SOI: 1.1/TAS
DOI: 10.15863/TAS
Scopus ASJC: 1000

ISSN 2308-4944 (print)
ISSN 2409-0085 (online)

№ 10 (90) 2020

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

Philadelphia, USA

Teoretičeskaâ i prikladnaâ nauka

Theoretical & Applied Science

10 (90)

2020

International Scientific Journal

Theoretical & Applied Science

Founder: **International Academy of Theoretical & Applied Sciences**

Published since 2013 year. Issued Monthly.

International scientific journal «Theoretical & Applied Science», registered in France, and indexed more than 45 international scientific bases.

Editorial office: http://T-Science.org Phone: +777727-606-81

E-mail: T-Science@mail.ru

ISSN 2308-4944

9 772308 494201 10

International Scientific Journal

Theoretical & Applied Science

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International Scientific Journal

Theoretical & Applied Science

ISJ Theoretical & Applied Science, 10 (90), 470.
Philadelphia, USA

Impact Factor ICV = 6.630

Impact Factor ISI = 0.829
based on International Citation Report (ICR)

The percentage of rejected articles:

ISSN 2308-4944

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 30.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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IDENTIFICATION AND SAFETY ASSESSMENT OF GOODS FROM POLYSTYRENE

Abstract: *It is established that the studied samples of polystyrene goods contain different types of organic and macromolecular structures. The ratios of substances in the composition of polyethylene materials were identified using the methods of IR spectroscopy, viscometer, density and PTR.*

Key words: *Commercial nomenclature of foreign economic activity, classification, polyolefin, IR spectroscopy, viscometer, density and PTR.*

Language: *English*

Citation: Khamrakulov, G., Sarimsakov, A., Khamrokulov, M., & Abdulakimov, I. (2020). Identification and safety assessment of goods from polystyrene. *ISJ Theoretical & Applied Science, 10 (90),* 301-306.

Soi: http://s-o-i.org/1.1/TAS-10-90-51 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.51

Scopus ASCC: *2200.*

Introduction

Goods manufactured by the chemical and as well as with the related industries have more significant share of products and usually are the subject of export-import trade operations. There are raw materials and various substances among them which are used in industrial production, as well as a large number of industrial and domestic products. In the commodity nomenclature of foreign economic activity of the Republic of Uzbekistan, these goods are concentrated in sections V-VII (groups 25-40).

The polystyrene which has been researched is classified in heading 3903 TN [1].

3903	Styrene polymers in primary forms:
	- polystyrene:
3903 11 000 0	- foaming
3903 19 000	- other:
3903 19 000 1	--- freon-resistant
3903 19 000 9	--- other
3903 20 000 0	- styrene acrylonitrile copolymers (SAN)
3903 30 000 0	- copolymers of acrylonitrile butadiene styrene (ABS)
3903 90	- other:
3903 90 100 0	- a copolymer of only styrene and allyl alcohol, with an acetyl number of 175 or more
3903 90 200 0	- brominated polystyrene containing 58 wt.% or more, but not more than 71 wt.% bromine, in one of the forms mentioned in Note 6(b) to this group
3903 90 900 0	- other

This heading also covers polystyrene and styrene copolymers. The most important copolymers of styrene are copolymers of styrene acrylonitrile (SAN), copolymers of acrylonitrile butadiene styrene (ABS), copolymers of styrene butadiene. Most copolymers of styrene and butadiene with a high content of butadiene meet the requirements of note 4 to group 40 and therefore are included in group 40 as synthetic rubber. [1]

In the examination of these materials a large role belongs to their identification. This is important not only for raw materials and semi-finished products, but also for finished products, since they are all characterized by a diverse composition.

Due to its valuable properties, polystyrene is used to produce a wide range of consumer goods. Like hard plastic, it is often used in products requiring transparency, such as food packaging and laboratory glassware. In combination with various dyes, additives or other plastics, polystyrene is used for the manufacture of appliances, electronics, automotive parts, toys, garden pots and other equipment.

2 MATERIAL AND METHODS

Polystyrene is also converted into a foam called polystyrene foam (EPS) or extruded polystyrene (XPS), which is valued for its insulating and cushioning properties. Expanded polystyrene can contain more than 95 percent of air and is widely used for insulation of homes and household appliances, lightweight protective packaging, surfboards, packaging for catering and food products, automotive parts, road stabilization systems and etc.

Non-foamed polystyrene is a colorless, transparent thermoplastic material that is widely used in the electrical and radio industries. It is also used in packaging, for example, food and cosmetics. It is also used in the manufacture of toys, watch cases and phonograph records.

Styrene and acrylonitrile (SAN) copolymers, which have high tensile strength, are well formed and have high chemical resistance, are used to make cups and glasses, typewriter keys, refrigerator parts, oil filter containers and some items of kitchen equipment. Copolymers of acrylonitrile, butadiene and styrene (ABS), which have high impact resistance and weather resistance, are used in the manufacture of parts and auxiliary parts of vehicle bodies, refrigerator doors, telephones, bottles, shoe heels, cases and cases of various apparatus and equipment, water pipes , building panels, ships, etc.

The problems of the classification of goods in accordance with the commodity nomenclature of foreign economic activity are common to all types of products. However, it is worth noting that when assigning certain types of goods to high-tech industries (chemical products) to a certain Harmonized system (HS) code, experts have additional difficulties due to the need to use special technological knowledge, which leads to errors in determining the subheading of the goods. [5]

Polystyrene is classified on several bases (Table 1). [2]

Table 1.

By stereoisomer	By the method of obtaining	By appointment
1. Atactic 2. Isotactic 3. Syndiotactic	1. emulsion polystyrene (PSE) 2. suspension polystyrene (PSS) 3. block polystyrene (PSB)	1. high impact polystyrene 2. transparent or general purpose polystyrene 3. extruded polystyrene foam

Nowdays there are several varieties of polystyrene and all of them have the same formula. The nature of the spatial arrangement of benzene rings relative to the molecular chain distinguish: (table 2)

- atactic (amorphous) polystyrene;
- isotactic polystyrene;
- syndiotactic polystyrene.

Table 2. Physical and chemical and thermal properties of atactic, isotactic and syndiotactic polystyrene

Name	T_m ^0C (melting)	The density of crystals, g/cm^3	Molecular weight distribution range, $x10^3$	T_g ^0C (glass transition)
Isotactic Polystyrene	240	1,111	150-710 (Toluene, 30 ^0C)	~90
Syndiotactic Polystyrene	270	1,03	150-710 (Toluene, 30 ^0C)	~90
Atactic Polystyrene	190-230	-	30-700 (benzene, 25 ^0C) 10-1600 (Toluene, 25 ^0C)	~90

The test samples were taken in the form of granules. Using UR spectroscopic analysis, PS-525 polystyrene grades (OAO Nizhnekamskoilchemistry) were studied (Fig. 1).

Grade 525 - polystyrene for the manufacture of injection molded products and the production of coatings by joint extrusion. Designed for the malnufacture of medical and laboratory products, cups and jewelry boxes. The melt rheology of the present polymer allows the coating of cups, plates and other disposable tableware. [3]

Using the Fourier method, IR spectrometry was used to identify the functional groups of isotactic polystyrene (Fig. 1). IR spectra were recorded and processed on a Perkin Elmer Spectrum Version 10.4.3 IR Fourier spectrometer with a resolution of 4 cm^{-1} in the frequency range from 4000 to 400 cm^{-1}.

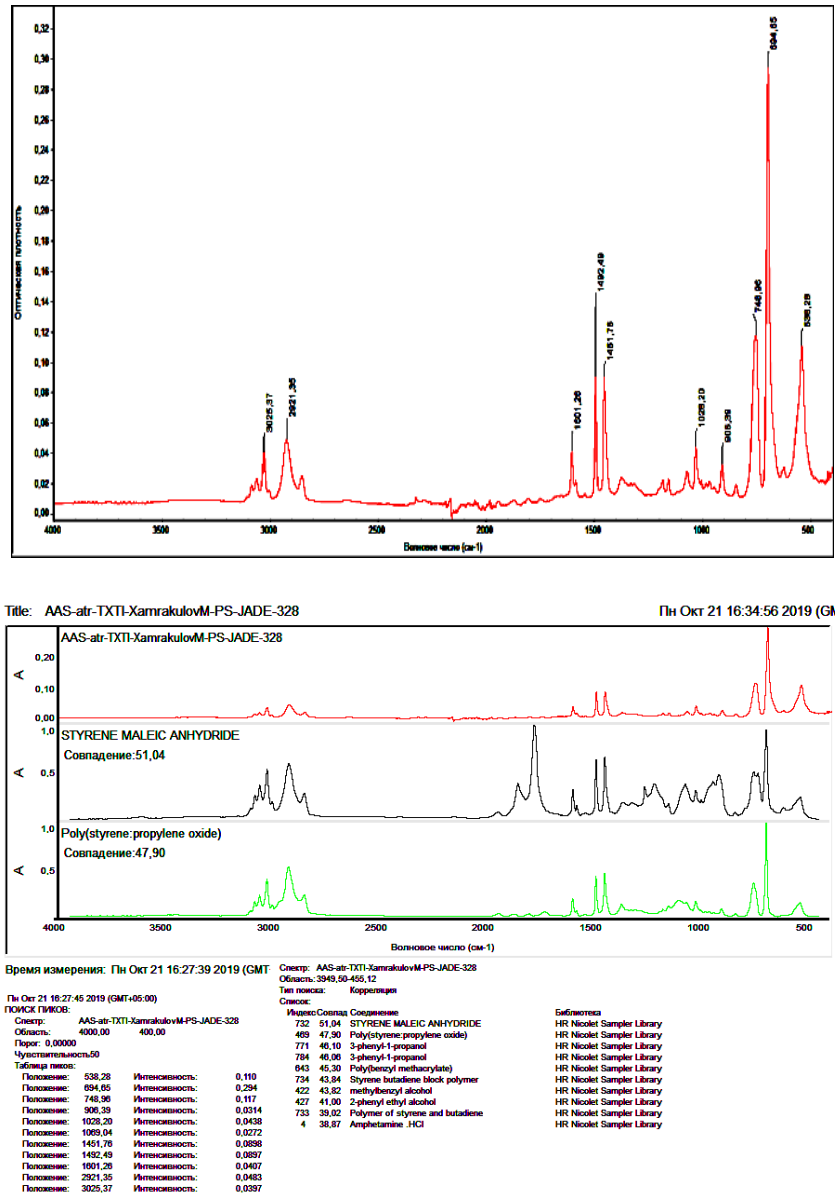

Fig. 1. IR spectrum of PS-525 polystyrene brand

3 RESULTS ACHIEVED

Table 3. Characteristic frequencies for some functional groups [4]

Frequency range (cm^{-1})	The assignment
~3400	OH stretching vibrations, deformation vibrations in vinyl alcohol
2920-2935	Asymmetric stretching vibrations ofaliphatic CH_2 groups
1580-1620	Mostly C=C stretching vibrations of aromatic rings
~1560, ~1410	C=O stretching symmetric and asymmetric vibrations in RCOO-
1450-1470	Deformation vibrations of aliphatic CH_2,CH_3 groups
~1240	C=O stretching vibrations in $CH_3C(O)=OR$
830-940	Symmetric and asymmetric C-O-C stretching vibrations in aliphatic ethers

The main features of the classification of carbochain polymers in primary forms are: type of polymer, specific gravity, structure, physical properties, composition, shape and size of granules, state of aggregation, hydroxyl number, purpose.

4 DISCUSSIONS

Since the polystyrene studied in the research is a different type of polystyrene, its detailing in accordance with the stereoisomers should be performed in 11-digit numbers and not in 10-digit numbers of the commodity of goods in foreign economic activity of Republic of Uzbekistan. For this reason, it was proposed in the dissertation to clarify the commodity of goods in foreign economic activity codes for isotactic, syndiotactic, atactic and other types of polystyrene, namely a separate subsubposition of goods

As a result of studies using customs examination for polystyrene in primary forms, the following new code numbers for commodity nomenclature of foreign economic activity of the Republic of Uzbekistan are recommended. (table 4).

Table 4. Recommended code numbers for polystyrene in primary forms according to the Commodity Nomenclature of Foreign Economic Activity (in a new subheading)

Recommended product codes for the Commodity Nomenclature of Foreign Economic Activity	Name
39031100091	Isotactic PS
39031100092	Syndiotactic PS
39031100093	Atactic PS
39031100099	other types of polystyrene

Classification and coding systems for goods are necessary for the automated processing of product information in various fields of activity, for the study of consumer properties, the safety and quality of goods, the accounting and planning of goods turnover, the improvement of the standardization system for product certification and marketing research.

The safety of polystyrene, especially when it and its derivatives are used in the food industry as packaging material, is primarily assessed by the amount of residual monomer in the structure of polystyrene. This is due to the fact that polystyrene gets through a polymerization reaction of a monomer - styrene in a liquid state having a sufficiently high boiling point. Often, the polymerization reaction is carried out at a temperature below its boiling point and, as a result, a certain amount of styrene monomer remains in the polystyrene structure. Often this amount of styrene is below the maximum allowable concentration (table 5.). However, given the high toxicity of styrene, it is necessary to strictly control its concentration in polystyrene products, depending on the areas of practical application and operating conditions. Polystyrene is often used as a disposable food package, such as disposable tableware and food packaging containers. At the same time, if packaged food products contain water, oils, fats and protein products with a limited shelf life, then the possibility of migration of styrene into food products into water of low rate of migration is excluded. [6]

Table 5. Sanitary rules and hygiene standards for packaging and closures [7]

Name of material	Controlled indicators	Allowable migration, mg1	Maximum permissible concentration in water, mg1	Hazard Class	Maximum permissible concentration in the air, mg/m^3	Hazard Class
Polystyrene plastics:						
block polystyrene shockproof	Styrene	0,010	-	2	0,002	2
	Alcohols					
	methyl	0,200	-	2	0,500	3
	butyl	0,500	-	2	0,100	3
	Formaldehyde	0,100	-	2	0,003	2
	Benzene	-	0,010	2	0,100	2
	Toluene	-	0,500	4	0,600	3
	Ethylbenzene	-	0,010	4	0,020	3

Stabilizers are introduced into polymeric materials in very small amounts from 0.01 to 1%. The possibility of human contact with them, as well as food, cosmetics, water, lasts throughout the life of a person. Therefore, given the wide variability of individual sensitivity to chemical agents, the danger of a number of stabilizers penetrating through damaged skin, as well as the possibility of an allergic, carcinogenic, and mutagenic effect, their choice for synthetic materials should be carried out only after appropriate hygienic assessment. [8]

Stabilizers are added to polystyrene plastics in order to inhibit their aging under operating conditions. If polymeric materials are intended for technical purposes, then there is no reason to limit the list of chemicals used as stabilizers. [9]

Under the condition of heating foodstuffs in polystyrene packaging, the rate of migration of styrene into foodstuffs increases several times and in such conditions it is not permissible to use polystyrene packaging materials. [10]

Wine and vodka products are not allowed to be packaged in polystyrene containers, since due to the good solubility of styrene in alcohol-aqueous media, its migration rate increases hundreds of times.

5 CONCLUSIONS

In addition to the above, upon receipt of expanded polystyrene and its larger number of copolymers of various compositions, when using plasticizers in each case, taking into account possible applications, it is necessary to develop special methods for controlling the safety of polystyrene products.

Thus, materials in contact with foodstuffs must comply with the Hygienic standard “Maximum allowable quantities of chemicals in contact with foodstuffs” according to hygienic safety indicators. The values of hygienic standards indicated in them are the main evaluation criteria when conducting studies of materials.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.997	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 30.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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IDENTIFICATION AND CONTROL OF THE POLYOLEFIN CODE ON THE COMMERCIAL NOMENCLATURE OF FOREIGN ECONOMIC ACTIVITY

Abstract: *It is established that the studied samples of polypropylene goods contain different types of organic and macromolecular structures. The ratio of substances in the composition of polyethylene materials was identified using IR spectroscopy, density, MFR. As a result, we recommended new CN FEA code numbers for polypropylene to protect Uzbekistan's economic interests in international relations.*

Key words: *Commercial nomenclature of foreign economic activity, export-import, polyolefin, stereoisomers of polypropylene, identification, IR spectroscopy, melting point, density.*

Language: *English*

Citation: Khamrokulov, M., Xasanova, D., Ibragimov, T., & Kamolova, M. (2020). Identification and control of the polyolefin code on the commercial nomenclature of foreign economic activity. *ISJ Theoretical & Applied Science, 10 (90),* 307-312.

Soi: http://s-o-i.org/1.1/TAS-10-90-52 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.52

Scopus ASCC: *2200.*

Introduction

Polyolefin penetrated all the dominant sectors of the economy: electronics, electrical engineering, mechanical engineering, automotive, instrument making, transportation, construction. Today, the chemical industry of Uzbekistan, with significant production, raw materials and scientific and technical potential, is one of the leading basic sectors of the country's economy. According to experts, the estimated annual growth rate of the global chemical industry will be 2.7%, and by 2030 the global market for chemical products will reach 4391 thousand billion US dollars. [1]

In Uzbekistan, polypropylene consumption is growing year after year. Polypropylene export in 2018 amounted to 23,443.4 tons (25,459.5 thousand US dollars). And also, the import of polypropylene in 2018

amounted to 36,977.0 tons (49,752.2 thousand US dollars) (table-1). [2]

The identification and classification of polypropylene in primary forms and products made of them is in most cases accompanied by the involvement of experts or qualified specialists in the relevant field of knowledge, since the code control of such goods according to the HS of the Republic of Uzbekistan is difficult due to the specificity of the classification criteria and the lack of a comprehensive information base.

Table 1.

Export	**3902100000 – Polymers of propylene or other olefins in primary forms: polypropylene**					
	2016 y.		**2017 y.**		**2018 y.**	
	number, in tons.	thousand dollars USA	number, tons.	thousand dollars USA	number, tons.	thousand dollars USA
	60 628,7	47 291,3	49 992,3	44 743,5	23 443,4	25 459,5
Import	**3902100000 – Polymers of propylene or other olefins in primary forms: polypropylene**					
	65 591,8	93 293,3	47 653,6	52 531,8	36 977,0	49 752,2

The application of the procedural mechanism of interaction with expert organizations lengthens the timeframes for decision-making; many issues arising in the process of customs control of polypropylene in primary forms and products from them can basically be resolved on the spot. In practice, in most cases, an examination is appointed to identify any material from which the goods are made, and the expert opinions obtained are used to secure. [3]

2 MATERIAL AND METHODS

VII section of the HS of the Republic of Uzbekistan “Plastics and products from them; rubber, rubber and articles thereof” is intended for the classification of goods from plastic and rubber, both raw materials and products of their processing. The basic principle of the construction of the section is the chemical composition of the goods. This section includes two groups 39 and 40. The general criterion for assigning goods to the group of the section is the structure - these are polymers, the difference is according to the criterion for the presence of elastic properties. [4]

The main features of the classification of plastics in primary forms are: type of polymer, specific gravity, structure, physical properties, composition, shape and size of granules, state of aggregation, hydroxyl number, and purpose. [5]

3902	Polymers of propylene or other olefins in primary forms:	
	3902 10	- polypropylene
	3902 20	- polyisobutylene
	3902 30	- propylene copolymers
	3902 90	- other

Today there are several varieties of polypropylene, all of them have the same formula, but differ in spatial molecular structure: isotactic, syndiotactic, atactic.

The stereoisomers of polypropylene (isotactic, syndiotactic, atactic and stereoblock) significantly differ in mechanical, physical and chemical properties.

Atactic polypropylene is a rubbery product with high fluidity, melting point ~ 80 ° C, density 0.85 g / cm3, it is well soluble in diethyl ether and in cold k-heptane.

Isotactic polypropylene in its properties compares favorably with atactic; in particular, it has a higher modulus of elasticity, a higher density (0.90-0.91 g / cm3), a high melting point (165-170 ° C) [6], better resistance to chemicals, etc. n. In contrast to the atactic polymer, it is soluble only in certain organic solvents (tetra line, decal in, xylene, toluene), and only at temperatures above 100 °C. The X-ray stereo block polymer of polypropylene exhibits certain crystallinity, which cannot be as complete as that of purely isotactic fractions, since atactic sites cause disturbances in the crystal lattice. [7]

3.8 billion cubic meters of marketable gas, 387 thousand tons of polyethylene, 83 thousand tons of polypropylene are produced at the Us yurt gas chemical complex at the Surge field. According to international news agencies, the demand for polypropylene - the second most abundant polymer in the world - is increasing by 4-6% annually. In 2017, world consumption of polypropylene exceeded 69 million tons.

At the moment, Uz-Cor Gas chemical complex has produced the following grades of polypropylene (table-2): [8]

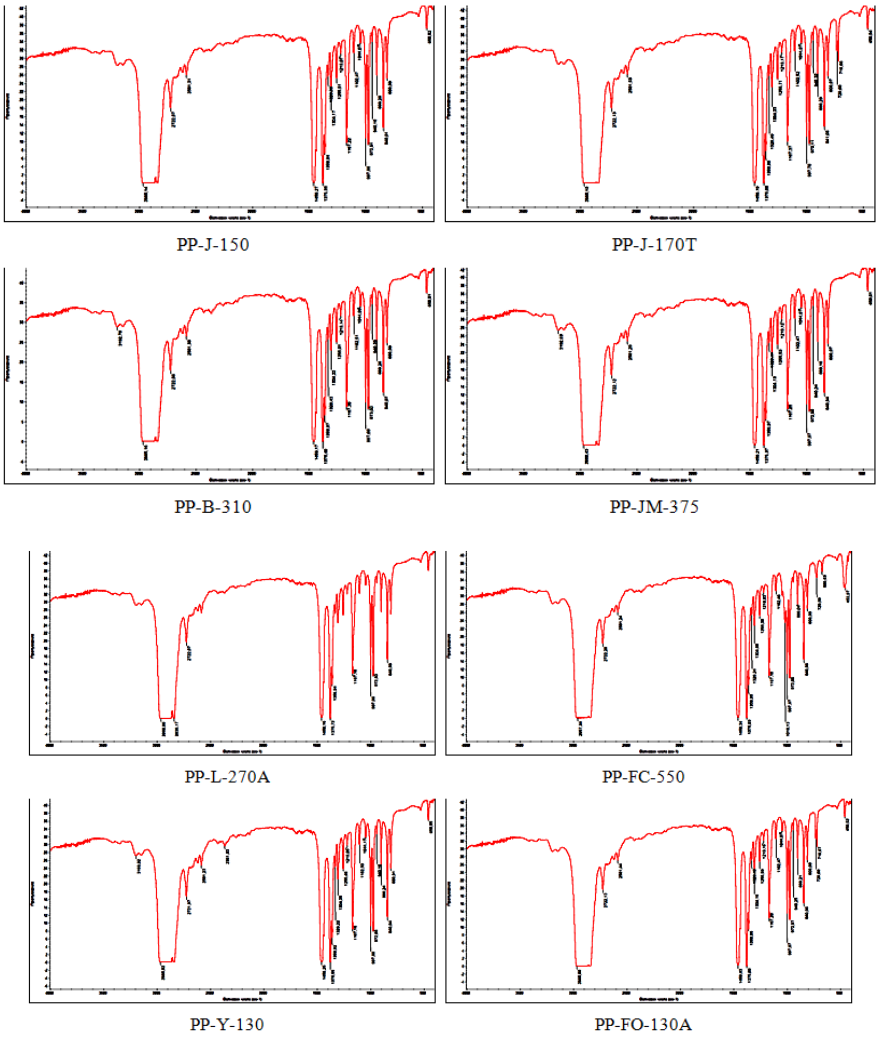
Table 2.

Brand	Density, g/cm^3	Flow rate, g/10min	Melting point, ^{0}C	Application
Injection				
J-150 PP H	0.85~0.95	8-12	160	Household goods
J-170T PP H	0.85~0.95	23-33	160	General household goods, stationery, disposable syringes
J-330 PP B	0.85~0.95	3-5	160	Household goods (spoons, cups), stationery, toys
J-350 PP B	0.85~0.95	8-12	160	Battery cases, housings for household appliances
J-360 PP B	0.85~0.95	14-22	160	Battery cases, housings for household appliances
J-370 PP B	0.85~0.95	30-40	160	Large Injection Products, Household Electrical Appliances
JM-375 PP-B	0.85~0.95	40-50	160	Large Injection Products, Household Electrical Appliances
J-550S PP R	0.85~0.95	10-14	160	Cosmetic containers, cups, food containers, transparent cases, stationery, disposable syringes, CD/DVD cases, etc.
Blown				
B-310 PP-B	0.85~0.95	0.4-0.6		Chemical bottles, food trays, etc.
B-520 PP-R	0.85~0.95	1.8-2.2	140	Gum Bottles, Detergent bottles, Cosmetic Bottles
B-320 PP-B	0.85~0.95	0.8-1.2	160	Industrial sheets, food packaging trays, etc.
Yarn Fibers				
Y-120 PP H	0.85~0.95	0.8-1.2	160~165	Monofilament yarn
Y-130 PP H	0.85~0.95	3-5	160~165	Monofilament yarn
FR-160 PP H	0.85~0.95	15-19	155~165	Multi-thread tapes
FR-170H PP H	0.85~0.95	24-27	155~165	Multiti, BCF, staple fiber
Film				
FO-130A PP H	0.85~0.95	2.8-3.2	155~165	Oriented for General Purpose Films
FC-550 PP R	0.85~0.95	7-9	155~165	Thermo-adhesive layer for non-oriented films
FI-151 PP H	0.85~0.95	7-9	155~165	General Purpose IOPP Films, Shrink Films
L-270A PP H	0.85~0.95	24-28	155~165	Kraft paper coating

Using the Fourier method, IR spectrometry was used to identify the functional groups of stereoisomers of polypropylene (Fig. 1). IR spectra were recorded and processed on a Perkin Elmer Spectrum Version 10.4.3 IR Fourier spectrometer with a resolution of 4 cm^{-1} in the frequency range from 4000 to 400 cm^{-1}.

3 RESULTS ACHIEVED

Fig. 1. IR spectra of stereoisomers of polypropylene



4 DISCUSSION

The analysis of the IR spectrum of PP grades showed that in the region of the highest frequencies (2950–2970 cm^{-1}) there are bands corresponding to stretching vibrations of aliphatic CH3 groups (table-3). Among the various combinations of bands used as isotactic indices, the ratio of peak areas of 998 cm^{-1} to 973 cm^{-1} is one of the most common.

Table 3. Characteristic frequencies for some functional groups [9]

Frequency Range (cm^{-1})	Attribution
2950-2970	Valence asymmetric vibrations of aliphatic CH_3 groups
2600-3100	O-H stretching vibrations in H-bonded RC(O)O-H
1450-1470	Deformation vibrations of aliphatic CH_2, CH_3 groups
~1240	C-O stretching vibrations in $CH_3C(O)=OR$
1000-1250	C=S stretching vibrations
985-995	CH deformation vibrations in $RHC=CH_2$
800-900	Mostly C-C deformation vibrations

To interpret the vibrational spectra of polymers, it is necessary to know the spectral repeating chain link, i.e. such a unit from which the whole macromolecule can be built by certain operations of symmetry. Sometimes this unit coincides with the monomer unit of the chain (isotactic polypropylene), in some cases it contains two monomer units (syndiotactic polypropylene, polyacrylonitrile) or includes only

"half" of the small unit (polyethylene). When analyzing the spectrum, it should be borne in mind that the number of characteristic vibrations for a given chemical group will be different depending on whether this group belongs to a polymer or non-polymer molecule. For example, consider the characteristic vibrations of the —CH_2— group. In the non-polymer CH_2Cl_2 molecule, the CH_2 group is characterized by three characteristic vibrations: two stretching vibrations in the range of 2940–2915 cm^{-1} and 2885–2860 cm^{-1} and one deformation vibration in the range of 1480–1460 cm^{-1}. In a polymer molecule containing —CH_2— groups, one should expect six characteristic vibrations: twice the number of the three characteristic vibrations mentioned above, polarized, however, in different ways — parallel and perpendicular to the axis of the chain.

The results of experimental work allow us to classify polypropylene in primary forms by molecular structure.

5 CONCLUSIONS

In conclusion, it should be noted that the study of the classification of polypropylene polymers according to their physicochemical composition can clarify some controversial issues of the HS of the Republic of Uzbekistan. And also it can be noted that, the studied brands of polypropylene are classified by heading 3902 TN FEA RUz. [4]

The development of new product codes makes it possible to protect the economic interests and security of the economy of Uzbekistan in international relations.

As a result of studies using customs examination for stereoisomers of polypropylene in primary forms, the following new code numbers for CN FEA are recommended. (table 4).

Table 4. Recommended code numbers for stereoisomers of polypropylene in primary forms according to the Commodity Nomenclature of Foreign Economic Activity (in a new subheading)

Recommended CN codes	Type of polypropylene	T_m, ^0C	Density, g/cm^3	The density of crystals, g/cm^3	The range of molecular weight distribution, $x10^3$
3902 10 000 1	Isotactic PP	165	0,90-0,91	~0,94	50-630 (1-chloronaphthalene, 145 ^0C) 20-620 (decalin, 135 ^0C)
3902 10 000 2	Syndiotactic PP	155	0,86-0,89	0,93	90-450 (heptane, 30 ^0C)
3902 10 000 3	Atactic PP	~80	0,85	-	20-40 (heptane, 30 ^0C)

The listed varieties of polypropylene in chemical composition include polypropylene consisting of carbon and hydrogen. However, they differ significantly in molecular weight, structure, density, melting point, price and other properties associated with the conditions of their production, their application areas.

Thus, for the identification and classification of stereoisomers of polypropylene during examination, it is sufficient to test them in accordance with the parameters given in tables-4.

