender equality in the workplace, marketplace, and society. The motto of the program "Business means equality" - in itself speaks of its essence.

At the meeting in Tashkent the International conference "On the role and importance of small business and private entrepreneurship in the implementation of socio-economic policy in Uzbekistan" (13-14 September 2012) were presented to these "Principles". In the future within the framework of the Subregional programme of the UN Women for the Eastern Europe and the Central Asia will be running a series of events to promote "the principles of empowerment of women" among the representatives of business structures in Uzbekistan, Kazakhstan and Moldova [11].

The most important projects in which the UN Women collaborates with the women's Committee of Uzbekistan are "Women against HIV/AIDS in Uzbekistan", "The economic empowerment of

women", assistance in fulfilling obligations under international instruments (Convention on the elimination of all forms of discrimination against women (CEDAW) and others).

The project "The economic empowerment of women", aimed at improving the economic and social situation of rural women. Within the first phase of this project, a Memorandum was signed between the women's Committee of Uzbekistan and the OJSCB "Microcreditbank" the contribution of 100 thousand US dollars in soum equivalent to the provision of microcredit to rural women at a reduced annual interest rate from 17% to 3%.

In the framework of the project in the Republic of Karakalpakstan, Kashkadarya and Ferghana regions in 2012 360 women acquired knowledge for the development of their own business and microcredit, 178 - received preferential credits under group responsibility and were able to start their own entrepreneurial activity. The selected credits have helped women in remote rural areas and communities to organize work at home and acquire knowledge in the field of family enterprise.

In the framework of the project in 2013, there was continued the organization in the Republic of Karakalpakstan, Ferghana, Kashkadarya, Jizzakh, Syrdarya and Tashkent regions of trainings on the development of economic skills and knowledge of rural women, the establishment of the Self-help Groups, and assistance in obtaining micro-credits. Over 500 women were trained in workshops on capacity building and business planning, 363 women submitted their business plans to an expert panel of JSCB "Microcreditbank", currently being negotiated with the Central Bank of the country on the allocation of credit.

Overall, the adoption of more than 30 years ago the Convention on the elimination of all forms of discrimination against women was a breakthrough in understanding of the important role of women in development of society and the recognition of the serious problems associated with the enforcement of their rights. The document clearly outlines the areas in which women are the least protected, addressing the political and private life, nationality, education, employment, health, economic and social privileges of marriage and family life. In the context of the interdependence of all human rights - civil, political, socio-economic and cultural, when women's rights have become an integral component of all human rights, women are most in need of factual, real, and not just legal equality, the existence of effective mechanisms for protection of their rights and equal opportunities.

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SECTION 7. Mechanics and machine construction.

COMPARATIVE ANALYSIS OF STRESS-STRAIN STATE OF WORKPIECES MADE OF ALUMINIUM ALLOY DURING OF THE EQUAL CHANNEL ANGULAR PRESSING PROCESS ACCORDING TO DIFFERENT SCHEMES

Abstract: *This article presents a comparative analysis of the results of computer simulation in software LS-DYNA of the process of equal channel angular pressing process of the workpieces made of aluminium alloy in terms of intersection the channel matrix at angles: 90°, 90° with a bending radius axis R30, 120°.*

Key words: *equal channel angular pressing, stress, workpiece, normal force, bending moment.*

Language: *English*

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The classic variant of the equal channel angular pressing (ECAP) process of metallic alloys is a forcing through workpiece of round or square cross-section through intersecting channels of the matrix at an angle of 90°. There are other variants ECAP is based on changing the configuration or angle of intersection of the channels of the matrix. Modernization of configuration is the smoothing of the abrupt transition at the intersection of the channels of the matrix. The angle of intersection of the receiving and output channels of the matrix it is recommended to choose in the range from 90° to 150°.

To implement the process of ECAP process deformable non-ferrous alloys it is necessary to consider the physico-mechanical properties of materials and dimensions of the workpiece, the pressing speed (displacement of the punch in the receiving channel matrix), accuracy, strength and rigidity of the matrix and punch.

ECAP process is performed on all metal deformable plastic alloys: magnesium, nickel, aluminium, titanium, copper, steel, etc. In the works [1, 2, 3, 4, 5, 6] presents an assessment of stress-strain state of pressed under different conditions (without backpressure, with backpressure, pressing in cold and hot condition of the workpiece) metal alloys: Ti-6Al-4V, M1, ASME SA-738 CrA, AZ31, 1340. The workpieces was pressed at an angle of 90°. For titanium alloy plastic strain amounted more than 0.8, the shear stress of more than 150 MPa, the principal stress of more than 300 MPa, the surface stress of more than -500 MPa (at action of negative values of the normal force and bending moment). Taking into account the action of backpressure, hydrostatic pressure in the deformation zone of copper workpiece amounted to more than 700 MPa at a true strain of about 1.0 after one cycle of pressing. The plastic deformation of low-alloy steel (is heated to 500 °C) leads to an increase of the strength characteristics 2.5 times compared with the initial state. ECAP process of magnesium alloy increases the yield strength and tensile strength deformed workpiece at 2.7 and 1.3 times, respectively. 1st principal stress reached a value of 350 MPa, 2nd principal stress of 248 MPa, 3rd principal stress – -237 MPa in the result of ECAP process the aluminium alloy at an angle of 90°.

Aluminium alloys are used in aircraft industry, construction and mechanical engineering. Aluminium alloys are not inferior in strength titanium alloys at lower density The technique of pressing of aluminium alloys relative to other metals is at the highest level [7].

Analysis of stress-strain state of the material of the workpiece is pressed according to different

schemes will identify the most efficient method by comparing the results of computer simulation of the ECAP process in three-dimensional setting.

The implementation of the simulation of the ECAP process was carried out in several stages. In a computer program KOMPAS-3D were constructed three-dimensional solid model matrices with receiving and output channels, intersecting at the following angles: 90°, 90° with a bending radius axis R30, 120°. The model of the pressed workpiece is located in the receiving channel of the matrix. The dimensions of the models matrices and the workpiece presents in Fig. 1.

The models were loaded in the module Explicit Dynamics software Ansys Workbench. For the accuracy of the calculation, on all models were constructed grid defines the number of elements (nodes). The selected matrix materials (steel alloy) and workpieces (aluminium alloy), given appropriate physico-mechanical properties. The matrix is not deformed, was a rigid body. Applied a constant load on the end surface of the workpiece. Formed contact conditions of ECAP process. All information for modeling of ECAP process the workpiece at an angle of 90° presents below in text format.

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*TITLE
ECAP
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2, 10.1802, 1.41679, 43.7638
3, 15.1802, 1.41679, 43.7637
4, 20.1802, 1.41678, 43.7637
5, 25.1802, 1.41678, 43.7636
…….....
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13782, -27.1867, 78.5534, 6.66382
13783, -7.37131, -66.6355, 75.3602
13784, -10.529, -46.6353, 28.3738
13785, -85.5565, 80.4424, 3.34854
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3, 1, 13, 46, 35, 24, 14, 47, 36, 25
4, 1, 14, 47, 36, 25, 15, 48, 37, 26
5, 1, 15, 48, 37, 26, 16, 49, 38, 27
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164, 1, 95, 106, 205, 168, 96, 107, 204, 172
165, 1, 96, 107, 204, 172, 97, 108, 203, 176
166, 1, 97, 108, 203, 176, 98, 109, 202, 180
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168, 1, 99, 110, 201, 184, 122, 121, 140, 139
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171, 2, 556, 2851, 2592, 3098, 3098, 3098, 3098, 3098
172, 2, 556, 2592, 3348, 3098, 3098, 3098, 3098, 3098
173, 2, 517, 3876, 3272, 3093, 3093, 3093, 3093, 3093
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66860, 2, 11791, 13072, 13653, 12699, 12699, 12699, 12699, 12699
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*SECTION_SOLID
$ 1SECID 2ELFORM 3AET
2, 13
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8NUMINT
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$ 1EPS1 2EPS2 3EPS3 4EPS4 5EPS5 6EPS6 7EPS7
8EPS8
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$ 1ES1 2ES2 3ES3 4ES4 5ES5 6ES6 7ES7 8ES8
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2, 7.85, 2e+008, 0.3
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*PART
$ HEADING
Part 1
$ 1PID 2SECID 3MID 4EOSID 5HGID 6GRAV
7ADPORT 8TMID
1, 1, 1, 0, 0
*PART
$ HEADING
Part 2
$ 1PID 2SECID 3MID 4EOSID 5HGID 6GRAV
7ADPORT 8TMID
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7DATTYP
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10000, 1e+011
100000, 1e+011
*DEFINE_CURVE
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7DATTYP
2
$ 1A 2O
0, -3.5e+006
10000, -3.5e+006
100000, -3.5e+006
*DEFINE_CURVE
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7DATTYP
3
$ 1A 2O
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10000, 0
100000, 0
*DEFINE_CURVE
$ 1LCID 2SIDR 3SFA 4SFO 5OFFA 6OFFO
7DATTYP
4
$ 1A 2O
0, 0
10000, 0
100000, 0
*DEFINE_CURVE
$ 1LCID 2SIDR 3SFA 4SFO 5OFFA 6OFFO
7DATTYP
5
$ 1A 2O
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10000, 0
100000, 0
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6MBOXID 7SPR 8MPR
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$ 1SFS 2SFM 3SST 4MST 5SFST 6SFMT 7FSF
8VSF
, , -1.666e-4, -1.666e-4, , , ,
$ 1SOFT 2SOFSCL 3LCIDAB 4MAXPAR
5SBOPT 6DEPTH 7BSORT 8FRCFRQ
2, , , , 3, 5, ,
*CONTACT_AUTOMATIC_SINGLE_SURFACE
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6MBOXID 7SPR 8MPR
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$ 1FS 2FD 3DC 4VC 5VDC 6PENCHK 7BT 8DT
0, 0, 0, 0, 10
$ 1SFS 2SFM 3SST 4MST 5SFST 6SFMT 7FSF
8VSF
$ 1SOFT 2SOFSCL 3LCIDAB 4MAXPAR
5SBOPT 6DEPTH 7BSORT 8FRCFRQ
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$ CONTROL OPTIONS
*CONTROL_TERMINATION
$ 1ENDTIM 2ENDCYC 3DTMIN 4ENDENG
5ENDMAS
10000, 100000, 0.01, 10, 0.1
*CONTROL_TIMESTEP
$ 1DTINIT 2TSSFAC 3ISDO 4TSLIMT 5DT2MS
6LCTM 7ERODE 8MS1ST
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$ 1IHQ 2QH
1, 0.1
*CONTROL_BULK_VISCOSITY
$ 1Q1 2Q2 3TYPE
1.5, 0.06, -2
*CONTROL_CONTACT
$ 1SLSFAC 2RWPNAL 3ISLCHK 4SHLTHK
5PENOPT 6THKCHG 7ORIEN 8ENMASS
0, 0, 1, 1, 1, 0, 2, 0
$ 1USRSTRC 2USRFRC 3NSBCS 4INTERM
5XPENE 6SSTHK 7ECDT 8TIEDPRJ
$ 1SFRIC 2DFRIC 3EDC 4VFC 5TH 6TH_SF
7PEN_SF
$ 1IGNORE 2FRCENG 3SKIPRWG 4OUTSEG
5SPOTSTP 6SPOTDEL 7SPOTTHIN
2, 0, 0, 1, 0, 1, 0.5
*CONTROL_SOLID
$ 1ESORT 2FMATRX 3NIPTETS 4SWLOCL
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$ 1LCID 2VALDMP 3STX 4STY 5STZ 6SRX
7SRY 8SRZ
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$ 1HGEN 2RWEN 3SLNTEN 4RYLEN
2, 1, 2, 2
*CONTROL_ACCURACY
$ 1OSU 2INN 3PIDOSU
1, 4
$ TIME HISTORY
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6BINHF
1000
*DATABASE_MATSUM
$ 1DT 2BINARY 3LCUR 4IOOPT 5DTHFF
6BINHF
1000
*DATABASE_NODOUT
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6BINHF
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```

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$ 1DT 2LCDT 3BEAM 4NPLTC
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*DATABASE_BINARY_RUNRSF
$ 1DT 2NR
5000
$ LIST SETS
*SET_NODE_LIST
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$ 1NID1 2NID2 3NID3 4NID4 5NID5 6NID6 7NID7 8NID8
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271, 272, 273, 274, 275, 276, 269, 270
277, 278, 279, 280, 281, 282, 283, 284
285, 286, 287, 288, 289, 290, 291, 292
293, 294, 295, 296, 297, 298, 299, 300
……..…….....
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4813, 4814, 4815, 4816, 4817, 4818, 4819, 4820
4821, 4822, 4823, 4824, 4825, 4826, 4827, 4828
4829, 4830, 4831, 4832, 4833, 4834, 4835, 4836
4837, 4838
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2
$ 1NID1 2NID2 3NID3 4NID4 5NID5 6NID6 7NID7 8NID8
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131, 132, 133, 134, 135, 136, 129, 130
137, 138, 139, 140
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$ 1SID 2DA1 3DA2 4DA3 5DA4
3
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313, 314, 315, 427, 502, 503, 504, 505
506, 507, 508, 509, 510, 511, 512, 513
514, 515, 516, 517, 518, 519, 520, 521
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3404, 3405, 3406, 3407, 3408, 3409, 3410, 3411
3412, 3413, 3414, 3415, 3416, 3417, 3418, 3419
3420, 3421, 3422, 3423, 3424, 3425, 3426, 3427
3428, 3429, 3430, 3431
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4
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141, 142, 143, 144, 145, 146, 139, 140
147, 148, 149, 150, 151, 152, 153, 154
155, 156, 157, 158, 159, 160, 161, 162
163, 164, 165, 166, 167, 168, 169, 170
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243, 244, 245, 246, 247, 248, 249, 250
251, 252, 253, 254, 255, 256, 257, 258
259, 260
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1902, 1919, 1908, 1908
1925, 1925, 1900, 1937
1888, 1909, 1928, 1928
1897, 1898, 1937, 1937
……..…….....
393, 394, 1884, 1884
394, 1849, 1884, 1884
378, 379, 1885, 1885
379, 1821, 1885, 1885
378, 1885, 1878, 1878
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1, Displacement
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3, 1, 2, 3, 1.000, 0, 0, 0
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$ 1KeyID 2HEADING
2, Displacement
$ 1ID 2DOF 3VAD 4LCID 5SF 6VID 7DEATH 8BIRTH
3, 2, 2, 4, 1.000, 0, 0, 0
*BOUNDARY_PRESCRIBED_MOTION_SET_ID
$ 1KeyID 2HEADING
3, Displacement
$ 1ID 2DOF 3VAD 4LCID 5SF 6VID 7DEATH 8BIRTH
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```

Modeling of ECAP process was carried out in the program LS-DYNA. The results of the calculations are presented in the form of color contours on the model defining the stress-strain state of the workpiece (Fig. 2 – 4). The contours were obtained at the time of movement of the workpiece from the receiving to the output channels of the matrix.

The plastic strain of the material – irreversible deformation, caused by the change in stresses. The degree of plastic strain is determined by the deformation coefficient, i.e. the ratio of the sizes of the solid body after the deformation to the appropriate sizes before deformation [8].

The deviatoric stress – part of the stress tensor, obtained by subtracting from it the ball portion of this tensor. The deviatoric stress describes the change in shape of the deformed solid body without changing its volume [9].

1. The receiving and output channels intersect at an angle of 90°.

In accordance with the colors of the contours on the model, significant plastic deformation of the material (1.1) is observed on the contact surface of the workpiece at the transition of the receiving channel in the output matrix (Fig. 2, b). The plastic strain of the workpiece in the receiving channel is minimal.

In Fig. 2, c – e values of the maximum (1st) principal deviatoric stress of the material is positive (tension), the 2nd principal deviatoric stress – positive and negative (tension and compression), the minimum (3rd) principal deviatoric stress is negative (compression). Defined maximum value: the 1st principal deviatoric stress of the material in the bend of the workpiece, the 2nd and 3rd principal deviatoric stresses around the end surface of the workpiece in the receiving channel.

2. The receiving and output channels intersect at an angle of 90° with a bending radius axis R30.

The maximum plastic strain occurs on the end surface of the workpiece, facing to the punch (Fig. 3, b). The value of strain of the material amounted to 0.394. At the output channel, plastic strain of the material is reduced to 0.13.

The maximum value of the 1st principal deviatoric stress of the material (Fig. 3, c) is defined on the end surface, which receives the applied load, and the 3rd principal deviatoric stress – from the opposite end surface of the workpiece (Fig. 3, e). Significant 2nd principal deviatoric stress of the material concentrated is on the maximal bending radius of the workpiece in the channel matrix (Fig. 3, d).

3. The receiving and output channels intersect at an angle of 120°.

With increasing angle of intersection of the channels of the matrix, plastic strain of the material in the bend of the workpiece amounted to 0.61. Significant plastic strain occurs in the layers of material in contact with the lower part of the outlet channel (Fig. 4, b).

Significant principal deviatoric stresses distributed by the volume of the workpiece: 1st – in material, located in the output channel of the matrix (Fig. 4, c); 2nd – in the material, located in the receiving channel matrix (Fig. 4, d); 3rd – in local areas of the material located in the output channel of the matrix (Fig. 4, e).