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Impact Factor:					
	ISRA (India) = **4.971**	**SIS** (USA) = **0.912**	**ICV** (Poland) = **6.630**
	ISI (Dubai, UAE) = **0.829**	**РИНЦ** (Russia) = **0.126**	**PIF** (India) = **1.940**
	GIF (Australia) = **0.564**	**ESJI** (KZ) = **8.997**	**IBI** (India) = **4.260**
	JIF = **1.500**	**SJIF** (Morocco) = **5.667**	**OAJI** (USA) = **0.350**

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 26.10.2020 **http://T-Science.org**

QR – Issue **QR – Article**

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TAX AND ZAKAT COLLECTION SYSTEM OF THE BUKHARA EMIRATE DURING THE 19TH CENTURY

Abstract: *At the end of the nineteenth century, the Emirate of Bukhara had a land size bigger than Spain and Portugal. It consisted of a variety of geographic and climatic areas from desserts to mountainous areas. The centre of the Emirate was three oases and they formed the economic, political and socio-cultural hubs of the Emirate with the capital of city Bukhara. This article is depicting the zakat and other taxation systems that were functioning during the 19th century in the Bukhara emirate.*

Key words: *Bukhara, tax, zakat.*

Language: *English*

Citation: Ganiyev, A., & Zinatullayev, Z. (2020). Tax and zakat collection system of the Bukhara emirate during the 19th century. *ISJ Theoretical & Applied Science, 10 (90),* 313-317.

Soi: http://s-o-i.org/1.1/TAS-10-90-53 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.53

Scopus ASCC: *1202.*

Introduction

After taking over Samarkand, the Russians fully controlled the flow of the river Zerafshan. In 1870, due to the lack of water flow from the river of Zerafshan, the agriculture lands of the Emirate of Bukhara suffered crop failures and this affected the welfare of the society, which led to famine among the population in the following years. Regarding this problem, a meeting was held in Samarkand in 1872. Three representatives from each side met the major General Abramov a commandant of the Zerafshan Okrug at that time to settle the issue of water shortage in the river of Zerafshan, especially on the side of the Bukhara Emirate. Because of the negotiations, they decided to replace the control systems old-water flow. The source of funding was the annual taxes collected from the users of the water. Earlier, before the Russian's conquest, these collected taxes were spent on the maintenance of the irrigation systems of the river Zerafshan. This time, the collected funds were spent on repair works, which were conducted under the control of the Russians. Eventually, the Emirate lost most of its territories and its political power. In ruling the state, the Emir became dependent upon the Russian empire, and by 1873, the Emirate of Bukhara became a Russian Protectorate. However, after the death of the Emir Muzaffar, when his son Emir Sayid Akhad Bahodir Khan came to the throne, the Russians did not interfere with the internal affairs of the Emirate and let the Emir rule his state independently. The Emir resided in the city of Kermine. The most common occupations of Iranians living in Central Asia, were silk weaving (shaibofi), confectionery (confectionery), sale of medicinal cumin (attori) and jewelry (jewelry). [9, P. 86]

ANALYSIS OF THE ZAKAT SYSTEM THAT WAS FUNCTIONING DURING THE 19TH CENTURY IN THE BUKHARA EMIRATE

From ancient times, Central Asia has been in the spotlight of many rulers, invaders and historians with its temperate climate, fertile lands, fertile gardens, and richness of underground mines. In ancient times, the region was invaded by the Achaemenids, then by the Greco-Macedonians, and remained at the centre of political processes in the Middle Ages. [10, P.15] The fact that the main routes of the Great Silk Road pass through Central Asia has also increased the strategic importance of the region. Ancient cities such as Bukhara, Samarkand, Nasaf (Karshi), Termez, Khiva, Shosh (Tashkent) were known in the world as centers of science and culture in which Islamic civilization was developed. [6, P. 5] Even in the middle Ages, Bukhara was an economically developed, commercial and scientific centre. Ibn Hawqal, one of the medieval historians, writes: "If any district or region in the world has similar qualities to others, then they cannot be like Bukhara in abundance and abundance. The fruits of Bukhara are the best fruits of Movarounnahr, and the taste is also the sweetest. Although Bukhara is so overcrowded, due to its large population and population, the country's products do not reach them, as their needs are twice as high as the amount of land harvested. [11, P. 154]. After the conquest of Central Asia by the Arabs, a system of governance based on Islamic Sharia was established in the region. The devon, positions, salaries, as well as the tax system were also regulated by Sharia law. The tax system, such as jizyah, kharaj, ushur, and zakat, which existed in all Islamic countries in the middle Ages, was also established in Movarounnahr and has been in practice for thousands of years. In this article, we present a number of analyses of the tax and zakat system of the Emirate of Bukhara in the XIX century. "Zakat" for the Muslim is an obligation that comes from the Almighty and its importance is emphasised in the Qur'an and many Ahadith (Prophetic actions and sayings). The role of the zakat as a balancer in the society has been proved for many centuries since the spread of Islam. [2, P. 10] In Bukhara emirate, there were two main zakatchi, who respectively were given areas to administer. First zakatchi was responsible to administer the western part of the emirate, whereas another one was responsible of the eastern part of the emirate. Both had subordinates in districts totalling in number more than 30. Other zakatchi specialized in the zakat collections from the livestock and had to move around to identify farmers who had cattle. The importance of the zakat collectors' location was vivid due to the trade routes, which connected Russia, India and Afghanistan passed through Central Asia, and zakat on movable property was one of the most common types. Zakat collections from trade articles, livestock and land produces were among the most popular ones in Central Asia. [7, P.43] Before the Russian conquest, the zakat system function was under the control of the state administration. As Becker states, "The Government officials, such as *kush-begi* and subject to him were the *divan-begi* (finance minister and treasurer) and his subordinate the *zakatchi* [1]*-kalan* (in Bukhara emirate) or *zakatchi* (in Kokand khanate) administered the Zakat system." [1, P. 5]

Mejov observes, "Additionally, the owner of the caravan paid for every camel extra 20 kopeek (Russian cent) in order to receive the right to carry goods in the Kokand Khanate area without paying such amount for a year." Zakat was paid once a year, however, if the traded goods increased within less than a year, the owner was obliged to announce to the zakatchi about his increased goods amount and pay additional from the increased part the due zakat amount. The merchant, who brought his goods to trade again within a year, kept his caravan outside the city and met the zakatchi and if he paid his zakat due earlier that year, the zakatchi only re-calculated his goods amount and compared with his last zakat payment goods amount. [5, P. 201] Zakat on caravans was one of the most common in the Bukhara emirate, due to its active involvement in foreign trade. "Zakat collection stations were based in the city of Samarkand, Chalek and Katta-Kurgan. In Samarkand and Chalek zakat from all types of goods, which were heading to Russia and coming to Zerafshan valley was collected. Unlike in Katta-Kurgan, zakat was collected from caravans which goods were supposed to be sold only within this okrug" [4, P. 173]

In the Bukhara Emirate, every district had one responsible person who was the head of the tax collections. This person called *serker*, who had a team of subordinates in order to make a list of records of payers, with the information about the amount of payment as well as with actual collection itself. Afore-mentioned subordinate collectors were *darg, amin, mirza* and *jigit*[2]. Every *darg* was responsible for one *dakha*[3]. These *dakhas* existed until 1872 when the Russians changed their name into *volost* or village communities. In the Bukhara Emirate, such division into *dakhas*, enabled collectors to work in an easy way and collected taxes from all over the area within a given period. Most of the *dakhas* were under the

[1] A *Zakatchi* (pl. *Zakatchis*) – a person who is responsible to administer the zakat collections.
[2] *Jigit* - a term of Tatar origin used for mounted messengers, assistants, bodyguards
[3] *Dakha*-it is a small district that consist of few *kishlaks* (villages) and each of them had some type of economic or agricultural relations to each other.

control of the local police or *amin.* His role was to control the produce after it was collected and put into bundles before the *serker* came to measure them and assign the tax amount. He made sure that after the collection of the yield no one could steal or move part of the yield, in order to hide part of the produce that was due to *kharaj, tanab* or zakat. In some *dakhas,* these *amins* number depended on how big was the locality if the area was big; the number of *amins* reached up to four. The role of the *jigit* was designated as a messenger. In this way, in every *amlakstvo*[4], collection system came under the administration of the *serker* and his subordinates *darga, mirza and jigit* who assist him in anyways. However, they did not receive any wages from the collected money and it did not change after the Russians' arrival. The Russians re-established the collection of *kafsen*[5], and it was collected from farmers; then collected amount of *kafsen* was given to the collectors as a remuneration, which was around 10% of the collected taxes. As Sobolev points out, "In Zerafshan region, around 1000 people were involved in the collection of the aforementioned taxes. Moreover, many village *amins* and *aksakals* were involved." [8, P. 349] Most of the collectors were not assigned any fixed salary; however, they had to be given a certain amount from the collected money as a reward. In Zerafshan *okrug*[6] remuneration rate was 2.5% from the collected amount. However, Sobolev writes that the "Conquered regions by Russian in the earlier period, such as in Syr-Darya and Semirechensk *oblasts* were assigned remuneration of 5 to 10 % from the total collected amount." [8, P. 349] Russians explained a difference in the remunerations that in the Bukhara Emirate additional, wage for the collectors' *kafsen* was re-established, amounting up to 10% from the collected amount.

Every year, at the beginning of March, *serkers,* together with his assistants' march in their area of responsibility, in order to make a list of records on taxes to be collected. *Mirzas,* assistants of a *serker* prepared these lists. In order to receive a reliable list of records for taxes due, it was necessary to calculate the *tanab* and *kosh-pul* [7] lands in detail. All these countings were hard work to accomplish only by the *mirzas* alone in a whole district. It was important for the *mirza* to know the previous year's results, as to whether the irrigated land was the same size as compared to the previous year. The *tanabchi*[8] periodically calculated the land size. If a new canal was going to open, the *tanabchi* knew how many acres of land this waterway was capable to irrigate and they added the new dimensions to the previous year's results. Hence, the tax of *kosh-pul* was defined according to the new size of the land. For the *tanab* collected from the yield of fruits and vegetables, it was difficult to estimate the amount of the tax payment beforehand. Factors such as weather conditions and watering of the farmlands hindered the correct estimation of the expected yield. M*irzas* used this chance to visit every farmland, personally estimate expected yield, and pre-agree with the farmer the payment amount as *tanab.* These record lists were not always checked by the *serkers* due to their commitment with the other types of taxes. For example, right after the *tanab* collections record list was ready; the *serker* had to focus on the record list of the taxes to be collected from the *kharaj* lands. This records list was very detailed and every person who had even a small land was included in this record list.

Kharaj records lists were compiled in the following way: instructed by the *serkers,* the *dargs* had to make sure that the farmers in stacks and the bundles amassed yielded crops. *Darg* observed these compiled bundles, after that he requested farmers not to move or hide any yield. At the field, farmers had to grind their cereals, during the process *dargs* made sure everything went well. After the grinding process ended, *dargs* sealed every bundle of the wheat with special clay from four sides, to make sure that wheat would not be stolen. For their work, *Dargs* received as a remuneration a certain amount of wheat.

The amount of the yield which had to be collected as a tax to the treasury depended on the amount of the bundle and it was determined Sobolev points out that during the measurement occurred "…in the presence of *Serkers, mirzas, dargs, amin, aksakal,* local dwellers and some officials of the *Beg.* With the consent of the owner of the yield, the payment amount as *kharaj* written down in the *paygir* (records)." [8, P. 351] If the farmer had any hesitation regarding the due payment amount, his yield was re-measured and due payment written down in the list of records. The above-mentioned way of making the list of records on taxes was used for all types of yield upon their maturity. *Kharaji* records list was divided into two types: records of the white (*ok*) and blue (*kok*). The white record lists consist of the land produce, which ripened early, for instance, barley and wheat. The blue

[4] *Amlakstvo* – a district which was governed by the *serker*

[5] *Kafsen* – tax collected from farmers during the harvest and was intended to reimburse the collectors' expenses and payment for the work done

[6] *Okrug* – a military district

[7] *Kosh-puli*-its purpose served to generate funds to maintain the people who work to dug channels, improve the old channels and for related expenses. This type of tax charged two *Tenge* from one *kosh* of land during the Bukhara emirate under the Sha-Murad's time of reign (1772-1799).

[8] Tanabchi - land measurers, who has the skills to determine the size of the land accurately.

record list consisted of the yield ripen later, for example, corn, paddy and millet.

Collection of the *kharaj* from land produces were organized according to the list of records compiled by the *aksakals*, *amins*, *darga* and other relevant people appointed by the *serkers*, and all the collected amount brought to the *serkers.* Sobolev explains that: "When the Zerafshan region still was under the Bukhara Emirate, collected *kharaji* money were spent as wages to the employees, officers as well as military servants." [8, P. 349] In Zerafshan *Okrug*, at the beginning of the Imperial reign, the Russians did not manage to achieve success towards the taxation system administration, as they pursued. They did not want to hire land measurers (*tanabchi*), due to the extra costs and unavailability of the necessary funds to maintain the new system for collection. Even Russian researcher Sobolev concluded that it was better not to change the whole taxation system and study this system more in order to gain control over, in stages. Even though the local taxation and zakat system was more efficient than what the Russians could offer, of course, it also had some inaccuracies due to the human factor, but it was functioning better than after the Russian conquest. Nevertheless, in the minds of the conquerors, the question of taking control of this system existed. As a result, they could use the collected funds for their own purposes instead of the local society's benefit as used to be before their conquest. The afore-mentioned taxes and zakat formed the budget of the Emirate:

THE INCOME OF THE TREASURY CAME FROM THESE COLLECTIONS

Kharaj, *tanab*, *kosh-pul*, *Somon-pul* (*kharaji* collection from some wheat produce), *chob-pul* (tax collections from the usage of the public trees in order to feed the worms to produce the silk), collection from mills, rental collection, income from confiscated goods, zakat collections, customs tax, *atxana-puli* (tax collections from the caravans in order to feed their camels during their rest in the caravan sarays), tax collections for crossing from Zerafshan river, value added tax from tea, excise duty, postal income, road tax, income from wheat export, the land income, collection from households, *Mirob-onoy* (irrigation), distinctive collection, *kafsen* (collected to reimburse the collectors' expenses and payment for the work done).

From the Islamic perspective, collections from movable and immovable properties were considered as either *sadaqah*, zakat or tribute. *Kharaj* and *tanab* were established because of the origin of these lands, they were conquered and the usage of these lands by Muslim and non-Muslim. Kharaj is collected from the mulki lands as well. Kharaj collected was of the same rate as from the amlaki lands. These lands belonged to the state and collected kharaj served as a payment for the usage of the land of the state. Grebenkin points out that the "Kharaj collected from the mulki lands were in two types, first is kharaj-muvazef, which is definite and unchangeable. Second is kharaj-maqasima, its rate depends on the size of the produce. The first type of kharaj was taken from all lands whether; they are used or not used. This type of kharaj-muvazef was collected in the higher Zerafshan valley. Only in the Fan beglik, kharaj-maqasima and kharaj-muvazef existed at the same time." [3, P. 71]

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Impact Factor:					
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SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2020 **Issue:** 10 **Volume:** 90
Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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IDEOLOGICAL AND ARTISTIC FEATURES OF «ZARBULMASAL»

Abstract: *"Zarbulmasal" is a unique example of Uzbek prose art, as well as a unique original work in terms of structure, content, language, sharpness of artistic means. A great deal of attention has been given to this work by artistic people, as it's literary critics, originality in terms of content and ideological direction totally differs from other works. In this article, the ideological, artistic and historical features of "Zarbulmasal" are elucidated.*

Key words: *Gulkhani approach, ideological feature, artistic feature, literary environment, scientific-critical text, images of birds, eloquence of the writer, plot, folklore, originality.*
Language: *English*
Citation: Kodirova, S. A. (2020). Ideological and artistic features of «Zarbulmasal». *ISJ Theoretical & Applied Science, 10 (90)*, 318-320.
Soi: http://s-o-i.org/1.1/TAS-10-90-54 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.54
Scopus ASCC: *3304.*

Introduction

"Zarbulmasal" is a masterpiece that has passed down the name of Gulkhani from generation to generation and has given the poet an eternal place in the history of Eastern literature. Gulkhani is a writer who managed to create a beautiful and original work in the genre of parables in the literary environment of Kokand in the first half of the XIX century.

"Zarbulmasal" attracted the attention of Russian orientalists in the 80s of the XIX century. In 1890, it was published in the printing house of Kazan University and translated into Russian. It was once again translated into Russian by M. Sale in 1951. The translator relied on Soviet-era editions of the work. In 1948, R. Mukimov, a literary critic from Samarkand, summarized his work on Gulkhani and his literary heritage and defended his dissertation on "Life and literary activity of Gulkhani". In the scientific assessment of Gulkhani's work, the preface of the work states that it was written at the behest of Umarkhan. The patron of literature says that this image should be turned into a book by thinking deeply about the popular proverbs - folk proverbs, and considers Gulkhani worthy of this delicate service.

II.Analysis.

In order to better understand how and on what basis the scientific-critical text of the work is based, it is necessary to know and consider the history of the work, the reasons for writing, and then the content, ideological direction, the main plot. It is of paramount importance to have a certain idea about the composition, language, methodological features.

In the introductory part of the work, Gulkhani tells an interesting story about the history of writing "Zarbulmasal". At one of the usual "Bazmi Jamshidlar" (parties) literary evenings in the palace of Emir Umarkhan, the important role of "burung`i-yaxshilardin qolg`on zarbulmasallarning so`zlanmishda va chechanlik bobida" (the eloquence of zarbulmasals which are passed from the best poets) is discussed. In the conversation, Alisher Navoi's words "Oshning ta`mi tuzi bilan, suvning ta`mi muz bilan" (The taste of soup with salt, the taste of water with ice) were recalled by Emir, and the order of the Emir Umarkhan was focused on the need to collect these zarbulmasals among the people. After this task, the writer began to write "Zarbulmasal", obliging the orders of the Emir and to chaotically narrate "Yapaloqqush bilan Boyqushning qudaliqlari arosinda to`rt yuz zarbulmasali avomunnos" (between the relationship of Yapaloqqush and Boshqush, there are four hundred illiterate).

There are great conclusions to be drawn from this brief description of the writing history of the work. One is that the Emir and those around him

recognized Gulkhani's populist nature and sharp literary ability. On the other hand, in an effort to fully demonstrate his talent, Gulkhani needed only a signal from authority, which was born under the pretext of "Zarbulmasal".

Another conclusion to be driven from this episode, which should be noted here, is that by gathering the rulers, khans, people of science, art and literature of the past around them, along with demanding scientific and creative works from them, they guided them, guided the field of spirituality in certain ways. The task is to study and generalize the methods and experience of not only Emir Umarkhan, but also the rulers of the Ghaznavids, Karakhanids, Temurids and khanates in the cultural centers of history.

Gulkhani's work "Zarbulmasal" is based on prose, in which the events of material life, the interaction of people of different social backgrounds are figuratively transferred to the image of birds. This is the aspect of Zarbulmasal that is closer to the traditions of Eastern meditation, especially “Kalila and Dimna”. However, the images of birds in the work breathed in the local environment, spoke about the national language and customs, quoted a number of Uzbek proverbs, sayings and stories, and exchanged ideas in a non-violent way, which is a method of artistic expression; not exactly seen in the history of masals.

In terms of storytelling, the work is close to pre-Gulkhani examples of Uzbek fiction, such as the stories of Rabguzi and Khoja. However, in terms of the beginning, direction, structure, content and methods and means of expression of the work, “Zarbulmasal” differs significantly from all examples of fiction.

The complexity of the nature of the genre, that is, its inability to fit into any literary genre, which is not considered as a story, parable, or comedy, is itself a sign of the originality of “Zarbulmasal”. In the play, the peculiarities of each of these genres, the ways of expression are mixed, creating a clear general tone.

In literary theory, “Zarbulmasal” was described as a "humorous story." In our opinion, it is necessary to add the adjective "metaphorical" to it. “Zarbulmasal” is a story aimed at expressing the purpose in a metaphorical way. Even if it is a metaphor, it is not a simple metaphor, but a complex one. The first metaphor for the movement of birds is the use of various legends of people such as Halvoki Misgar, Yodgor postindoz, camels, scorpions, tortoises and other insects.

The main idea of “Zarbulmasal” has been described by our literary critics as "to show and expose the dominance of destruction not only in the Fergana region, but in Movorounnahr in general".

The ideological direction of the work is very clear in the expressions, which were given during the presentation of the bold for Boyoglu's daughter. In the political rivalry between the two khans, Gulkhani wants to show the superiority of his khanate and discriminate against the opposition. It turns out that the main idea of the work is not to show and expose corruption, but to be proud of the prosperity and victory of their country and the idea of patriotism.

In "Zarbulmasal" the reader wonders why Gulkhani so eloquently praises the Kokand khanate and insults Bukhara. In Kokand, there were ruined lands, such as the village of Hapalak.

An overwhelming majority of scholars have suggested that Gulkhani's approach and remarks are ironic and deceptive, in effect denouncing the destructive policies of his khanate.

As in the whole content of the work, of course, in this case, too, the writer may have meant irony and evasion. However, the most important aspect of this issue is that Gulkhani, no matter how progressive he was, was first and foremost man of his time - the era of khanates, a citizen of the Kokand khanate. Like his contemporaries and compatriots, he rejoiced in the success of the Kokand khan and khanate, and the narrow sense of patriotism created by the historical situation was not alien to him. By depicting the villages of Bukhara in ruins, the author not only exposes the Bukhara Khanate for that period, but also gives a broad and clear picture of the socio-political landscape of the historical period for the next generation.

“Zarbulmasal” is a work with a complex plot. It has a molded main plot line. There are side plot lines molded into the main plot. In the formation of the scientific-critical text of the work, special attention should be paid to the logic and rigor of the plot.

III.Discussion

It should be noted that the main plot of "Zarbulmasal" - the relationship of owls, the demand for thousands of cramped walls for a girl in the form of small episodes in historical sources up to Gulkhani also occurs. For example, in Article 11 of Nizami Ganjavi's Mahzun-ul-Asror, it is narrated that Nushirvan went hunting in a remote village and there were two birds "talking" in an unusual way. According to the minister, the birds were talking in the way of the gods, and one of them demanded the other to give him the ruins. In response, the second bird replied, "If our king survives, there will be a hundred thousand ruined villages." The same content is expressed in a different form in the work of Abu Bakr Muhammad Tartushi "Siroj-ul Mulk", which predates Nizami. Among the stories of Rabguzi, the stories of Khoja, we come across such episodes as above, but each of them has a different content, a different direction. In fact, Gulkhani expanded this subject to the level of an epic work, gave it a deep social meaning, introduced a large number of characters, turned the direction of the event into an exciting dramatic pattern, which existed in the folklore and

moved from it to religious and educational works. On the basis of this event, he created a unique work in terms of language, style and art. Most importantly, Gulkhani connected the pillars of the Uzbek people's spirituality into a single thread by striking out the birds.

The work has the appearance of a collection of stories, consisting of various proverbs and stories. Based on the informations, some people say that there are more than 400 (or less) proverbs in “Zarbulmasal”. In fact, there are only about 200 folk sayings generalized here under the name of proverbs.

Taken together all various literary passages, stories and narrations, hadith narrations, literary arts, expressions, the number of masals in Zarbulmasal is about 300. Among them there are many stories and narratives, which have an independent plot and are formed on the main plot of the work. It is important to know the place of these stories in the work in the formation of the scientific-critical text and in determining the level of integrity of the manuscripts.

The main points of the main plot line in "Zarbulmasal" are:

1. Argument between the owl and his daughter Kunushbonu (beginning of the story).
2. Conversation with a butterfly (invitation to a gift).
3. The presence of Korkush at the residence of Kulangir sultan.
4. On the way to the Boyoglu, settlement of Korkush, he met Hudhud.
5. Conversation between Korkush and Boyoglu on good deeds.
6. The boy makes a proposal to Kunushbonu (to get married).
7. The sending of Shoranul to Malikshabohang as a gift by a butterfly.
8. Malikshabohang's trip to Kordon and Turumtoy. On their way to the wedding, the incidents between them.
9. Disputes and conflicts between Kordon and Boyoglu.
10. Cordon's meeting with Korkush.
11. The return of fear to the Owl's mausoleum and the emergence of a compromise.
12. Dowry and marriage ceremonies.

In the examples of folklore, written literary and historical sources, the name Kaykubod is rarely used as a place name. This name is not one of the most actively used traditional names, such as Bukhara, Samarkand, Kashmir, Baghdad. Therefore, the question arises as to whether the name given by Gulkhani is historically real or legendary. If so, in which part of the Fergana climate can its place be? The content of the parable, observing the historical basis of some of the scenes in it, we came to the conclusion that all the words in the play have their own vital basis, and nothing in it is said in vain and without reason. The popularity of this work must have increased because of the fact that the events were told in the language of birds, which attracted the attention of many in life.

IV.Conclusion.

In general, "Zarbulmasal" deserves special attention in terms of its ideological direction and art. It reflects the spiritual maturity of man, the ideas of self-realization with artistic sophistication. "Zarbulmasal" is a unique example of Uzbek literature as a multifaceted, interesting plot line, rich in folklore, a very popular figurative work. It reflects the recent history, national values, customs, language and traditions of permanent residents.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
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SOI: 1.1/TAS DOI: 10.15863/TAS
International Scientific Journal
Theoretical & Applied Science
p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)
Year: 2020 **Issue:** 10 **Volume:** 90
Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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ATOMIC-ABSORPTION AND ATOMIC-EMISSION WITH INDUCTIVE CONNECTED PLASMA DETECTION OF NICKEL AND ZINC IN OIL

Abstract: *The effect of concentration of surfactant on the value of an analytical signal in investigation of the atomic absorption of Nickel and Zinc was determined. The use of the Triton X-100 and acetylacetone could increase Nickel detection sensitivity by 96% and Zinc by 49% by sonication of the samples. The content of analysts in the analyzed sample was determined by methods of atomic absorption and atomic emission spectroscopy with inductive coupled plasma. The correctness of results was checked by the "entered-found" method.*

Changing the dose by weight, it was shown that a significant systematic error is absent. The summary of the obtained results was produced with two independent methods of F-and Student's t-criteria.

It is shown that the dispersions are homogeneous, and the average mismatch is not substantial and justified by the random spread. The atomic absorption technique has assessed the limit of the detection of analysts by the developed method. It is shown that the appeared results are below of these represented in the literature data.

Key words: *atomic absorption and emission spectroscopy with the inductively coupled plasma (AES-ICP), crude oil, petroleum, Triton X-100, ultrasonic processing, analysis, metrological characteristic.*

Language: *English*

Citation: Yurchenko, O. I., Chernozhuk, T. V., & Kravchenko, O. A. (2020). Atomic-absorption and atomic-emission with inductive connected plasma detection of nickel and zinc in oil. *ISJ Theoretical & Applied Science, 10 (90),* 321-324.

Soi: http://s-o-i.org/1.1/TAS-10-90-55 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.55

Scopus ASCC: *1600.*

Introduction

Crude oil is a complex mixture of carbohydrates that occur on the Earth in a liquid state. It represents a significant portion of the original fossil fuels. Information on the concentration of microelements in crude oil is becoming more and more critical for the geochemical characteristics of the source breeds and pools, and also requires some corrective actions during the crude oil processing [1,p.7;2, p.556;3, p.139; 4, p.38].

Generally, the traces of metals in the most significant concentrations conducive to environmental

pollution, which have been found in different raw materials, are Nickel and Vanadium. Due to their mutagenic and cancerogenic potential, Ni and V emissions are strictly controlled in many countries [5,p.5;6,p.16;7,p.649].

Besides, Nickel, along with other metals, is a catalytic poison and causes corrosion in furnaces and boilers during oil refining. Other metals, such as Ferrum, Cooper, and Zinc, may also be present in significant quantities and can be partially transferred to fractions, reducing their quality and performance.

That is why the knowledge about the concentration of metals in raw oil provides robust information that allows to assess and regulate the further working conditions and its analysis [8, p.33].

For the analysis of crude oil on the content of analytes, the methods of atomic absorption and atomic emission with inductively coupled plasma spectroscopy are widely used. A special role is played by sample preparation, new environments, and standard samples of composition.

The purpose of work is the development of the newest methods of atomic-absorption and atomic emission with inductively coupled plasma for the definition of analytes in oil with improved metrological characteristics.

Experimental part

In this work, the Atomic Absorption Spectrometer C-115-M1 is used; Measurements were performed in the flame of propane-butane-air at optimal parameters: λ_{Ni}=231,9 nm, λ_{Zn}=213,9 nm, PhEP (photoelectric pickup) = 1kV, current = 5mA, lamps with hollow cathode for Nickel and Zinc.

Atomic emission spectrometer with inductive coupled plasma *i* CAP 6300 DUO (Thermo Scientific, Jewel., the USA) was used. Measurements were performed according to the instructions «Thermo SPEC/PMT software for TJA Sequential ISAP Spectrometers Getting started. Part Number 140962-00».

Optimum measuring conditions:: λ_{Ni}=259,940 nm, λ_{Zn}== 213,6 nm, the turnover rate of the peristaltic pump – 100 rpm., pressure of the argon stream during spraying – 30 psi, the term of integration – 2 seconds, the plasma power 1500 Watts. Ultrasonic Bath PS-20 (3.2 L; operating capacity is 120 Watts and 40 kHz of frequency). Weight-scale OHAUS PA 64 (65/0.0001 g) with external calibration/state verification. Crockery measuring, laboratory, and glass devices: cylinders, flasks (capacity of 5, 10, 50, and 100 ml), pipettes (with capacity 1, 2, 5, and 10 ml), cups in GOST (All-Union State Standard) 17770-74 and GOST 20292-74.

Nitric acid, standard sample of Nickel solution for the 022.38 -96 NSSU (National State Standard of Ukraine), 1 mg/ml; The standard sample of the Zinc solution in the 022.47 -96, 1 mg/ml; Triton X-100 *Mr* – 646 g/mol, CCM 0.06 g/L 2,9 $10^{-4} - 1{,}0 \cdot 10^{-1}$mol/l; Acetilaceton C pentane – 2,4 – dione: Nickel and Zinc acetylacetonate were used although.

Results and discussion

The calibration solutions were prepared from the standard samples of the composition of metal ions solutions and acetylacetone of Nickel and Zinc with additives of surfactant and acetylacetone. The addition of the Triton X-100 reduced the surface tension of the solution but increased the dispersion of aerosol, which allowed to release the time of the retention of analyses in the atomic state and to improve the sensitivity of the atomic-absorption of Nickel and Zinc. By modifying the solutions, the sensitivity of the atomic absorption of the Nickel increased by 96%, and the Zinc by 49%.

The selection of the concentration of Triton X-100, treatment by ultrasounf time, the results of the detection of analyses by two methods of the correctness of the results of atomic-absorption of Nickel and Zinc determination are given in Table 1-5.

As could be seen from the results in Table 1, the maximum of analytical signal in the detection of analytes is achieved by using Triton X-100 (ω = 5%).

We could conclude that the sample should be treated by ultrasound within 30 minutes.

By varying the mass of a dose by weight, it was established that the systematic error is not significant[9,p.1980;10,p.16;11,p.159;12,p.18;13,p.312;14,p.65;15,p.843].

Since $F < F_{table}$, $t < t_{table}$, (F = 6,39; t = 3.31), it can be assumed that the results are equivalent, the difference in reproducibility is not significant, and the discrepancy among obtained by two available methods is insignificant and justified by the spread of values.

The limit of detection of atomic-absorption of Nickel is evaluated: $C_{min} = 0{,}043$; $C_{lit} = 0{,}100$ $\mu g/ml$, and also Zinc - $C_{min} = 0{,}001$, $C_{lit} = 0{,}004$ $\mu g/ml$.

Conclusions

The use of new environments, based on surfactants can significantly increase the sensitivity of the atomic absorption of analytes. The increase of precision and accuracy of measurements is achieved by using solutions of acetylacetone of Nickel and Zinc as standard samples, which allowed to bring the composition of the calibration solutions to the analyzed ones according to chemical composition.

Table 1. The choice of the concentration of surfactant for atomic-absorption detection of Nickel and Zinc (n=5; P=0.95).

ω,%	Ni, mg/kg		Zn, mg/kg	
	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r
3	0,44±0,01	0,01	2,28±0,03	0,01
4	0,46±0,02	0,01	2,37±0,03	0,01
5	0,54±0,02	0,01	2,50±0,03	0,01
6	0,54±0,03	0,01	2,50±0,04	0,01

Table 2. The choice of ultrasound treatment time at the atomic- absorption detection of the solutions of Nickel and Zinc (n=5; p=0,95).

Time of the treatment, min.	Ni (Triton X-100), mg/kg		Zn(Triton X-100), mg/kg	
	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r
10	0,40±0,01	0,01	2,28±0,03	0,01
15	0,45±0,02	0,01	2,35±0,03	0,01
20	0,50±0,03	0,01	2,42±0,03	0,01
25	0,53±0,01	0,01	2,47±0,04	0,01
30	0,54±0,02	0,01	2,50±0,04	0,01

Table 3. Results of the atomic absorption of Nikel and Zinc in oil using Triton X-100, stabilized by US (ultrasound) (n=5; p=0,95).

Ni, mg/kg		Zn, mg/kg	
$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r
0,54±0,02	0,01	2,50±0,10	0,01

Table 4. Check the correctness of the atomic absorption detection of Nickel and Zinc by «injected – found out» method (n=5; p=0,95).

Metal	Contain, mg/kg	Injected, mg/kg	Found out, mg/kg	S_r
Ni	0,54	0,50	1,03±0,27	0,01
Zn	2,50	3,00	5,6±0,20	0,01

Table 5. Results of the determination of Nickel and Zinc content by AES-ICP in oil with the addition of surfactants, stabilized by US (n=5; p=0,95).

Ni, mg/l		Zn, mg/l	
$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r
0,55±0,02	0,01	2,51±0,10	0,01

Table 6. Systematic error estimation at atomic absorption detection of Nickel and Zinc by variation of the dose by weight of the sample (n=5; p=0,95).

Weight of the samples, g	Ni, mg/kg		Zn, mg/kg	
	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r	$\overline{C} \pm \frac{t_{P,f} \cdot S}{\sqrt{n}}$	S_r
0,6	0,53±0,14	0,01	2,48±0,11	0,01
0,7	0,54±0,15	0,01	2,50±0,12	0,01
1,0	0,53±0,15	0,01	2,49±0,12	0,01

Table 7. Consistency of results obtained by two independent methods of Fisher and Student's t-criteria

Metal	F	$S_{1,2}$	$t_{1,2}$
Ni	1,04	0,02	0,2
Zn	1,03	0,01	0,28

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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STUDY OF SPINDLE UNIT DYNAMICS METAL CUTTING MACHINE

Abstract: *The methods of conducting an experiment to study the dynamic characteristics of the elements of the spindle assembly are considered. The results of experimental studies of the dynamics of the spindle assembly of a cutting machine are presented.*

Key words: *spectrum, oscillations, diagnostics, machine tools, spindle, dynamics, field tests, mathematical modeling.*

Language: *Russian*

Citation: Mamadiyarov, A. J. (2020). Study of spindle unit dynamics metal cutting machine. *ISJ Theoretical & Applied Science, 10 (90),* 325-331.

Soi: http://s-o-i.org/1.1/TAS-10-90-56 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.56

Scopus ASCC: *2200.*

ИССЛЕДОВАНИЕ ДИНАМИКИ ШПИНДЕЛЬНОГО УЗЛА МЕТАЛЛОРЕЖУЩЕГО СТАНКА

Аннотация: *Рассмотрены методы проведения эксперимента по исследованию динамических характеристик элементов шпиндельного узла. Представлены результаты экспериментальных исследований динамики шпиндельного узла металлорежущего станка.*

Ключевые слова: *спектр, колебания, диагностика, металлорежущие станки, шпиндель, динамика, натурные испытания, математическое моделирование.*

Введение

Получение поверхностей изделий требуемого качества при механической обработке зависит, как правило, от обеспечения оптимального сочетания динамического состояния станка с технологическими факторами. Проявляющаяся зачастую при обработке нестабильность процесса резания приводит к ухудшению показателей качества обработки вследствие возбуждения в зоне резания колебаний недопустимо высокого уровня. С целью уменьшения вероятности формирования детерминированной вибрации на частотах собственных и вынужденных колебаний обычно используют ограничение режимов резания, что нежелательно отражается на производительности процесса. Улучшение динамических показателей станка чаще всего обеспечивает смещение допустимой границы режимов в сторону их увеличения. Отсюда следует вывод о потенциальной возможности повышения качества обработки путем улучшения динамического состояния станка. В работах [1, 2] проведено теоретическое изучение и моделирование динамических характеристик шпиндельных узлов станков.

Шпиндельный узел (ШУ) – один из наиболее ответственных элементов динамической системы станка, поскольку через колебания переднего конца шпинделя оказывается воздействие на показатели качества и точности обработки, стойкость режущего инструмента и т. д. Исходя из этого определение частот собственных колебаний (ЧСК) шпиндельного узла необходимо уже на этапе конструкторско-технологического проектирования [1,2,3]. Учитывая сложность динамической системы шпиндельного узла металлорежущего станка НТ-250М и количество факторов, которые непосредственно оказывают влияние на формирование ЧСК узла, возникает необходимость проведения всестороннего

исследования и определения наиболее значимых элементов системы, которые необходимо учитывать в процессе моделирования.

С целью подтверждения теоретических положений проведено экспериментальное исследование шпиндельного узла станка НТ-250М, упрощенное изображение которого приводится на рис. 1.

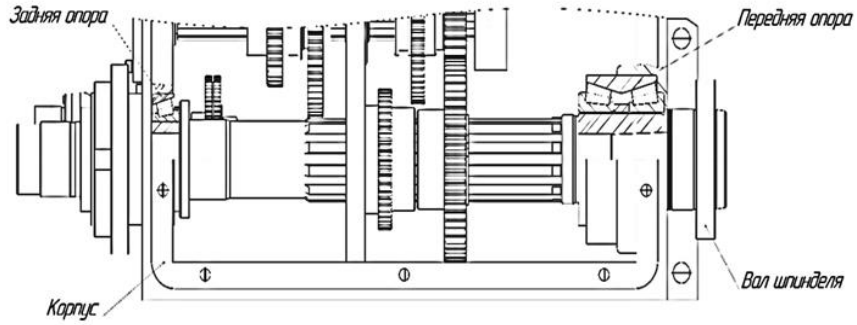


Рис. 1. Упрощенное изображение шпиндельного узла НТ-250М

Для определения технического состояния ШУ станка НТ-250М с помощью вибрационных измерений разработана методика сбора и обработки информации, а также проведения исследований по выявлению эксплуатационных факторов, влияющих на параметры вибрационного сигнала.

В процессе эксперимента измерялись и регистрировались следующие характеристики ШУ: виброперемещения, виброскорости и виброускорения, а также спектры вибрации элементов шпиндельного узла НТ-250М, при различных режимах обработке.

К задачам проведения исследований относились:

- установление зависимости вибрационного сигнала ШУ от условий эксплуатации;
- установление критериев технического состояния ШУ станка НТ-250М;
- установление режимов обязательного контроля при диагностировании.

Исходя из необходимости получения достаточного количества данных о техническом состоянии ШУ станка НТ-250М, к информации предъявлялись требования: непрерывности, полноты, достоверности, однородности.

Данные об изменении технического состояния ШУ, работающих в одинаковых условиях, учитывая эргодическое свойство случайных процессов при обработке материала, записывались на прибор «VIBXPERT II» позволяющий осуществлять частотный анализ вибросигнала. Измерения вибраций производились согласно блок-схеме (рис. 2), которая включает датчик (пьез акселерометр), анализирующее устройство (прибор «VIBXPERT II»), компьютер с пакетом программ для вибромониторинга.

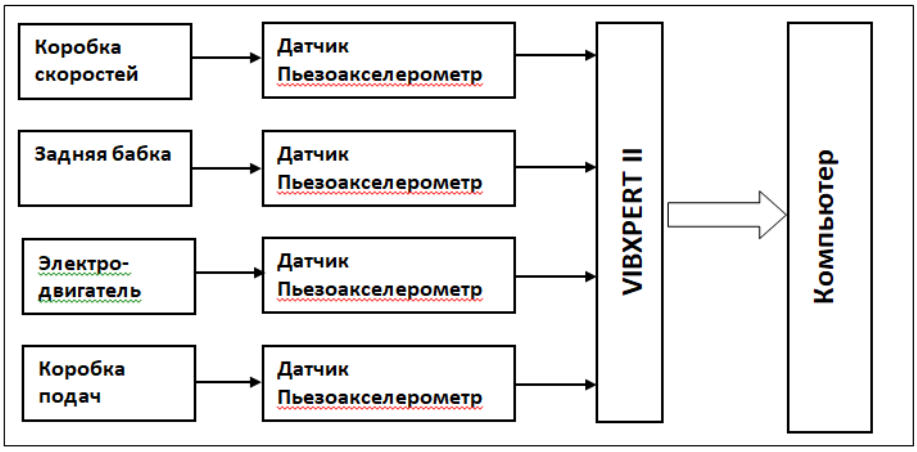


Рис. 2. Блок схема аппаратуры для анализа вибрации станка НТ-250М

Для преобразования механических колебаний в цифровую форму использовался датчик пьезоакселерометр с широким частотным диапазоном. Пьезоакселерометры имеют наименьшую погрешность измерения и обладают достаточно широким частотным диапазоном от 5

Гц до 25 тыс. Гц. Масса датчика мала по отношению к массе исследуемых объектов и поэтому не оказывает влияния на колебательные характеристики.

В процессе измерений виброперемещений, виброскоростей и виброускорений пьезоэлектрический датчик устанавливался с помощью специального магнита на корпусе шпиндельной бабки в непосредственной близости от опор в вертикальном и горизонтальном направлении. Схема проведения эксперимента представлена на рис. 3.

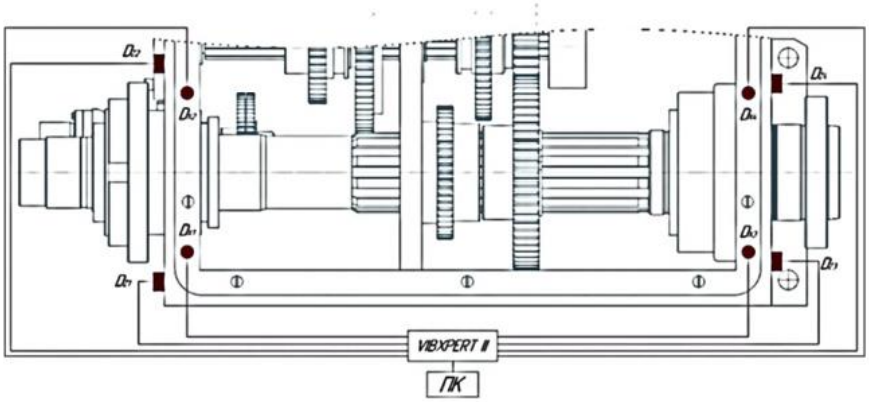


Рис. 3. Схема проведения эксперимента:
ЭДВ - электродвигатель; D_{x1}, D_{x2}, D_{z1}, D_{z2} - пьезоэлектрический акселерометр; VIBXPERT II - переносной анализатор сигналов - сборщик данных VIBXPERT II; ПК - персональный компьютер для обработки и анализа результатов измерения.

Таблица 1. Расчет характерных частот подшипников НТ-250М

№ п/п	m,кг	n,шт	d, мм	D, мм	B,мм	Z, шт	D_w, мм	$F_{об}$, Гц	$f_{вн}$, Гц	f_c, Гц	$f_в$, Гц	$f_н$, Гц
2-697920Л2	5,49	1	98,425	152,4	92	26	18,5	40	16,8	6,8	864	176
4-7716Л1	3,11	1	80	140	77,07	14	15	40	30,8	10,4	415,2	144,8
7308	0,703	2	40	90	23	12	13,1	33	22,8	7,9	301,8	94,2
36208	0,36	1	40	80	18	9	12,7	33	15,5	5,9	242,9	54,2
36209	0,41	2	45	85	19	9	12,7	33	16,2	6,3	239,6	57,4
112	0,39	1	60	95	18	12	11,11	33	15,6	5,9	323,7	72,3

Примечание: $f_{вр}$ – частота вращения вала; $f_{тк}$ – частота вращения тел качения; f_c – частота вращения сепаратора; $f_в$ – частота перекатывания тел качения по внутреннему кольцу; $f_н$ – частота перекатывания тел качения по наружному кольцу; f_2-частота перекатывания вала через тела качения.

Результаты замеров обрабатывались с помощью микропроцессора прибора «VIBXPERT II». Каждый опыт проводился по 10 линейным усреднениям, что гарантирует надежность измерения. В каждом замере определялись характеристики общего уровня виброперемещения, виброскорости, виброускорения типа пик и среднеквадратичное отклонение, а также усредненный спектр указанных характеристик. По результатам проведенных измерений отслеживались величины вибрации на выбранной частоте по имеющемуся спектру при помощи анализатора «VIBXPERT II» на персональном компьютере, после передачи данных со сборщика.

По результатам эксперимента наблюдается удовлетворительная сходимость спектров собственных частот системы с данными, полученными аналитическими данными. На рис. 4 показаны зависимости интенсивности вибрации подшипниковых опор ШУ от режимных параметров станка.

Из экспериментальных зависимостей видно, что интенсивность вибрации прямо зависит от частоты вращения шпинделя и режимов резания

Для анализа динамики колебаний воспользуемся методикой, изложенной в работе В.А. Кудинова [2, 3, 4, 5].

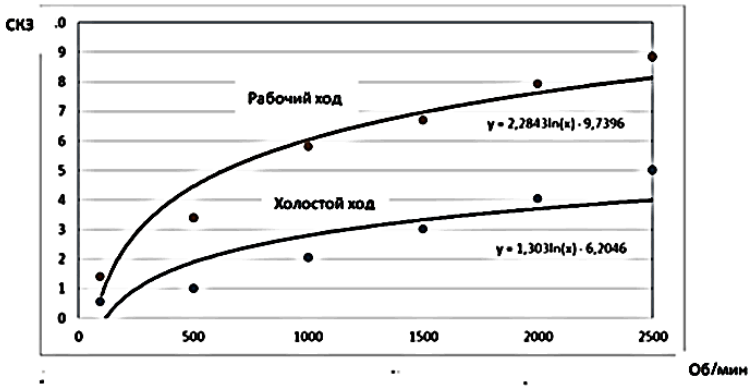


Рис. 4. Зависимость интенсивность вибрации ШУ от частоты вращения.

Основные допущения**,** принимаемые при составлении расчетной схемы подшипниковых опор, состоят в следующем:

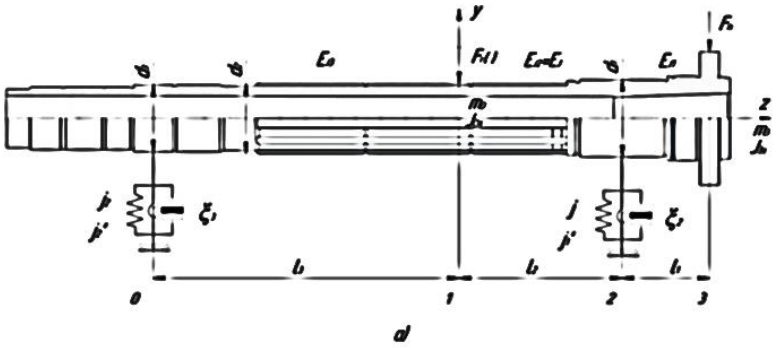
опорные узлы рассматриваются в виде линейной динамической системы с распределенными и сосредоточенными параметрами;

вал и его корпус (в случае цилиндрического корпуса) представляются упругой балкой ступенчато-переменного сечения;

шпиндельные узлы обладают радиальной, осевой и угловой жесткостью с линейными характеристиками жесткости и демпфирования;

упруго-инерционные и демпфирующие свойства вала и его опор не изменяются по углу поворота вала, т.е. изотропны.

Входными воздействиями на упругую систему опорного узла являются силовое воздействие (крутящий момент) от электродвигателя P(t) и переменная нагрузка от резца держателя, на котором расположена резец δ(t) (рис. 5).



(t) (рис. 5).

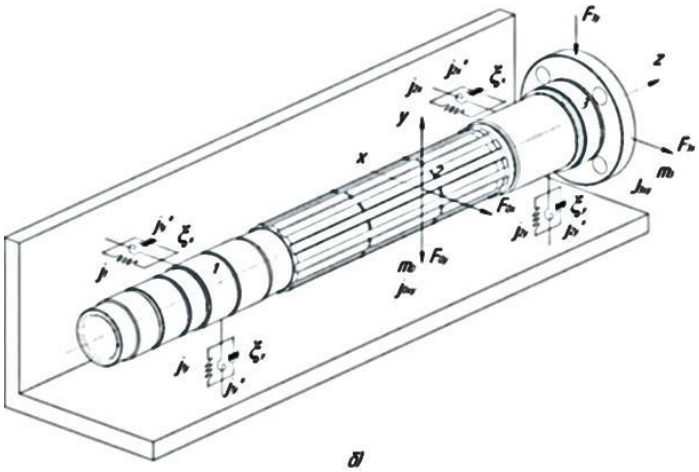


Рис. 5. Схематическое изображение упруго-демпферных элементов ШУ

Среди численных методов расчета статических и динамических характеристик шпиндельных узлов механизмов, представляемых как линейные упругие системы, получил распространение метод начальных параметров (в матричной формулировке - метод переходных матриц).

Шпиндель узел (рис. 5) рассматривают как ступенчатую балку длиной l на упругих опорах с вязким демпфированием, пропорциональным скорости колебаний. Балку разбиваем на 3 участка, разграниченных изменением диаметра (геометрического момента инерции), опорой, сосредоточенной массой и внешней сосредоточенной нагрузкой. Каждый i-й участок имеет постоянные (в пределах участка) распределенную массу m_i и изгибную жесткость EJ_i.

Смонтированные на шпинделе детали (коробка скоростей, и резец) представляем в виде сосредоточенных грузов, расположенных на обеих концах шпинделя и имеющих массу μ_i и момент инерции J_{ix}. Расчет динамических характеристик шпиндельного узла сводится к определению амплитуд установившихся колебаний шпинделя в сечении расположения опор от воздействия гармонических силовых возмущений со стороны процесса резания и привода электродвигателя.

Линейная постановка задачи позволяет использовать принцип суперпозиции и последовательно определять характеристики узла при всех указанных выше воздействиях.

На шпинделя расположены сосредоточенные нагрузки – возмущающая сила F_1 (t) и момент M_1, действующие со стороны резца, а также сила F_2 (t) и момент M_2, действующие со стороны привода.

При составлении уравнения колебаний опорных узлов в матричной форме записи имеем:

$$[M]\cdot\Delta''+[B]\cdot\Delta'+[K]\cdot\Delta=F(t), \qquad (1)$$

где Δ - вектор узловых перемещений ($3n$); $F(t)$ - вектор узловых динамических нагрузок ($3n$); $[M]$, $[B]$, $[K]$ - матрицы масс, демпфирования и жесткости ($3n$x$3n$), n - число узлов в расчетной схеме (рис. 5).

Если возмущение имеет установившийся гармонический характер:

$$F(t)=F_0\cdot e^{i\omega t}, \qquad (2)$$

то решение системы (3) методом комплексных амплитуд следует искать в виде [5]:

$$\Delta(t)=\Delta_0\cdot e^{i\omega t}, \qquad (3)$$

где F_0 и Δ_0 - комплексные амплитудные значения векторов узловых нагрузок и перемещений; ω - частота возмущения; i- мнимая единица. Подставляя (2) и (3) в (1) получим

$$\left([K]-\omega^2\cdot[M]+i\cdot\omega\cdot[B]\right)\cdot\Delta_0=F_0. \qquad (4)$$

Откуда комплексные амплитуды колебаний в опорах:

$$\Delta_0=\left([K]-\omega^2\cdot[M]+i\cdot\omega\cdot[B]\right)^{-1}\cdot F_0. \qquad (5)$$

Полагая, что силы демпфирования в опорах пропорциональны силам упругости, т.е. $\omega\cdot[B]=\eta\cdot[K]$, запишем (4) в виде:

$$\left[V^T\right]^{-1}\cdot\left([V]^T\cdot[K]\cdot[V]-\omega^2\cdot[V]^T\cdot[M]\cdot[V]+i\cdot\eta\cdot[V]^T\cdot[K]\cdot[V]\right)\cdot[V]^{-1}\cdot\Delta_0=F_0$$

Откуда вектор комплексных амплитуд Δ_0 выражается через матрицу собственных форм $[V]$ и собственные частоты колебаний ω_j (j - номер собственной частоты):

$$\Delta_0[V]\cdot diag\left[\frac{1}{(1+i\eta)\cdot\omega_j^2-\omega^2}\right]\cdot[V]^T\cdot F_0=[W]\cdot F_0\bar{\Delta}_0, \qquad (6)$$

с учетом того, что модальная матрица $[V]$ имеет свойства ортогональности [2,5,6]:

$$[V]^T\cdot[M]\cdot[V]=[E]\text{(единичная матрица)},$$
$$[V]^T\cdot[K]\cdot[V]=diag\left[\omega_j^2\right].$$

Таким образом, решение (6) основано на представлении амплитуд вынужденных колебаний в виде разложения в ряд по формам собственных колебаний, что дает существенный выигрыш в скорости вычислений по сравнению с формулой (5). Выигрыш еще более увеличивается, если учитывать только низшие формы колебаний опорного узла (3-5 форм). В случае применения относительно коротких стержневых элементов для учета влияния поперечных сил на искажение формы поперечных сечений необходимо использовать модифицированные выражения для матриц масс $[M]^e$ и жесткости $[K]^e$ элементов, приведенные в [2, 5].

При составлении уравнений колебаний упругой системы опорного узла, запишем следующие матрицы.

Матрица инерционных характеристик M_j в j-й точке:

$$M_j=\begin{bmatrix} m_X & 0 & 0 & 0 & S_Z & -S_Y \\ 0 & m_Y & 0 & -S_Z & 0 & S_X \\ 0 & 0 & m_Z & S_Y & -S_X & 0 \\ 0 & -S_Z & S_Y & J_X & -\psi_{XY} & -\psi_{XZ} \\ S_Z & 0 & -S_X & -\psi_{XY} & J_Y & -\psi_{YZ} \\ -S_Y & S_X & 0 & -\psi_{XZ} & \psi_{YZ} & J_Z \end{bmatrix}, \qquad (7)$$

где m - массы; J— моменты инерции; S и ψ — соответственно статические и центробежные моменты инерции.

Корпус, в котором устанавливается шпиндельный узел, условно принимается как абсолютно жесткое тело, поэтому в местах присоединения шпиндельного узла к корпусу с помощью болтовых соединений задаются нулевые перемещения по всем трем осям. Поскольку на шпиндельном узле выполнено два точных диаметра для центрирования узла в корпусе, то по указанным поверхностям задаются нулевые

перемещения по осям X и Z, при этом по оси Y перемещения не ограничены.

Физико-механические свойства элементов ШУ приводятся в табл. 2.

Таблица 2. Физико-механический свойства элементов, входящих в состав шпиндельного узла

Элемент	Материал	Плотность кг/м^3	Модуль Юунга, ГПа	Коэффициент Пуассона	Предел текучести [МПа]
Шпиньдель Станка НТ250-М	Сталь45 ГОСТ 1050-2013	7810	200	0,3	560

Результаты моделирования. В табл. 3 приведены первые десять частот собственных колебаний шпиндельного узла, полученные в результате модального анализа разработанной математической модели.

Таблица 3. Результаты расчета частоты собственных колебаний ШУ

№ п/п	1	2	3	4	5	6	7	8	9	10
Частота Гц	1327	1327.6	2039	2039.8	2862	3090	3091	3502	3503	4290

В результате проведенных экспериментов установлены зависимости амплитуды колебаний в подшипниковых опорах узла при различных частотах вращения шпинделя.

Учитывая то, что диапазон частот вращения шпинделя лежит в пределах от 40 до 2500 об/мин, максимальная частота возбуждения колебаний, рассчитанная для ШУ, будет достигать 42 Гц, а минимальная – 0,67 Гц. Таким образом, в данный диапазон не попадает ни одна ЧСК, т. е. колебания ШУ не будут влиять на точность и качество обработки.

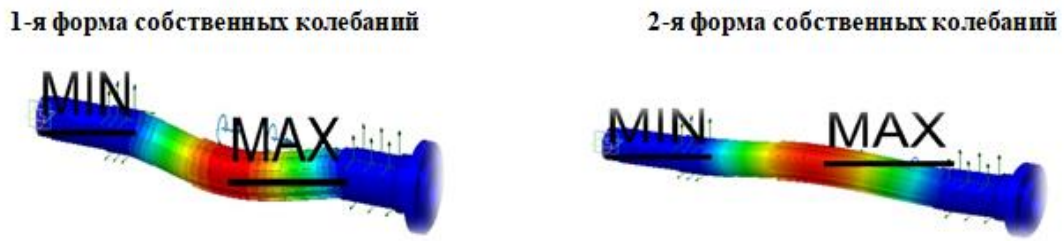


Рис. 6. Формы собственных колебаний шпидельного узла.

Выводы.

В результате проведенного анализа, что уровень вибрации станка и отдельных ее узлов однозначно определяет ее техническое состояние.

Анализ экспериментальных данных показывает, что вибрационное состояние станка НТ-250М существенно зависит от режимных параметров резания (осевого и радиального усилия, частоты вращения, глубины резания и твердости обрабатываемого материала). При росте осевых и радиальных нагрузок интенсивность колебаний уменьшается, тогда как с возрастанием частоты вращения и глубины резания она увеличивается;

- с увеличением частоты вращения шпинделя n_c увеличивается доля высокочастотных составляющих ω_2 в общий дисперсии динамических нагрузок, при этом наблюдается существенное повышение общего уровня вибраций станка;
- спектральный анализ показывает, что главную роль при выявлении причин повышенных вибраций подшипниковых опор металлорежущих станков, играет спектр огибающей;
- на основании кинематического и динамического анализа работы ШУ, рассчитаны характерные частоты вибраций, соответствующие определенными видам дефектов подшипников ШУ станка НТ-250М.

В результате проведенного анализа влияния параметров составных элементов ШУ токарного станка НТ-250 была разработана математическая модель ШУ.

Частота вращения шпинделя изменялась в диапазоне от 40 до 2500 оборотов, которые соответствуют условиям реальной работы станка. Согласно полученным данным частота колебаний в опорах изменялась в пределах 12… 25 Гц. В свою очередь, амплитуда колебаний не превышала 0,01мм.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.997	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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THE ROLE OF FORMAL METHOD IN RUSSIAN-UZBEK LITERARY RELATIONS

Abstract: *This article discusses Uzbek-Russian literary relations, in particular, the "Formalism" movement in Russia in the early twentieth century and its impact on Uzbek literature. There are scientific comments on the theoretical definition and content of this trend. The influence of this trend on Uzbek literature was discussed.*

Key words: *Russian-Uzbek literary relations in the early twentieth century, the current of formalism, literary influence.*

Language: *English*

Citation: Ahmedov, H. H. (2020). The role of formal method in Russian-Uzbek literary relations. *ISJ Theoretical & Applied Science, 10 (90),* 332-335.

Soi: http://s-o-i.org/1.1/TAS-10-90-57 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.57

Scopus ASCC: *1208.*

Introduction

Literary relations developed rapidly in the 1920s and in the former USSR in general. Due to historical circumstances, there have been significant qualitative changes in the social life of the population of fifteen republics united into one common country and one common cultural space. In literary policy, as in all spheres, although ideological propaganda was the main goal, the literary relations established between the national literatures undoubtedly yielded some positive results. Holding ten days of national literature and art is one of the good traditions of that time.