The dependences of the normal force and bending moment from time pressing of the ECAP process presents in Fig. 5 – 7.

The values of the normal force is negative, because there is a compression of the material of the workpiece from the load. With the exception of the alternating change of the normal force in the case of the ECAP process the workpiece in the matrix at the intersection of the channels at an angle of 90° in the plane of the section Y and in the case of the ECAP process the workpiece in the matrix at the intersection of the channels at an angle of 120° in the plane of the section X.

The maximum normal force, acting on the plane of the section X, amounted to -0.16×10^9 mN according to scheme No. 1 (Fig. 5, a).

The maximum normal force, acting on the plane of the section Y, amounted to -95×10^6 mN according to scheme No. 3 (Fig. 7, b).

The maximum normal force, acting on the plane of the section Z, amounted to -0.425×10^9 mN according to scheme No. 1 (Fig. 5, c).

The bending moment occurs as a result of changing the shape of the workpiece. The values of bending moment, for all schemes ECAP process, is positive, i.e., the moment acts in one direction.

The maximum bending moment, acting on the plane of the section X, amounted to 0.23×10^9 mN×mm according to scheme No. 3 (Fig. 7, a).

The maximum bending moment, acting on the plane of the section Y, amounted to 0.14×10^9 mN×mm according to scheme No. 3 (Fig. 7, b).

The maximum bending moment, acting on the plane of the section Z, amounted to 1.79×10^9 mN×mm according to scheme No. 1 (Fig. 5, c).

Thus, the analysis of the results of computer simulation of ECAP process at different angles workpiece of aluminium alloy allows to make the following conclusions:

1. ECAP process the workpieces at the intersection of receiving and output channels of the matrix at an angle of 90° with a bending radius axis R30 is the most rational way of pressing. This is evidenced the small plastic strain and stresses in the workpiece material, compared with other schemes ECAP process. The plastic strain of the workpiece material during ECAP process according to scheme No. 2 in 3 times less, than during ECAP process according to scheme No. 1. ECAP process according to scheme No. 1 is less efficient, requires significant pressure on the punch, which can entail to tool breakage.

2. The maximum normal forces and bending moments act in the plane of the section Z (along the axis of the workpiece).

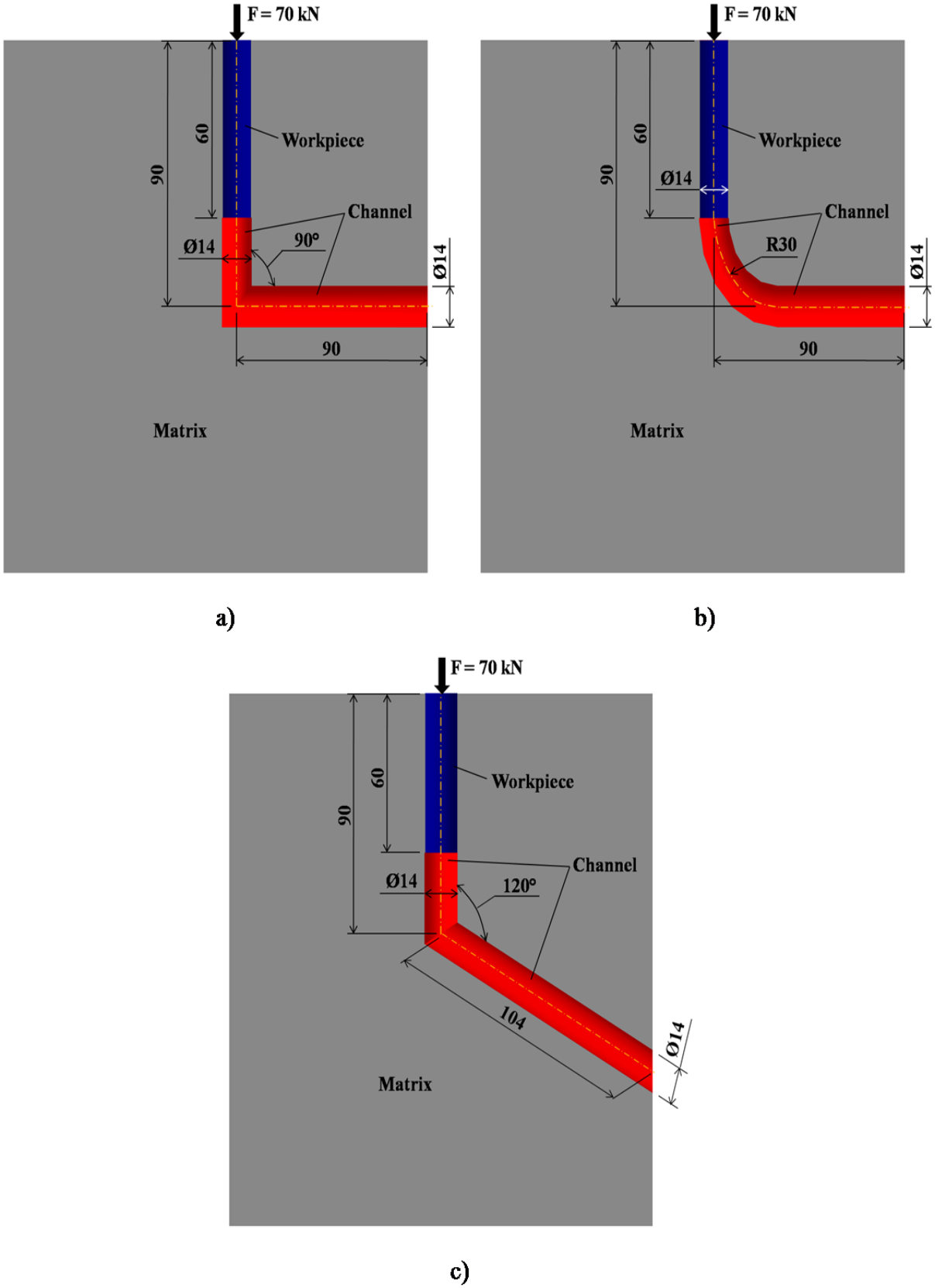


Figure 1 – Schemes equal channel angular pressing process of the workpieces: a – the receiving and output channels intersect at an angle of 90° (scheme No. 1); b – the receiving and output channels intersect at an angle of 90° with a bending radius axis R30 (scheme No. 2); c – the receiving and output channels intersect at an angle of 120° (scheme No. 3).

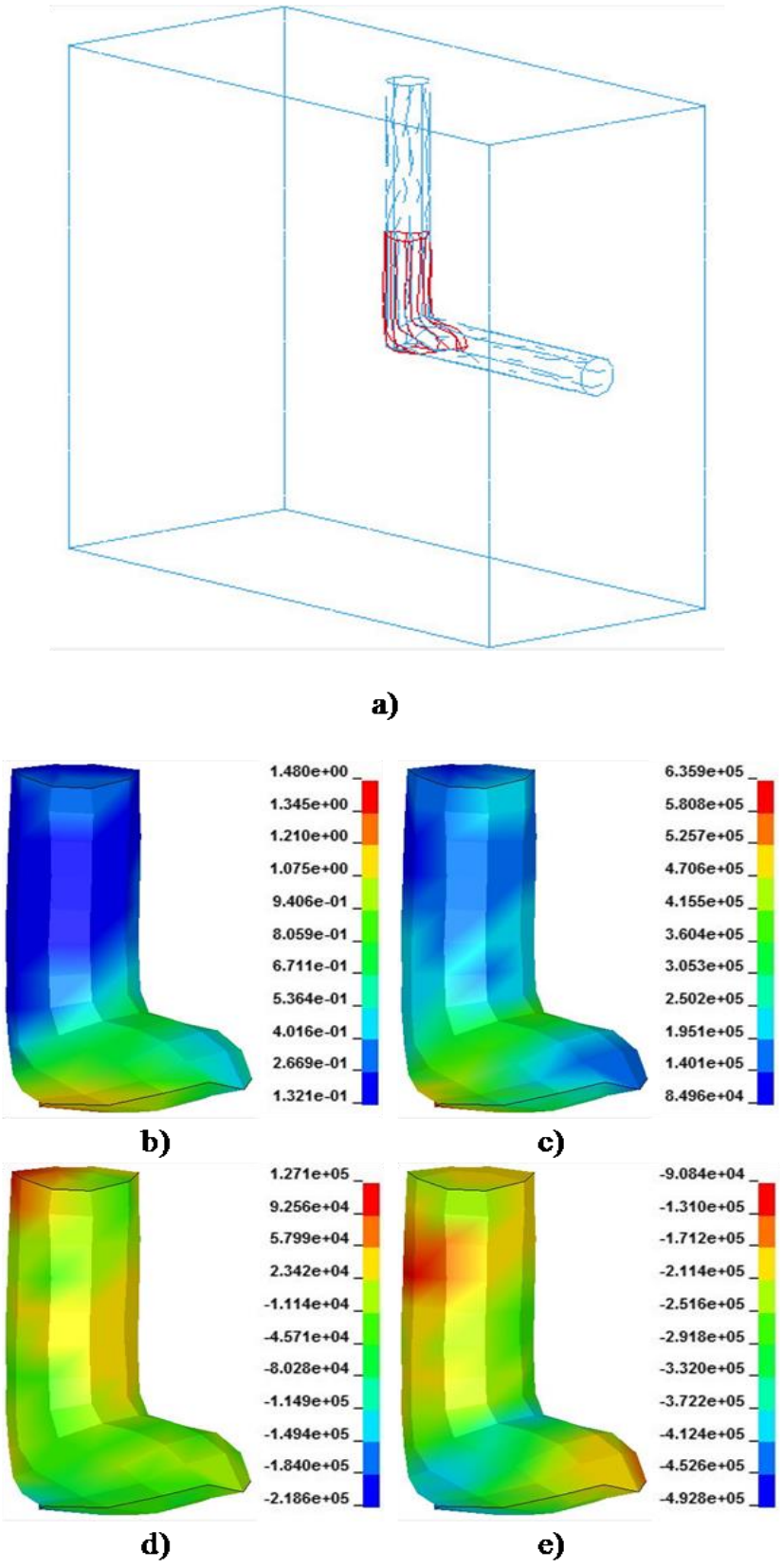


Figure 2 – The results of simulation of the equal channel angular pressing process of the workpiece in the matrix with intersection of the channels at an angle of 90° (scheme No. 1): a – the location of the deformed workpiece in the channels; b – contours of effective plastic strain; c – contours of maximum principal deviatoric stress; d – contours of 2nd principal deviatoric stress; e – contours of minimum principal deviatoric stress. Units: mm, mg, ms, mN, K.

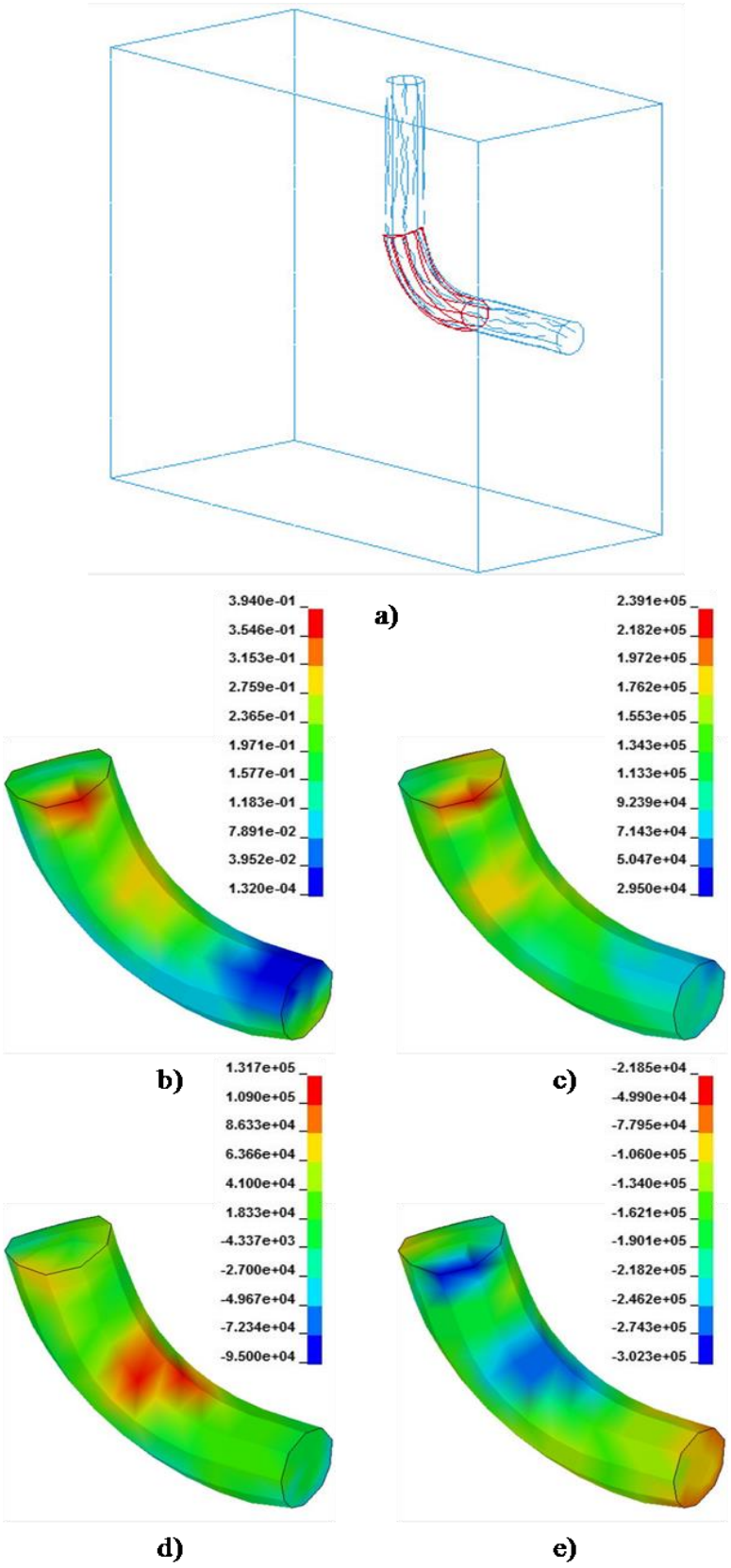
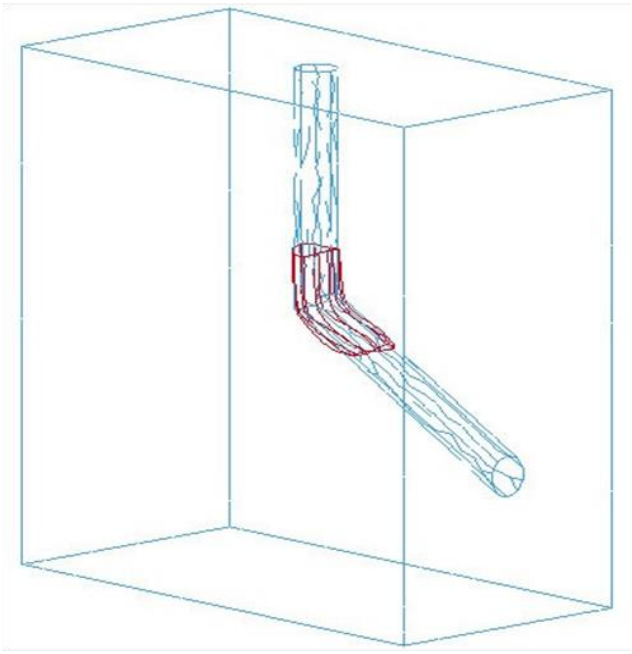
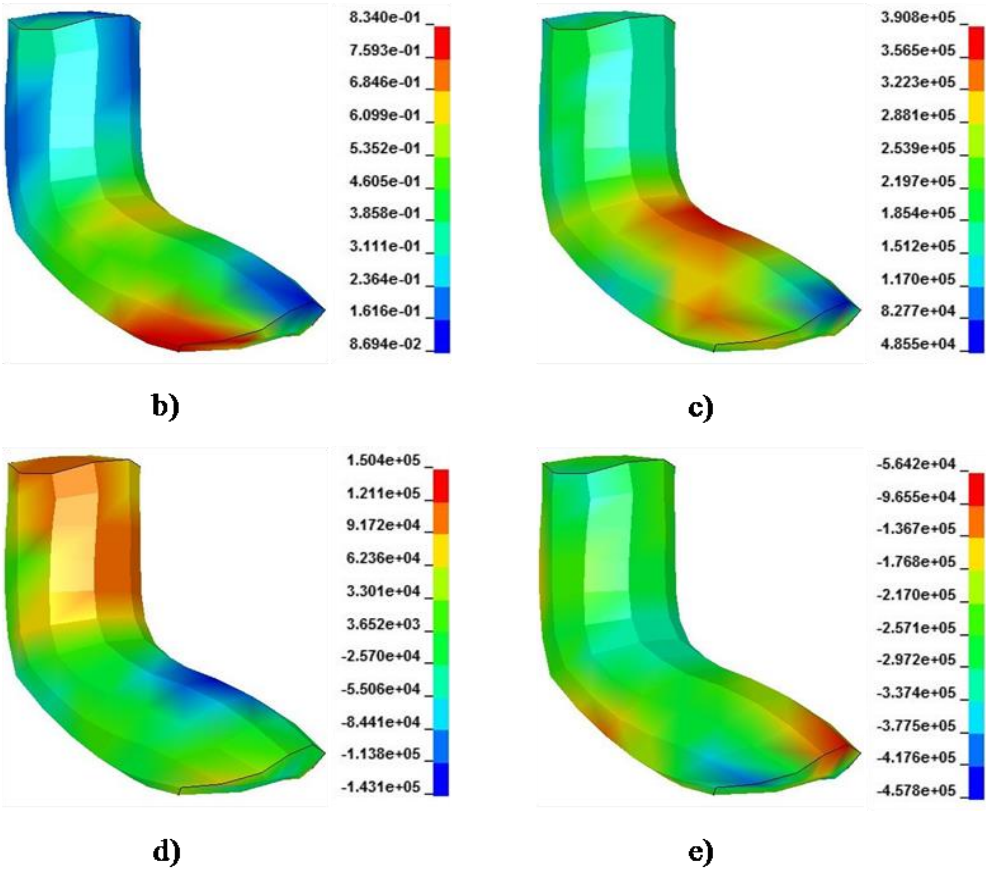


Figure 3 – The results of simulation of the equal channel angular pressing process of the workpiece in the matrix with intersection of the channels at an angle of 90° with a bending radius axis R30 (scheme No. 2): a – the location of the deformed workpiece in the channels; b – contours of effective plastic strain; c – contours of maximum principal deviatoric stress; d – contours of 2nd principal deviatoric stress; e – contours of minimum principal deviatoric stress. Units: mm, mg, ms, mN, K.



a)



b) c)

d) e)

Figure 4 – The results of simulation of the equal channel angular pressing process of the workpiece in the matrix with intersection of the channels at an angle of 120° (scheme No. 3): a – the location of the deformed workpiece in the channels; b – contours of effective plastic strain; c – contours of maximum principal deviatoric stress; d – contours of 2nd principal deviatoric stress; e – contours of minimum principal deviatoric stress. Units: mm, mg, ms, mN, K.