II.Literature review

The translation of works of art and creative meetings in different regions have, without exaggeration, yielded positive results. Even today, in many national republics, literary traditions are preserved, albeit partially. Among Uzbek intellectuals and writers there were many artists who studied and worked in Moscow. In particular, academician-philosopher Erkin Yusupov studied at the Moscow State Pedagogical Institute, academician-literary scholar at the Moscow State University named after Izzat Sultan Lomonosov for three years (1950-1953), and scholar Abdurauf Fitrat worked at the Moscow Institute of Oriental Studies in 1923-1927. He later taught Turkish, Arabic, Persian, and literature at Leningrad State University. Abdulla Kadiri, the founder of the Uzbek school of novels, studied in the former Soviet capital from 1924 to 1926, and Abdulhamid Cholpon, a fiery poet, twice - in 1924-1927 and 1931. In 1934 he lived and worked in Moscow. In general, the advanced intelligentsia of the nation lived and worked in Moscow, the political and cultural center of the former Soviet Union. In general, literary relations are highly developed. Since the 1920s, the Russian literary environment has had a strong positive impact on Uzbek literature. There is a lot of research on this. In the literary process of the 1920s, the general uplifting mood, the contradictions of the new life and the "old age" began to be reflected in high and modern tones and forms, in new content and forms. During these years, the appeal to new forms of poetry, especially free poetry, became widespread. Artists began to move away from rigid poetic stereotypes in depicting life's ups and downs, changes, emotions, and experiences. It was at this time

that it became clear that the finger system of poetry and its various forms fully responded to the rush of violence. Abdullah Alavi (Arabnajot), an observant observer of the literary process of that time, analyzed the realities of that period in his article "We have a question of form and Nazim Hikmat". [1. Abdulla Alaviy. Magazine “Alanga”. 1929].

At that time, Uzbek artists were strongly influenced by the Turkish poet Nozim Hikmat, Tatar and Azerbaijani writers, and Russian innovative poets (Mayakovsky, Andrei Beliy and others). In the first half of the twentieth century, the science of poetry, the literary process, was developing on a large scale in Russia. Forms of free poetry, which had a great influence on Uzbek poetry, were widespread in Russian literary life. Leading figures in this process came together around the Society for the Study of Poetic Language - OPOYAZ (Society for the Study of Poetic Language) and conducted wonderful experiments.

III.Analysis

The Society for the Study of Poetic Language - OPOYAZ members were directly the founders, promoters and implementers of the formal method. Although there have been a few observations and studies on this organization, we have turned to the research of Vadim Kozhinov, who has a more objective approach to scientific truth. [2. Kozhinov V. Reflections on Russian literature. 1991].

OPOYAZ's work does not address the content of the literature, and this has led to criticism. In many of their works, the content is taken out of the realm of literature and art. OPOYAZ members do not deny the unity of theme and idea in any literary work. However, in their opinion, these are only non-artistic elements of the work, as well as the basis for the "artistic device" [2. Page 279]. According to B. Tomashevsky, the play has a traditional content, but it is a non-traditional element. In the works of Tinyanov and B. Eichenbaum, this issue is a bit more complicated [2. 280]. In order to get rid of these two notions, the OPOYAZ members refused to use them in this way (but they did not deny it until the end). They introduced the concept of “material”. It is now the raw material from which the work is created, both in the sense of content (subject, motive) and in the sense of form (word, sound), “yeast”; on the other hand, they introduced the concept of “method” (priyom), an element of a ready-made “artistic device” that encompasses aspects of content and form [2. 281 - page]. Researcher V. Kozhinov notes that thanks to OPOYAZ members, literary criticism has gained a rare popularity.

Eichenbaum later recalled in 1944: “The work was carried out in a strong unity of theory and practice. All the attention was focused on breaking the old rules and acquiring new poetic experiences and innovations. The poets themselves (especially Mayakovsky) were very active in this work [2. Page 283]. In their concepts, OPOYAZ generalizes the peculiarities of one or another literary trend of the time. At the same time, they were literary historians and theorists. They did not go the way of approving or denying any literary current or trend, but engaged in an objective and scientifically accurate analysis of any literature from antiquity to the twentieth century. But there are conflicting opinions among literary critics on this issue.

According to some, the futurist movement to deny the vitality of the culture of the past has essentially become the main program of action of the OPOYAZ [2. Page 284]. At the same time, it is true that all goodness begins to grow in the bosom of antiquity. This was stated by B. Eichenbaum, one of the leading theorists of OPOYAZ.

He noted that Lermontov's new poetic style, which led him out of a dead end in poetry that took place after the 1920s, was present in some poets of the Pushkin era. [3. B. Eichenbaum. M. Lermontov: The Experience of Historical and Literary Evaluation, L. 1924]. A similar Nekrasov tradition developed in Katen's poetry in the past. Kozhinov reiterated that OPOYAZ members were involved in the history of “literary fashion” in connection with the problem of the nature of reading. [2. Ibid., P. 290]. This society was formed at the peak of the development of “literary fashion”. The diverse and frequently changing literary schools and “schools” created such an atmosphere that A. Block's “Russian dandies” [4. 1918] we read: “We all know by heart: Sologub, Balmont, Severyanin, Mayakovsky, but it's all over, it's over, and now Ehrenburg is going to be fashionable.”

IV.Discussion

In essence, OPOYAZ members have studied the development of literary fashion, not literature itself. [2. Page 292]. Fashion, on the other hand, has taken only the outer side of what is called novelty from literature. Fashion in the form of "novelty" is an external, superficial novelty. Therefore, a great or average work can be in fashion at the same time. But over time, the transitory nature of the middle class has shown that adults have survived [2. Page 294]. Yu. Tinyanov argues that the "value" of an event should be judged by its "evolutionary significance," that is, by how important the work is for its time. The theories of "OPOYAZ" respond to the "social orders" of the time with modernity and intelligence [2. Page 300].

In addition to purely literary-aesthetic and theoretical activity, there is a sense of revolutionary of this organization. For example, one of the activists of the OPOYAZ, O. Brick, considered the practical importance of his schools in teaching artists to serve the revolution. [5. Brick. “T.n. «Formal method» - Bookstore]

A brilliant representative of the formalists is Andrei Beliy. Beli was a poet and poetess in his own right. [6. Demin V. Andrey Beliy. 2007].

He even founded the Andrei Beliy Society in New York in 1981, where he published periodicals, translated, and organized symposia. The study of the work of poets and poetesses has been conducted in the United States, Japan and a number of European countries. Andrei Beli's "Symbolism", his scientific works, his novel "Petersburg" and his innovative poems became very popular [7. Beliy A. Symbolism. 1910]. "No one has worked as boldly on the word as Andrei Beliy," said K. Mochulsky, a French-speaking French researcher. [Kozhinov V. Reflections on Russian Literature. P. 210].

Andrei Bely was an artist who paid a lot of attention to word experiments and new poetic methods among formalists. [9. Andrey Beliy. Problems of creativity].

The 10th and 20th centuries were a period of intense literary debate and struggle. The various literary movements, trends, and schools that emerged during this period eventually contributed to the development of Great Literature. Representatives of the school of formalism and formal methods have developed new literary methods and techniques. True, they had both successes and failures. The success was that the works created by the proponents of the formal method, the research, were recognized by the literary community. Pure works of art as well as literary studies were born. On the other hand, this method brought an atmosphere of renewal, change, and modernity to the literary process. Third, they sought the unseen possibilities of artistic expression, of artistic aesthetic thinking.

At the same time, the formal method has its drawbacks and shortcomings. The biggest mistake was to pay too much attention to the shape and make it absolute; many researchers agree on this point. The importance of content, its priorities, is often overlooked. Of course, not all formalists make the same mistakes.

It should also be noted that the approach to the formal method was different. Uzbek experts also endorsed the creative experiences of most formalists, with some focusing on their limitations. For example, Kazakboy Yuldashev writes: “However, there is also the fact that the formalist approach in some cases has given a fine artistic pattern. Fiction is essentially a pursuit of diversity. Formalism is a more militant form of research in this direction” [10. Q. Yuldashev. Fundamentals of artistic analysis. 347]. A group of scholars believes that this literary process did not make a decisive turn in Uzbek literature: History of Uzbek literature of the XX century. Page 32]. In another source, we find a different admission: “Mayakovsky entered European literature, the literature of the Near and Middle East, with a thunderbolt. His achievements in the field of free poetry have been followed by artists beyond the borders of our country” [12. History of Uzbek Soviet Literary Criticism. There are other opinions about this current: “These currents are close to romanticism and are born on the basis of the principles of romantic imagery ... They seek to depict life through mysterious symbols.” [13. Introduction to Literary Studies. Page 257]. There are those who are critical of this trend: Formalism works under the motto “Art for Art's sake.” Such an approach leads the artist to deny the ideology of the work of art and to focus on the dry form, thereby undermining the dialectical connection between the content and the form of the work. Despite these shortcomings, some of the formal school's research is still used in mathematical linguistics and poetics. [14. Dictionary of Literary Terms, p. 346]. Another dictionary contains similar, but more objective and potential ideas: “Formalism is an aesthetic tendency to deviate from the requirement of a harmonious unity of artistic form and content and to view it as the main criterion of art without absolute independence of form ... Proponents of the formal method They studied many aspects of the form: artistic language, style, poem structure, poem composition, rhythm, meter, plot construction, and composition of the work of art. The research carried out by such representatives of the Russian formal school as V. Shklovsky, V. Zhirmunsky, Y. Tinyanov, G. Vinokur, B. Eichenbaum is of great importance in the development of literature. [15. Dictionary of Literary Criticism, p. 348]. So far, neither the proponents of formalism nor those who oppose their literary doctrines have stopped arguing in literary circles and scientific conferences. Although the school has fallen out of the literary scene, some of the literary works they have created have not lost their relevance to this day.

V.Conclusion

In short, the literary method, in which the formal method was able to make revolutionary changes in its time, has emerged, and significant changes in the literary life of its time, optimistic literary-theoretical views, traditions, let alone introduced a new kind of literary thinking. “A poet or a writer who appeals to a genre creates according to the possibilities and requirements of the genre to which he or she applies. This demand and opportunity inevitably leads to two literary phenomena, tradition and innovation. While tradition always keeps the artist within certain limits, renewal leads to the demonstration of the artist's talent.” [16. Bahodir Sarimsoqov. Page 107]. The symbolists, the reformers of their time, were the experimenters of innovative reforms in literature. Despite their successes and shortcomings, they have largely achieved the literary and aesthetic tasks set before them.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
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	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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REFLECTION THE SYSTEM OF CONCEPT OF SAHIBKIRAN IN THE "TIMURNOMA"

Abstract: *In Uzbek folk epics, the alp is artistic generalization of the ideal hero, who embodies the power of the ethnos and the people. This image is built on the basis of generalized reflections on the people's consciousness, memory, artistic contemplation of the life and social activities of familiar persons, great kings, who passed in the history of Ethnos. This means that the alp and the reality in the epic are not a clear historical figure and a chronicle of the period, but rather a product of the typified artistic reality of all periods, alps are personalities who are ideal hero for ethnos and nations.*

Key words: *Amir Temur, alp, alpness system, image, folk book, Sahibqiron, Sahibqiron system, epic contemplation.*

Language: *English*

Citation: Sayitkulov, I. A. (2020). Reflection the system of concept of Sahibkiran in the "Timurnoma". *ISJ Theoretical & Applied Science, 10 (90),* 336-340.

Soi: http://s-o-i.org/1.1/TAS-10-90-58 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.58

Scopus ASCC: *1208.*

Introduction

A certain person shows ignorance of the laws of epic and epic contemplation if he interprets that Alpomish, Gorogli and other Alps in connection with a certain historical period. These types of personalities, who play an important role in the socio-political life of the ethnos, receive their artistic interpretations in the alpine system, which is the criterion for heroic epics. In this system, the role and mission of the Alps in the life of Ethnos is reflected artistically. Sahibqirons (owner of the brightest star), who play a very important role in the glorious history of the nation, are found in a few ethnic groups around the world. Comparing the notions of Sahibqiron with the alpness system in heroic epics allows us to fully understand the essence and artistic interpretations of these two very important concepts. The article analyzes the artistic interpretations of the features of the system of entrepreneurial imagination of Sahibqiron in "Temurnoma". On the basis of the fiction, the features of the image "Sahibqiron" in the artistic literature are reflected.

II.Literature review

The main hero of the war novel (jangnoma) "Temurnoma" is Amir Temur. The fact that the work is called "Temurnoma" also confirms our opinion. The folk war novel depicts the life, socio-political activities and destiny of Amir Temur, his role in the history of statehood not only in Central Asia, but also in the Eurasian region, which he conquered. The quality of Sahibqiron is constantly used in the existing historical, literary, folk tales and folklore stories about the life of Amir Temur. In the war novel of "Temurnoma" the image of Amir Temur is depicted together with this quality. In the history, literature and folklore of Muslim peoples, the concept of Sahibqiron is used only for certain individuals. In this case, it is assumed that a person with the status of Sahibqiron is born at certain intervals of time, when several planets (especially Saturn and Jupiter) are lined up in the sky (qiron). It is noted in history that Alexander the Great, The Prophet Muhammad Sallah alayhi Wa Sallam and Amir Temur were born during a period of Qiron periodicity, that occurred every eight hundred years.

Below we will consider the artistic interpretations of the main features of the system of entrepreneurial imagination in folk epic thinking through the analysis of the story “Temurnoma”. All historical and literary sources provide information about the fact that the status of Sahibqiron has certain characteristics in the imagination of the people. This system of ideas clarifies not only on the war-novel, but also on the system of Sahibqiron in the artistic, philosophical, historical contemplation of all the peoples of the East. Below we consider the artistic interpretations of the main features of the system of Sohibqiron imagination in folk epic thinking through the analysis of the war novel “Temurnoma”.

III.Analysis

1. The birth and prediction of a future hero at the time of the Qiron (when several planets line up in the sky at certain intervals

In ilmi nujum (astrology)and in Legends, Zuhra(Venus) is defined as the planet of friendship and love, The Mushtariy (Jupiter) is the planet of triumph, luck, glory and joy. The time when these two planets meet in the same constellation is called the blissful moment - the qiran. A child born at such a time is considered the owner of that Qiron. It is predicted in advance that such a child will be a happy and owner of statehood.[1] In the “Temurnoma” is shown that Amir Temur gained great historical achievements and great deeds because he was born in the period of qiron. [2]According to the astrologers, historians and scholars of the Muslim East, the luck of a child born at the time of Qiran is high. According to the calculations, Alexander The Great, the Prophet Muhammad Sallahu alayhi vasallam and Amir Temur were born in the same period, every eight hundred years, at intervals – are considered “chosen” individuals.

2. The fact that The birth of the hero (Sahibkiran) was predicted and marked by the previous Sahibkiran's teacher.

This case is described the chapter of (49-54) called that “Doston: Seven rulers from seven climates are ambassadors for the assassination of Amir Temur Sahibkiran. In his statement’ The fact that the previous Sahibkiran Pir (patron saint) leaves information about a new Sahibkiran who will be born after a certain period of time is the will of the divine power, indicates that it is the result of a belief that the divisor is destiny. In the war novel of «Temurnoma”, this traditional stereotype is expressed in a very artistic way through the historical events of their time and the lives of individuals.

3. The manifestation of the signs of the hero's birth, his choice by the divine forces.

This is described in the chapter called that ‘The first doston (epic). Statement of Hazrat Amir Temur Sahibqiron's birth from his mother’. In particular, in this chapter Tegina Begim reports his state to Sadr as Sha’riat[3] Tarag‘ay Bahodir by his shepherd. (43-44) The fact that Tegina Begim brings Sahibqiron to the world is also said in the form of prophecies in the folk masterpiece (43)

Before he was born, Amir Temur was predicted to be a " jahongir and sahibqiron " by divine forces before his parents' wedding. In folklore, the signs of an unborn child appear to the parents before conception and it is described variously (44-45). Since the Sahibqirons are real historical figures, the patrons saint and Erans who patronize them are also embodied in the image of historical figures or people of a certain rank in society.

4. The resistance of opponents to the birth of the sahibkiron.

The Temurnoma describes that the birth of Sahibqiron is reported in the holy books, historical sources, and in the calendars of astrologers. Opponents are also aware of this good news by various means and oppose the birth of Sahibqiron. In particular, the masterpiece depicts Tegina Beg's co-wife, Mrs. Yoqun, the first wife of Taragay Bahodir, as an indirect rival to Sahibqiron. First of all, the birth of Amir Temur was revealed in Ms. Yoqun's dream as follows: "Tegina begim made the sun from the moon skirt and went from East to West and took the whole universe. then he wanted to go to India” (47). Mrs. Yoqun sends her slave Moydun to Sabulak, a famous interpreter in Samarkand, to interpret her dream. Sabulak said that: "At seven hundred and thirty-five in history, a baby will be born. According to the time of the stars, that day is near. The baby will be the owner of the land in future and will take over the whole universe. His descendants rule this great kingdom for eight hundred years"(48). Then Mrs. Yoqun planned to murder Mrs.Tegina. But it was not occurred. Due to the intervention of the unseen Erans, this work did not take place and the hired killer was killed. However, as a result of Mrs. Yoqun's conspiracy, Amir Temur lived without his father until the age of twelve.

5. The fact that sahibqiron constantly in the eyes of the pir (patron saint) and the Erans (divine forces)

Salohiddin Tashkendi said about Sahibqiron's teachers: “First Amir Temur Sahibqiron was brought up by Sheikh ul Alam, the second by Sheikh Shamsiddin Kulol, the third he was brought up by

[1] Али, Муҳаммад. Амир Темур солномаси. –Тошкент: Алишер Навоий номидаги Ўзбекистон Миллий кутубхонаси нашриёти, 2008. 8-бет.

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In the following places, the page of quotations from the same edition is shown in parentheses.

[3] In history, this sheikh was Amir Temur's maternal grandfather, and in "Temurnoma" this image was assigned to the pir and erans in folk epics.

Sheikh Hassan Bokhurzi and fourth Naqshband pirim educated him. Amir Temur was brought up by four teachers until he grew up" (95). Sheikh Sayfiddin (Sheikh ul Alam), Hoja Baho ul Haq vad din (Bahovuddin), Sheikh Hasan Kulol, Qalandar Khoja Kamal Khojandi, Sheikh Shams Kulol, Elder (aziz), Qazodin, Goyib Erans, Mavlono Sa'diddin, Hazrat Sayyid ota, Mast kalandar were described as an educator of Amir Temur in the war novel. However, the "Temurnama" emphasizes Sheikh Sayfddin (Sheikh ul Alam) and Hoja Baha ul Haq wad din (Bahovuddin) as the main patron saint.

6. The birth and upbringing of the hero in a foreign country, not in motherland, on the basis of "Sahibqiron"

In the masterpiece, the seven climate sultans found out that Sahibqiron was born in Movarounnahr and send their rulers as ambassadors to Bukhara to destroy him. The ambassadors looked for Amir Temur on the basis of signs of "Sahibqiron" When Tegina heard this, she became very worried and said, "This sign is in my son". In his dream, she saw the Sheikh ul-Alam. Sheikh ul-Alam said, "Come to Bukhara, stand by my grave and worship God. This is the fate of your son" (52) and showed her how to get out of this situation.

This means that in Temurnoma, rivals from seven climates looked for the future Sahibqiron on the basis of the signs of "Sahibqiron". However, the war novel does not specifically describe the signs of a six-month-old "Sahibqiron". The sign of "Sahibqiron" is mentioned in the general plan. The "Temurnoma" also describes Ms. Yoqun (Taragay Bahodir's first wife) conspiring to expel Tegina Begim from Taragay Bahodir's homeland. Therefore, the child was born in another country and was brought up by Amir Choku until he was twelve years old. The chapter called 'Listen the birth of Amir Temur" (47-49) and the chapter "Doston: Seven rulers from seven climates are ambassadors for the assassination of Amir Temur Sahibqiron. In his statement"(49-54) include these episodes.

IV.Discussion

7. Opponents find out about Sahibkiran's birth in various ways and try to eliminate him.

The "Temurnoma" states that Amir Temur was born and became well-known when he was six months old. The kings of the seven climate also find out about the Sahibqiron.

In particular, the inscription on the cave shows Amir Temur to Yeldirim Sultan Boyazid, the caliph of the Roman countries at that time. After the hero's birth, Dilshod, the queen of Baghdad, was the second to find out about him. Chaqimni (51) predicts from the ruler that the owner had been born and one day he would conquer the princess's land. Thirdly, this event is revealed in the dream of King Shuja (51). The fourth king of India, the fifth king of Europe(Farang), the sixth, king of Chinese and the seventh Tatar-Russian kings were aware of the birth of the hero and send their servants to Bukhara to kill the child. In the "Temurnoma", we see that it is associated with the traditional system of seven that the kings of the seven countries found out about the birth of the hero and took measures to destroy him. (There are seven colors in the rainbow; seven gates of heaven; seven days in a week; seven seas and seven continents; seven major parts of the human body (2 legs, 2 hands, trunk, neck and head) In this, seven kings means seven climate. Because as a result of the violation of the existing order in the seven climates of the earth, the divine forces choose Sahibqiron as the restorer. And it emerges a product of popular perception of the hero. In the masterpiece, the collaboration of the seven climatic kings against Sahibqiron can be seen as a product of the artistic interpretation of the eternal struggle between the forces of good and evil.

8. Appearing certain mysteries and unusual behavior of the future Sahibqiron.

The protagonist must be different from his peers and those around him. The "Temurnoma" also describes the peculiarities of the Sahibqiron at the age of twelve, and the fact that he was recognized by the people as the Sahibqiron. The following four supernatural qualities of sahibqiron are described in the masterpiece:

1) to draw a bow which drawn by forty people by his own;

2) lift a full cart with one hand;

3) tearing off the dragon's head with his teeth;

4) having scabies and not itching for seven years (54).

So, the above four situations described in the play show the process by which the protagonist demonstrates his "Sahibqiron" qualities in practice and is recognized by the people.

9. The fact that the hero will be tested and given the status of Sahibkiran by patron saint, will give him the and he will initiate his world-wide activity.

In "Temurnoma", the hero's visit to Rijal ul Ghoib and his selection as Sahibqiran are described in the chapter "Now we come to this chapter: the situation of Sahibkiran" (56-60). In particular, it describes the events in which Amir Temur's teacher - Sheikh Kulol took him to Rijal ul Ghoib (Ghoib Erans – divine forces) and elected him as a Sahibqiron (59). After that, Amir Temur returned from the palace of the Erans as the Emir of the Seven Climates and began his world-wide career. His role and destiny on earth are described in the chapter "Now we come to this chapter: the situation of Sahibqiron" (56-60). Thus, the masterpiece states that the protagonist was chosen as a Sahibqiron, and that he knew his duties, mission and destiny on earth from the divine powers.

10. The fact that the hero has spiritual and physical opponents, he defeats them.

Since the battle scenes dominate the course of events in the war novel of "Temurnoma", it is impossible that the hero does not have his own non-combatants, enemies and rivals. From this point of view, in the war novel we can divide the Sahibqiron's, enemies and rivals into two groups:

10.1. Spiritual rivals. In the "Temurnoma" Nasir Khusraw (60-72), Mansur (151-154), Hakim Nizari (259-267) and Salosil liars (269-273) are described as spiritual rivals to Sahibqiron. The masterpiece is an artistic interpretation of the events in which they declare themselves to be the Prophet and Amir Temur the Dajjal, and seek to rule through a crowd that is convinced of this claim. These events described in the play can be interpreted as an artistic interpretation of the fact that Sahibkiran was glorified not only among the oppressed, but also as a defender of religion.

10.2. Military-political rivals. The "Temurnoma" covers Amir Temur's conquest of certain territories and his battles with rivals on the battlefields. In particular, in the masterpiece Amir Temur faced up to rivals like Barokhan, Donboy Bahodur, Amir Hojibek, Oktemurhan, Shah Mansur, Jayon Chashm, Toktemurhan, Toktemur soldier Zafarbek, Shah Shujo, Muslimbek, Zolotus, Akshaykh, Kutulmishbek, Yeldirim Boyazid. In this process, the courage of the Sahibqiron, his image as a skilful commander and an invincible warrior is clearly shown.

11. Secrecy and protection of the gift belonging to the Sahibqiron.

This event described 154-164 pages called that "In this epic, Mirza Jahangir Tora ibn Amir Temur went to the land of Balkh, to his uncle Barakkhan. A statement that Amir Temur went and killed Barak Khan and then conquered India" In particular, during Sahibkiran's visit to India, he saw a high mountain. There was only one way to cross it. In the cave near the trail, he encountered a dragon, as tall as a plane tree, as thick as a minaret, with two eyes like a torch, is black, and the poison of its breath destroyed the world. He had a beautiful snake around his neck, with a red head, a green tail, and a white belly on his back. He was the king of all dragons and snakes. He came and greeted Sahibqiron. And the snake handed over to his owner the gift of the Prophet Solomon (peace be upon him) to Sahibqiron (159). This style of imagery, typical of fairy tales, is also common in other parts of the "Temurnoma" and in the depiction of events. So, in the "Temurnoma", a certain eran or prophet predicts the birth of a Sahiqiron. His gift is kept secret. The presence of such images indicates that the notion of "Sahibqiron" in the epic contemplation of peoples are formed in a unfied pattern.

12. Physical-spiritual contact of the sahibqiron with four sides of the Earth's surface (north, south, east, west), sky, and underground.

In the "Temurnoma", The Sahibqiron established contact with the west of the Earth (313-321), with the South (154-164) sides and with the sky (273-281) himself, with the North and underground, with the son of King Mirzo (228-236), and with the East (211-221) through his grandson Muhammad Mirzo. Main mission of him completed contacting with the four corners of the earth, the heavens and the earth, which we have mentioned above.

13. The predictions of the priests of the hostile country about the death of Sahibqiron.

The Kalmyks in the Temurnoma besieged the Samarkand fortress when Amir Temur was in Istanbul. An old Kalmyk (321) narrates to Hoja Ismatullah the signs of Sahibqiron's imminent death. This is based on the fact that the image of Sahibqiron is a real historical figure.

V.Conclusion

In conclusion, the basis of folk books about Sahibkiran is based the notions people about the person who was chosen as a great king and born in a period of qiron. These ideas clarify not only the war novel of "Temurnoma", but also the system of "Sohibqiron" in the artistic, philosophical and historical contemplation of the entire Eastern peoples. After all, the Sahibqirons are glorious heroes of history. The Alps, on the other hand, are the artistic representations of individuals who play an important role in the primitive ethnic life of a nation.

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Impact Factor:					
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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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TEST CHARGED PARTICLES AROUND REGULAR BLACK HOLES IMMERSED IN MAGNETIC FIELD

Abstract: *The article deals with test particles around a charged regular black holes immersed in magnetic field.*
Key words: *magnetic field, test, energy.*
Language: *English*
Citation: Xudoyberdieva, M. K. (2020). Test charged particles around regular black holes immersed in magnetic field. *ISJ Theoretical & Applied Science, 10 (90),* 341-346.
Soi: http://s-o-i.org/1.1/TAS-10-90-59 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.59
Scopus ASCC: *3100.*

Introduction

The particle collision of two particles around the RBH has also been studied which may cause the production of high energy particles, as goes the permutations between neutral, positively, and negatively charged particles. For the first time Roger Penrose suggested a process towards explaining the origin of UHECR by assuming the decay of a particle in the ergo-region into two particles where one particle falls into the BH with negative energy, and the second one has ejected away from the BH with an energy larger than the initial the energy of the parent particle. Recently, a model called the magnetic Penrose process (MPP) has been developed by to describe the motion of charged particles around a BH which are itself embedded in an external magnetic field. The efficiency of the process in the ordinary Penrose process ranges up to 21% in the case of extreme rotating BHs. It works in three regimes of efficiency: low, moderate, and ultra. It is shown that SMBH can be a source of UHECR where the beta decay of neutrons in the ergo sphere results in the emission of protons that can have energies up 1019-21*eV* in the ultra-high efficiency regime Frolov, have shown that non-rotating BH can act as particle accelerators when immersed in an external magnetic field considering charged and magnetized particle collisions. In an external magnetic field considering particle collision BH environment. Moreover BSW type collisions .It is always motivate to explain the origin of UHECR to study testing energy extraction models in different BH models.

II.Literature review

The new urge to considering such processes came from an interesting observation made in Ref. [2]. It was found there that two particles which move towards the horizon of the extremal black holes can produce infinity energy in the centre of mass frame. This effect (called the BSW one after the names of its authors) provoked a large series of works and is under active study currently. The most part of them was restricted to the investigation of the vicinity of the horizon where collision occurs. In terms of energy production, we also consider particle collisions/decay happening inside the accretion disk of the RBH. This discussion is relevant the detection of ultra high energy cosmic rays (UHECR) that could help identify potential black hole candidates and/or further strengthen the argument that BH are indeed sources of these extremely high energy particles. One of the most interesting properties of BHs is energy extraction from them, there are several models whose purpose is to explain particle acceleration around a rotating BH.

III.Analysis

Throughout this work we use signature (-; +; +; +) for the space-time and geometrized unit system $G = c = 1$ (However, for an astrophysical application we have written the speed of light explicitly in our

expressions). Latin indices run from 1 to 3 and Greek ones from 0 to 3.