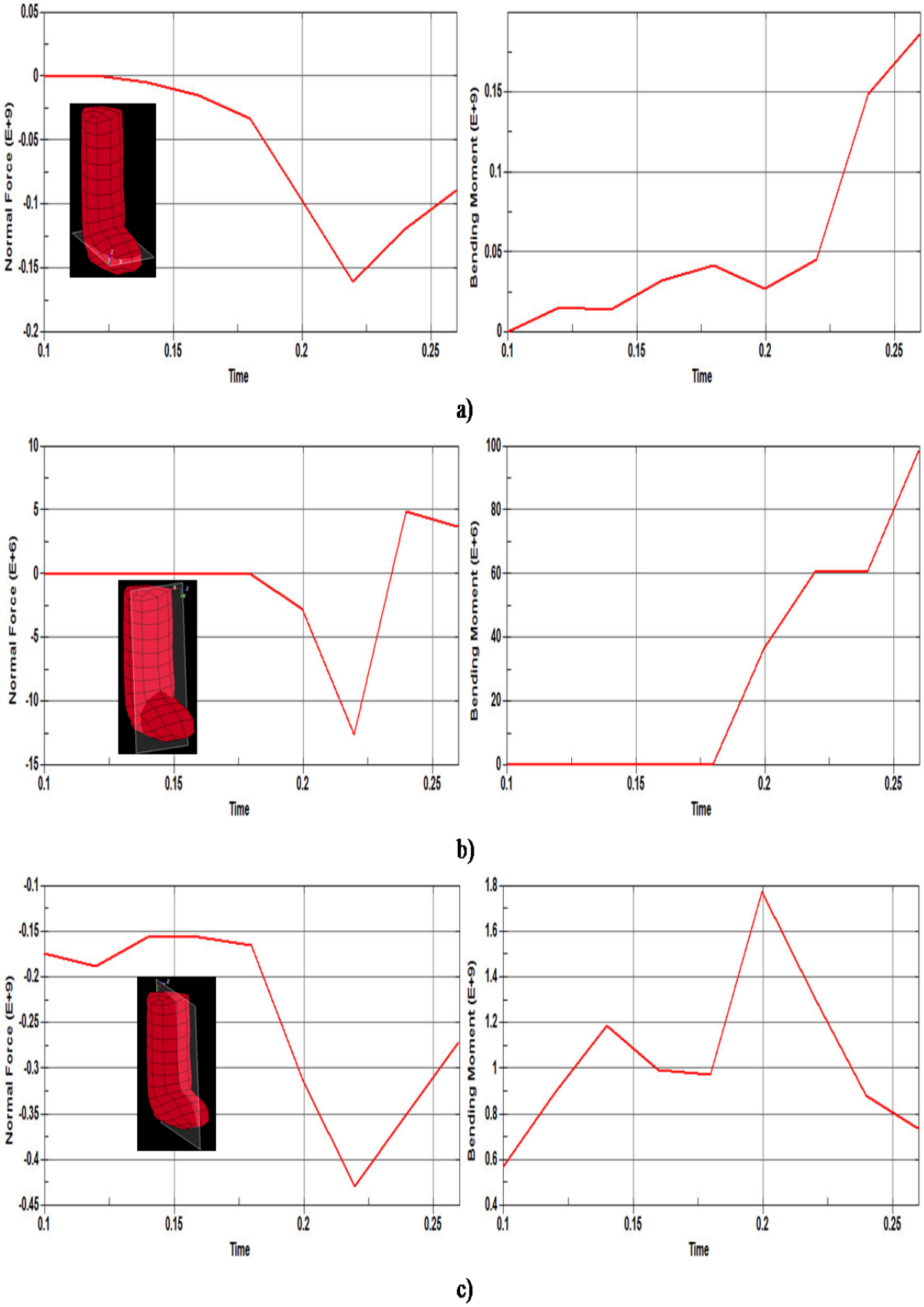


Figure 5 – The dependences of the normal force and bending moment from the time of the equal channel angular pressing process of the workpiece according to scheme No. 1: a – the plane of the section X; b – the plane of the section Y; c – the plane of the section Z. Units: mm, mg, ms, mN, K.

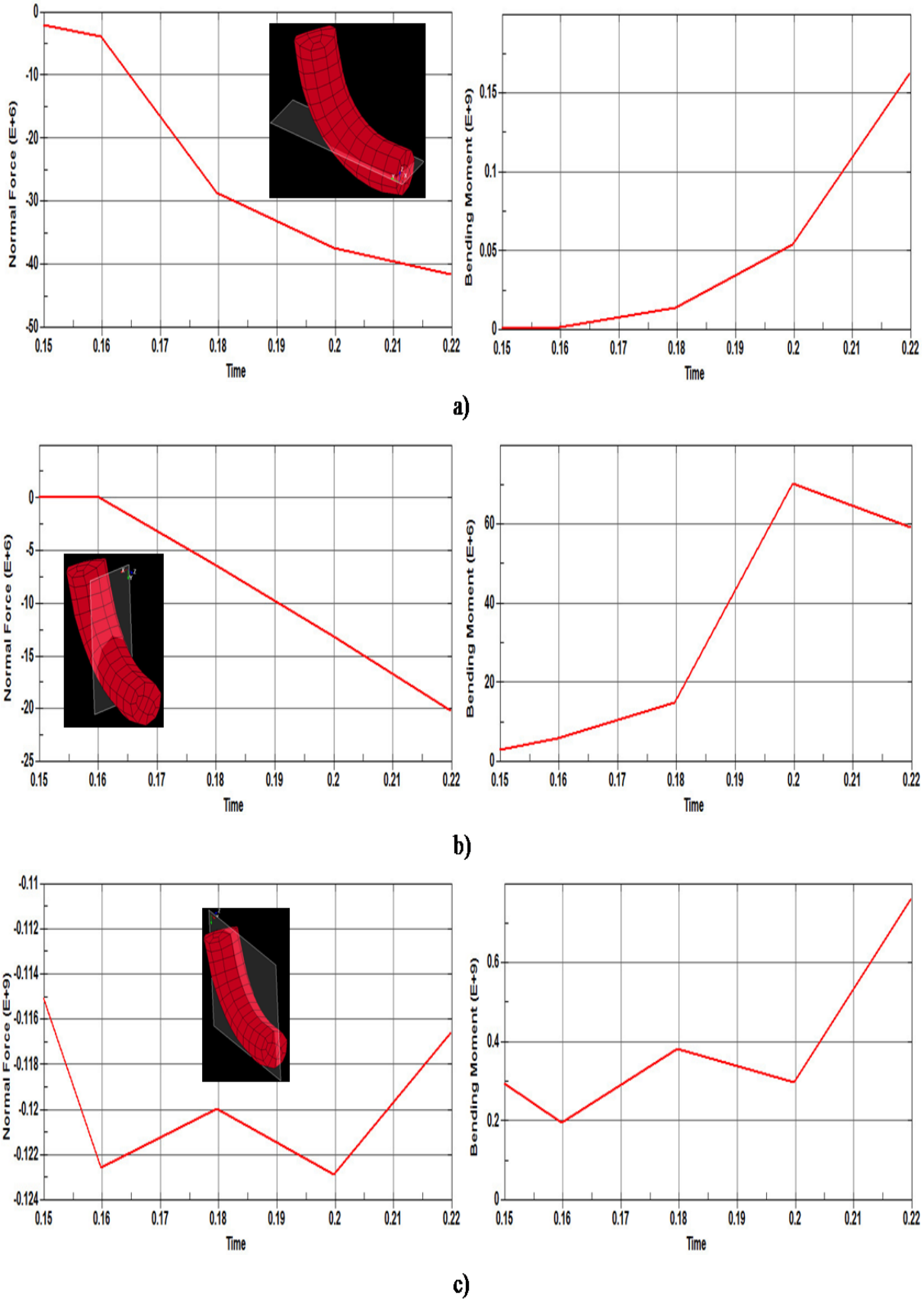


Figure 6 – The dependences of the normal force and bending moment from the time of the equal channel angular pressing process of the workpiece according to scheme No. 2: a – the plane of the section X; b – the plane of the section Y; c – the plane of the section Z. Units: mm, mg, ms, mN, K.

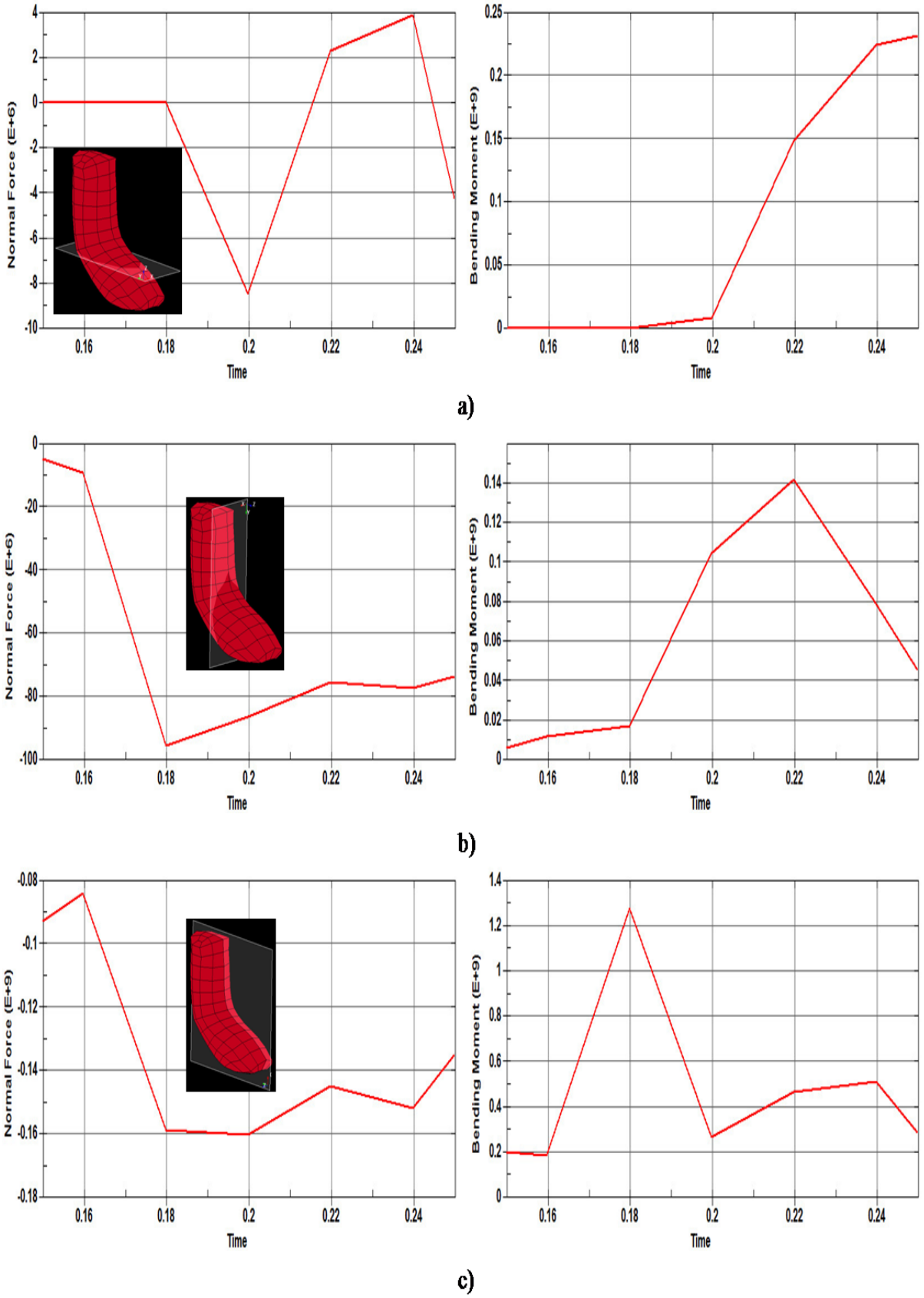


Figure 7 – The dependences of the normal force and bending moment from the time of the equal channel angular pressing process of the workpiece according to scheme No. 3: a – the plane of the section X; b – the plane of the section Y; c – the plane of the section Z. Units: mm, mg, ms, mN, K.

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SECTION 19. Management. Marketing. Public administration.

STRATEGY OF INTERNATIONALIZATION FOR THE HIGHER EDUCATION SYSTEM (ON THE EXAMPLE OF GEORGIA)

Abstract: *The article considers the significance, motifs and prospects of the higher education internationalization, as that of the subsequent process of globalization. The strategy of internationalization of the higher educational institutions is assessed in Georgia, the country having been an active member of the international environment for some 20 years now. In addition, the trends promoting the integration of the enlightening system and its establishment in the global environment were also identified.*

Key words: *Internationalization, higher education, mobility, strategy.*

Language: *English*

Citation: Chokheli EN, Alpenidze ON (2015) STRATEGY OF INTERNATIONALIZATION FOR THE HIGHER EDUCATION SYSTEM. ON THE EXAMPLE OF GEORGIA. ISJ Theoretical & Applied Science 07 (27): 65-71.

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The globalization has made the world face new challenges. In the 21st century, the mankind lives in a rapidly changing environment, which is seen in the fields of education, finances, economics, science, technologies, communication and politics. The designation of the new context of the epoch is seen in deepening the mutual relations and strengthening the competition of the countries. This process is unavoidable for every country of the world [3, p.51].

Such a reality has changed the role of education, in particular, of higher education. This is defined as the means to give the citizens a global view to better realize the relationships between the nations and countries and develop the tolerance to the cultural differences and pluralism.

At present, the principal mission of the higher educational institutions is bringing up a citizen being competitive on the global market. This mission is particularly well accomplished by the educational establishments with high level of internationalization, i.e. those employing mobile academic and administrative staff, who are engaged in the international exchange programs, research projects and other educational activities more actively.

A number of investigators work on the problem of internationalization of higher education, and they perceive it as the response of the higher educational institutions to globalization, which has affected the field of education, like the latter has accelerated the process of globalization.

Today, internationalization means the integration of the international components with the higher educational establishments implying putting the global intercultural issues forward and their incorporation with university functions and actions [11]. When talking about the higher education internationalization, Knight, the Canadian scientist accents the integration of intercultural and international elements with the university teaching process and trends of the studies [10, p.21].

In the modern epoch of global knowledge and technologies, partner companies and markets I order to have employees able to act on the international arena, require the graduates to have the international awareness and knowledge of foreign languages and intercultural relations. Consequently, the internationalization ensures virtual and physical mobility of the students and personnel and sharing the education and practice [8].

Under the influence of globalization, the higher educational institutions adopting the principles of globalization are not “local enterprises” any more, but are engaged in the process of international changes [5, p.321].

The views expressed about the internationalization of higher education are shared by the international organization, too. As per the

European Association of International Resettlement, internationalization is a set of processes making the higher education less local and more internationally oriented [4].

Based on different literary sources, Gacel-Avila concludes that the internationalization of higher education must be perceived as a thorough strategy concentrated on the three following factors: 1. as a fundamental component of the educational policy, it must improve the quality of education and transform the educational system to meet the global requirements; 2. it must show the strategic role of the international corporations in bringing up a world citizen, and 3. pay more attention to the issues of internationalization of higher education within the scope of the studies [6, p.131].

In addition to the above-mentioned, when considering the question of internationalization of higher education, the scientists underline the motifs following the internationalization. Adams, studying the issues of internationalization of European education, thinks that internationalization is considered a positive perspective to be actively used, as it is capable of expanding the prospects of study by giving greater choice, adapting the traditional enlightening system to modern requirements by introducing innovative teaching programs, bringing benefit through the relationships with prestigious higher establishments and creating new sources of income for the universities [1].

Altbach and Knight also comment on the internationalization of higher education. They name profit as the principal motif to accomplish the process of internationalization, and as the subsidies of traditional higher educational institutions are being reduced in many countries, they consider internationalization as an additional source of finances to be used by means of establishing branches or partnerships with local universities or realizing joint educational programs or joint studies [2, p.301].

So, the process of internationalization of higher education is irreversible and the sooner the countries and relevant higher educational establishments realize this and take necessary steps, the more timely they will establish themselves in the international environment and gain more benefit.

Unlike the higher institutions of Europe and other countries of the world, those in Georgia, due to the limitations established by virtue of a different political system, were given the possibility to become a part of the international environment in the 1990s and compete with other institutes of the world. Consequently, the level of internationalization at the higher educational establishments of Georgia is not high and establishment themselves in the global competitive environment and attraction and maintenance of the students and qualified staff is an important challenge for the higher educational institutions.

The goal of the study is to evaluate the process and strategy of internationalization at Georgian higher educational establishments and make relevant conclusions and recommendations what will significantly support the higher institutes of the country striving to the integration in the international environment.

1. Methodology

The information available at the international organizations and published on the web-sites of the local higher educational institutes was used to evaluate the strategy of internationalization at Georgian higher educational establishments. In addition, in order to gain the primary empirical data of the internationalization of higher education in Georgia, the questionnaires were developed, which were distributed among the higher institutes. The analysis of the web-sites has demonstrated the trend of the universities being more active with the acts of internationalization than the educational institutes. The universities were made a target group, and the heads of their international departments were provided with the link of the questionnaires via e-mail. They could use the link to answer the questions on the questionnaires. Where an e-mail address of the recipient could not be identified, the information was sent to the principal e-mail address of the universities to forward it to the concerned entities.

The questionnaires were developed through a special web-portal SurveyMonkey, allowing not only collecting the answers, but also grouping and analyzing the gained answers and showing them as graphs and diagrams.

As per the data of 2014 of the Ministry of Education of Georgia, there were 28 universities and 31 studying universities in the system of higher education. Within the limits of the study, the web-sites of 28 universities and 27 studying universities were totally developed and the questionnaires were provided to 28 universities, including 12 public universities and 16 private universities. Answers were received from 18 universities, including 10 public universities allowing saying that the results of the study are valid.

2. Results and discussions

One of the most important trends in the internationalization of the higher education is the international mobility of students and academic staff, including two kinds of movement: from one's native country to foreign countries and vice versa, from a foreign country to one's native country. This issue is also important for Bologna Process with the

major goal to ensure high mobility. By 2013, the number of students in Georgia was 109 500 [7], including 3.1% inbound students and 9.04% outbound students (table 1).

Table 1.

Inbound and outbound internationally mobile students.

Time	2010	2011	2012	2013
Inbound internationally mobile students	832	1 709	1 670	3 420
Outbound internationally mobile students	8 736	8 452	9 966	9 905

As the statistics show, there is no mobility balance of students in Georgia meaning that the outbound students from Georgia are much more than inbound students in Georgia. The misbalance is different for different regions of the world [9]. For example, until 2013, mobility with the USA and Europe is one-sided and is from Georgia, while mobility of the countries of Central Asia is also one-sided, but is directed towards Georgia (table 2).

Table 2

Student's international mobility to and from Georgia.

Foreign students from other countries	Number of Students	Students from Georgia	Number of Students
India	585	Russia	2743
Turkey	330	German	2019
Azerbaijan	280	Armenia	1151
Sri Lanka	133	USA	566
Russia	125	France	527
Lithuania	50	Turkey	474
Nigeria	49	United Kingdom	352
Armenia	19	Greece	267
Trinidad and Tobago	15	Austria	180
Ukraine	10	Italy	189
Iran	7	Latvia	169
Israel	7	Azerbaijan	137
USA	6	Czech Republic	119
Other countries	54	Other countries	1063
Total Students from other countries	1670	Total Students from Georgia	9 966

The major trend of the internationalization of the higher educational establishments is joint and exchange programs, which are often considered an easy way of internationalization. The EU programs in Georgia known as ERASMUS MUNDUS and TEMPUS programs, are a subject to consider separately. These programs were merged in 2014 and now operate within the scope of ERASMUS+ program. ERASMUS MUNDUS program ensures the mobility of students and academic staff by means of long-term exchanges. Table 3 shows the mobility through this program in Georgia. As per the data of 2013-2014, 17 universities participated in the ongoing projects, including 11 public and 6 private educational establishments. In 2007-2013, total 847 students and academic staff participated in this program [13].

Table 3

Erasmus Mundus-financed exchanged programs in Georgia.

Year	Undergraduate	Masters	Doctoral students	Post-doctoral	Academic staff	Total
2007	16	14	11	5	3	49
2008	23	14	13	5	3	58
2009	22	17	12	5	3	59
2010	18	15	10	3	4	50
2011	18	12	13	8	9	60
2012	79	68	72	34	45	298
2013	92	65	51	22	43	273
Total	268	205	182	82	110	847

TEMPUS started to realize its projects in Georgia in 1995. It has contributed much to the introduction and implementation of Bologna Process throughout Georgia. Thirty higher educational establishments have participated in TEMPUS program in Georgia. One of the TEMPUS projects "The Internationalization in Central Asia and Eastern Neighboring Area" (ICAEN) and another ongoing project "Promoting Internationalization of HEIs in Eastern Neighborhood Countries through Cultural and Structural Adaptations" (PICASA), which started in 2013 and must be over in 2016, are immediately oriented on promoting the Internationalization at the higher educational institutions of Georgia [12].

As for the availability of joint and exchange programs at the higher educational institutions of Georgia in general, the picture is as follows (figure-1): three universities of the higher educational institutions participating in the studies have over 21 exchange programs, two of them have 5 exchange programs, and other two have from 10 to 20 exchange programs. As for the joint programs, the situation is not favorable in this respect, because it turned out that only two public universities, each have three double-grade programs and only one educational institute had one double-grade program.

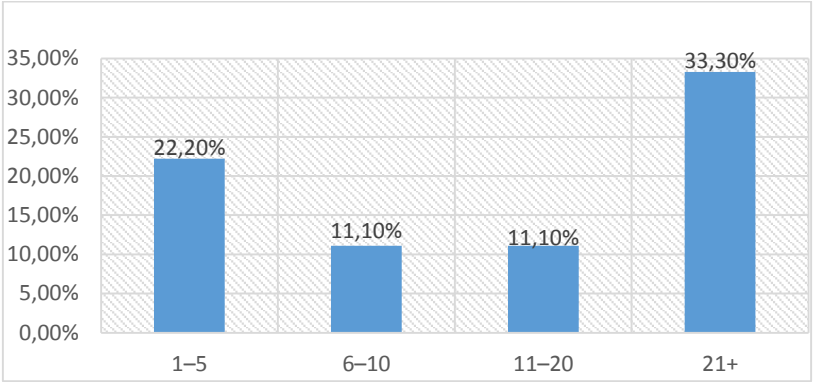

Figure 1- Students' exchange programs with foreign universities.

The evaluation of the availability of the exchange programs with foreign universities showed that only one university had studies with over 21 institutes, two universities had no data about any studies and others were engaged in the research projects (figure-2).

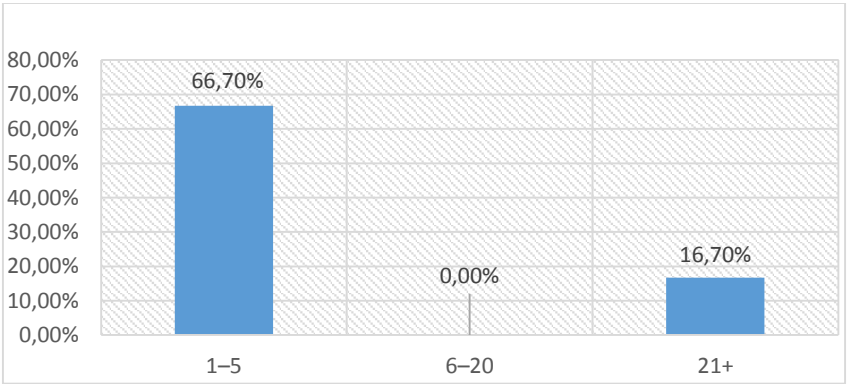

Figure 2 - Joint studies with foreign institutes.

In the modern world, as the language of business relations is primarily English and communication is hard to imagine without computer technologies, they evaluate the degree of internationalization by considering the presence of the English web-sites of the universities. The analysis showed that 12 of the higher educational establishments in Georgia (12%) have no English web-sites, 6 of them (10%) have some incomplete web-sites (figure-3).

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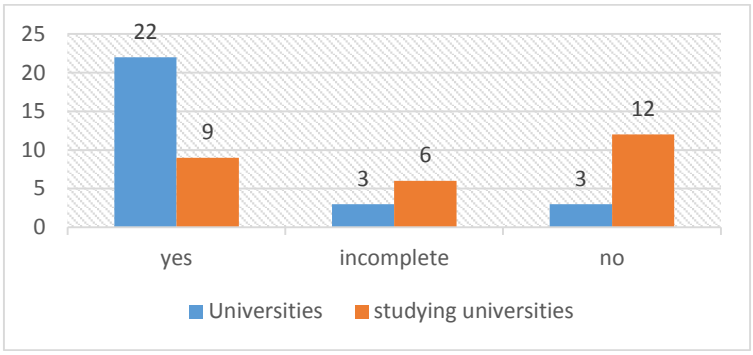

Figure 3 - Availability of English web-sites at the higher educational institutions.

An important component of the internationalization of the higher educational institutions is the partnership with the international educational institutes, as almost all trends of internationalization are based on the collaboration with foreign institutes. Only two universities of the higher educational institutions participating in the study have a partnership with over 100 universities, three universities have up to 50 partners, two universities have up to 30 partners and other two have up to 10 partners (figure-4).

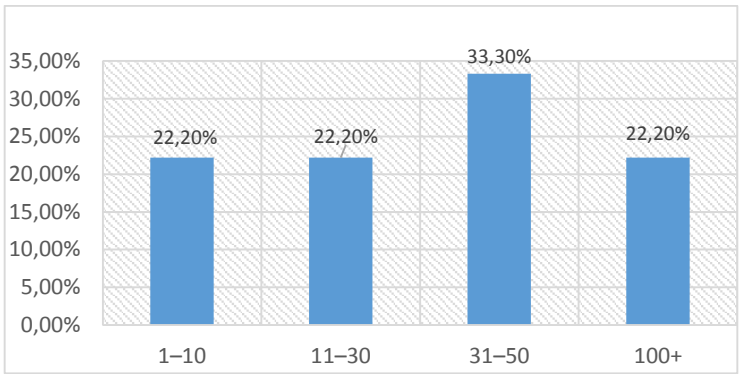

Figure 4 - Partnership relations with foreign universities.

During the study, attention was paid to the availability of the foreign programs at the universities capable of attracting foreign students, one of the trends of internationalization. The results of the study evidenced that only seven universities and three educational institutes have foreign programs (figure-5).

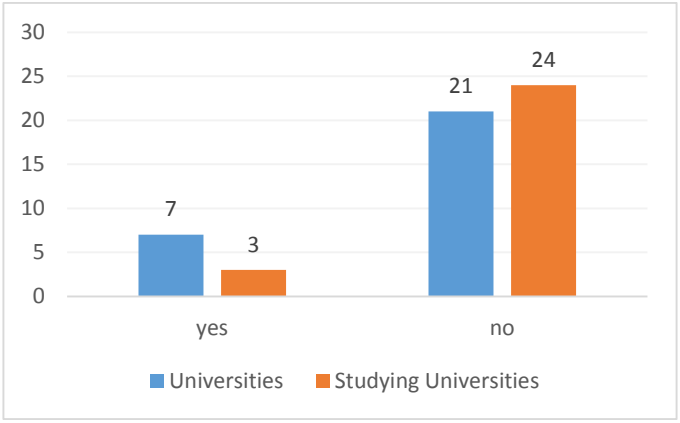

Figure 5 - Availability of foreign programs at the higher educational institutions.

The study of the internationalization process paid particular attention to the membership of the universities with different international organizations and associations. As the results of the study suggest, only three HEIs had no relevant information (figure-6).

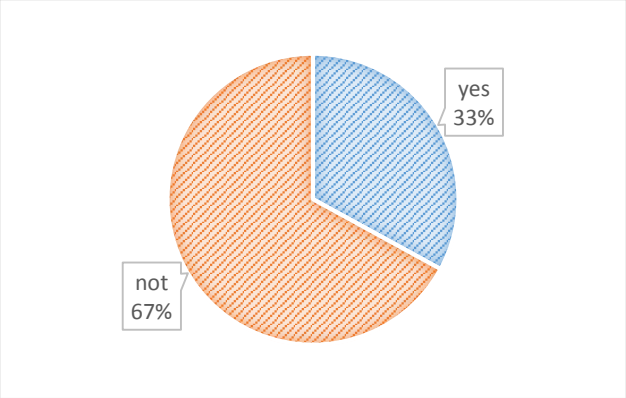

Figure 6 - Membership of the international organizations.

Finally, during the study, particular attention was paid to the internationalization strategy. The analysis showed that of the higher educational institutions participating in the study, only universities have the strategy or its individual component defined. A more accurate picture is as follows: only three universities have the said strategy, at four universities the strategy is a part of the general university strategy, one university is developing the strategy at present and one does not have the strategy at all (figure-7).

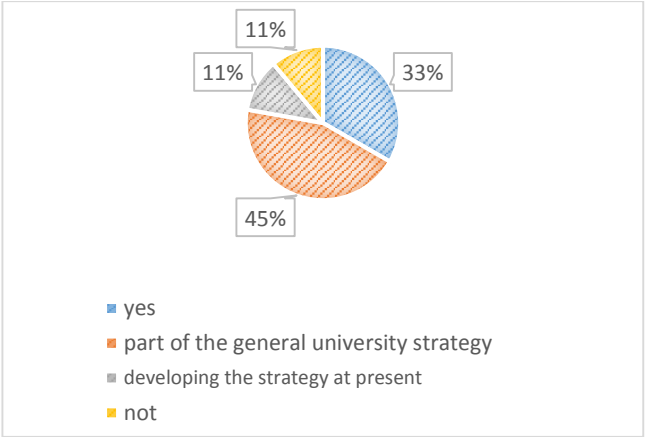

Figure 7 - Availability of the internationalization strategy.

3. Conclusions

So, the internationalization of higher education is important for the development of any country of the world. Its realization at the higher educational establishments with their past based on a different reality needs much efforts. In 2012, 4,3 million students studied abroad, with over 57% of them studying in Western Europe and Northern America what is not surprising following their history and deep roots of internationalization. In such a reality, it is necessary for the higher educational institutions of Georgia and similar states to develop the internationalization strategy, which will improve their competitiveness step by step, help them identify their niche and establish themselves in the global environment. For this purpose, it is necessary to:

- Analyze the present level of internationalization and estimate its potential.
- Estimate the impact of the environmental factors, prospects and threats.
- Develop the new strategies to improve the trends of internationalization.
- Develop a strategic plan, which will give a detailed description of the steps, resources and time.
- Develop the indicators of the strategy implementation monitoring.

This will help the higher institutions define the implementation plan of internationalization of the higher educational institutions in the long run what needs substantiated and systematic approach. However, in a short-term run, following the existing analysis, the higher educational institutions must consider the following:

- Perfecting the university web-sites, developing bi- or tri-lingual web-sites and putting them in compliance with the international standards. Internationalization and relations with foreign partners in particular, attracting foreign students, developing the international programs and activating them, is virtually impossible without an English web-site. This is a minimum requirement.
- Intensifying the network relations. A membership of the international organizations and associations allows the universities to find partners to accomplish joint educational and research programs.
- Developing exchange programs all over the world, which are relatively small in Georgia than in Europe and what mostly imply mobility in one direction: from Georgia to foreign countries.
- Developing collaboration programs, double- and joint-grade programs in the first instance with prestigious universities improving the image of local universities and allowing attracting more foreign students.
- Developing foreign-language (English) programs, which will help attract foreign students; working more actively in analyzing the inbound students to Georgia, studying their requirements and offering appropriate programs to them.

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SECTION 29. Literature. Folklore. Translation Studies.

SEMANTIC PHRASEOLOGY IN POETIC LANGUAGE OF NIGAR RAFIBAYLI

Abstract: *The usage of somatic phraseological units in N. Rafibayli poetic works of considerable interest. This interest is based first of all on great number of phraseological units in the poet's works. In the article it's noted the uniqueness of individual usage of phraseological units by the poet as one of the most important poetic devises.*

Key words: *Semantism, phraseology, poetic language, imagery.*

Language: *English*

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The poetic texts take into account that it is primarily the choice of phraseology units, phraseology of speech is an important indicator of the culture. Poet organizing poetic text, poetic speech phraseology units uses its own way. Phraseology units in Nigar Rafibeyli poems have the interesting status image-plot. The study in the current issue of the phraseology view, is important in the study of poetic stylistics.