The space-time around a RBH can be obtained using GR coupled to nonlinear electrodynamics (NED) and the corresponding action for these coupled fields is written

$$S = \frac{1}{16\pi}\int dx^4\sqrt{-g}\left(R - L(F)\right) \qquad (1)$$

where$F = F^{\mu\nu}F_{\mu\nu}$is the electromagnetic field invariantand $F_{\mu\nu} = A_{\nu,\mu} - A_{\mu,\nu}$is the electromagnetic field tensorand $A_\mu$is the electromagnetic field four potential. The spacetime around the RBH has been found bycoupling Einstein's theory of gravity to NED where the Lagrangian is found as a function of the electromagnetic field invariant.

$$L(F) = \frac{4n}{\alpha}\frac{(\alpha F)^{\frac{k+3}{4}}}{\left[1 + (\alpha F)^{\frac{k}{4}}\right]^{1+\frac{n}{k}}} \qquad (2)$$

For the case $k = 1$and $n \geq 3$, where n is assumed to be an integer [1], the metric tensor is,

$$ds^2 = -f dt^2 + f^{-1}dr^2 + r^2 d\Omega^2 \qquad (3)$$

The effective potential for a charged particle a constant plane ($\theta = const$ and $\dot{\theta} = 0$) can be found by solving equation $E = V_{eff}$(taking $\dot{r} = 0$) and we have and four-velocities of the charged particle

$$\dot{t} = \frac{1}{f}(\mathcal{E} - qA_t)$$

$$\dot{r}^2 = (\mathcal{E} - qA_t)^2 - f[1 + \left(\frac{l}{rsin\theta} - \frac{qB}{2}rsin\theta\right)^2]$$

$$\dot{\phi} = \frac{l}{r^2 sin^2\theta} - \frac{qB}{2} \qquad (4)$$

In this section, we will study the centre-of-mass energy of two particles in the case of charged-charged, charged neutral particles collisions. The expression for the centre of-mass energy for two particle system with mass m_1 and m_2, in a given gravitational field is as a sum of two-momenta

$$\{E_{cm}, 0,0,0\} = m_1 u_1{}^\mu + m_2 u_2{}^\mu \qquad (5)$$

where, $u_1{}^\alpha$ and $u_2{}^\beta$ are four-velocity of the two colliding particles and the velocities satisfy the condition $u_\mu u^\mu = -1$. Keeping the condition one can square (5) and we have.

$$E_{cm}{}^2 = m_1{}^2 + m_2{}^2 - 2m_1 m_2 g_{\mu\nu}u^\mu u^\nu \qquad (6)$$

and after simplifying

$$\frac{E_{cm}{}^2}{m_1 m_2} = \frac{m_1}{m_2} + \frac{m_2}{m_1} - 2g_{\mu\nu}u_1{}^\mu u_2{}^\nu \qquad (7)$$

Let us consider simple estimation, assuming that the mass of the particles is different from each other N times, i.e. $m_1 = Nm_2$, N cannot be zero, obviously that $N > 1$ corresponds to $m_1 > m_2$, and vice versa $N < 1$ to$m_1 < m_2$ .Thus, the expression for center-of-mass energy (7) takes the following form.

$$\varepsilon_{cm}{}^2 = \frac{E_{cm}{}^2}{m^2} = 1 + N^2 - 2Ng_{\mu\nu}u_1{}^\mu u_2{}^\nu \qquad (8)$$

taking into consideration equations

$$\varepsilon_{cm}{}^2 = 1 + N^2 - \frac{2N}{f}(fr^2\left(\frac{l_1}{r^2} - \frac{q_1 B}{2}\right)\left(\frac{l_2}{r^2} - \frac{q_2 B}{2}\right) - (\varepsilon_1 - q_1 A_t)(\varepsilon_2 - q_2 A_t) + \sqrt{\left\{(\varepsilon_1 - q_1 A_t)^2 - f\left[1 + \left(\frac{l_1}{r} - \frac{q_1 B}{2}r\right)^2\right]\right\}\left\{(\varepsilon_2 - q_2 A_t)^2 - f\left[1 + \left(\frac{l_2}{r} - \frac{q_2 B}{2}r\right)^2\right]\right\}} \qquad (9)$$

Here we will consider the collision of the charged particles with the same mass m_1=$m_2 = m$ (charge might be different, for example, electron and positron) and initial energy $\varepsilon_1 = \varepsilon_2 = 1$, then the expression for the centerof-mass energy takes the following form Now we will study in detail, center-of-mass energy of two colliding (neutral/charged) particles with different cases, i.e. particles with the same mass (m_1=$m_2 = m$) and different mass $m_2 \neq m_1$ (assuming $m_1 = Nm_2$, here N is some non-zero number) and the angular momentum ($l_1 = -l_2$=l and $l_1 \neq l_2$), and initial energies $\varepsilon_1 = \varepsilon_2 =$ 1 in the equatorial plane using equations of motion charged particles .In figure 1 radial dependence of center-of-mass is plotted in different values of Q and n.

One can see from left panel of this figure that the center-of mass energy increases as the charge of RBH increase, but the increase of n cause to decrease the energy (middle panel), left panel is plotted for extreme charged RBH case for given values of n obviously that the maximum of the energy is at horizon when $r \to r_h$

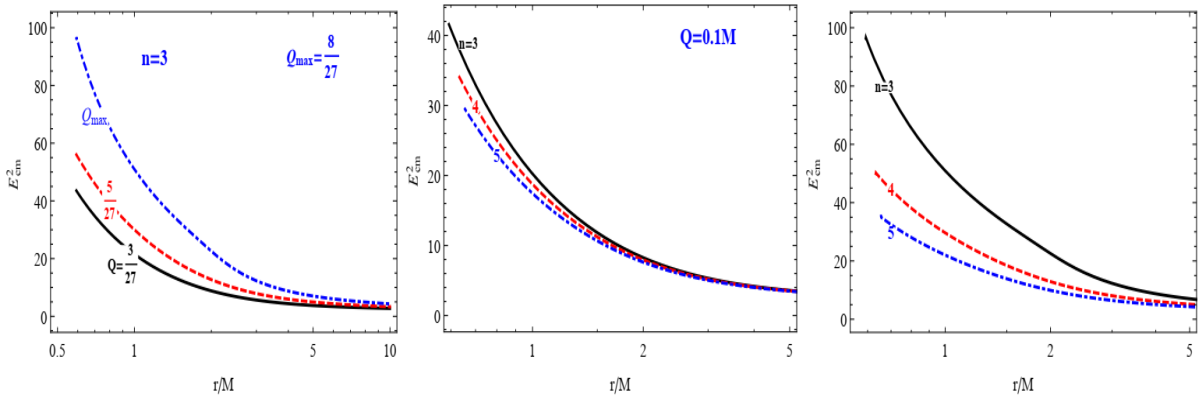

FIG. 1: Radial dependence of center-of-mass energy for charges with value $q = -100$ and $q = 2$

Let us consider that two charged particle having the same charge and the same angular momentum collision with opposite direction. The question that what is the minimum values of charge q and angular momentum l that the center-of-mass energy $\varepsilon > 100$ can be greater than 100.

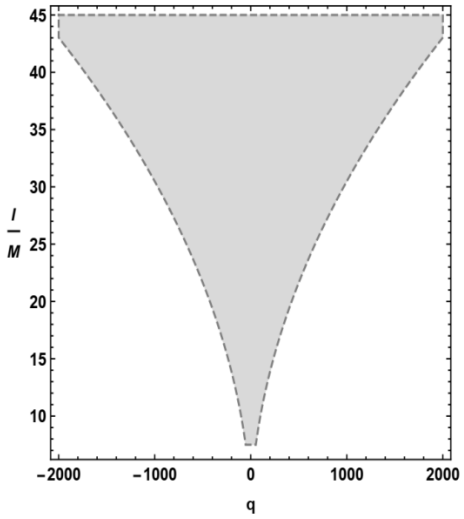

FIG. 2: Figure shows they are where $\varepsilon > 10$ for different cases in the case $B = 0$

"The colored area" in figure 2, where a field which set of points consisting of the values of l and q, correspond "the area" where $\varepsilon > 10$. In the border of the colored area $\varepsilon = 10$ and in the white-uncolored area $\varepsilon < 10$ the figure in below we try to find minimum values of charged particles in the collision with angular momentum $l_1 = -l_2$=l0 the energy to be $\varepsilon > 100$

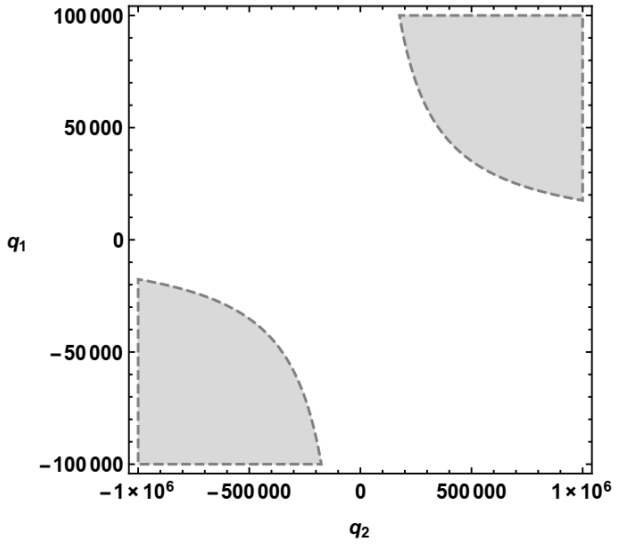

FIG. 3: the same figure with Fig.2 but for. $\varepsilon > 100$

In figure 3 we set up the shaded region consisting of the values of q_1 and q_2 for $\varepsilon_{cm} > 100$. In both figures 2 and 3 we have considered the particle with the same mass.This can be attributed to the values for q_1 vs q_2 for both figures interchanging places, so the plot just had a change of axis. Now the momentum value change had no effect because q_1 vs q_2 have very high values compared to the angular momentum. In figure 2 we made $q_1 = q_2 = q$ and $l_1 = l_2 = l$ and then plotted q with respect to l. For this plot $\varepsilon_{cm} > 10$.It can be seen that as q increases at a greater rate l will still have a smaller increasing rate. In figure 3 we again made $q_1 = q_2 = q$, and $l_1 = l_2 = l$.In this case $\varepsilon_{cm} > 100$ and l had a much higher range compared to the figure 1 and 2. This illustrated bow when the angular momentum.It can be seen that when q is of a small range then the value of l will have an effect on the plot.

IV.Discussion

A. Harmonic oscillations. The effective potential of a charged particle becomes minimum at a distance r_0 in the equatorial plane ($\theta = \pi$=2). Let us consider the case when the charged particle slightly shifts radially its position on a given circular orbit, the charge tries to back its equilibrium orbits where the effective potential is minimum corresponding charges parameters, then the charge starts oscillate around the circular orbits where the charge initially has been. If the derivation of the effective potential by radial coordinate is small enough, the condition of linear harmonic oscillation can be satisfied. Variation of the charged particle around the distance r_0 is $\delta r = r - r_0$ and the equation of the linear harmonic oscillations can be described by using the Taylor expansion around the distance r_0

$$V_{eff}(r) = V_{eff}(r_0) + \frac{\partial V_{eff}(r)}{\partial r}\Big|_{r = r_0}{}^{(r-r_0)} + \frac{1}{2}\frac{\partial^2 V_{eff}(r)}{\partial r}\Big|_{r = r_0}{}^{(r-r_0)^2+(\delta r)^3} \quad (10)$$

In cases small displacement of charged particle around the stable circular orbits the higher orders (more than three) of δr tends zero. In fact that the first derivative of the effective potential is zero in circular orbits, then the equation (10) can be rewritten as

$$V_{eff}(r) = V_{eff}(r_0) + \frac{1}{2}\frac{\partial^2 V_{eff}(r)}{\partial r}\Big|_{r = r_0}{}^{(r-r_0)^2} \quad (11)$$

III. PSEUDO - NEWTONIAN POTENTIAL.

Here we derive the pseudo-Newtonian potential (or the Paczy˘nski-Wiita (PW) potential for the RBH (a Maxwellian solution), which is an interesting astrophysical object. First, we calculate the Keplerian angular momentum to derive the PW potential

$$\Omega_k = \frac{\mathcal{L}_{erit}{}^2}{\varepsilon^2} = \frac{Mr^3(1+\frac{Q}{r})^{n-1}\left[1+(1-n)\frac{Q}{r}\right]}{\left[r(1+\frac{Q}{r})^n - 2M\right]^2} \quad (12)$$

The general form of the pseudo-Newtonian potential

$$V_{PW} = \int F_{CF}\,dr, \quad F_{CF} = \frac{\Omega_k}{r^3} \quad (13)$$

Here FCF is centrifugal force. Taking into consideration (13) one can easily calculate the PW potential as

$$V_{PW} = -\frac{M}{r(1+\frac{Q}{r})^n - 2M} \quad (14)$$

Equation (14) at Q = 0 reduces to the potential for a Schwarzschild BH

$$V_{PW} = -\frac{M}{r-2M} \quad (15)$$

FIG. 4: The topmost panel illustrates how the PW potential for marginally bounded neutral particles increases around a RBH for a fixed charge Q while varying n. The bottom panel illustrates the same

pattern for a fixed degree of nonlinearity *n* while varying *Q*. In figure 4 we plot the radial profile of the PW potential to illustrate the effects of the RBH charge *Q* and the degree *n.* The presence of both parameters *Q* and *n*causes the PW potential to increase. This corresponds to a shorter radial distance to the RBH for larger values of *n*

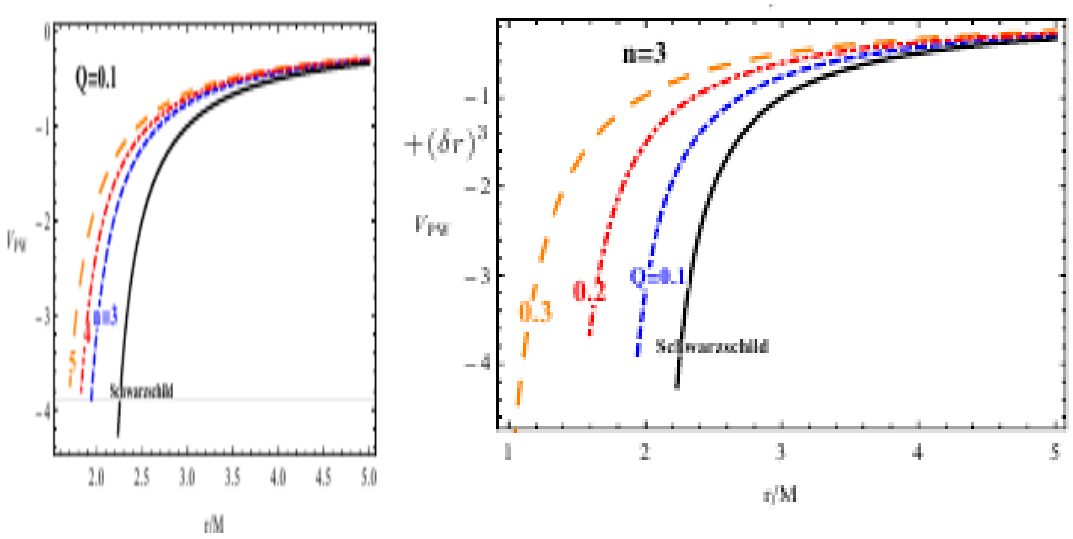

FIG. 4

V.Conclusion

We studied in detail properties of the RBH space-time obtained by coupling general relativity to nonlinear electrodynamics [1], focusing on the solutions having the proper .Maxwell weak-field limit of the nonlinear model of electrodynamics. We concentrated on the properties of the space-time curvature, the electric field, and the motion of neutral particles and electrically charged particles. An analytical expression for the radius of the outer event horizon for the cases of n ¼ 3 and n ¼ 4 was obtained, and it was shown that the radius of the event horizon decreases as the RBH charge Q, and degree of nonlinearity n, increase.

The rate at which the event horizon decreases as these parameters increase speeds up much more than in the Reissner Nordstrom case. For the electric field around the RBH we can state that an exact expression for the radial component of the electric field strength was derived. It was understood that the strength of the electric field E increases at large distances when n ¼ 3 and as Q is increased. In extreme charged RBH case the value of E-field becomes negative, near the event horizon.

The motion of neutral particles was considered and it was shown that (a) the ISCO and marginally bounded radius decreases as Q and n are both increased. The rate of this decrease is larger for RBHs than in the RNBH case. (b) The value of the effective potential for neutral particles increases with increasing the values of the parameters Q and n. This research is supported by by Grants No. VA-FA-F-2-008 and No. YFA-Ftech-2018-8 of the Uzbekistan Ministry for Innovation Development, F.4-18 of the Uzbekistan Academy of Sciences, and by the Abdus Salam International Centre for Theoretical Physics through Grant No. OEA-NT-01. This research is partially supported by an Erasmus + exchange grant between SU and NUUz.BA thanks the Institut f¨ur Theoretische Physik and the Silesian University for the warm hospitality during his stay in Frankfurt and Opava.

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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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INVESTIGATION OF THE PHYSICOCHEMICAL PROPERTIES OF SOME OIL SHALE IN AZERBAIDZHAN

Abstract: *This article deals with the properties of gas, tar, which are obtained by coking of oil shale from six fields of Azerbaijan: Big Siyaki, Small Siyaki, Khinalig, Lokbatan, Shekikhan and Kechallar.*

The decomposition gas contains a certain amount of hydrogen sulfide and the composition of the low-boiling tar fractions contains a significant amount if thiophene compounds.

Key words: *shale, decomposition gas, tar, thiophene, coking, kerogen.*

Language: *Russian*

Citation: Yusifzade, A. A., & Farzalizade, F. M. (2020). Investigation of the physicochemical properties of some oil shale in Azerbaidzhan. *ISJ Theoretical & Applied Science, 10 (90),* 347-351.

Soi: http://s-o-i.org/1.1/TAS-10-90-60 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.60

Scopus ASCC: *1600.*

ИССЛЕДОВАНИЯ ФИЗИКО-ХИМИЧЕСКИХ СВОЙСТВ НЕКОТОРЫХ ГОРЮЧИХ СЛАНЦЕВ АЗЕРБАЙДЖАНА

Аннотация: *В данной статье приведены свойства газа, смолы, которые получены при коксовании горючих сланцев шести месторождений Азербайджана: Большой Сияки, Малый Сияки, Хыналыг, Лёкбатан, Шекихан и Кечалляр.*

В составе газа разложения содержится некоторое количества сероводорода, а в составе легкокипящих фракций смолы содержится значительное количество тиофенах соединений.

Ключевые слова: *сланец, газ разложения, смола, тиофен, коксование, кероген.*

Введение

УДК 662.67.66.092.147.3:541:1

При термическом разложении керагена горючих сланцев выделяется газ, в котором содержится значительное количество CO, CO_2, H_2S, CH_4, H_2O, а также смолы, которые содержат различные по составу жидкие органические продукты, что связано с химическим составом сланцев.

Нами проводилось полукоксование сланцев шести месторождений Азербайджана, свойства которых нами данные в предыдущей статье

Температура процесса изменялась от 350 до 500ºС. Процесс декомпозиции сланца состоит из двух стадий. При 300-375ºС происходит разложение керогена, а при 375-500ºС протекают вторичные процессы разложения и уплотнения. Нами проводилось несколько экспериментов и бралось среднее значение экспериэксперимента [1]

Экспериментальная часть. Согласно действующей в России экспериментальной установки [2] нами была собрана аналогичная.

Установка включает узлы (рис.1) подготовки газового теплоносителя, бункер и шнековый

питатель для подачи мелкозернистого сланца в реактор, пылеосадительные устройства и систему конденсации для раздельного улавливания летучих продуктов. Реактор выполнен из нержавеющей стали диаметром 107 мм[3]

Для обеспечения заданного температурного режима при разогреве установки и во время опыта осуществляется компенсационный электрообогрев реакторов 17 и 21, циклона 18, бункера для сбора пыли 23. Гидравлический режим в установке регулировался изменением разряжения, создаваемого вакуумным водокольцевым насосом. Заданную температуру процесса полукоксования сланца в реакторе 17 регулировали изменением соотношения "газ-воздух" и подачей части обратного газа, подаваемого компрессором (на рис.1 не показан) в нижнюю часть реактора 17. [4]

В качестве газового теплоносителя использовались продукты неполного горения природного газа. Для приготовления теплоносителя в эжектор 5 из сети поддавался природный газ и сжатый компрессором 1 воздух. Воздух подогревался до 250ºС в воздухоподогревателе 4. Для предотвращения попадания в питатель сланца 14 парогазовых продуктов, в реактор 17, через питатель непрерывно подавалась небольшое количество обратного газа. В нижней части камеры сгорания 7 предусмотрен в патрубок с предохранительным клапаном 6.

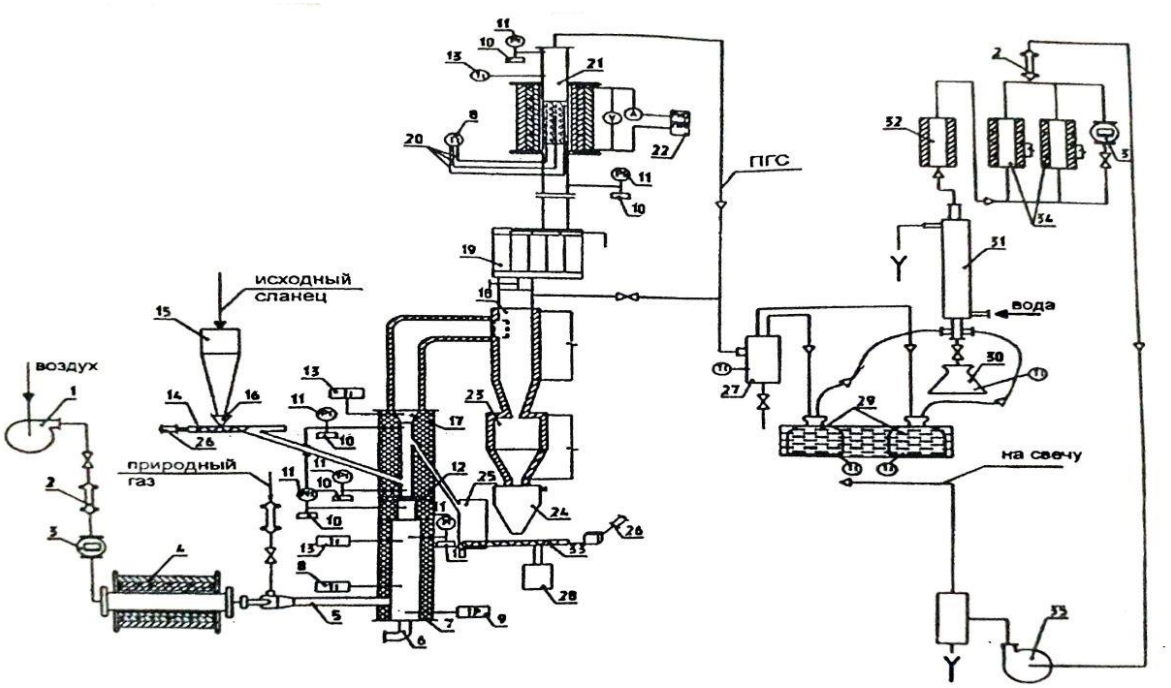

Рис.1 Схема экспериментальной установки.

1- компрессор; 2 - дозатор; 3 - очиститель; 4-воздухоподогреватель; 5 - эжектор; 6 - предохранительный клапан; 7, 12- камера сгорания; 8, 10, 11- ёмкость; 9- электрический запальник; 13, 20 - дозатор; 14, 22- сборник парогазовых продуктов; 15, 28- бункер; 16- клапан; 17 - реактор; 18 - циклон; 19 - фильтр; 21 - реактор пиролиза; 23, 24 - бункер для сбора пыли; 25 - бункер для шлама; 26 - выбросы в атмосферу; 27, 29, 31 - холодильник; 28 - сбор твердых остатков; 30 - приёмник; 32 - сушильная колонна; 33 - шнек; 34 - колонна с активированным углём; 35 - водокольцевой насос.

В зоне ввода газовоздушной смеси установлен электрический запальник 9, питаемый от высоковольтного трансформатора.

Процесс полукоксования сланца и последующего пиролиза парогазовой смеси осуществлялся следующим образом. Полученная в камере сгорания газовый теплоноситель подавался под газораспределительную решётку реактора полукоксования 17. В реактор, на решетку из бункера 15 с помощью шнека 14 поступал мелкозернистый сланец. Благодаря соответственно подобранной скорости газового теплоносителя над решеткой создавался псевдоожиженный слой сланца. Сланец в слое нагревался за счёт тепла газового теплоносителя и здесь же происходило его термическое разложение. Твёрдый остаток переработки - полукокс - удалялся шнеком 33 в бункер 28.

Парогазовая смесь отсасывалась из надслоевого пространства реактора 17 и проходя

через циклон и фильтр 18 освобождалась от вынесенной из реактора пыли полукокса и сланца. Далее, очищенная от пыли парогазовая смесь поступала в реактор-пиролизер 21, где осуществлялся пиролиз парогазовой смеси на катализаторе. Парогазовая смесь отсасывалась из верхней части реактора-пиролизера вакуумным водокольцевым насосом 35 и поступала в систему конденсации, состоящую из воздушного холодильника 27, приемников жидких продуктов с водяным охлаждением 29 и холодильника типа "труба в трубе" 31 с приемником 30. Продуктовой газ в смеси с теплоносителем и парами сланцевого бензина отсасывались из системы конденсации вакуумным водокольцевым насосом 35 через колонку с хлористым кальцием 32 и далее через систему улавливания суммарной фракции (газового бензина и легкой фракции смолы с температурой кипения до 200ºС) через колонки с активированным углём 34 и направлялись на свечу.

В ходе опыта фиксировались следующие технологические параметры: расходы газа и воздуха на горение, давление в реакторе, суммарный перепад давления на решетке и в слое, состав и давление газового теплоносителя на выходе из камеры сгорания, состав и давления газового теплоносителя в камере смешения, температура теплоносителя в слое над решеткой, над слоем и на выходе из реактора, состав и давление смеси газов на выходе из реактора полукоксования и т.д.

Нами составлялся материальный баланс процесса полукоксования на каждый сланец.

Материальные балансы данные при температуре 480ºС.

Таблица 1. Материальные балансы процесса полукоксования сланцев.

Наименование компонента % мас.	Наименование сланца					
	Большой Сияки	Малый Сияки	Хыналыг	Лёкбатан	Шекихан	Кечалляр
Взято: Сланец	100	100	100	100	100	100
Итого получено	100	100	100	100	100	100
1.Газ	13,9	12,85	12,1	10,1	12,4	11,9
2.Жидкая смола	14,43	14,4	3,9	20,3	5,5	16,5
3.Отработанный сланец	70,67	71,85	83,4	69,1	81,4	70,8
4. Потери	1,0	0,9	0,6	0,5	0,7	0,8
Итого	100	100	100	100	100	100

Продукты, полученные в процессе полукоксования анализировали в капиллярном газовом хроматографе. Качественная идентификация компонентов анализируемых смесей осуществлялось с помощью ЭВМ по временам удерживания, путем сравнения их с данными, хранящимися в памяти.

Состав газов разложение дан в таблице 2

Таблица 2. Состав газов разложения.

Компоненты	Содержание, % объёмные					
	Большой Сияки	Малый Сияки	Хыналыг	Лёкбатан	Шекихан	Кечалляр
CO	0,25	0,22	1,4	0,2	0,45	0,29
CO_2	2,08	2,25	2,12	1,7	1,95	1,89
CH_4	1,82	2,03	2,5	1,9	2,1	1,92
C_2H_4	1,75	1,74	1,88	1,6	1,82	1,7
C_2H_6	1,20	1,33	1,37	1,1	1,28	1,25
C_3H_6	1,22	1,17	1,13	0,95	1,18	1,19
C_3H_8	0,88	0,67	0,6	0,65	0,62	0,73
C_4H_8	1,40	1,7	0,55	0,85	1,5	1,58

C_4H_{10}	2,59	2,47	0,2	0,31	0,6	0,4
H_2S	0,79	0,77	0,35	0,84	0,9	0,95

Сланцевая смола и её дистиллаты не могут сравниваться с нефтью или её погонами. В химическом составе сланцевой смолы наряду с углеводородными молекулами содержится значительное количество кислородных, сернистых и азотистых соединений.

Фракционный состав смол представлен в таблице 3.

Таблица 3. Фракционный состав смол.

Температура, ºС	Большой Сияки % об.	Малый Сияки % об.	Хыналыг % об.	Лёкбатан % об.	Шекихан % об.	Кечалляр % об.
н.к. – 90	2,2	1,8	1,6	2,3	1,7	2,0
90 – 120	0,7	0,8	0,65	0,92	0,75	0,97
120 – 150	3,1	2,9	2,8	3,24	2,88	3,18
150 – 170	6,1	6,0	5,7	6,6	5,9	6,45
170 – 215	10,0	9,7	9,4	10,44	9,63	10,35
215 – 230	1,4	1,6	1,48	2,1	1,5	1,75
230 – 250	4,1	3,8	3,9	4,3	3,94	4,2
250 – 280	6,1	6,5	5,9	6,2	5,7	6,3
280 – 300	4,2	4,5	4,6	4,3	4,7	4,1
300 – 330	14,2	15,3	15,5	14,9	13,9	14,4
Выше 330	47,9	47,1	48,47	44,7	49,4	46,3

Основную массу смолы из горючих сланцев составляют высокомолекулярные соединения, выкипающие выше 300ºС. Смолы характеризуются высоким содержанием ароматических углеводородов и гетероатомных соединений. Тиофен и его ближайшие гомологи содержатся в легких фракциях смолы (до 160ºС) и могут быть выделены методом ректификации[5].

Индивидуальный состав смол определялся при помощи хроматографа.

Химический состав легкокипящих фракций н.к. - 215ºС пиролиза сланцев представлен в таблице 4

Таблица 4. Химический состав фракций н.к. - 215ºС смолы.