Nigar Rafibeyli was born on 23 June 1913 in the town of Ganja. Her parents were medical surgeons. Her father, Khudadat Rafibeyli was the first Azerisurgeon who had studied in Europe. In 1919, he was invited to head the Ganja government by the republican government of Azerbaijan Democratic Republic, but he was soon arrested at instigation by Armenian bolsheviks and sent to Nargin island, where he was executed by bolshevik soldiers. Nigar Rafibeyli finished her school in Ganja and moved to Baku for her higher education. She studied at Pedagogical Technical School. She taught at school but always wrote novels. Her first poem called "Chadra" (Veil in Azeri) was published in "Dan Ulduzu" magazine in 1928. In years 1930–1932 she worked in the Azerbaijanfilm studio.

Nigar Rafibeyli phraseology on the units, at first glance does not seem so obvious. Phraseology nationwide to benefit from the fund, poetic context phraseology input method differs from other poets.

B the way, somatisms are widely used in the structure of phraseological units. This is due to the fact that names of body parts present the most archaic and, at the same time, the most constant lexical layer, which is tightly connected with both functional and sensual aspects of the human being and with individual specifics of different language groups.

Somatic – use of parts of the body. Before we start regarding somatic phraseological units, we consider what somatisms are. The term ''**somatism**'' is derived from Greek ''**soma**'' meaning ''**body**''.

By somatisms are understood "not only lexemes, naming parts of body, but also words related to the organism of the human and animals (a bone, a skin, blood, a muscle, a nerve etc.), because they denote vital elements of the material substance, without which a living organism cannot exist''.

Ways of translating PU:

description;
grammatical transformation;
exchange of phrases;
exchange of parts of sentence;
formation of contextual exchange;
additioning;
exchange;
sending;
generalization;
concrete definition;
calque;
figurative.

Nigar Rafibeyli stylistic possibilities are also references to poetry, Poetic texts, especially in applications characterized by functionality.

These features can be applied to applications in the literature. Nigar Rafibeyli language resources as an artist, a traditional poetic forms used by the label.

Despite the ability of dazzling and diverse applications, and still remains a subject of theoretical poetics. We study "rhetorical appeals" We prefer the term "Application for the set in the form of rhetorical appeals address not only speech, but also in this or any other object, or an event to mark the emotional value to him, the speech of the author to give the proper intonation". Applied linguistics, studied enough at first glance, its syntactic role. From the communicative function of applications are studied by psychology and theory of rhetoric.

Aspect of speech, language, communication and communication ethics applications created formulas that label, layer-group norms, communication situations and so on is relevant.

The closeness of the relationship and communication has been applied to the contact creative function takes into account the degree. "The actual appeal, his close friend, talks to children phrases a lot of time, is accompanied by derogatory epithets suffices-caress ... This is especially characteristic of emotional speech".

The analysis allows to identify the objects of his poems Rafibeyli circle. Loving these references, a woman who is longing for his mother's heart beats. Phafos appeals to the romantic style and passion, is a sincere confession, communication, mental, emotional closeness and determines naturalness. Nigar Rafibeyli, the fate of artisans, women, life, wife, mother, talking about the fate of the great poet Rasul Rza, children, grandchildren worthwhile to recall the request. This application seems to be the classic image of the lady.

A flower blooming amongst the ruins
set me wondering
Why do men say that in such desolation
no flower can grow?
The walls of the little house were broken,
the roof had tumbled in.
It had become the dwelling place
of fierce winds and winter snow.
The untamed winds had laid waste
the dear comforts of this once-loved home
And had pierced the passer-by
with melancholy pity.

War period is remembered for the works of the poetess high applications. "In general, it is a very important social and political issues, Ms. Nigar any high-noise, without seeming luxury sincere, could write".

N. Rafibeylis natural objects, as well as thematic group air applications, and the poet of the world, the universe, the relationship between the emotional and psychological state says. Occupies a special place in his poetic world applications of flowers, hearts tenderness attention as an expression.

These intimate, sincerity Subject, things are reflected in the rhetorical appeals. Nigar Rafibeyli poems addressed only the language is not the event, but also a certain poetic image is the formation of the literary stroke. Thus, the author appeals to the poetry of Nigar Rafibeyli emotive-axiology showing attitude, poetic plays an important role in the formation of pathos.

The usage of somatic phraseological units in N. Rafibayli poetic works of considerable interest. This interest is based first of all on great number of phraseological units in the poet's works. In the article it's noted the uniqueness of individual usage of phraseological units by the poet as one of the most important poetic devises.

The curtains, by gentle women's hands
so lovingly stitched and sewn,
Hung ragged like shell-torn banners
over a desolate city.
Amidst the heaps of stone and rubble
bloomed the beautiful flower,
And that flower filled all my thoughts
with one all-important question.
I asked: what gardener planted and nurtured
you here, frail flower?
Tell me your story, the dastan of your life,
and I shall listen.
Perhaps although this place is no more vibrant
with nightingale's song,
Abandoned by birds, yet you were called
into being by Spring's first breath?
"I am the voice of the Earth,"
the flower answered with human tongue.
"I am that Greater Life
which must forever triumph over Death."

"Somatic phraseologisms" in addition to its ambiguity, fiction allow you to create different shades of meaning. In N. Rafibayli poetic works functional stylistic point of view, the interesting aspects of poetic texts in terms of phraseology units attract attention. Phraseologisms have a dominant position in Rafibeyli somatic poetic language.

Speaking about the productivity of somatisms used by formation of somatic phraseological units, we should mention that somatic phraseological units, which possess hand, eye, head, heart, foot (feet) as constituent words are the most productive.

Somatic phraseological units, containing face, ear, back, blood, nose, finger, bone, heel, hair, leg, lip, skin, tongue, tooth (teeth), arm, neck etc. are

non-productive constituents of somatic phraseological units (SPUs).

There Figurativeness manifested itself more metaphorical level. Phraseology units play an important role in the formation of somatism meanings.

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SECTION 2. Applied mathematics. Mathematical modeling.

DATA MINING FOR PARAMETER SELECTION OF SWARM INTELLIGENCE ALGORITHMS

Abstract: *Swarm Intelligence algorithms commonly used to solve optimization problems. This study considers the problem of the parameters selection of the Particle Swarm Optimization algorithm. Methods of data mining are proposed to use for the selection. An example of applying regression analysis and classifying for Particle Swarm Optimization are given. The analysis carried out allows us to find good parameters of the Particle Swarm Optimization algorithm for a test optimization problem. The effectiveness of parameters found has been compared with parameters recommended by other researchers.*

Key words: *adaptation, data mining, particle swarm optimization, parameters selection, regression, analysis.*

Language: *Russian*

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МЕТОДЫ АНАЛИЗА ДАННЫХ ДЛЯ ПОДБОРА ПАРАМЕТРОВ АЛГОРИТМОВ РОЕВОГО ИНТЕЛЛЕКТА

Аннотация: *Алгоритмы роевого интеллекта широко применяются для решения задач оптимизации. В работе рассматривается задача подбора и анализа параметров алгоритма роя частиц. Для подбора параметров предлагается использовать инструменты анализа данных, приводится пример использования регрессионного анализа и методов классификации для алгоритма роя частиц. Проведенный анализ позволил выделить эффективные наборы параметров алгоритма роя частиц для тестовой задачи. Проведено сравнение полученных параметров с рекомендованными другими авторами.*

Ключевые слова: *адаптация, анализ данных, алгоритм роя частиц, подбор параметров, регрессионный анализ.*

Введение

Для решения многих задач оптимизации не существует точных детерминированных методов, позволяющих получить близкое к оптимальному решение задачи за приемлемое время, поэтому используются различные приближенные эвристические методы. Недостатком эвристических методов является трудность определения их параметров, которые обеспечивали бы высокую эффективность, поскольку для различных классов задач и даже для разных задач одного класса эффективные значения параметров отличаются. Целью данной работы является исследование применимости методов анализа данных, таких как регрессионный анализ и классификация, для поиска взаимосвязей между параметрами эвристических алгоритмов и полученными решениями задач оптимизации на примере алгоритма роя частиц. На данном этапе предполагается только первоначальный анализ предложенного подхода на абстрактной тестовой задаче.

1. Методы подбора параметров эвристических алгоритмов

Задача подбора значений параметров генетического алгоритма, алгоритмов роевого интеллекта и прочих эвристических алгоритмов рассматривается во многих исследованиям. Как правило, при использовании таких методов проводятся экспериментальные подборы различных наборов параметров, затем останавливаются на параметрах, дающих в

среднем наилучшие результаты для рассматриваемых задач. Так, например, автор алгоритма муравьиной колонии М. Дориго указывает, что в экспериментах использовалось 3-5 вариантов значений по каждому из коэффициентов для выбора наилучших [1, с.36]. В работе [2, с.14] авторы пишут, что алгоритм колонии муравьев «сильно зависит от настроечных параметров, которые подбираются только исходя из экспериментов» (подбираются вручную) Подобные «ручные» способы подбора встречаются во многих работах по эвристическим алгоритмам, М. Педерсен называет этот способ традиционным и наиболее простым [3, с. 2].

Более сложным в реализации подходом является автоматическая настройка параметров алгоритмов с помощью различных эвристик. В обзоре эвристических методов А. П. Карпенко указывает: «…одной их особенностей популяционных алгоритмов является наличие в них значительного… числа свободных параметров. От значений этих параметров может сильно зависеть эффективность алгоритма, однако формальные рекомендации по выбору значений этих параметров, исходя из особенностей решаемой задачи, как правило, отсутствуют. В связи с этим интенсивно развиваются методы адаптации и самоадаптации значений этих параметров» [4, с.30].

Для повышения эффективности алгоритмов роевого интеллекта могут быть использованы эволюционные механизмы адаптации, например, в работах [5, с. 112] и [6, с. 3] для алгоритмов роевого интеллекта был применен генетический алгоритм, с помощью которого выполнялся подбор значений параметров. Такой способ подбора параметров принято называть мета-оптимизацией, поскольку при этом параметры эвристического алгоритма подбираются другим алгоритмом оптимизации. В работах М. Педерсена в качестве алгоритма мета-оптимизации используется простой в реализации и обладающий высокой скоростью работы алгоритм “Local Unimodal Sampling” [3, с.9].

Оба рассмотренных подхода отличаются несложными средствами выявления зависимостей между параметрами алгоритмов и их эффективностью. В первом случае просто накапливается статистика и выбирается те параметры, которые в большинстве случаев оказались более эффективными. Недостатком является принятие без обоснования положения о возможности найти значений параметров, хорошие для всех задач из некоторого обширного класса, что противоречит NFL-теореме [7]. Ведь поиск лучших параметров осуществляется уже после того, как задачи решены и получена статистика. Для других же задач эти коэффициенты могут оказаться далекими от дающих хорошие решения. Второй подход лишен этого недостатка, поскольку подбор параметров происходит динамически именно для той задачи, которая решается в данный момент. Но и в этом случае используется только одно правило: чем лучше решение, тем эффективнее считается используемый набор параметров и тем выше вероятность, что этот набор, или набор, производный от него, будет использован в последующих итерациях.

Возможно, будет целесообразно использовать средства анализа данных для выявления закономерностей между параметрами алгоритмов роевого интеллекта и полученными решениями. Именно эта гипотеза и рассматривается в данной работе на примере алгоритма роя частиц.

2. Алгоритм роя частиц

Алгоритм роя частиц получил известность как универсальный и эффективный алгоритм решения задач оптимизации благодаря работам Кеннеди и Эберхарта [8; 3, с. 29]. Алгоритм широко освещен в литературе [3, 8, 9, 10, 11], поэтому в данной статье история возникновения алгоритма и его эвристическое обоснование опущены.

Пусть имеется задача нахождения минимума функции вида $f(\mathbf{X})$, где $\mathbf{X}$ – вектор варьируемых переменных, которые могут принимать значения из некоторой области поиска решений $\mathbf{D}$ размерности m, $\mathbf{D} = \{d_{min1}, d_{max1}, \ldots, d_{min\,m}, d_{max\,m}\}$. Рой представляется системой агентов (частиц), и каждая частица в каждый момент времени характеризуется значением переменных $\mathbf{X}$ из области $\mathbf{D}$ и значением оптимизируемой функции $f(\mathbf{X})$. Правила перемещения каждой из частиц на каждой итерации алгоритма можно записать следующим образом:

$$\mathbf{V} \leftarrow \omega\mathbf{V} + \alpha_1(\mathbf{Pb} - \mathbf{X})\mathbf{R}_1 + \alpha_2(\mathbf{Gb} - \mathbf{X})\mathbf{R}_2$$
$$v_j \leftarrow v_{\max j}, if\ v_j \geq v_{\max j}, j = 1, \ldots, m$$
$$\mathbf{X} \leftarrow \mathbf{X} + \mathbf{V}$$
$$\begin{cases} x_j \leftarrow d_{\max j}, x_j \geq d_{\max j} \\ x_j \leftarrow d_{\min j}, x_j \leq d_{\min j} \end{cases}, j = 1, \ldots, m$$

где $\mathbf{X}$ – положение частицы,

$\mathbf{V}$ – скорость частицы,

$\mathbf{Pb}$ – наилучшее положение, которое занимала частица в процессе работы,

$\mathbf{Gb}$ – наилучшее положение среди всех, найденных всемb частицами в процессе работы,

$\mathbf{R}_1$ и $\mathbf{R}_2$ – векторы случайных чисел, равномерно распределенных от 0 до 1.

Коэффициенты α_1, α_2, ω, и вектор $\mathbf{V}_{max}$ – параметры PSO, которые используются в формуле и влияют на перемещения частиц в пространстве поиска. Параметры α_1 и α_2 определяют, соответственно, степень учета

индивидуального и группового опыта агентов. Коэффициент ω характеризует инерционные свойства частиц. Вектор $\mathbf{V}_{max}$ ограничивает скорости частиц.

В классическом PSO $\mathbf{V}_{max} = (\mathbf{D}_{max} - \mathbf{D}_{min})$, это означает, что частица за один шаг может пересечь все пространство поиска. В данной работе, как и в исследовании [6] используется дополнительный параметры β, ограничивающий скорость частиц, следующим образом [6, с.3]:

$$\mathbf{V}_{max} = \beta(\mathbf{D}_{max} - \mathbf{D}_{min}).$$

В этом случае можно записать вектор параметров PSO как $\mathbf{P} = \{\alpha_1, \alpha_2, \omega, \beta\}$.

3. Описание эксперимента

3.1. Генерация данных

Для проведения экспериментов по выявлению зависимостей между значениями параметров алгоритма роя частиц и эффективностью полученных решений необходимо иметь выборку значений параметров и полученных решений некоторой задачи оптимизации. На данном этапе исследования был решено ограничить эксперименты одной задачей, поскольку для разных задач эффективные значения параметров могут существенно отличаться согласно NFL-теореме [7] и ряду исследований, в которых показана значимость параметров алгоритма роя частиц. Различные исследования рассматривают задачи из совершенно разных областей: обучения искусственных нейронных сетей [3], календарного планирования [6], оптимизации систем электроснабжения [12] и многих других.

В данной работе была выбрана широко известная задача Розенброка [13], модифицированная для многомерного пространства решений. Тестовая задача имеет вид:

$$f(X) = \sum_{i=1}^{N-1}[(1 - x_i) + 100(x_{i+1} - x_i^2)^2] \to min$$
$$-5 < x_i < 5\ ,\ i = 1, \dots, N \qquad (1)$$
$$N = 10$$

Диапазоны значений коэффициентов определялись исходя из опыта исследований алгоритма роя частиц [3, 5, 6, 10]:

$$-3 < \alpha_1 < 3$$
$$-3 < \alpha_2 < 3 \qquad (2)$$
$$-1 < \omega < 1$$
$$0 < \beta < 1$$

Использовалось 100 частиц и 20000 итераций алгоритма. Было сгенерировано 1200 наборов случайных коэффициентов, значения которых были равномерно распределены в указанных выше диапазонах. Так как алгоритм роя частиц является стохастическим, полученные результаты зависят от случайных факторов (последовательность псевдослучайных чисел в вычислениях). Потому одного запуска алгоритма недостаточно, чтобы правильно оценить эффективность используемых коэффициентов. Для минимизации влияния случайных факторов необходимо выполнить процедуру многократного запуска и выбора лучшего решения несколько раз и затем взять средний результат, который и покажет эффективность решения задачи на некотором наборе параметров. В данном эксперименте для каждого набора параметров тестовая задача решалась 10 раз, затем определялось среднее значение критерия $f(\mathbf{X})$ (1).

В итоге было сформировано 1200 кортежей вида $<\boldsymbol{P}, \varphi> = <\alpha_1, \alpha_2, \omega, \beta, \varphi>$, где φ является полученным после усреднения показателем качества соответствующего набора параметров.

3.2. Регрессионный анализ

Для построения зависимости значения критерия задачи (1) φ от параметров алгоритма роя частиц **P** было построено полиномиальное уравнение регрессии 4 степени следующего вида:

$$\varphi^*(\mathbf{P}) = \sum_{i=1}^{4}\sum_{j=1}^{4} k_{ij}(p_i)^j + C \qquad (3)$$

где $\varphi^*(\mathbf{P})$ – оценка показателя качества φ при использовании вектора параметров **P**,

p_i – параметр алгоритма роя частиц (i = 1, 2, 3, 4 для α_1, α_2, ω, v_{max}, соответственно),

k_{ij} – коэффициент полинома при параметре p_i в степени j (табл.1),

C – свободный член полинома, раный в данном случае 18449.5.

Степень полинома выбрана равной 4, так как при более низких степенях ошибка регрессии была на порядок больше, а повышение степени не привело к существенным улучшениям точности модели. Для нахождения коэффициентов полинома т свободного члена была использована среда разработки систем интеллектуального анализа данных «KNIME» (www.knime.org).

Таблица 1

Коэффициенты уравнения регрессии.

P	$j = 1$	$j = 2$	$j = 3$	$j = 4$
α_1	-1366.9	-1061.8	2.55	80.37
α_2	-8021.9	438.0	693.3	-8.76
ω	-10.57	-3938.9	-770.6	5394.5
β	-25913.7	82258.0	-104806	47376.6

Используя уравнение (3) можно найти глобальный экстремум оценки $\varphi^*(\mathbf{P})$ в области значений параметров (2). Но построенное уравнение регрессии является недостаточно точным в предсказании показателя качества φ. Отклонение оценочных значений $\varphi^*(\mathbf{P})$ от истинных значений φ проиллюстрированы рисунком 1, где линией показана зависимость значения $\varphi^*(\mathbf{P})$ от α_2, а маркеры показывают значения φ при данных значениях параметра α_2 в сгенерированном наборе кортежей.

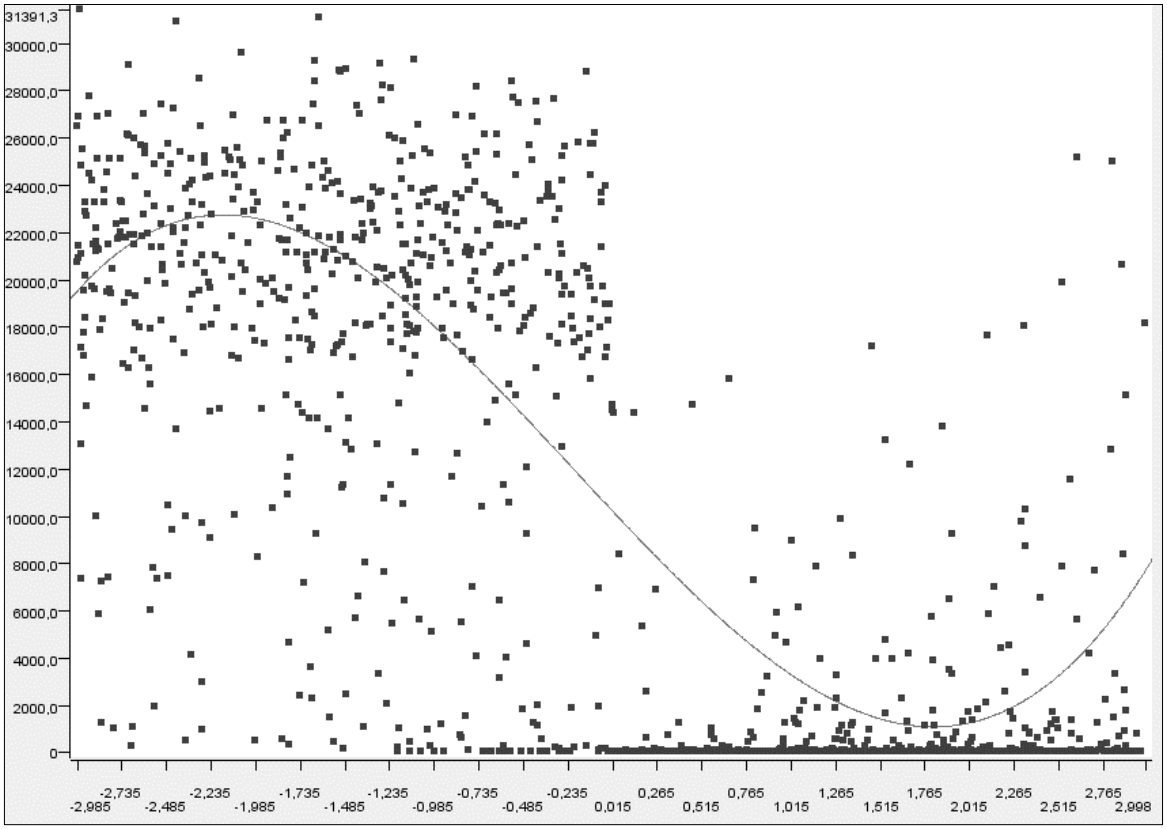

Рисунок 1– Регрессионная кривая для параметра α_2.

3.3. Построение классификатора

Помимо регрессионного анализа был проведено исследование параметров с помощью классификаторов. Среди всех кортежей было выбрано 5% наилучших по значению критерия φ, которые поместили в класс «A». Все остальные кортежи поместили в класс «B». Была выдвинута гипотеза, что можно построить классификатор, способный по обучающей выборке создать правила, отличающие кортежи класса «A» от кортежей класса «B» по набору параметров. В случае подтверждения гипотезы можно применить полученные правила для более точного выбора наиболее эффективных для решаемой задачи параметров.

В обучающей выборке использовалось 75% кортежей класса 1 и 10% кортежей класса «B». Таким образом, с совокупности тестовая выборка составила 12.75%. Были применены классификаторы из широко распространенной Open Source библиотеки «Weka», версии 3.7 (которая легко интегрируется с упомянутой выше

средой «KNIME»). В таблице 2 приведены полученные на тестовой выборке результаты применения различных классификаторов.

Из таблицы 2 видно, что классификатор JRip позволил построить наиболее точную среди прочих классификаторов модель, предсказывающую, попадут ли результаты решения тестовой задачи оптимизации при заданных параметрах в число 5% наиболее эффективных среди случайно сгенерированных наборов параметров.

Таблица 2

Ошибки классификации кортежей.

Классификатор	Ошибка (%)
JRip	9.7
MulilayerPerceptron	9.8
RandomForest	10.3
LMT	11.6
LibSVM	11.8
NaiveBayes	12.3
J48	15.7
PART	17.0

Помимо относительно высокой точности, модель классификатора JRip очень проста и состоит всего из одного правила или конъюнкта (в общем случае JRip строит модель в дизъюнктивной нормальной форме):

if ($\alpha_2 > 1.4192$ & $\alpha_1 > -1.10315$ & $\alpha_1 < 1.92441$)
then class =A
else class = B

Полученная модель показывает, что эффективные решения с высокой вероятностью можно получить, используя значение параметра α_2 выше 1.4192 и α_1 в диапазоне от -1.10315 до 1.92441.

Следующим шагом является объединение моделей, полученных с помощью классификации и с помощь. Регрессионного анализа. Для этого модель, построенная классификатором JRip используется как набор ограничений при поиске экстремума регрессионной зависимости. В итоге совмещение результатов регрессионного анализа и классификатора дает следующие параметры алгоритма роя частиц для тестовой задачи:

$$\begin{aligned} \alpha_1 &= 1.92441 \\ \alpha_2 &= 1.4192 \\ \omega &= 0.661 \\ \beta &= 0.291 \end{aligned} \quad (4)$$

3.3. Сравнение с рекомендуемыми параметрами других авторов

Для оценки эффективности полученных параметров (4) было выполнено 200 запусков решения тестовой задачи (1) алгоритмом роя частиц с данными значениями параметров. Затем были определены параметры алгоритм роя частиц, рекомендуемые другими исследователями как эффективные. Известные исследователи в области роевого интеллекта Эберхарт и Ши приводятся следующие значения параметров, эффективные для многих задач непрерывной оптимизации [3, с.19; 11]:

$$\begin{aligned} \alpha_1 &= 1.49445 \\ \alpha_2 &= 1.49445 \\ \omega &= 0.729 \\ \beta &= 1.0 \end{aligned} \quad (5)$$

при этом β не рассматривается как изменяемый параметр, поскольку в классическом алгоритме роя частиц максимальные значения скоростей частиц ограничены только размерами пространства поиска решений.

В работе М. Педерсена [10, с. 7] приводится несколько наборов параметров для различных количеств итераций и различных размерностей задач оптимизации. Для рассматриваемой ситуации (размерность задачи равна 10, а число итераций алгоритма – 20000) рекомендуется использовать параметры

$$\begin{aligned} \alpha_1 &= -0.2746 \\ \alpha_2 &= 4.8976 \\ \omega &= -0.3488 \\ \beta &= 1.0 \end{aligned} \quad (6)$$

в этой работе ограничения на скорости частиц так же не рассматриваются как изменяемый параметр алгоритма.

Как указано выше, для всех трех наборов параметров тестовая задача (1) была решена по 200 раз. Результаты, полученные при использовании этих наборов, приведены в таблице 3.

Таблица 3

Сравнение наборов параметров.

Набор параметров	Среднее значение критерия	Минимальное значение критерия
(3)	0.59	8.63E-9
(4)	8.87	2.90E-11
(5)	879.24	588.92

Таким образом, использование регрессионного анализа и классификатора в среднем дало результаты решения тестовой задачи намного лучше результатов при выборе рекомендуемый в литературе значений. С одной стороны, этого следовало ожидать, поскольку значения параметров (4) и (5) были подобраны для широкого класса задача, а параметры (4) для одной конкретной задачи (1). С другой стороны, большинство возникающих на практике задачи оптимизации являются нестандартными, поэтому использование рекомендованных фиксированных значений параметров может не привести к получению высокоэффективных решений для большинства случаев. При этом следует отметить, что результаты с параметрами (4) можно назвать очень хорошими по сравнению со средним результатом решений, полученных на этапе генерации данных, то есть с произвольными значениями параметров. Среди 1200 кортежей, полученных на этом этапе, среднее значение критерия составляет 955.4, при это худшие результаты превышали 3000.

Заключение

Для нахождения эффективных значений параметров алгоритма роя частиц были построены модели на основании регрессионного анализа и на основании классификации методом JRip. Модели строились по обучающим данным, содержащим различные значения параметров и полученные с этими значениями усредненные результаты решения тестовой задачи. Регрессионный анализ позволил создать модель зависимости между значениями параметров алгоритма и эффективностью полученных с ними решений. Классификатор JRip позволил выделить области наиболее эффективных значений параметров. Полученные области были использованы как области допустимых значений при поиске экстремумов регрессионных кривых по каждому из параметров.

Найденные таким образом параметры показали качество решений на порядки выше среднего по выборке (средний результат 0.59 против 955.4). Таким образом гипотеза о возможности найти эффективные значения параметров алгоритма роя частиц для отдельной тестовой задачи была подтверждена.

Так же было проведено сравнение со значениями параметров, рекомендованными в литературе, сравнение показало значительное превосходство найденных параметров (0.59 против 8.87 и 879.24). При этом нужно отметить, что рекомендованные параметры относились к широкому классу задач, и параметры, рекомендованные Дж. Кеннеди и Р. Эберхартом (5), показали очень высокую эффективность.

Направление дальнейшие работы

Дальнейшим этапом исследования является исследование применимости подхода для решения различных задач из некоторого ограниченного класса. Другими словами, необходимо проверить, будут ли параметры, подобранные на одной задаче эффективными на других подобных задачах, поскольку главным недостатком описанного подхода является необходимость многократного решения тестовых задач на сгенерированных наборах параметров. Но если единожды подобранные параметры по одной задаче окажутся эффективными на всех аналогичных задачах, то такой подход позволит значительно снизить время решения задач, в отличие от методов мета-оптимизации и ручного подбора параметров, которые предполагают выполнение подбора для каждой решаемой задачи отдельно.

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SECTION 31. Economic research, finance, innovation, risk management.

SIMPLIFIED TAX SYSTEM AS AN INSTRUMENT FOR DEVELOPMENT OF SMALL BUSINESS

Abstract: *The article discusses the features and characteristics of the simplified taxation system. Based on the data of the Federal Tax Service, the dynamics of income from taxpayers who use the simplified system of taxation in the Kaluga and Tula regions was analyzed.*

Key words: *budget revenue, small business, small entrepreneurship, taxation, special tax regimes, simplified tax system.*

Language: *Russian*

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УПРОЩЕННАЯ СИСТЕМА НАЛОГООБЛОЖЕНИЯ КАК ИНСТРУМЕНТ РАЗВИТИЯ МАЛОГО БИЗНЕСА

Аннотация: *В статье рассматриваются особенности и основные характеристики упрощенной системы налогообложения. На основании данных Федеральной налоговой службы проведен анализ динамики поступлений от налогоплательщиков, использующих упрощенную систему налогообложения, в Калужской и Тульской областях.*

Ключевые слова: *доходы бюджета, малый бизнес, малое предпринимательство, налогообложение, специальные налоговые режимы, упрощенная система налогообложения.*

В современных условиях хозяйствования малым организациям и индивидуальным предпринимателям зачастую оказывается крайне сложно вести свою деятельность: условия рыночной экономики предполагают наличие конкурентов, требуют огромных финансовых вложений.

Как известно, «малое предпринимательство, выступая особой формой экономической активности, является ключевым звеном и индикатором развития российской экономики» [5, с.184]. В связи с этим, малым предприятиям и ИП требуется всесторонняя поддержка со стороны государства, особенно в создании льготного налогообложения.

В этих целях в 2003 году Федеральным законом «О внесении изменений и дополнений в часть вторую Налогового кодекса Российской Федерации и некоторые другие акты законодательства Российской Федерации, а также о признании утратившими силу отдельных актов законодательства Российской Федерации о налогах и сборах» в Российской Федерации была введена упрощенная система налогообложения (далее – УСН).

Так, УСН представляет собой специальный налоговый режим, предусматривающий особый порядок уплаты налогов юридическими лицами и физическими лицами, которые являются индивидуальными предпринимателями [7, с.42].

УСН ориентирована на стимулирование развития малого бизнеса, поэтому существуют определенные условия для перехода на данную систему налогообложения, установленные Налоговым кодексом Российской Федерации. Прежде всего, ограничивается количество работников организации или ИП: оно не должно превышать 100 человек. Доход организации или ИП должен составлять менее 60 млн. руб., а остаточная стоимость имущества – менее 100 млн. руб. Кроме того, доля участия в организации, переходящей на УСН, других

организаций не должна превышать 25%, организация не должна иметь филиалов и представительств. Организация не имеет права перейти на УСН, если по итогам девяти месяцев того года, в котором организация подает уведомление о переходе, ее доходы превысили 45 млн. рублей [1].

Для организаций УСН заменяет налог на прибыль организаций (за исключением налога, уплачиваемого с доходов по дивидендам и различным видам долговых обязательств), налог на имущество организаций (за исключением имущества, налоговой базой которого является его кадастровая стоимость), а также налог на добавленную стоимость.

Для индивидуальных предпринимателей УСН заменяет налог на доходы физических лиц (в отношении доходов от предпринимательской деятельности), налог на имущество физических лиц (в отношении имущества, используемого в предпринимательской деятельности), а также налог на добавленную стоимость (за исключением НДС, уплачиваемого при ввозе товаров на таможне, а также при выполнении договора простого товарищества или договора доверительного управления имуществом) [1].

Таким образом, УСН заменяет все основные налоги, уплачиваемые организациями и ИП, тем самым упрощая ведение налогового учета субъектами хозяйствования.

Налоговым периодом для упрощенной системы налогообложения является год. УСН не предусматривает льгот для налогоплательщиков. Уплаченные суммы УСН перечисляются в бюджеты субъектов РФ по нормативу 100%.

Упрощенная система налогообложения позволяет налогоплательщику самостоятельно выбрать объект налогообложения, в качестве которого могут выступать либо доходы, либо доходы, уменьшенные на величину расходов. Кроме того, налогоплательщику предоставляется право изменить объект налогообложения со следующего календарного года.

В связи с тем, что УСН предусматривает два разных объекта налогообложения, для каждого из них предусмотрены соответствующие ставки. При объекте налогообложения «доходы» ставка устанавливается в размере 6% и не предусматривает каких-либо изменений. Если же объектом налогообложения являются доходы, уменьшенные на величину расходов, устанавливается ставка 15%. Данная ставка может регулироваться законами субъектов РФ и устанавливаться в размере от 5 до 15 процентов. Кроме того, субъекты имеют право дифференцировать данную ставку для разных категорий налогоплательщиков.

В связи с тем, что «состояние российской экономики в значительной степени определяется экономическим положением российских регионов» [3,с.124], рассмотрим функционирование упрощенной системы налогообложения на примере двух субъектов Центрального федерального округа Российской Федерации – Калужской и Тульской областей.

Калужская область является ярким примером региона с бурно развивающейся экономикой, что, в свою очередь, влечет и необходимость развития малого бизнеса. Так, проведенная комплексная оценка социально-экономического развития Калужской области показала, что на улучшение социально-экономического развития Калужской области положительное влияние оказывает рост инновационной и инвестиционной привлекательности, который будет продолжаться и в дальнейшем [19,с.296]. В то же время, как показала оценка рисков несбалансированности региональных бюджетов, проведенная Балыниным И.В. (на основе самостоятельно разработанной модели [4, с.318]), Калужская область относится к группе риска «выше среднего» [6, с.107].