Компоненты.	Большой Сияки	Малый Сияки	Хыналыг	Лёкбатан	Шекихан	Кечалляр
Головная фракция, %	43,8	21,0	19,3	22,8	24,5	46,4
Бензол	11,2	1,9	2,1	3,6	5,2	10,7
Тиофен	5,7	1,0	1,2	2,9	3,8	5,2
Толуол	2,9	3,9	3,2	3,8	4,1	2,7
Метилтиофен	16,2	20,2	18,4	15,8	14,9	13,7
Этилбензол и ксилолы	4,9	17,3	12,1	15,2	13,5	5,8
Другие компоненты	15,3	34,7	43,7	35,9	34,0	15,5

Как видно из данных таблицы 4 в легких фракциях смолы содержится значительное количество тиофеновых соединений, что делает целесообразным их использование в качестве сырья для извлечения тиофена или тиофена-ароматического концентрата по способу, технологические оформленному в промышленном масштабе. [6-14]

Выводы. Таким образом, нами проведено полукоксование шести сланцев Азербайджана, дан состав газа и смолы, полученной в процессе. Показано, что в газе содержится сероводород, а в низкокипящих фракциях сланцевой смолы содержится тиофен и его гомологи, а также бензол и этилбензол и алкилбензолы.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
	GIF (Australia) = 0.564	ESJI (KZ) = 8.997	IBI (India) = 4.260
	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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INNOVATIVE EDUCATIONAL TECHNOLOGIES AT THE UNIVERSITY: INNOVATIVE PORTFOLIO TECHNOLOGY

Abstract: *The article outlines aspects of innovative educational technologies at the university, in particular, portfolio technologies are discussed. The author substantiates that the student's portfolio serves to assess the level of competence in the field of foreign languages, and is one of the types of monitoring students' educational achievements.*

Key words: *personally oriented technologies, modular-block technologies, information and communication technologies, management technologies, integral technologies, gaming technologies, design technologies, educational technology, critical thinking.*

Language: *English*

Citation: Karimova, N. (2020). Innovative educational technologies at the university: innovative portfolio technology. *ISJ Theoretical & Applied Science, 10 (90),* 352-356.

Soi: http://s-o-i.org/1.1/TAS-10-90-61 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.61

Scopus ASCC: *3304.*

Introduction

The current stage in the development of society poses a number of fundamentally new problems for the Russian education system due to political, socio-economic, ideological and other factors, among which the need to improve the quality and accessibility of education should be highlighted.

Innovation (eng. Innovation - innovation) - the introduction of new forms, methods and skills in the field of training, education and science.

In relation to the pedagogical process in a university, innovation means the introduction of something new into the content, methods, forms and goals of teaching and upbringing, the organization of close cooperation between the teacher and the student.

The main goal of innovative education technologies is to prepare a person for life in a constantly changing world. The essence of such training lies in the orientation of the educational process to the potential of a person and their implementation. Education should develop mechanisms for innovation, find creative ways to solve vital problems, and contribute to the transformation of creativity into the norm and form of human existence.

Innovative technologies in education are the organization of the educational process based on methods and technologies that allow achieving certain educational success in assimilating the maximum amount of knowledge, maximum creative activity, obtaining practical skills and abilities.

Literature review

The use of modern pedagogical technologies in the educational process of the university creates completely new possibilities for the implementation of the didactic principles of individualization and differentiation of teaching, has a positive effect on the development of students' cognitive activity, their creative activity, consciousness, realizes the conditions for the transition from teaching to self-education. The effectiveness of the use of pedagogical technologies in the educational process is confirmed by the research works of a number of authors: G.K.Selevko, V.I. Andreev, V.P.Bespalko, V.I.Bogolyubov, M.V.Klarin, V.Yu.Pityukov, V.I.Slastenina, Ya.A.Savelyeva, etc. Today, a comprehensive theoretical development of the problem of using modern pedagogical technologies in the professional training of a specialist in a higher school is acquiring special urgency and significance.

Modern technologies in education are considered as a means by which a new educational paradigm can be implemented. The most general interpretation of the concept of "technology" is that it represents a scientifically and practically grounded system of activities used by man to transform the environment, to produce material or spiritual values. Any activity, notes V.P. Bespalko, can be either technology or art. Art is based on intuition, technology on science. Everything begins with art, technology ends, so that then everything starts from the beginning [1]. Any planning, and one cannot do without it in pedagogical activity, contradicts impromptu, actions on intuition, that is, it is the beginning of technology. In pedagogical science and practice, there are different positions to the definition of pedagogical technology. So, M.V.Klarin designates this concept as a systemic set and the order of functioning of all personal, instrumental and methodological means used to achieve pedagogical goals [2]. G.K.Selevko believes that pedagogical technology is a well-thought-out model of pedagogical activity, which includes the design, organization and conduct of the educational process with unconditional provision of comfortable conditions for students and teachers [3]. In turn, V.P.Bespalko defines the concept of interest to us as a set of means and methods of reproducing theoretically grounded learning and upbringing processes that make it possible to successfully implement the set educational goals [1, p. 29]. Such a variety of interpretations of pedagogical technology is not accidental, since each author proceeds from a certain conceptual approach to understanding the essence of technology in general.

Innovative educational technologies at the university

An innovative pedagogical technology is a project of a certain pedagogical activity that is consistently implemented in practice, the main indicator of which is a progressive beginning in comparison with established traditions and mass practice. One of the main features of an innovative technology is that its development and application require high teacher and student activity.

The activity of the former is manifested in the fact that he is well aware of the psychological and personal characteristics of his students and, on this basis, makes individual adjustments to the technological process. Students' activity reveals the fundamental nature of education, creativity, professionalism.

The implementation of technological innovations in the educational process of higher education can help to solve the problems of training specialists who meet the requirements of the time. The use of modern pedagogical technologies in the educational process of the university creates completely new possibilities for the implementation of the didactic principles of individualization and differentiation of teaching, has a positive effect on the development of students' cognitive activity, their creative activity, consciousness, realizes the conditions for the transition from teaching to self-education. Modern technologies in education are considered as a means by which a new educational paradigm can be implemented.

In the professional training of law students, the higher school seeks not only to teach students the functional knowledge of a foreign language, but also to develop their foreign language communicative competence, i.e. the ability to use a foreign language as a means of solving professional problems, the ability to carry out foreign language interpersonal and intercultural communication at a university with native speakers. The process of using various innovative technologies is gaining great importance.[7]

At the heart of teaching the course "Foreign language in the field of jurisprudence" they are as follows:

- Personally oriented technologies;
- modular-block technologies;
- information and communication technologies;
- management technologies;
- integral technologies;
- gaming technologies;
- design technologies;
- technology for the development of critical thinking through reading and writing (challenge - comprehension - reflection);
- method of real situations (case study);
- interactive learning technology;
- language portfolio or portfolio.

We want to focus on one of them, namely portfolio technologies. A portfolio is defined as a collection of a student's work and results that showcases their efforts, progress, and achievements in various areas. This educational technology serves as a supplement to the traditional control and assessment tools, aimed, as a rule, at checking the reproductive level of assimilation of information, factual and algorithmic knowledge and skills. The portfolio technology allows you to take into account the results achieved by the student in a variety of activities - educational, creative, communicative, etc. and is an important element of the activity-based approach to education.

The student's portfolio serves to assess the level of competence in the field of foreign languages, is one of the types of control of educational achievements of students (knowledge, skills, abilities and personal qualities - competencies).

Portfolio is a creative process that allows you to take into account the results achieved by a student in various types of educational, creative, social, communicative activities during their studies at a higher educational institution.

The portfolio technology implements the following functions in the educational process:

- diagnostic (changes and growth (dynamics) of indicators for a certain period of time are recorded);
- goal setting (supports educational goals formulated by the standard);
- motivational (encourages the student and teacher to interact);
- meaningful (maximally reveals the entire range of achievements and work performed);
- developing (ensures the continuity of the development and learning process);
- rating (shows the range and level of skills and abilities in the study of a foreign language in the field of jurisprudence).

For a student, a portfolio is an organizer of his educational activities, for a teacher, it is a means of feedback and a tool for evaluating activities.

Several types of portfolios are known. The most popular are the following:

- portfolio of achievements;
- portfolio report;
- portfolio self-assessment;
- portfolio planning of my work;

The choice of the type of portfolio depends on the purpose of its creation.[5]

A distinctive feature of the portfolio is its personality-oriented nature:

- the student, together with the teacher, determines or clarifies the purpose of creating a portfolio;
- the student collects material;
- the evaluation of results is based on self-assessment and mutual assessment.

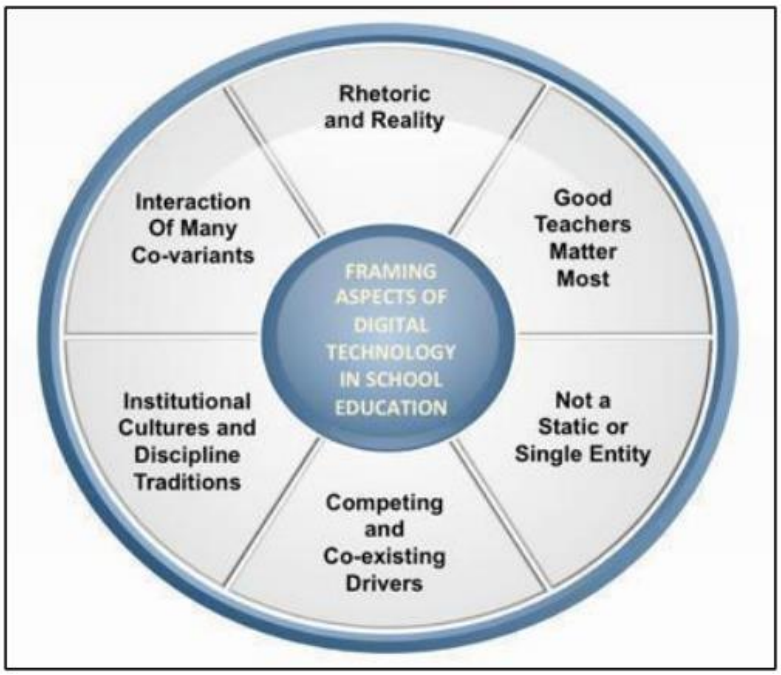

Fig.1. The theoretical lens

First, it is evident from the literature that digital technologies have the potential to enhance and, in theory, transform traditional ways of teaching, learning and assessment. However, despite a variety of new hardware devices and software solutions, traditional forms of pedagogy remain resistant to change [2]. While digital technology affects almost every aspect of our everyday lives, learning in classrooms is still the norm for the majority of school organisation [3]. As Marcus-Quinn and Hourigan argue, schools still lag significantly behind the transformative promise of digital technologies. Hence there is a tension between the rhetoric and reality of using technologies for teaching, learning and assessment – that is, the actual experience in the classroom and the real world in which many children live in their homes and local communities.

Second, whilst digital technologies have significant promise in terms of facilitating innovative teaching and learning, well-prepared and effective teachers matter most. The quality and effectiveness of pedagogy and related educational outcomes is heavily dependent on the way teachers use and mediate the technology in their classrooms. It follows that innovative and impactful professional learning for teachers has never been more important in order to help schools respond to these developments and harness the educational potential of digital technologies.[4]

An important characteristic of portfolio technology is its reflexivity. Reflection is the main

mechanism and way of self-assessment and self-report. Reflection is a process of cognition based on self-observation of one's inner world, "a psychological mirror of oneself."

The student must learn:

- select and evaluate information;
- accurately determine the goals that he would like to achieve;
- plan your activities;
- give assessments and self-assessments;
- track your own mistakes and correct them.

The best way to become familiar with portfolio technology is through practical implementation. In my practice, I use the following portfolio technology.

A student's portfolio of achievements is a document of a single sample, which is a folder with file inserts and consists of various sections, formed at the student's discretion.

In the portfolio section about his own achievements, the student demonstrates various forms of creative activity:

- participation in the student council;
- work in a legal clinic;
- participation in the editorial board of the student newspaper;
- participation in KVN;
- demonstration of sports achievements;
- participation in musical and dance ensembles;
- participation in scientific student conferences, competitions, Olympiads, competitions, etc.

The creative activity of students can be reflected in the portfolio in the form of tables, which indicate the name of the educational area, the name of the document, the level of participation, location, points.

Copies of certificates, certificates, diplomas, certificates, gratitude, placed in the portfolio, can be a demonstration of high performance in a particular area of student activity.[6]

A student can place his own creative achievements and creative successes not only in educational activities, but also in life in general in his portfolio in the form of an essay.

The most important source of scientific information and a means of transmitting it in space and time is a scientific document. In the field of legal competence and in the field of English language learning, the most important documents that form the Student Portfolio are: abstracts, annotations, articles, reports, research projects, essays, topics and texts in the field of law in English, reports and presentations.

The desire to improve the level of knowledge and proficiency in a foreign language in the field of law motivates the student to form his own portfolio with various types of documents reflecting his educational activities.

Depending on the level of knowledge of the English language, students can form sections - portfolio files, both in English and in Russian. The higher scores of the portfolio of those students that are formed in English will be considered and evaluated preferable.[8]

New educational standards introduce a new direction of assessment activity - the assessment of personal achievements. This is due to the implementation of the humanistic paradigm of education and a personality-oriented approach to learning. The introduction of an assessment of personal achievements ensures the development of the following personality components: motivation for self-development, development of self-esteem, volitional regulation, responsibility.[7]

Therefore, in the standards, the final assessment of the student also includes the accumulated assessment that characterizes the dynamics of individual educational achievements throughout the years of study at the university.

Portfolio is the best way to organize the cumulative assessment system. This is a way of recording, accumulating and evaluating the work, the results of the student, indicating his efforts, progress and achievements in various fields over a certain period of time. In other words, it is a form of fixing self-expression and self-realization.

The portfolio provides the transfer of "pedagogical emphasis" from assessment to self-assessment, from what a person does not know and cannot, to what he knows and can do. A significant characteristic of a portfolio is its integrativeness, including quantitative and qualitative assessments, involving the cooperation of a student and a teacher in the course of its creation.

The portfolio is not only a modern effective form of assessment, but also helps to solve important pedagogical problems: to maintain high educational motivation of students; encourage their activity and independence, expand the opportunities for learning and self-study; develop the skills of reflective and evaluative activities of future specialists.

As a result, it seems possible to note the advantages of this educational technology, which are as follows:

- unlike the traditional approach that separates teaching (of a foreign language), learning and supervision, the portfolio organically integrates these components of the learning process;
- allows you to combine the quantitative and qualitative assessment of the student's achievements in the field of legal English through the analysis of various products of educational and cognitive activities;
- not only assessment is encouraged, but also self-assessment and mutual assessment of students, as well as introspection and self-control;
- the formation of a portfolio is aimed at cooperation between a student and a teacher in order to assess the achievements, efforts and progress in teaching English in the field of law;

- portfolio - a form of continuous assessment in the process of continuing education, which shifts the emphasis from the rigid factors of traditional assessment to flexible conditions for alternative assessment.

The portfolio helps to solve the following important pedagogical tasks of teaching a foreign language in a non-linguistic university:

- to support and stimulate the educational motivation of students;
- develop the skills of students' reflective and evaluative activities;
- to form the ability to learn - to set goals, plan and organize their own educational activities;
- lay down additional prerequisites and opportunities for successful specialization in the field of law.

The portfolio gives a new impetus to the development of the assessment problem, shows possible directions for updating the traditional system, and ultimately forms a new understanding of the learning process itself.

Conclusion

The portfolio technology is one of the most important in the system of motivation for active work and high achievements of students' educational activities.

Possessing the principles of consistency, contact, and creativity, portfolio technology can significantly increase the efficiency of the educational process.

The subject of any new pedagogical technology is specific interactions between students and teachers in different types of activities, organized on the basis of precise structuring, systematization, programming, algorithmicization, standardization of methods and techniques of teaching or education, with the introduction of computerization and technical means.

So, modern pedagogical technologies in a new way implement the content of education and ensure the achievement of the set didactic goals, implying scientific approaches to the organization of the educational process at the university, expand the range of educational services provided to students, change and provide new forms, methods and means of teaching.

The use of modern pedagogical technologies is one of the most promising directions in the development of higher education, contributing to a greater individualization of the educational process, the intensification of training and education, the formation and self-actualization of the personality of a future specialist.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
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	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 27.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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IMPACT OF ECONOMIC EFFICIENCY ON THE ECONOMIC POWER OF THE APPLICATION OF QUALITY MANAGEMENT SYSTEM IN TEXTILE ENTERPRISES OF THE REPUBLIC

Abstract: *This article examines the impact of the cost-effectiveness of the application of quality management systems in the textile enterprises of the country on the economic potential. The importance of calculating the cost-effectiveness of standardization, how the cost-effectiveness indicator differs over the period of determination, and other issues were also analyzed.*

Key words: *textile industry, quality management, cost-effectiveness, standardization, design, stock capacity, stock return.*

Language: *English*

Citation: Yuldasheva, U. S. (2020). Impact of economic efficiency on the economic power of the application of quality management system in textile enterprises of the republic. *ISJ Theoretical & Applied Science, 10 (90),* 357-361.

Soi: http://s-o-i.org/1.1/TAS-10-90-62 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.62

Scopus ASCC: *2000.*

Introduction

At the current stage of economic development, standardization is becoming more and more technically, economically and socially important in accelerating social production and increasing efficiency. This process is based on the nature of standardization and its rise to a qualitatively new level.

Resolution of the President of the Republic of Uzbekistan dated September 11, 2018 No PP-3939 "On measures to accelerate the implementation of business initiatives and projects in the regions" The right to certify the conformity of products manufactured in the Republic of Uzbekistan by declaration. [1]

The Decree of the President of the Republic of Uzbekistan dated December 14, 2017 No PF-5285 "On measures to accelerate the development of the textile and clothing industry" pays special attention to radically improving the system of standardization and certification in the textile industry. Including: [2]

- increase the number of existing laboratories with international accreditation;
- Ensuring rapid and complete harmonization of national standards of the textile industry with international standards;
- Tasks for the introduction of modern quality management systems in the textile industry.

Literature review

A bibliographic method is used as a research methodo-logical toolkit. At the first stage, the analysis of the content of publications, interviews related to impact of coronavirus to agricultural supply chain was performed. In this case, the search query used combinations of keywords, COVID-19 and agriculture. Then, the bibliographic database on the content of articles for the period 2019 to 2020, inclusive, was analyzed. There many reseaches about pandemia`a effect to World economy as well as Shashi R.C. [1], Aboah, J. W. [2], Cui J.Z. [3], Ivanov D. [4] and others.

Some local economists, as well as Burkhanov A. [13] were inversitigated features Of Investment In Mutual Fund: In Case Of Russia. Khodiev B. Y. [5], Mustafakulov Sh. I., [6] and others proposed evaluation method-ology for integrated assessment of

production capacity management, which is based on qualitative and effective indicators of production capacity management. Methodology for assessment the efficiency of production capacities management at textile enterprises were investigated by Yuldashev N.[14], B. O. Tursunov in other works [7;8;10], but they have not investi-gated problems of influence of the Covid-19 pandemic coro-navirus of the world economy.

Analysis and results

It is obvious that the introduction of quality management in the textile enterprises operating in our country is important not only for entrepreneurs, but also for increasing the economic potential of the republic. Now, let's look at what is the essence of the cost-effectiveness of using a quality management system.

Standardization is a process that has historically emerged as an activity that delimits many different objects in the material and social spheres.

It should be noted that it covers many objects as a regulatory activity. The expansion of standardization objects and their penetration into many spheres of economic and social life requires the allocation of a large amount of resources for the development of standardization. But on the other hand, there is a growing demand for the rational use of resources, the full provision of resources for various areas of standardization development.

In such cases, the calculation of the cost-effectiveness of standardization is of particular importance, ie it has the following advantages:

- assessment of future development alternatives of standardization, ie standardization at the macro level determines the solution of important issues;
- The expediency of using standardization in some repetitive processes, event management;
- selection of descriptions of standardization objects and selection of the set of optimal parameters of the standardization object when solving optimization problems;
- assessment of management carried out by standardization at different stages of the management cycle;
- Rational distribution of economic resources among the areas of development of standardization.

Determining the cost-effectiveness of standardization is based on a number of common systems that are unique in standardization, as well as in the performance of work to improve product quality. Their unity is based on the fact that they represent a concrete form of introduction of scientific and technical progress, so the economic efficiency of standardization is part of the economic efficiency of scientific and technical development or the efficiency of new technology. New techniques for this need to be considered broad enough.

In short, standardization has an active impact on all elements of the production process, leading to the improvement of the objects and means of labor, technology, labor.

Today, about 1,000 textile enterprises operating in the country have international certificates. This indicates that the textile industry is developing rapidly.

It should be noted that in January-May this year, the volume of industrial production amounted to 8.3 trillion. soums, the growth rate compared to the same period last year was 108.1%, the forecast was fulfilled by 103%. In the first half of this year, the volume of industrial production amounted to 10.2 trillion. The growth rate is expected to increase by 106.2% compared to the same period last year.[12]

In order to reduce the impact of the pandemic on the economy of the republic, one of the priorities of the industry is to create new enterprises in the regions, provide employment and increase their real incomes.

In 2020, the total value of the textile and clothing industry in the regions will reach 598.4 million. It is planned to implement 53 large projects worth $ 232.4 million (including foreign investment and credit). As a result of these projects, more than 13,575 jobs will be created. As of June 1 this year, the total value of 49.8 mln. doll. 12 projects were commissioned and 2,200 new jobs were created. [15] The observation of such an economic growth trend in the textile industry is indicative of the competitiveness of textile products. In order for a product to be competitive, of course, the role of international standards set in enterprises is great.

The fact that the standards have several options is a necessary resource for choosing the best of them. The introduction of the general economic approach is based on the possibility of choosing from the options of individual standards from the general economic point of view.

Cost-effectiveness is not able to use all its possibilities as a special optimization method because the draft standards are not multi-option. From an economic point of view, projects remain inefficient, consisting only of activities that take into account the proposed parameters.

Another important aspect is the need to take into account as fully as possible the main and side effects of the introduction of standards, not only in the cases in which they are applied, but also in the areas in which they may be affected.[11]

When calculating the cost-effectiveness of standardization, the consequences of a standard product over the entire life cycle - design, manufacturing, handling and consumption - are taken into account.

At the design stage in textile enterprises, the reduction of the volume of design work, labor costs, design time is taken into account due to the following factors:

- Improving the organization of design work;
- reuse of standard technical documentation;
- use of standard conditional graphic images;
- reduction of the volume of copying;
- Reduction of the volume of documents stored in technical archives;
- reduction of project development costs in full compliance with the standards;
- Reduction of time spent on discussion and approval of new technical documentation.

At the production stage of the enterprise, the following is determined to calculate the cost-effectiveness:

- reduction of material consumption;
- reduction of labor costs;
- unification;
- reduction of fund capacity;
- reduction of the share of fuel and electricity costs;
- reduction of the share of conditional fixed costs per unit of output due to the increase in production.

The reduction in consumer spending is taken into account to calculate the economic effect in the treatment and consumption phases. In this case, the following is determined:

- Improving the technical level and quality of products;
- reduction of transportation and storage costs;
- the need to replace several with one standard product unit;
- prolongation of service life of products;
- increase the reliability of products;
- reducing the share of fuel, energy, auxiliary materials consumption;
- reducing the number of service personnel;
- reducing the cost of repairs.

In our opinion, the efficiency of standardization in the textile industry is part of the efficiency of new techniques, so in standardization work will have to use a single coefficient of efficiency of capital costs, which includes the cost of production and implementation of standards. If the effect does not stop at the calculated time, the description of the general economic approach will not be complete.

The cost-effectiveness indicator differs according to the period of determination as follows:

- annual;
- by years of production of standardized products;
- for a period of standard force;
- for the entire service life of the standardized product, for all years of its production.

Depending on the specific need, one of the cost-effectiveness indicators listed above may be considered necessary. For example, the average annual efficiency should take into account their variation over the years. In the first year of production, the process of product development goes on, and the economic efficiency is less because the capacity of the enterprise is not fully used in the production of a new type of product; the yield obtained in the second and third years is the highest; efficiency has declined in recent years due to the emergence of competing options.

Let's take a closer look at this issue. Efficiency means profitability, and economic efficiency is profitability expressed in monetary units, ie soums.

The cost-effectiveness calculation is usually based on the following types of efficiency of innovative projects:

- financial efficiency for its direct participants, taking into account the financial consequences of the project;
- budget efficiency, taking into account the financial impact of the project on the regional and local budgets;
- general economic efficiency, taking into account the financial costs and results associated with the project.

In recent years, there have been major changes in the development of standardization in the textile industry, with the development of standardization programs instead of separate standards.

A goal-oriented program planning approach is key in developing standards. In the development of standardization programs, there are 2 directions that differ from object to object.

The object of standardization is a finished product or large organizational systems obtained in technological sequence (raw materials, equipment, technology and organization of production, metrological supply, production of directly finished product), for example, design preparation of production, technological preparation of production or can be put into production.

Substantiating the effectiveness of programs has its own peculiarities in justifying the effectiveness of individual standards. The computational work begins with the first completed product types, gradually going through each level of the program, and includes a series of steps that allow the following to be determined: [3]

- quality of finished products, raw materials and supplies;
- annual economic efficiency from the use of improved quality finished products;
- additional economic benefits from separate, unrelated sources for each level of the program;
- The total cost of the program and the development and implementation of a set of normative and technical documentation;
- indicators characterizing the type of economic as well as other types of effects;
- the cost-effectiveness of standardization as a percentage of the overall effectiveness of the program.

It is also necessary to pay special attention to the consideration of the time factor. Work on the program will be carried out in stages. Each stage requires a

certain amount of time and money. The complexity of calculating program efficiency usually does not allow for an integral effect, so it can also be limited to determining the annual efficiency as an approximate calculation.

As for standardization programs for organizational systems, it is necessary to limit them to the efficiency of systems in their development and subsequent use. For example, the company is introducing a comprehensive system of product quality management. Then there is the problem of determining the effectiveness of the costs incurred for these purposes. Once a decision is made to introduce it, it will be applied for several years with improvements, corrections. In this case, there is a problem of determining the efficiency of the operation of this system.

The same approach applies to other systems, for example, technological, design, production preparation, putting the product into production stages. Along with the overall economic efficiency, obtaining financial efficiency is also an important element.

In the enterprise, these systems are a direct source of increasing efficiency through the reduction of inefficient costs, increased profits.

Conclusions and suggestions

An important condition for obtaining a reliable value of economic efficiency is to compare the results by options. In our opinion, this will be ensured by the following parameters:

- on the volume of demand satisfied through the production of better quality products;
- by area and range of satisfied needs, as well as by the conditions of use of the product;
- by time factor;
- on the social consequences of production and consumption;
- the degree of negative impact on the environment in the production and use of the product.

One of the most important points is to compare the accepted basis and the accepted options on quality. The ability to compare options in terms of quality is the overall cost of deciding in favor of one or another option. It is carried out according to accepted quality indicators.

The determination of the level of quality is based on the comparison of the quality indicators of the base product, which is taken as the basis for comparing the quality indicators of the evaluated product.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 28.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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ANALYSIS OF INCOME TAX FROM INDIVIDUALS IN UZBEKISTAN

Abstract: *this article analyzes the essence of income tax for individuals, changes made to the Concept of improving the tax and budget policy of the Republic of Uzbekistan, from January 1, 2019, a single rate of income tax for individuals is established, as a result of which wages are increased.*

Key words: *individuals, taxes, personal income taxes, personal income tax base, personal income tax rates, salary, family budget.*

Language: *English*

Citation: Xudoyberganova, S. K. (2020). Analysis of income tax from individuals in Uzbekistan. *ISJ Theoretical & Applied Science, 10 (90),* 362-367.

Soi: http://s-o-i.org/1.1/TAS-10-90-63 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.63

Scopus ASCC: *2000.*

Introduction

The main and main goal of the radical state, economic and social reforms carried out in our country is to improve the standard of living of our people and improve its well-being. In particular, the purpose of increasing their income by reducing the tax burden on the population is actively implemented.

It is known that the income tax from individuals was introduced from April 1, 1991 in accordance with the law "on income tax from citizens of the Republic of Uzbekistan, foreign citizens and stateless persons"dated February 15, 1991.

According to the current legislation, individuals are citizens of the Republic of Uzbekistan, foreign citizens and stateless persons who have not received the status of a legal entity.

Income tax from individuals is one of the most basic sources of income of the state budget, it is part of the general category of income tax. Its peculiarity is that the tax is levied on the direct income of individuals.

President of our country Shavkat Mirziyoyev - "in order to raise the standard of living of our people, we need to form a system of payment worthy of Labor and increase the Real incomes of the population.It is necessary to revise the procedure for determining the minimum monthly wage, to eliminate the fact that taxes and other fees are associated with the minimum wage."- they argue. [1].

The following income of individuals is an object of taxation and is the income of residents of the Republic of Uzbekistan from sources in the Republic of Uzbekistan and beyond, and income of non-residents of the Republic of Uzbekistan from sources in the Republic of Uzbekistan.

It should be noted that the taxable income received from individual entrepreneurial activities, strictly defined in accordance with Chapter 58 of the tax code, is not considered an object of taxation of income tax from individuals, it is a strictly defined tax object.

The tax base of the income tax from individuals is the residual amount after deducting the deductions established by the tax legislation from the total income of individuals.

The total annual income of individuals includes money or other funds that a taxpayer must receive (receive) or receive for free. Including:

- income received in the form of payment for Labor;
- property income of individuals;
- income of individuals in the style of material naf;
- other income.

All payments that are accrued and paid to individuals who are in a labor relationship with the employer and perform work in accordance with the established employment contract (contract) are

recognized as income in the manner of payment for Labor:

According to the"concept of improving the tax policy of the Republic of Uzbekistan", a number of important changes have been made to the tax system of our country from 1 January 2019, and they are being improved. In particular, the tax burden and types of taxes were reduced, some were abolished, the tax system was simplified. Also on the income tax from individuals, changes were introduced to the tax legislation for 2019 year.