Как говорилось выше, при объекте обложения «доходы» регион не вправе вносить изменения в установленную ставку налога. Однако при объекте обложения «доходы, уменьшенные на величину расходов» субъекты имеют право устанавливать пониженные ставки. В Калужской области установлены пониженные ставки по следующим видам деятельности:

- добыча полезных ископаемых, предоставление услуг по ведению домашнего хозяйства, деятельность экстерриториальных предприятий, образование – в размере 5%;
- строительство – в размере 7%;
- обрабатывающее производство, производство и распределение электроэнергии, газа и воды – в размере 10% [21].

Таким образом, органы государственной власти Калужской области значительно уменьшают ставки УСН по отдельным видам экономической деятельности, и можно предположить, что именно данные направления являются приоритетными в развитии экономики региона.

Тульская область является регионом с развитой промышленной отраслью. Наиболее развиты в регионе машиностроение, химическая промышленность, черная металлургия, а также угольная промышленность. Пониженные ставки по УСН в регионе установлены для 22 видов экономической деятельности, среди которых можно выделить производство некоторых видов продукции, сельское хозяйство, обрабатывающая отрасль, строительство, научно-исследовательская деятельность и разработки.

Упрощенная система налогообложения является привлекательной и доступной для многих налогоплательщиков. Основные показатели, характеризующие применение упрощенной системы налогообложения в Калужской и Тульской областях, представлены в таблице 1.

Таблица 1

Основные показатели применения УСН в Калужской и Тульской областях.

Показатель	Калужская область			Тульская область		
	2011	2012	2013	2011	2012	2013
Количество налогоплательщиков, шт., в т. ч.	5943	18965	18904	6333	19303	20033
- организаций	3916	8769	9094	4597	10524	10833
- ИП	2027	9926	9810	1736	8779	9200
Доходы бюджета от поступлений по УСН, тыс. руб.	1587183	1787031	1929159	1606619	1860114	2090534

Источник: Составлено автором на основании данных Федеральной налоговой службы[21].

Анализируя данные таблицы 1, можно сказать, что в 2011 году в Калужской области насчитывалось 5 943 плательщика УСН, в том числе 3 916 организаций и 2 027 индивидуальных предпринимателей. Эти налогоплательщики в 2011 году обеспечили бюджету Калужской области доход в размере 1 587 183 тыс. руб. В 2012 году количество налогоплательщиков УСН в регионе возросло до 18 695, то есть 8 769 организаций и 9 926 индивидуальных предпринимателей. Доход от уплаты налогов в связи с применением УСН составил 1 787 031 тыс. руб. В 2013 году количество налогоплательщиков сократилось и составило 18 904, из которых 9 094 являлись организациями, и 9 810 – индивидуальными предпринимателями. Однако был обеспечен доход в размере 1 929 159 тыс. руб., что превышает показатель предыдущего года на 7,95% .

В Тульской области в 2011 году УСН использовали 6 333 плательщика, из которых 4 597 – организации, 1 736 – индивидуальные предприниматели. Доход, поступивший в связи с применением УСН, составил 1 606 619 тыс. руб., что превышает показатель Калужской области за данный период. В 2012 году количество налогоплательщиков увеличилось до 19 303, включая 10 524 организаций и 8 779 ИП, которые обеспечили бюджету Тульской области доход в размере 1 860 114 тыс. руб. В 2013 году УСН в Тульской области использовали 20 033 налогоплательщика: 10 833 организации и 9 200 индивидуальных предпринимателей. Доход бюджета от уплаты налога в связи с применением УСН составил в данном периоде 2 090 534 тыс. руб. Таким образом, мы видим, что показатели Тульской области превышают показатели Калужской области (рис. 1).

Резкое увеличение количества налогоплательщиков в 2012 году, вероятнее всего, связано с тем, что Федеральным законом от 28.11.2011 № 338-ФЗ в налоговое законодательство были внесены изменения, сделавшие данную систему налогообложения более привлекательной: с 1 января 2012 года предприниматели, применяющие УСН с объектом «доходы» и не имеющие наемных работников, могут уменьшить единый налог (авансовый платеж по нему) на всю сумму взносов, рассчитанную исходя из стоимости страхового года, даже если размер взносов составит более 50 процентов суммы налога (авансового платежа), что ранее не было регламентировано[2].

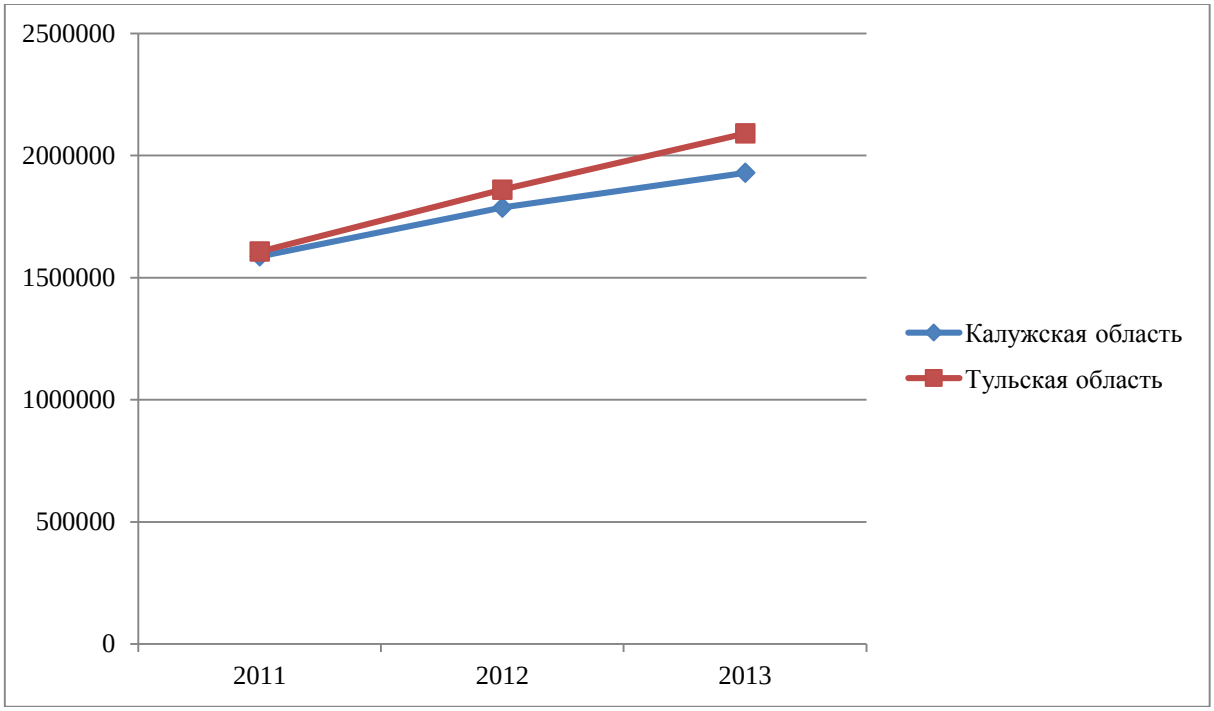

Рисунок 1 – Динамика поступлений бюджетов от УСН в Калужской и Тульской областях.

Источник: Составлено автором на основе данных Федеральной налоговой службы [21]

Подводя итог, можно сказать, что упрощенная система налогообложения является эффективным инструментом развития малого бизнеса, позволяющим значительно облегчить налоговое бремя законными способами. В то же время, упрощенная система налогообложения из года в год становится популярнее, и, не претерпевая значительных изменений, а также при наличии грамотной экономической политики российского государства, с ее помощью также можно будет решить одну из наиболее острых проблем – несбалансированность региональных бюджетов.

Научное исследование выполнено под руководством Сергиенко Н.С., к.э.н., доцента кафедры «Финансы и кредит» Калужского филиала Финансового университета при Правительстве Российской Федерации.

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SECTION 2. Applied mathematics. Mathematical modeling.

COMPARISON OF QUARTZ AND LEAD ZIRCONATE TITANATE EFFECT IN THE MANUFACTURE OF ACOUSTIC MICRO PROBE TO STIMULATE THE NEURAL TISSUE AND CREATE AN ACTION POTENTIAL AND ITS SIMULATION BY COMSOL MULTIPHYSICS SOFTWARE

Abstract: *In this paper, design and simulation of acoustic micro probe made of piezoelectric materials such as Lead Zirconate Titanate (pzt) and Quartz to stimulate nerve tissue and produce the wave of action potential in order to transmit the nerve messages inside of axoplasm of an axon have been explored. The simulation has been performed. by using the Comsol Multiphysics 3.5a software. In this simulation, we have designed a piezoelectric blade that part of it is placed inside of ionic enviroment that made of saline matter. By applying the voltage on outer side of blade, due to piezoelectric materials propertis, the blade vibrated and lead to displacement of sodium and chloride ions. This movement of ions creates a current within the ionic enviroment. Then, by applying the obtained current as input to fitzhugh nagumo model,we succed to produce the wave of action potential inside of axoplasm of an axon. The remarkable thing is that, in simulation of piezoelectric blade we used Lead Zirconate Titanate and Quartz and after completing the simulation process, Despite the large difference in the density of the material, due to the proximity of the voltage value at the different time of propagation of the action potential, less dense materials such as quartz can be used in acoustic micro probe designation in order to nerve stimulation.*

Key words: *Piezoelectric, Lead Zirconate Titanate, Quartz, Fitzhugh Nagumo, Action Potential, Axon*.

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Introduction

The nerve cell, or neuron, is the key player in the activity of the nervous system. It conveys information both electrically and chemically. Within the neuron itself, information is passed along through the movement of an electrical charge (i.e., impulse). The neuron has three main components: (1) the dendrites, thin fibers that extend from the cell in branched tendrils to receive information from other neurons; (2) the cell body, which carries out most of the neuron's basic cellular functioning; and (3) the axon, a long, thin fiber that carries nerve impulses to other neurons[1].

When the membranes of neurons is stimulated,a bioelectric change that occurs in the nerve membrane and propagate from the stimulation site to other parts of the nervous fiber. This phenomenon is called action potential. In other word, the action potential occurs on a excitable membranes of nerve cells, over the length of the axon and has the task of messaging[2]. Each action potential start with suddenly change in negative natural potential (rest mode) to positive potential of memrance and come back with the same speed in the negative mode and ends[3]. To convey a message of nerve, action potential travels along the nerve fibers to reach the nerve endings.

Lead Zirconate Titanat

Lead zirconate titanate (in short PZT) is one of the most frequently studied ferroelectric materials, due to its extremely wide field of application as a pyroelectric material. Lead zirconate titanate Pb($\mathbf{Zr_{1-x}}$Tix)O3 is a solid solution of ferroelectric

PbTiO3 (Tc=490C) and antiferroelectric PbZrO3 (Tc=230C). PZT properties depend on the ratio of Zr/Ti. In the room temperature Tr = 20C PZT is a ferroelectric, so it possesses also piezo and pyroelectric properties for: 0.042 < x < 0.380 (rhombohedral R3c), 0.380 < x < 0.470 (rhombohedral R3m) as well as 0.480 < x <1.000 (tetragonal P4mm). Solid solutions from the area of 0.47< x < 0.48 in T > 227 C constitute a mixture of tetragonal and rhombohedral phase, in Tr = 20 C they indicate monoclinic system symmetry (it is so called morphotropic phase boundary region). Physical properties of the PZT ceramics depend on technology, especially on temperature and time of densification because during the densification process evaporation of lead can be observed, which causes disturbance in the initial chemical composition. In practice, PZT is rarely used in a pure chemical form. The dielectric, piezoelectric and pyroelectric properties of PZT can be modified by adding dopants [4].

Appropriate choice of a type and a quantity of dopant ions is important. There are reports about obtaining Mn-doped Pb(Zr0:3Ti0:7)O3 ceramics (by conventional ceramic method) [5-7] and thin films [8,9] for pyroelectric applications. Doping manganese into PZT led to a significant increase of the pyroelectric effect and decrease of the dielectric permittivity and dielectric losses coefficient tg[10]. In this work powders preparation of manganese-doped lead zirconate titanate with composition of Pb (Zr0:3Ti0:7) 0:97 Mn0:03O3 (PMZT) is presented. The powders were obtained by sol gel method. The obtained powders were then used for preparing ceramic-polymer composites for pyroelectric applications. Ceramic polymer composites have lots of advantages in comparison with monolithic ceramics and thin films. They can be prepared at low cost in any sizes and shapes required for specific uses [11].

Quartz

The technical formula is SiO2 and it is composed of two elements, silicon and oxygen. In its amorphous form SiO2 is the major constituent in many rocks and sand. The crystalline form of SiO2 or quartz is relatively abundant in nature, but in the highly pure form required for the manufacture of quartz crystal units, the supply tends to be small. The limited supply and the high cost of natural quartz have resulted in the development of a synthetic quartz manufacturing industry. Synthetic quartz crystals are produced in vertical autoclaves. The autoclave works on the principle of hydrothermal gradients with temperatures in excess of 400 °C and pressures exceeding 1,000 atmospheres. Seed quartz crystals are placed in the upper chamber of the autoclave with natural quartz (lascas) being placed in the lower chamber. An alkaline solution is then introduced which when heated increases the pressure within the chamber. The autoclave heaters produce a lower temperature at the top chamber in comparison to the bottom. This temperature gradient produces convection of the alkaline solution which dissolves the natural quartz at the bottom of the chamber and deposits it on the seed crystals at the top. Alpha crystals produced by this method can have masses of several hundred grams and can be grown in a few weeks. If the temperature reaches 573 °C a phase transition takes place which changes the quartz from an alpha to a beta (loss of piezoelectric property). Quartz crystals are an indispensable component of modern electronic technology. They are used to generate frequencies to control and manage virtually all communication systems. They provide the isochronous element in most clocks, watches, computers and microprocessors. The quartz crystal is the product of the phenomenon of piezo-electricity discovered by the Curie brothers in France in 1880[11].

Fitzhugh Nagumo Model

The Fitzhugh-nagumo equations is a simplified form of the Hodgkin-Huxley model for electrical activity in a neuron. in this model a neuron can be stimulated with an input such as an electric current. The state of this excitation is described by variable $\boldsymbol{u_1}$ which represent the voltage (excitation) in the neuron as a function of time. when a neuron is excited, physiological processes in the cell will cause the neuron to recover from the excitation. The variable $\boldsymbol{u_2}$ in the model equation represents this recovery [12],[13]. The equations are given by :

$$\frac{\partial_{u_1}}{\partial_t} = \Delta \boldsymbol{u} + (\boldsymbol{\alpha} - \boldsymbol{u_1})(\boldsymbol{u_1} - \boldsymbol{1})\boldsymbol{u_1} + (-\boldsymbol{u_2}) + \boldsymbol{I} \quad (1)$$

$$\frac{\partial_{u_2}}{\partial_t} = \boldsymbol{\varepsilon}(\boldsymbol{\beta u_1} - \boldsymbol{\gamma u_2} - \boldsymbol{\delta}) \quad (2)$$

$\boldsymbol{\alpha}$ is the excitation threshold and $\boldsymbol{\varepsilon}$ is the excitability. $\boldsymbol{\beta}$, $\boldsymbol{\gamma}$ and $\boldsymbol{\delta}$ are parameters effecting the resting state and dynamics of the system [14].

Simulation

One of the most important software in simulation of finite element method (FEM) and analysis is comsol multyphysics. The distinguishing feature of this software is accuracy and speed of analysis. In this simulation, we have designed a piezoelectric blade made of lead zirconate titanate at first section and quartz in the second section, that part of it is placed within ionic enviroment that made of saline matter. By applying the external voltage on outer side of blade, a current within the ionic enviroment created. Then, by applying this current as input to fitzhugh nagumo model, the wave of action potential inside of axoplasm of an axon produced and

propagated over the length of axon. The remarkable thing is that, in order to avoid numerical limits and obtain the more accurate results, the size of piezoelectric blade, axon and ionic enviroment larger than their actual size is considered.

The simulation steps is as follow:

A) Selection of the dimension and type of modules

B) design of model Geometry

C) Determine the Subdomain Settings and boundary conditions

D) Select the materials and its characteristics

E) Mesh Generation

F) Choose the type of analysis

The following we will explain the steps .

A) Selection of the dimension and type of modules

In this simulation, we have used the three-dimensional structure and in order to simulation of piezoelectric blade, ionic environment and axon respectively, piezo solid, electrostatics and PDE modules have been used.

B) design of model Geometry

In simulation of finite element method, to reduce the time needed for model analysis, we use the appropriate geometric approximation to the size limition of the model.

The piezo electric blade modeled as a solid block with size of 15 ×15 ×140 $\boldsymbol{m^3}$ (l ×w ×h), As mentioned in previouse sections, a part of piezoelectric blade is placed in ionic environment that is modeled by solid block with size of 5 ×1 ×40 $\boldsymbol{m^3}$. Also the axons geometry is a hollow cylinder with length of 125 m and radius of 5 cm.

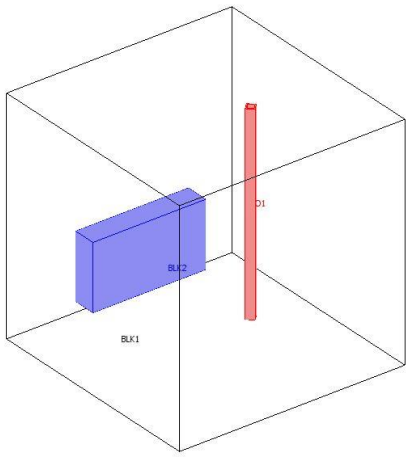

Figure 1 - Geometrical model for simulation.