In particular, the following incomes of individuals are not subject to taxation:[2]

- sums of material assistance (if given in case of emergency – by scan, in other cases-in the amount up to 12 times of the minimum wage during the year);

-athletes receive a cash prize for their participation in international sports competitions;

-cash prizes for donation;

-income from the sale of livestock, bee-keeping and agricultural products grown in the home and farm;

- gifts of employees received from a legal entity in the form of a natura with a value of up to 6 times the minimum wage during the year;

- income from individuals in the form of inheritance or gift order, as well as freely received money and nature;

-achievements on bonds of state bonds, interest on state securities, achievements on lottery;

- certificates of savings, income on state securities, as well as interest and achievements on deposits in banks;

-dismissal allowance paid within the amount of twelve times the minimum wage when the employment contract is terminated;

-received alimony;

- the sums that citizens receive as a ceiling of insurance;

-scholarships paid by educational and research institutions;

-state pensions;

-accumulative mandatory pension contributions, interest income on them, as well as accumulative pension payments;

-revenues directed to cover mortgage loans received for the purchase of individual housing under standard projects in rural areas, as well as accrued interest on them;

-The amounts to be directed for the education of children under the age of twenty-six or for the education of their own children in the higher educational institutions of the Republic of Uzbekistan, etc.

The tax code of the Republic of Uzbekistan, with amendments to 2019, is exempt from the following taxes on physical income directly from 1 January 2019 in its article 180: [3]

- heads and employees of diplomatic missions of foreign countries, officials of consular institutions, family members living with them;
- administrative and technical staff of diplomatic missions and consular institutions of foreign countries, as well as family members living with them;
- persons who are part of personnel serving diplomatic missions, consular institutions of foreign countries;
- employees of diplomatic missions of foreign countries in the Houses of the employees of the consular institutions;
- officials of international non-governmental organizations;
- persons who are in labor relations with an individual entrepreneur – on income received for their work performed under an employment contract concluded with an individual entrepreneur.
- Again, it should be noted that the list of individuals who were completely exempt from taxation was reduced and the following was removed from the list:
- on the money supply paid in connection with the transfer of service (performance of service obligations) to the servicemen of the Ministry of Defense, the MIA, the FVV, the NSS, the composition of ordinary soldiers, sergeants and officers of the internal affairs bodies, as well as employees of the NSC;
- On income received in connection with the performance of service duties by employees of constitutional and higher courts, civil and criminal courts, judges of economic, administrative and military courts, as well as employees of the prosecutor's bodies having career levels (military ranks).
- The following individuals will be exempted from tax on income in the amount of 4 times of the minimum wage for each month from 1 January 2019:
- Persons awarded the titles of" hero of Uzbekistan", hero of the Soviet Union, hero of Labor, persons awarded the Order of glory of three levels;
- disabled from childhood, as well as disabled people of I and II groups. The privilege is issued on the basis of a pension certificate or information from the medical and labor expert commission;
- parents and widowed wives of servicemen and employees of internal affairs bodies who were injured during the defense of the former USSR, the constitutional system of the Republic of Uzbekistan, or other obligations of the military service or the service in the internal affairs bodies, as a result of contusion or injury, or as a result of illness caused by being on the
- single mothers who have children under the age of two or more sixteen;
- widowed women and widowed men who do not receive a pension for the loss of their widows v who have children under the age of two or more

sixteen;

- one of the parents who has been disabled since childhood, living together with a child who requires constant care, becoming a unitary infantile.

Privileges apply when the relevant documents are submitted.

In the event that the rights to benefits arise during the calendar year, the rights to benefits are applied from the moment of their occurrence.

If an individual has the right to benefits on more than one basis, he is given only one privilege at his discretion.

The income tax from individuals was considered a progressive tax, at the present time passed into a strictly defined system.

According to the tax legislation, in 1998-2018 we want to consider the progressive form of introduction of tax scales in the collection of taxes from the salaries, reward money and other income of individuals in the Republic.

Table 1

	Years	Bounce	Rates on interest accounts	Annotation
1	1998-1999	5	15, 25, 35, 40, 45	
2	2000	4	15, 25, 36, 40	
3	2001-2014	3	12, 25, 36	*2014 year 1 yilgacha 3 cover wing carpets, solid putting kameib borgan (3-chart)*
4	2015-2018	4	0, 8.5, 17, 23	*2018 yilgacha 4 cover wing carpets, solid putting kameib borgan (3-chart)*

While analyzing the data of Table 1, the tax rate from the labor rights, prize money and other income of individuals in the republic from 1998 year is defined as 15, 25, 35, 40, 45 percent, that is, 5 digits, according to the tax legislation. Starting from 2000 year, the rate was maintained at 4-point, that is, 15, 25, 36, 40 percent, and from 2001 to 3-point, while its rate was 12, 25, 36-point, up to 2014 year at 3-point rate. In 2015-2018, taxes were levied at a 4-point rate.

And in 2019, income tax is levied on a single 12-digit rate of interest. This creates a relief to the work of accountants in carrying out tax calculations, increases job productivity[4] . (See Table 2)

Table 2

From 01.01.2019 year	rate
Income tax rate (Single)	12%

Dynamics of change in income tax rates from individuals[5]

Table 3

Minimum monthly salary level	Tax rates (in percentage)																	
	2000	2001	2002	2003	200-42005	2006	2007-2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1 bare	00	112	113	13	13	13	13	12	11	10	9	8	7,5	00	00	00	00	
2 bare	115													8,5	7,5			

3 bare																7,5	7,5	
4 bare	225																	
5 bare		225																12
6 bare	336		223	22	21	20	18			16	16	16	16	17	17			
7 bare								17	17									
8 bare																17	116,5	
8 higher than fold		336																
9 bare																		
10 bare																		
10 higher than fold	440		33	32	30	29	25	22	22	22	22	22	22	23	23	23	222,5	

Tax rates subject to income of non-residents of the Republic of Uzbekistan (Tax Code Article 182)

Table 4

Type of income	rate
Dividends and interest	10 %
Revenues from the provision of transport services in international transport	6 %
And other income received under labor contracts and civil-legal contracts	20 %

The amount of income tax from individuals who are paid to the budget, calculated at the rate established in 2019 year, will be reduced to the amount of mandatory monthly contributions, calculated in the amount of 0,1% transferred to the pension accounts of citizens ' personal savings

Each individual who works on the basis of an employment contract pays income tax from the monthly salary received. From the above table data, it is known that the rates of this type of tax are different – from 0 per cent of the minimum wage, from 5 per cent of the minimum wage to 7,5 per cent, from 5 per cent of the minimum wage to 10 per cent 16.5 per cent and above, to 22.5 per cent of the monthly It can be said that such a process, the calculation of income tax at such rates, would have caused a great challenge not only to an ordinary employee, but also to an organization accountant. Therefore, the fact that in 2019 Year 1 Yanvar was introduced at a single 12 percent rate regardless of the amount of monthly salary instead of the 4-digit rates of income tax, which were also imposed on individuals who had tortured the accountants for many years, on the one hand, if the calculation was very simplified, on the other hand, its transparency It should be noted again that 0,1 percent of this is directed to individual pension accounts.

Another of the most important changes in the tax system is the abolition of the 8-percent insurance fee, which is deducted from the income of citizens in the form of payment of Labor to the extra-budgetary pension fund. As a result of its cancellation, it is expected to receive a significant amount of funds at the disposal of citizens of the country.

Methodic

We would like to consider the procedure for calculating and withholding income tax from individuals through the following example and analyze the increase in income of individuals on account of the decrease in tax rates. Let's say that the monthly salary of the teacher is 3 million rubles. According to the current taxation procedure, this citizen pays 2 percent of the pension amount to which the personal savings of a citizen is collected, as well as a total of 481230 soums on the scale of the growth of the income tax. And the extra-budgetary pension fund pays 8 percent of the received income, that is, 240 thousand (3000 * 8%) sum, and 1 percent 30 000 sum to the trade union. In general, the total amount that touches the hands of the teacher is 2 248 770 rubles (3 000 000 - 481 230 - 240 000-30000) makes up ni.

According to the new regulation introduced from 2019 year, the teacher pays a single 12 percent of the income received – 360 thousand soums (3000 000 *12%=360000 soums) income tax. And the insurance fee (8 percent), which is charged to the extra-budgetary pension fund, as we mentioned, was canceled. 1 percent to the trade union is 30000 rubles. Hence, the total amount that touches the hands of the teacher is 2 610 000 rubles (3 000 000 - 360 000-30000).

Now we can calculate the difference in the middle– 2 610 000 – 2 248 770 = 331 230 sum. That is, on account of the introduction of a single rate of income tax and the cancellation of the insurance fee, the teacher evasion of paying less than the tax in the amount of 331 230 rubles, his income is increasing to 331230 soums. If we multiply the savings by twelve months of a year 331230*12 =3 974 760 Sou the amount of income for a year will increase. If we say that 3 people work in a family, then 11 924 280 r

In 2019, changes were also made to the tariff set from 1 January. On the account of the increase in the coefficients on razryads, the minimum monthly salary is 577172 sum. We will consider the calculation of income tax from individuals on the old and new system, even on the minimum monthly salary.

At the tax rates of 2018, a minimum wage set at the beginning of the year from 577172 sum is deducted (577172-172240)*7,5%=30370 sum is deducted from the income tax from individuals on the second scale. The extra-budgetary pension fund is 577172 * 8%= 46174 sum. To the trade union in both cases is the same amount (1%) 5771 sum. The salary that the employee will receive is 577172-30370-46174-5771 = 494857 sum.

We will consider the calculation of the tax rate introduced in 2019 Year 1 janvar. 577172*12% =69260 sum. The mandatory allocation of 8% to the extra-budgetary pension fund is 5771 sum to the trade union (1%), which was canceled. The salary that the employee will receive is 577172-69260-5771 = 502141 sum. The difference in the middle is 502141-494857=7284so. If we multiply the savings by twelve months of a year 7284*12 =87408 somga the amount of income for a year will increase.

In both cases, the increase in family income in itself leads to a greater satisfaction of family needs, the provision of family well-being.It is expected that the decrease in the income tax on tax reforms in Uzbekistan will lead to an increase in the income of individuals by 6.5 percent in 2019.

In the Russian Federation, the basic rate of income tax on individuals is set at 13 percent, in Kazakhstan and Kyrgyzstan 10 percent, and it has been effective for several years. [6]

Conclusions.

Taking into account the tax reforms carried out in our republic, we consider it desirable to carry out the following:

to implement measures of influence on legal entities that promote the economy without concluding labor contracts, paying employees the salary in cash, Kai, khufyona;

to increase the rights of inflation in an amount not less than the level of inflation to introduce interest rate;

introduction of the family declaration system in the taxation of income through taxation reduction of interest and tax rates from 12 percent to 10 percent;

it is also necessary to keep in mind the tax code, which is expected to introduce new social benefits that are of great importance.

The most basic idea of the new tax concept, which began to be implemented, is to reduce the tax burden, to ensure the welfare of our people through the use of a simple and stable tax system, which serves to implement the strong social policy implemented in our country.

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Impact Factor:					
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	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 28.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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COMPARATIVE ANALYSIS OF CHARACTERISTICS OF WATER AND INDUSTRIAL OIL FLOWS IN THE PIPELINE WITH THE DIFFUSER

Abstract: *The computer calculation of water and industrial oil flow in the pipeline with the diffuser was implemented in the article. Comparison of changing the cell Reynolds number, pressure, and velocity of fluids flow in the conditions of laminar and turbulent regimes was made. It is found that characteristics of fluids during laminar flow and turbulent flows according to the Algebraic yPlus and L-VEL models are almost identical. Maximum intensity of the vortex flows formation is observed at the outlet of the expanding part of the pipeline during laminar water flow and according to the Algebraic yPlus, L-VEL and Spalart-Allmaras turbulence models. Flow of industrial oil in the pipeline with the diffuser practically does not lead to the vortex flows formation.*

Key words: *water, industrial oil, the pipeline, laminar flow, the turbulence model, the diffuser, velocity.*

Language: *English*

Citation: Chemezov, D., et al. (2020). Comparative analysis of characteristics of water and industrial oil flows in the pipeline with the diffuser. *ISJ Theoretical & Applied Science, 10 (90),* 368-380.

Soi: http://s-o-i.org/1.1/TAS-10-90-64 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.64

Introduction

The transition process from laminar regime of fluid flow to turbulent regime is visually displayed during the calculation in the special computer programs. Laminar regime is characterized by moving the fluid layers in one direction at variable velocity at the distance from the axial line to the pipeline wall. Turbulent (transient) regime occurs when fluid flow through the hydraulic resistance [1-2]. In this case, changing the flow direction of the fluid layers, their mixing and the vortices formation of various intensities occur [3-4]. The calculation of turbulent flow of fluids is carried out by the turbulence models [5-7]. The turbulence models based on the Reynolds equation are characterized by the different descriptions of fluid flow in the wall region (the pipeline) and the number of the additional variables.

The Algebraic yPlus and L-VEL turbulence models, which have the highest stability and the lower accuracy, are used for the calculation of the coefficient of turbulent viscosity depending on flow velocity of fluid and the distance from the wall. The *k-ε* turbulence model, which is characterized by the fast convergence and the low accuracy in modeling the some hydraulic problems, includes the equation of turbulence kinetic energy and the equation of kinetic energy dissipation rate. The model is well suited for solving the problems of external flow around bodies. In the *k-ω* turbulence model, which is characterized by the low convergence and sensitivity to the initial approximation, the second parameter is calculated from the equation of specific rate of kinetic energy dissipation [8]. The accurate results for this model can be obtained by modeling fluid flow through curved channels. The Spalart-Allmaras turbulence model, which is characterized by stability and the good convergence, is used for the calculation of the kinematic coefficient of vortex viscosity of fluid flowing in the entire domain, including the wall layers [9-10]. The SST turbulence model is the improved combination of the *k-ε* and *k-ω* turbulence models.

The diffuser (the hydraulic resistance), which is the expanding section of the pipeline, is used to slow down flow of fluid. Using the turbulence models listed above and the laminar flow equation for the calculation, you can get the visual presentation of changing the parameters of fluid flow before the hydraulic resistance, along the diffuser length, and at the certain distance after the hydraulic resistance.

Materials and methods

The computer experiment to determine the characteristics of laminar and turbulent flows of fluids in the pipeline with the diffuser is implemented in the Comsol Multiphysics program. The models of water and industrial oil at atmospheric pressure and the temperature of 20 °C were used as working fluids. The discretization of fluids was given as P1+P1. The properties of water and industrial oil for modeling are presented in the tables 1-2.

Table 1. The properties of water at atmospheric pressure and the temperature of 20 °C.

Parameter	Unit of measurement	Value
Density	kg/m^3	998.2
Specific enthalpy	kJ/kg	83.91
Specific heat	kJ/(kg·°C)	4183
Thermal conductivity	W/(m·°C)	0.599
Diffusivity	m^2/s	14.3
Dynamic viscosity	Pa·s	1004
Kinematic viscosity	m^2/s	1.006
Coefficient of thermal volumetric expansion	$°C^{-1}$	1.82
Surface tension coefficient	N/m	726.9
Prandtl number		7.02

Table 2. The properties of industrial oil at atmospheric pressure and the temperature of 20 °C.

Parameter	Unit of measurement	Value
Density	kg/m^3	865
Kinematic viscosity	m^2/s	0.00003132
Flash point	°C	206
Pour point	°C	-15

The pipeline model with the diffuser had the following dimensions: the inner diameter at the inlet was 80 mm, the length of the cylindrical section before expansion was 60 mm, the inner diameter at the outlet was 160 mm, the length of the cylindrical section after expansion was 200 mm, the angle of the

expanding part was 18 deg., the length of the expanding part was 120 mm. The *X*-axis contours on the pipeline model were the wall, and the *Y*-axis contours were the inlet and the outlet. Initial velocity of fluids flow at the inlet was adopted 1 m/s. Flow time of fluids in the pipeline was adopted 1 s. Flow of fluids occurred in the conditions of laminar and turbulent regimes. Turbulent flows of fluids were calculated according to the models:

1. Algebraic yPlus – two constant parameters are set: k_a (0.402) and B_a (6.59);

2. L-VEL – two constant parameters are set: k_l (0.417) and E_l (8.6);

3. k-ε – seven constant parameters are set: $C_{\varepsilon 1}$ (1.44), $C_{\varepsilon 2}$ (1.92), C_μ (0.09), σ_k (1), σ_ε (1.3), k_v (0.41) and B (5.2);

4. k-ω – seven constant parameters are set: α (13/25), σ_k^* (1/2), σ_ω (1/2), β_0 (9/125), β_0^* (9/100), k_v (0.41) and B (5.2);

5. Spalart-Allmaras – eight constant parameters are set: C_{b1} (0.1355), C_{b2} (0.622), C_{v1} (7.1), $\sigma_{\tilde{v}}$ (2/3), C_{w2} (0.3), C_{w3} (2), k_v (0.41) and C_{Rot} (2).

The boundary conditions for laminar and turbulent flows of water and industrial oil in the pipeline with the diffuser are presented in the Fig. 1 and the tables 3-8.

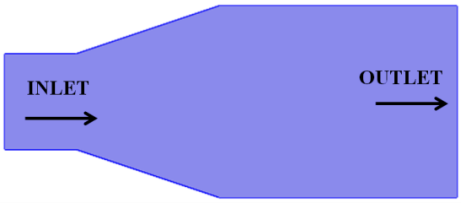

Figure 1 – The boundary conditions for the modeling the process of fluids flow in the pipeline with the diffuser.

Table 3. The boundary conditions for laminar flow of fluids.

Parameters	**Equations**
Main conditions	$\rho\frac{\partial u}{\partial t}+\rho(u\cdot\nabla)u=\nabla\cdot\left[-pI+\mu\left(\nabla u+(\nabla u)^T\right)\right]+F$ $\rho\nabla\cdot(u)=0$
Wall	$u=0$
Inlet	$u=-U_0 n$
Outlet	$\left[-pI+\mu\left(\nabla u+(\nabla u)^T\right)\right]n=-\hat{p}_0 n$ $\hat{p}_0\le p_0$

Table 4. The boundary conditions for turbulent flow of fluids according to the Algebraic yPlus model.

Parameters	**Equations**
Main conditions	$\rho\frac{\partial u}{\partial t}+\rho(u\cdot\nabla)u=\nabla\cdot\left[-pI+(\mu+\mu_T)\left(\nabla u+(\nabla u)^T\right)\right]+F$ $\rho\nabla\cdot(u)=0$
Wall	$u=0$
Inlet	$u=-U_0 n$
Outlet	$\left[-pI+(\mu+\mu_T)\left(\nabla u+(\nabla u)^T\right)\right]n=-\hat{p}_0 n$ $\hat{p}_0\le p_0$

Table 5. The boundary conditions for turbulent flow of fluids according to the L-VEL model.

Parameters	**Equations**
Main conditions	$\rho\frac{\partial u}{\partial t}+\rho(u\cdot\nabla)u=\nabla\cdot\left[-pI+(\mu+\mu_T)\left(\nabla u+(\nabla u)^T\right)\right]+F$ $\rho\nabla\cdot(u)=0$
Wall	$u=0$

Inlet	$u = -U_0 n$
Outlet	$\left[-pI + (\mu + \mu_T)(\nabla u + (\nabla u)^T)\right] n = -\hat{p}_0 n$ $\hat{p}_0 \le p_0$

Table 6. The boundary conditions for turbulent flow of fluids according to the *k-ε* model.

Parameters	**Equations**
Main conditions	$\rho \frac{\partial u}{\partial t} + \rho(u \cdot \nabla)u = \nabla \cdot \left[-pI + (\mu + \mu_T)(\nabla u + (\nabla u)^T)\right] + F$ $\rho \nabla \cdot (u) = 0$ $\rho \frac{\partial k}{\partial t} + \rho(u \cdot \nabla)k = \nabla \cdot \left[\left(\mu + \frac{\mu_T}{\sigma_k}\right)\nabla k\right] + P_k - \rho\varepsilon$ $\rho \frac{\partial \varepsilon}{\partial t} + \rho(u \cdot \nabla)\varepsilon = \nabla \cdot \left[\left(\mu + \frac{\mu_T}{\sigma_\varepsilon}\right)\nabla \varepsilon\right] + C_{\varepsilon 1}\frac{\varepsilon}{k}P_k - C_{\varepsilon 2}\rho\frac{\varepsilon^2}{k}$ $\varepsilon = ep$ $\mu_T = \rho C_\mu \frac{k^2}{\varepsilon}$ $P_k = \mu_T\left[\nabla u : (\nabla u + (\nabla u)^T)\right]$
Wall	$u \cdot n = 0$ $\left[(\mu + \mu_T)(\nabla u + (\nabla u)^T)\right] n = -\rho \frac{u_\tau}{\delta_w^+} u_{\tan g}$ $u_{\tan g} = u - (u \cdot n)n$ $\nabla k \cdot n = 0$ $\varepsilon = \rho \frac{C_\mu k^2}{k_v \delta_w^+ \mu}$
Inlet	$u = -U_0 n$ $U_{ref} = U_0$ $k = \frac{3}{2}(U_{ref} I_T)^2$ $\varepsilon = C_\mu^{3/4}\frac{k^{3/2}}{L_T}$
Outlet	$\left[-pI + (\mu + \mu_T)(\nabla u + (\nabla u)^T)\right] n = -\hat{p}_0 n$ $\hat{p}_0 \le p_0$ $\nabla k \cdot n = 0$ $\nabla \varepsilon \cdot n = 0$

Table 7. The boundary conditions for turbulent flow of fluids according to the *k-ω* model.

Parameters	**Equations**
Main conditions	$\rho \frac{\partial u}{\partial t} + \rho(u \cdot \nabla)u = \nabla \cdot \left[-pI + (\mu + \mu_T)(\nabla u + (\nabla u)^T)\right] + F$ $\rho \nabla \cdot (u) = 0$ $\rho \frac{\partial k}{\partial t} + \rho(u \cdot \nabla)k = \nabla \cdot \left[(\mu + \mu_T \sigma_k^*)\nabla k\right] + P_k - \beta_0^* \rho \omega k$ $\rho \frac{\partial \omega}{\partial t} + \rho(u \cdot \nabla)\omega = \nabla \cdot \left[(\mu + \mu_T \sigma_\omega)\nabla \omega\right] + \alpha \frac{\omega}{k} P_k - \rho \beta_0 \omega^2$ $\omega = om$

	$\mu_T = \rho\frac{k}{\omega}$ $P_k = \mu_T\left[\nabla u : \left(\nabla u + (\nabla u)^T\right)\right]$
Wall	$u \cdot n = 0$ $\left[\left(\mu + \mu_T\right)\left(\nabla u + (\nabla u)^T\right)\right]n = -\rho\frac{u_\tau}{\delta_w^+}u_{\tan g}$ $u_{\tan g} = u - (u \cdot n)n$ $\nabla k \cdot n = 0$ $\omega = \rho\frac{k}{k_v\delta_w^+\mu}$
Inlet	$u = -U_0 n$ $U_{ref} = U_0$ $k = \frac{3}{2}\left(U_{ref}I_T\right)^2$ $\omega = \frac{k^{1/2}}{\left(\beta_0^*\right)^{1/4}L_T}$
Outlet	$\left[-pI + \left(\mu + \mu_T\right)\left(\nabla u + (\nabla u)^T\right)\right]n = -\hat{p}_0 n$ $\hat{p}_0 \le p_0$ $\nabla k \cdot n = 0$ $\nabla\omega \cdot n = 0$

Table 8. The boundary conditions for turbulent flow of fluids according to the Spalart-Allmaras model.

Parameters	**Equations**
Main conditions	$\rho\frac{\partial u}{\partial t} + \rho(u \cdot \nabla)u = \nabla \cdot \left[-pI + \left(\mu + \mu_T\right)\left(\nabla u + (\nabla u)^T\right)\right] + F$ $\rho\nabla \cdot (u) = 0$ $\frac{\partial \nu^t}{\partial t} + (u \cdot \nabla)\nu^t = C_{b1}S^t\nu^t - C_{w1}f_w\left(\frac{\nu^t}{l_w}\right)^2 + \frac{1}{\sigma_{\tilde{\nu}}}\nabla \cdot \left(\left(\nu + \nu^t\right)\nabla\nu^t\right) + \frac{C_{b2}}{\sigma_{\tilde{\nu}}}\nabla\nu^t \cdot \nabla\nu^t$ $\nu^t = nutilde$ $\nabla G \cdot \nabla G + \sigma_\omega G(\nabla \cdot \nabla G) = (1 + 2\sigma_\omega)G^4$ $l_\omega = \frac{1}{G} - \frac{l_{ref}}{2}$ $\mu_T = \rho\nu^t f_{v1}$ $C_{w1} = \frac{C_{b1}}{k_v^2} + \frac{1 + C_{b2}}{\sigma_{\tilde{\nu}}}$ $f_{v1} = \frac{\chi^3}{\chi^3 + C_{v1}^3}$ $f_{v2} = 1 - \frac{\chi}{1 + \chi f_{v1}}$ $\chi = \frac{\nu^t}{\nu}$ $f_w = g\left(\frac{1 + C_{w3}^6}{g^6 + C_{w3}^6}\right)$ $g = r + C_{w2}\left(r^6 - r\right)$

	$r = \min\left(\frac{\nu^t}{S^t k_v^2 l_w^2}, 10\right)$ $S^t = \max\left(\Omega + C_{Rot}\min(0, S-\Omega) + \frac{\nu^t}{k_v^2 l_w^2} f_{v2}, 0.3\Omega\right)$ $\Omega = \sqrt{2\Omega : \Omega}$ $S = \sqrt{2S : S}$ $\Omega = \frac{1}{2}\left(\nabla u - (\nabla u)^T\right)$ $S = \frac{1}{2}\left(\nabla u + (\nabla u)^T\right)$
Wall	$u = 0$ $\nu^t = 0$ $G = \frac{2}{l_{ref}}$
Inlet	$u = -U_0 n$ $U_{ref} = U_0$ $\nu^t = \nu_0$ $\nabla G \cdot n = 0$
Outlet	$\left[-pI + (\mu + \mu_T)\left(\nabla u + (\nabla u)^T\right)\right]n = -\hat{p}_0 n$ $\hat{p}_0 \le p_0$ $\nabla \nu^t \cdot n = 0$ $\nabla G \cdot n = 0$

where ρ – density; u – the velocity field; t – time; p – pressure; I – the unit tensor; μ – dynamic viscosity; ∇u – the gradient of the velocity field; T – the temperature; F – the volume force; U_0 – normal inflow speed; n – the boundary normal pointing out of the domain; $\hat{p}_0$ – pressure for suppress backflow; p_0 – prescribed pressure at the boundary; μ_T – turbulent viscosity; k – turbulent kinetic energy; σ_k – the model constant, 1.0; ∇k – the gradient of turbulent kinetic energy; P_k – the production term; ε – turbulent dissipation rate; σ_ε – the model constant, 1.3; $\nabla\varepsilon$ – the gradient of turbulent dissipation rate; $C_{\varepsilon 1}$ – the model constant, 1.44; $C_{\varepsilon 2}$ – the model constant, 1.92; C_μ – the model constant, 0.09; $:$ – contraction; u_τ – friction velocity; δ_w^+ – the wall lift-off in viscous units; u_{tang} – tangential velocity; k_v – the von Kárman constant, 0.41; U_{ref} – the reference velocity scale; I_T – turbulent intensity; L_T – the turbulence length scale; σ_k^* – the closure coefficient, 0.5; β_0^* – the closure coefficient, 9/100; ω – specific dissipation rate; σ_ω – the closure coefficient, 0.5; α – the closure coefficient, 13/25; β_0 – the closure coefficient, 9/125; $\nabla\omega$ – the gradient of specific dissipation rate; ν^t – the working variable of the turbulence model; C_{b1} – the model constant, 0.1355; S^t – magnitude of vorticity; C_{w1} – the model constant, $C_{b1}/k^2 + (1+C_{b2})/\sigma$; f_w – the non-dimensional function, which equal 1 in the log layer; l_w – the distance to the closest wall; $\sigma_{\tilde{\nu}}$ – the model constant, 2/3; $\nabla\nu^t$ – the gradient of the working variable of the turbulence model; C_{b2} – the model constant, 0.622; G – the reciprocal wall distance; l_{ref} – the reference length scale; f_{v1} – the function is borrowed from Mellor and Herring; χ – the intermediate variable; C_{v1} – the model constant, 7.1; f_{v2} – the function is constructed, just like f_{v1}, so that S^t maintains its log-layer behavior all way to the wall; g – the intermediate variable; C_{w3} – the model constant, 2; r – the intermediate variable; C_{w2} – the model constant, 0.3; Ω – the vorticity tensor; C_{Rot} – the model constant, 2; S – measure of the deformation tensor; v_0 – undamped turbulent kinematic viscosity.

Results and discussion

The contours of the cell Reynolds number, velocity, and pressure of water and industrial oil flow in the pipeline with the diffuser are presented in the Figs. 2-7. The maximum value for each parameter on the contours is red, and the minimum value is blue.

Flow regime of water and industrial oil in the pipeline with the diffuser with initial velocity of 1 m/s is laminar, since the calculated Reynolds number is less than 2300.