C) Determine the Subdomain Settings and boundary conditions

C-1) *Subdomain Settings*

In this section of simulation, due to use Lead Zirconate Titanium and Quartz, comsol default setting was used for these materials. So that the density of these matters , respectively are equal to 7600 and 2651[kg/m^3].

The equation that used for ionic enviroment in the electrostatic module , is as following.

$$-\nabla.\,\varepsilon_0\varepsilon_r\nabla V = \rho \qquad (3)$$

Where V is electric potential, ε_r is the relative permittivity, ε_0 is the permittivity of vacuum and ρ is the charge density. Also saline relative permittivity is equal to 80.

In PDE module, the axon subdomain described by two dependant variables , u_1 and u_2. The equation that solved by PDE mode is as following.

$$e_a\frac{\partial^2 u}{\partial t^2} + d_a\frac{\partial u}{\partial t} + \nabla\Gamma = F \qquad (4)$$

where e_a is mass coefficient, d_a is damping coefficient, Γ is numerical flux and F is source term . in order to create the main equations ie (1) and (2) equations, we need to following parameters.

$e_a = 0$, $d_a = 1$, $F = 0$.

The numerical flux Γ for equation (1) and (2) is set to:

$$\Gamma = \Delta u + (\alpha - u_1)(u_1 - 1)u_1 + (-u_2) + I \qquad (5)$$

$$\Gamma = \varepsilon(\beta u_1 - \gamma u_2 - \delta). \quad (6)$$

Boundary conditions for the axons as well as the following :

$$u_1(t_0) = V_0.\big((x + d) > 0\big).(z + d > 0) \quad (7)$$

$$u_2(t_0) = nu_0.\big((-x + d) > 0\big).(z + d > 0) \quad (8)$$

C-2) Boundary Conditions

After determining the border areas of piezoelectric blade and applying voltage to the outer area, its time to determin the boundary areas within ionic enviroment and axon. Electric potential distribution in the ionic environment is done by using electrostatic module and Maxwell's equations.

Nonlinear differential equations or Fitzhugh-nagumo as axons describe the cell membrane behavior with respect to the input that we applied to them. All of the axon boundaries in the PDE mode are taken as Neumann boundary condition and the equation that used in boundary mode is as following:

$$-n.\Gamma = G. \quad (9)$$

Where Γ is numerical flux and G is source term. Γ from Equation (5) is obtained and G = 0. all boundaries of ionic environment are at ground potential (V = 0),also all boundaries of the axon are selected as electrical potential with the coupling variable u_1=V_0[10].

E) Mesh Generation

In this section, we have used the triangular elements in mesh generation process. The reason of using the triangular elements is rising the speed of solving the problem. Also have been tried to use smaller elements in sensitive areas such as axons and piezoelectric blade common border. 19,837 and 19619 is the number of elements used in mesh generation of lead zirconate titanat and quartz.

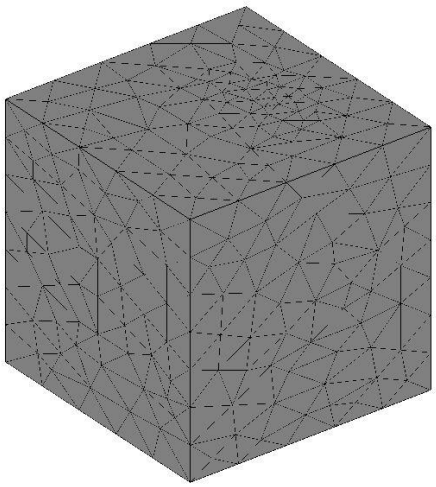

Figure 2 - The meshed model.

POST PROCESSING

After running the simulation, the results obtained and in the first part of the simulation results, we see the action potential propagation inside of axoplasm of an axon due to effection of Lead Zirconate Titanate micro probe on ionic enviroment and in the second part of simulation results, action potential propagation due to effection of quartz micro probe are visible.

A) Lead Zirconate Titanate micro probe results:

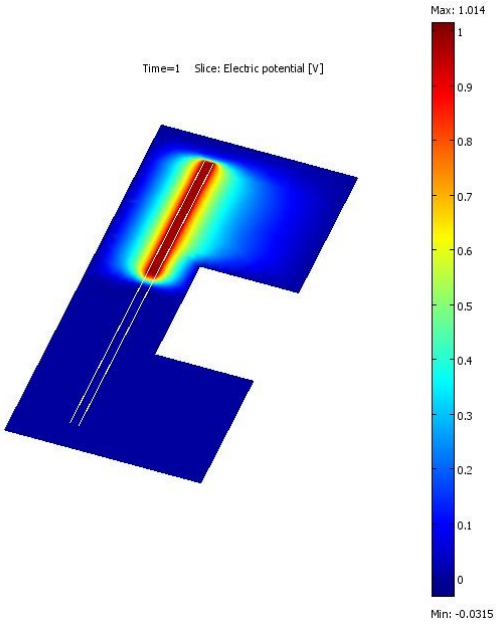

Figure 3 - Action potential propagation inside of axon at 1s.

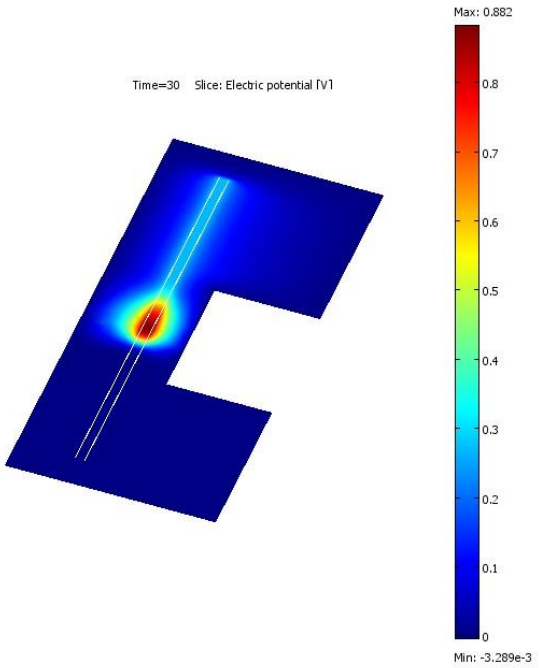

Figure 4 - Action potential propagation inside of axon at 30s.

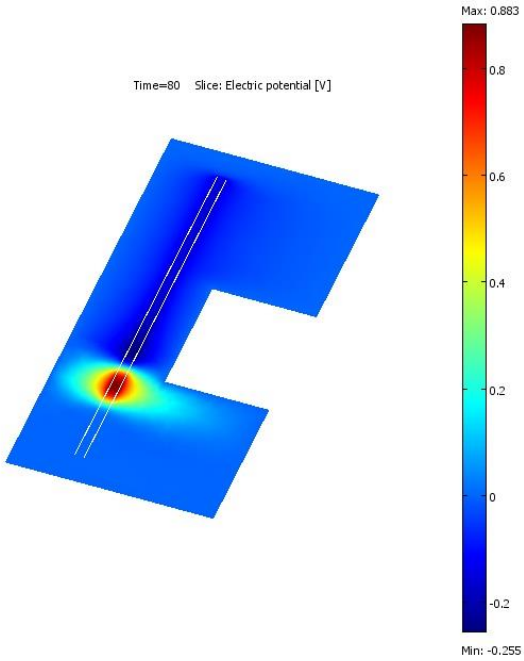

Figure 5 - Action potential propagation inside of axon at 80s.

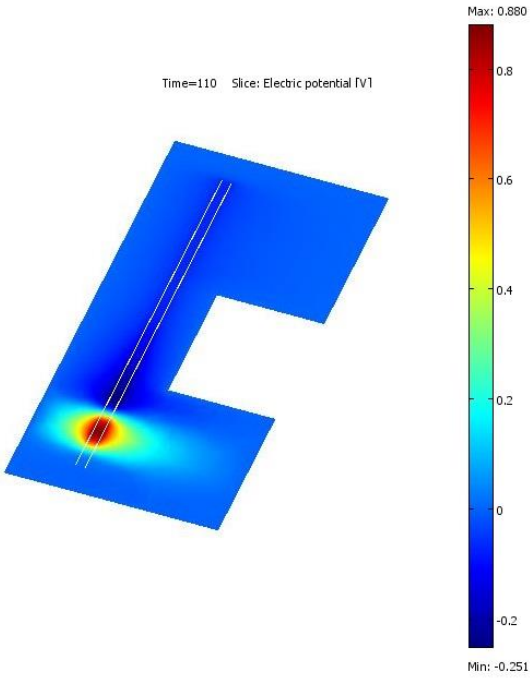

Figure 6 - Action potential propagation inside of axon at 110s.

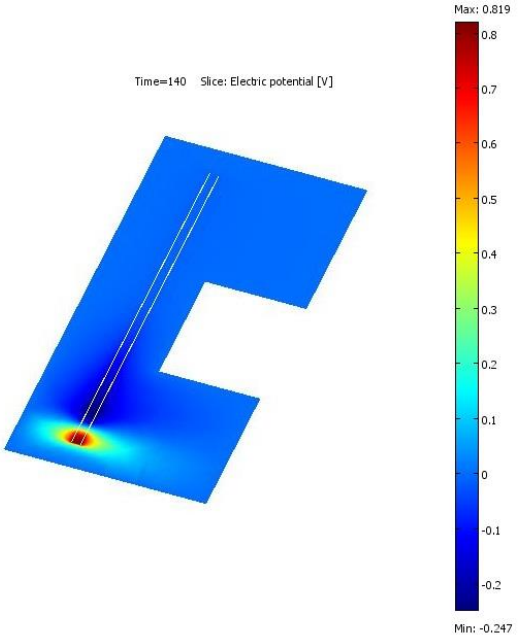

Figure 7 - Action potential propagation inside of axon at 140s.

B) Quartz micro probe results:

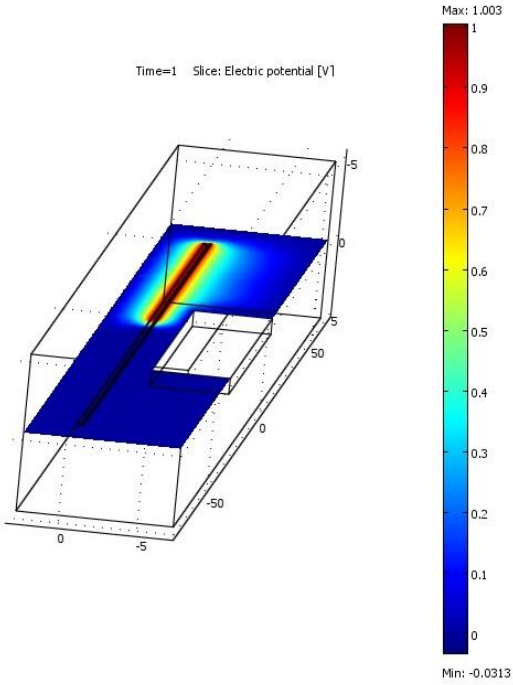

Figure 8 - Action potential propagation inside of axon at 1s.

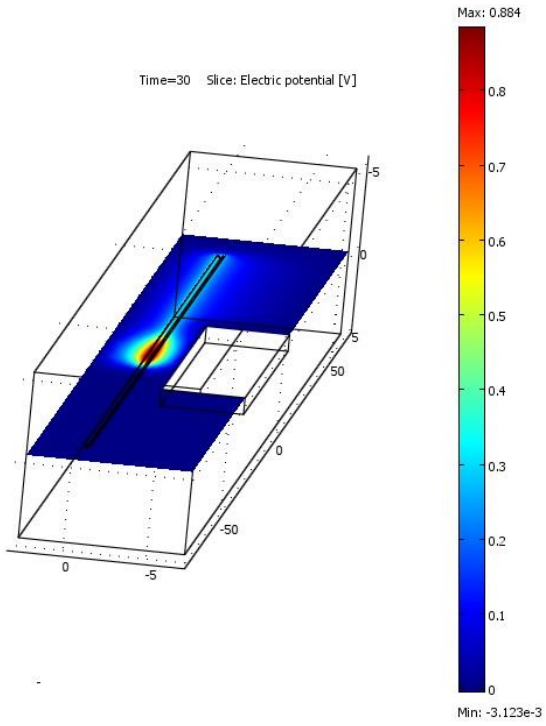

Figure 9 - Action potential propagation inside of axon at 30s.

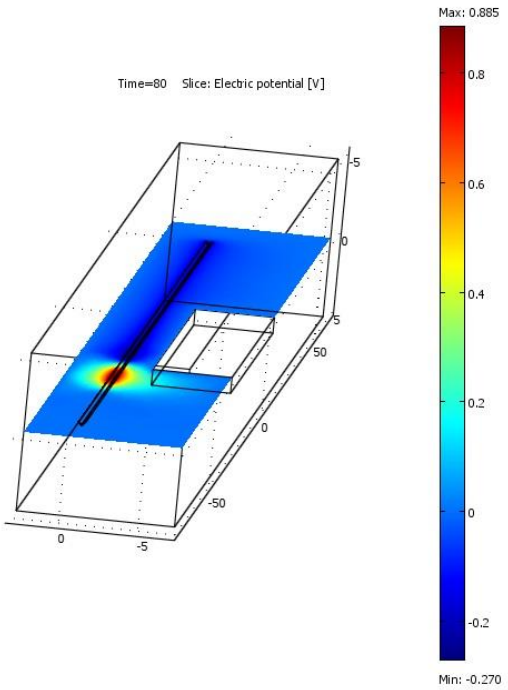

Figure 10 - Action potential propagation inside of axon at 80s.

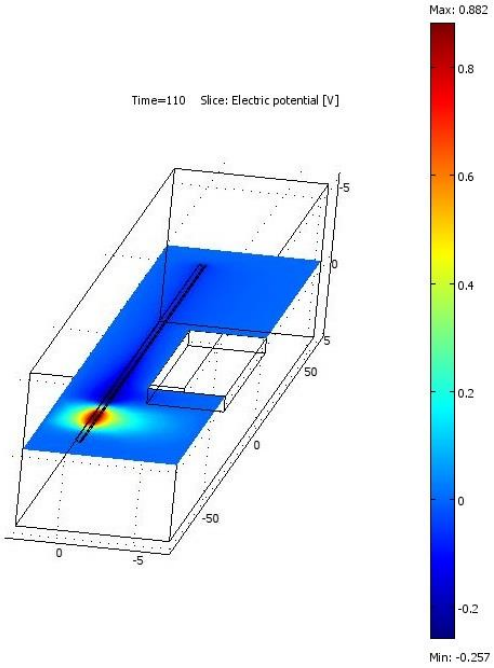

Figure 11 - Action potential propagation inside of axon at 110s.

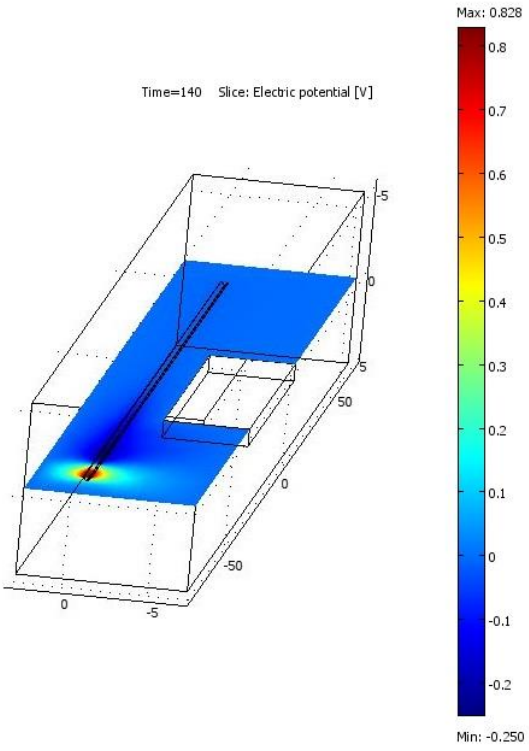

Figure 12 - Action potential propagation inside of axon at 140s.

CONCLUSION

In this paper, we design a piezoelectric blade made of Lead Zirconate Titanate and Quartz. Part of this blade is placed in ionic environment. Since the ionic environment should be similar to the human body and the space around nerve cells so it is made of saline matter. By applying the voltage source to outer side of blade, the blade start to vibrate and this lead to displacement of the sodium and chloride ions, when these ions move inside of ionic environment, a current created. By applying this current as input to Fitzhugh nagumo model, the wave of action potential

generated and at different times propagated inside of axon and transmite the neural messages over the length of axon. In this simulation, by comparing the obtained results of Lead Zirconate Titanate and Quartz, It can be concluded that despite the proximity of the action potential wave voltage values, less dense materials such as quartz can be used in acoustic micro probe designation in order to nerve stimulation.

APPENDIX

Table 1

Constants for Fitzhugh Nagumo equations that used in the simulation[10].

Name	Value	Describtion
α	0.1	Excitation threshold [V]
β	0.75	System Parameter
γ	1	System Parameter
δ	0	System Parameter
ε	0.01	Excitability
d	1	Off-axis shift distance [m]
V_0	1	Electric potential
nu_0	0.025	Relaxtion value

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