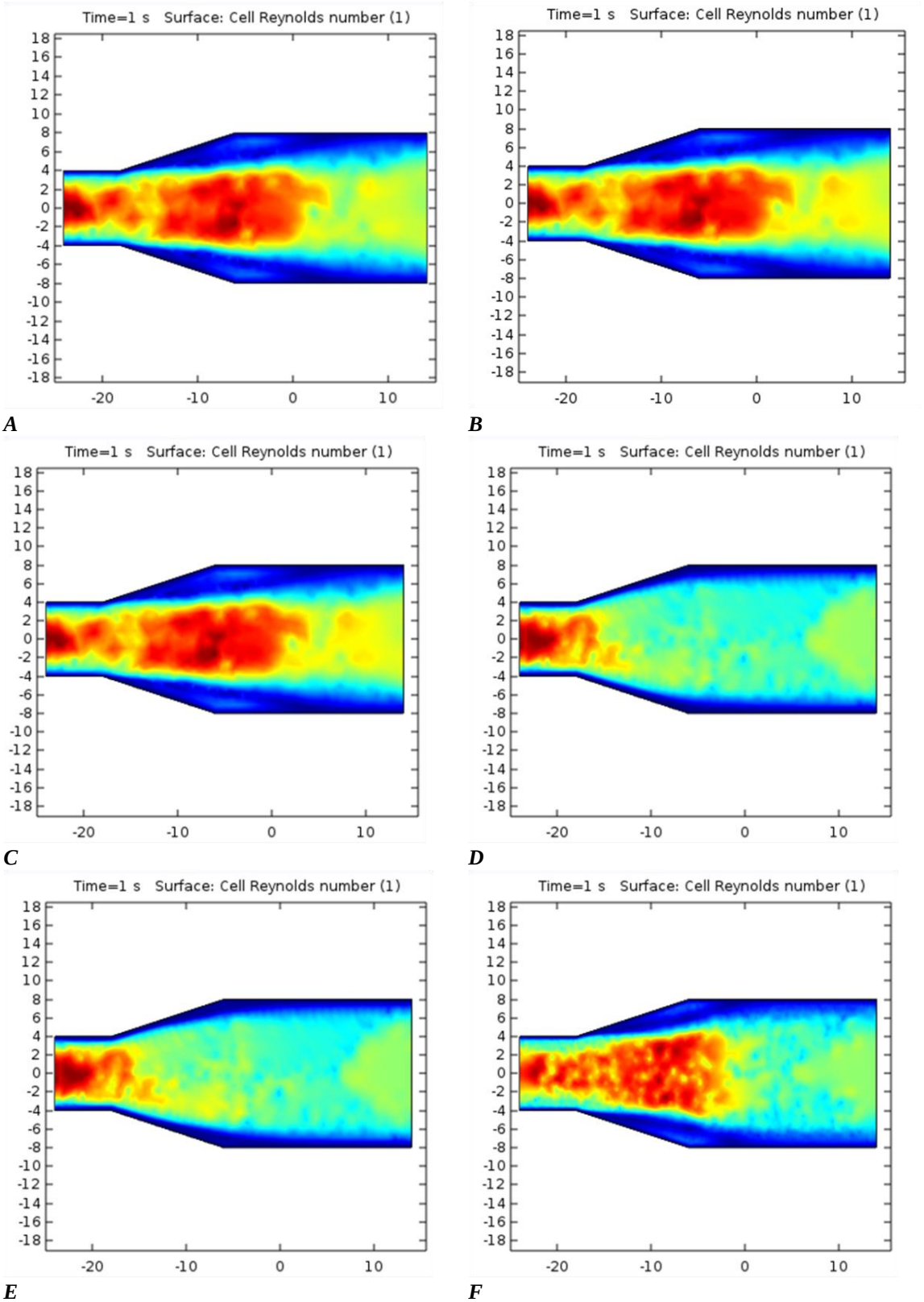

Figure 2 – The contours of the cell Reynolds number of water flow: *A* – laminar flow; *B* – turbulent flow according to the Algebraic yPlus model; *C* – turbulent flow according to the L-VEL model; *D* – turbulent flow according to the *k-ε* model; *E* – turbulent flow according to the *k-ω* model; *F* – turbulent flow according to the Spalart-Allmaras model.

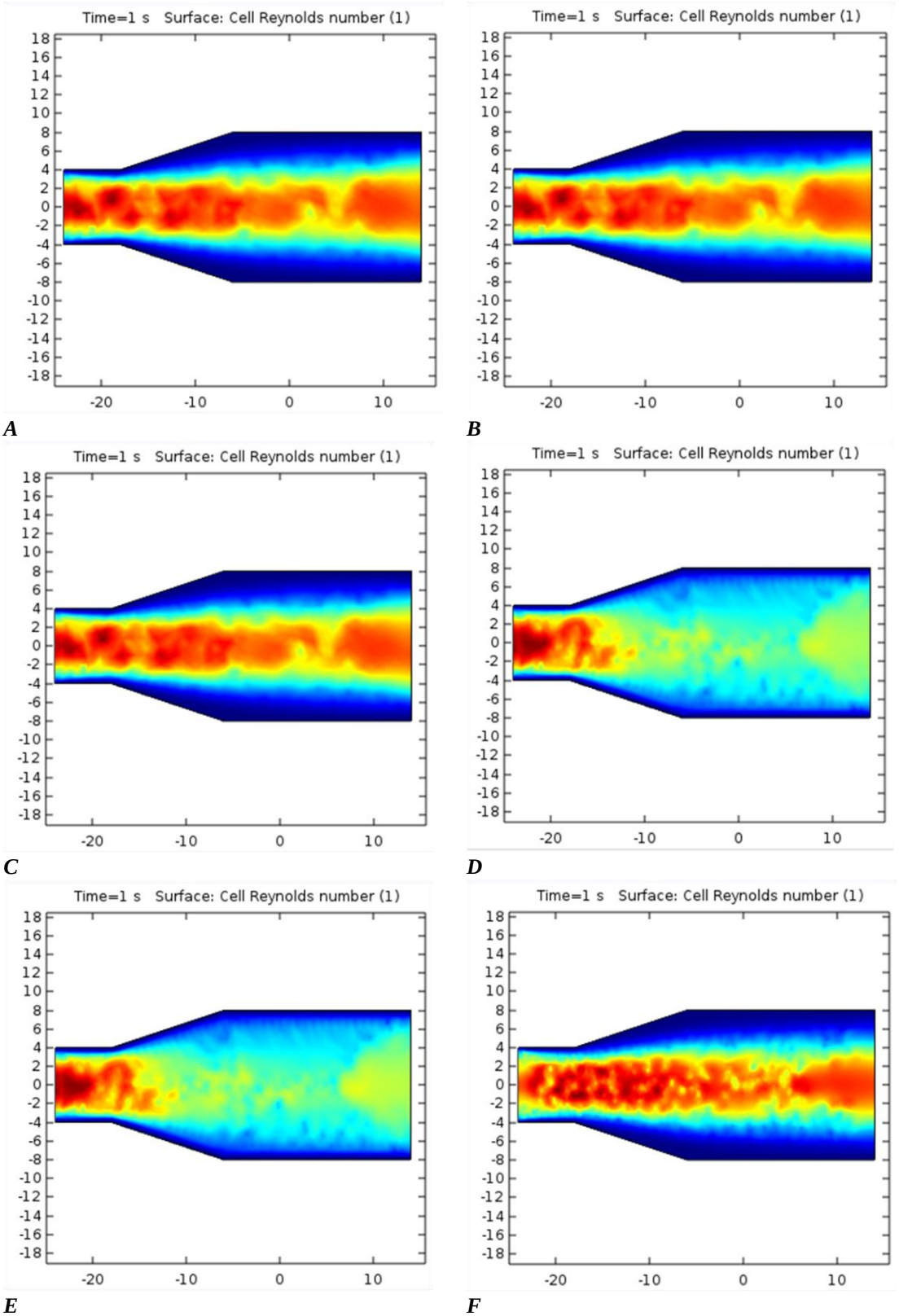

Figure 3 – The contours of the cell Reynolds number of industrial oil flow: *A* – laminar flow; *B* – turbulent flow according to the Algebraic yPlus model; *C* – turbulent flow according to the L-VEL model; *D* – turbulent flow according to the *k-ε* model; *E* – turbulent flow according to the *k-ω* model; *F* – turbulent flow according to the Spalart-Allmaras model.

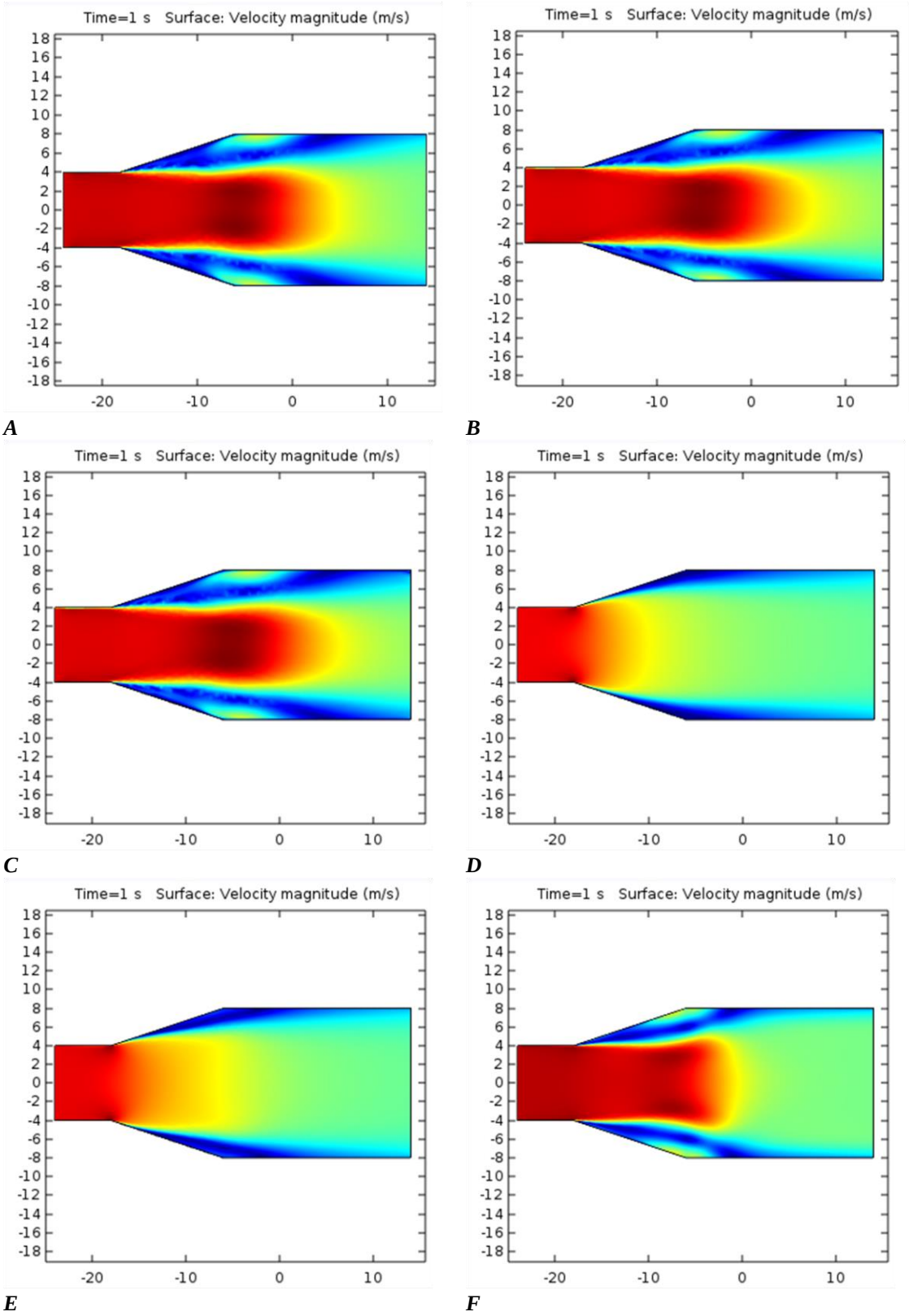

Figure 4 – The contours of flow velocity of water: *A* – laminar flow; *B* – turbulent flow according to the Algebraic yPlus model; *C* – turbulent flow according to the L-VEL model; *D* – turbulent flow according to the *k-ε* model; *E* – turbulent flow according to the *k-ω* model; *F* – turbulent flow according to the Spalart-Allmaras model.

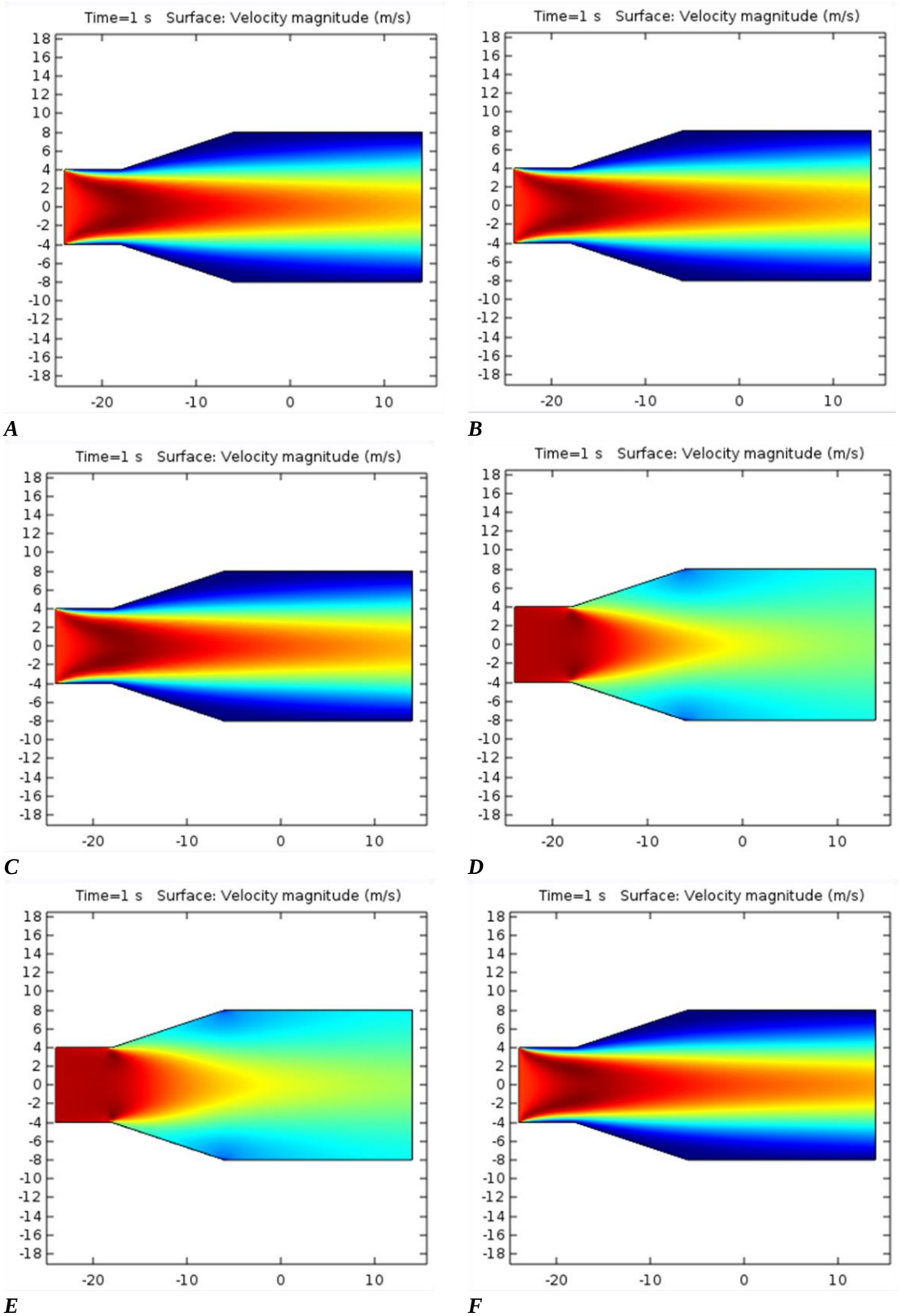

Figure 5 – The contours of flow velocity of industrial oil: *A* – laminar flow; *B* – turbulent flow according to the Algebraic yPlus model; *C* – turbulent flow according to the L-VEL model; *D* – turbulent flow according to the *k-ε* model; *E* – turbulent flow according to the *k-ω* model; *F* – turbulent flow according to the Spalart-Allmaras model.

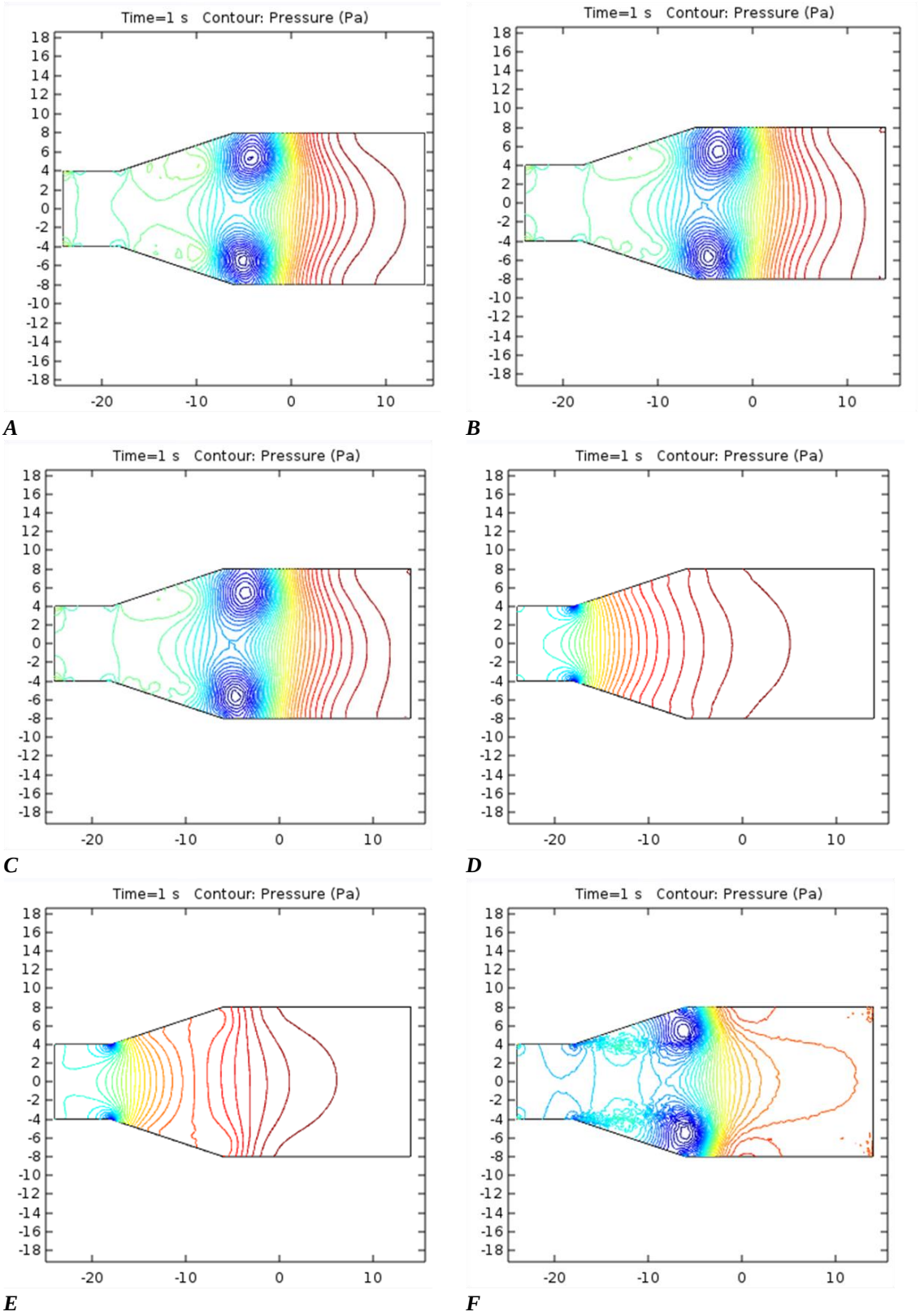

Figure 6 – The pressure contours of water flow: *A* – laminar flow; *B* – turbulent flow according to the Algebraic yPlus model; *C* – turbulent flow according to the L-VEL model; *D* – turbulent flow according to the *k-ε* model; *E* – turbulent flow according to the *k-ω* model; *F* – turbulent flow according to the Spalart-Allmaras model.

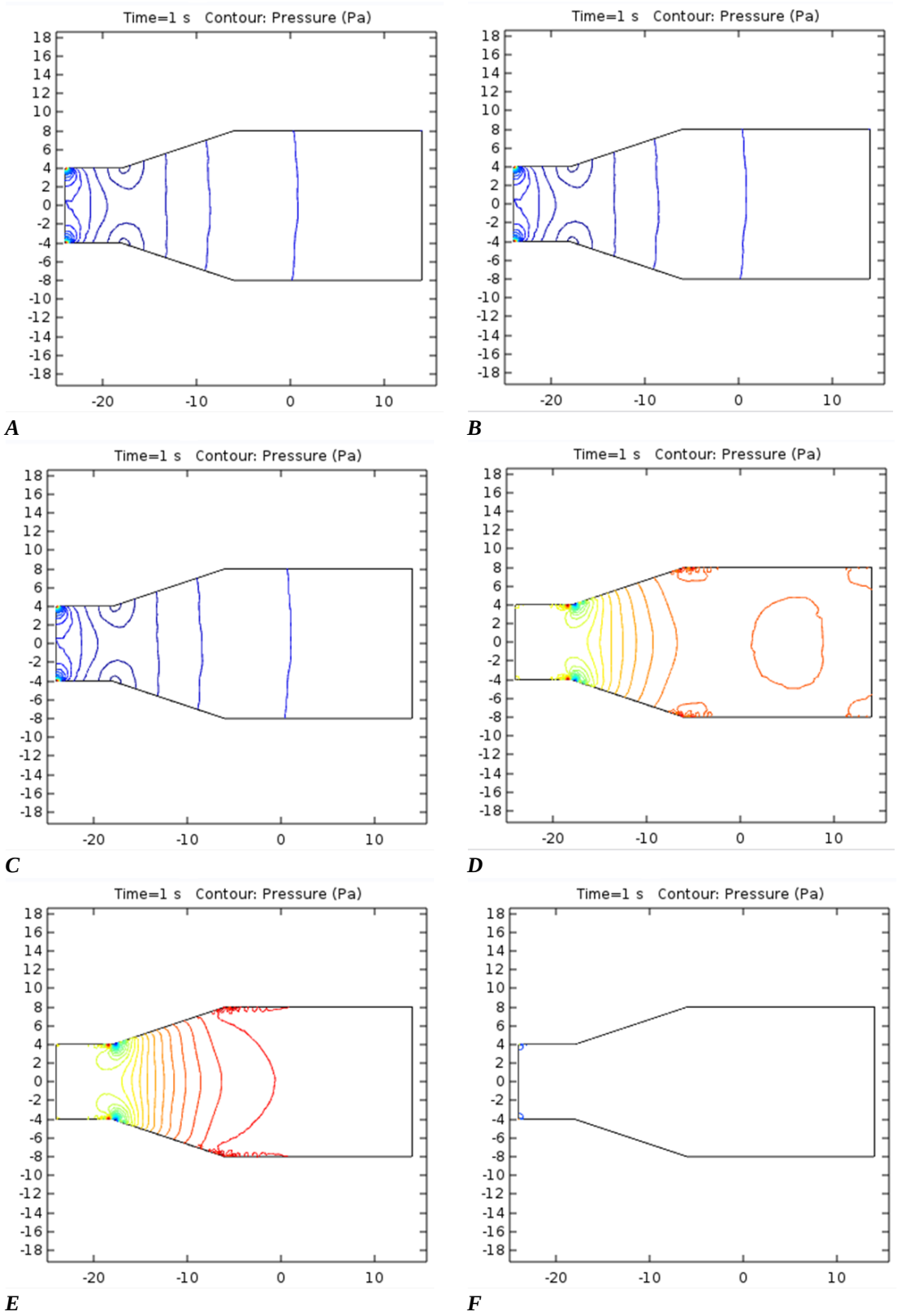

Figure 7 – The pressure contours of industrial oil flow: *A* – laminar flow; *B* – turbulent flow according to the Algebraic yPlus model; *C* – turbulent flow according to the L-VEL model; *D* – turbulent flow according to the *k-ε* model; *E* – turbulent flow according to the *k-ω* model; *F* – turbulent flow according to the Spalart-Allmaras model.

Let us consider flow of water in the pipeline. Flow velocity of water at the outlet of the diffuser increases by 8% relative to initial velocity. The maximum value of the Reynolds number in these conditions is 2105. The calculation according to the Algebraic yPlus and L-VEL turbulence models results in increasing flow velocity of fluid by 10% relative to initial velocity. The Reynolds number does not change. Flow velocities calculated according to the k-ε and k-ω turbulence models increase by 12% and 11%, respectively. However, the Reynolds number decreases by 1.6 times. The minimum values of flow velocity of water and the Reynolds number were determined at the calculation according to the Spalart-Allmaras turbulence model.

Let us consider flow of industrial oil in the pipeline. Flow of industrial oil is characterized by constant maximum velocity at the inlet to the diffuser in the conditions of the computer calculation according to the Algebraic yPlus, L-VEL, Spalart-Allmaras turbulence models and the laminar flow equation. It can be noted that maximum flow velocity of industrial oil increases by 10% compared to flow velocity of water. However, according to the *k-ε* and *k-ω* turbulence models was observed decreasing maximum flow velocity of industrial oil to initial velocity. The calculated values of the Reynolds number of industrial oil flow (from 1.30564 to 2.52396) indicate that it is impossible to the formation of vortex flows when fluid moves through the diffuser.

The formation of vortex flows occurs at the outlet of the diffuser (the pressure contours of water flow) according to the Algebraic yPlus, L-VEL, Spalart-Allmaras turbulence models and the laminar flow equation.

Conclusion

The following conclusions were made based on the performed analysis of the modeling results of flow of two different fluids in the pipeline with the local resistance:

1. Initial flow velocity of water and industrial oil of 1 m/s and the expansion angle of the diffuser of 18 degrees do not lead to the formation of intense vortex flows. Regime of water flow according to the calculated Reynolds number is closer to transition regime, while regime of industrial oil flow is laminar.
2. Flow of industrial oil retains its shape along the entire length of the considered section of the pipeline, but flow intensity decreases in the diffuser. Water flow retains its intensity and shape both in the diffuser and at the some distance after the expanding part.
3. The calculation features according to the Spalart-Allmaras turbulence model are presented by increasing flow velocity of industrial oil, and decreasing flow velocity of water under the same modeling conditions.

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Impact Factor:					
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	JIF = 1.500	SJIF (Morocco) = 5.667	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 30.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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THE EFFECT OF VITAMIN D DEFICIENCY ON THE FORMATION OF THE REPRODUCTIVE SYSTEM IN GIRLS

Abstract: *The article discusses literature data highlighting modern ideas about the role of vitamin D in the implementation of its nonclassical effects associated with a number of somatic pathologies and impaired reproductive system function. The effect of vitamin D deficiency on the development of obesity, insulin resistance, hypertensive conditions, cancer of various localization is described. A decrease in vitamin D supply is associated with endometrioid disease, metabolic disorders in polycystic ovaries.*

Key words: *Reproductive health, pathology, metabolism, localization, vitamin D.*

Language: *English*

Citation: Isroilova, G., Azimova, K., & Amonova, M. (2020). The effect of vitamin D deficiency on the formation of the reproductive system in girls. *ISJ Theoretical & Applied Science, 10 (90),* 381-385.

Soi: http://s-o-i.org/1.1/TAS-10-90-65 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.65

Scopus ASCC: *2700.*

Introduction

Although the importance of vitamin D in calcium phosphate homeostasis was proven early in its study, the understanding of the molecular biology of vitamin D remained undiscovered until the late 1960s. An important step in solving this problem was the study [1], which studied the stages of vitamin D metabolism and proved its nuclear localization in various tissues [2, 3]. The sequence of steps in the study of vitamin D has contributed to a better understanding of the multiple roles of vitamin D in biological responses. In the last decade, the non-skeletal effects of vitamin D have been in the spotlight, and the accumulated literature data support the idea of the importance of vitamin D for various organs and systems other than the skeleton [4, 5].

The term "vitamin D" is a group of several forms of vitamin D that are similar in chemical structure (secosteroids) and exist in nature:

- vitamin D1 (this was the name of the substance discovered in 1913 by E.V. McCollum in cod liver fat, which is a compound of ergocalciferol and lumisterol in a 1: 1 ratio);
- vitamin D2 - ergocalciferol, formed from ergosterol under the influence of sunlight, mainly in

plants; is, along with vitamin D3, one of the two most common natural forms of vitamin D;

- vitamin D3 - cholecalciferol, formed in the body of animals and humans under the influence of sunlight from 7-dehydrocholesterol; it is considered to be the "true" vitamin D, while others in this group are considered modified derivatives of vitamin D;

- vitamin D4 - dihydrotachysterol or 22,23-dihydroergocalciferol;

- vitamin D5 - sitocalciferol (formed from 7-dehydrositosterol).

Vitamin D is traditionally referred to as a fat-soluble vitamin. However, unlike all other vitamins, vitamin D is not actually a vitamin in the classical sense of the term, since it is biologically inactive. Vitamin D is converted into 1,25-dihydroxyvitamin D3 as a result of two successive hydroxylation reactions with the participation of enzymes 25- and 1a-hydroxylases in the liver and kidneys. Due to metabolism in the body, vitamin D turns into an active - hormonal form and has a variety of biological effects, interacting with specific receptors (VDR) localized in the nuclei of cells of many tissues and organs [6]. In this respect, the active metabolite of vitamin D behaves like a true hormone, which is why it was named D-hormone.

Vitamin D2 enters the human body from food and is metabolized to form derivatives that have an effect similar to the metabolites of vitamin D3, providing no more than 5-10% of the need. Its main sources are cereal products, fish oil, butter, margarine, milk, egg yolk, etc.

The second natural form of vitamin D, vitamin D3, or cholecalciferol, is formed from a precursor in the dermal layer of the skin - provitamin D3 (7-dehydrocholesterol) under the influence of short-wave ultraviolet B radiation.

The 1,25-dihydroxyvitamin D3 receptors (VDR) provide the ability to generate biological responses in more than 40 target tissues.

The cellular effects of vitamin D and its metabolites are very complex and are carried out mainly through intranuclear VDRs mediated by a ligand-activated transcription factor, which belongs to nuclear hormone receptors [3]. Binding of a ligand to a receptor initiates a cascade of events that include receptor phosphorylation and nuclear translocation, recruitment and then heterodimerization with the 9-cis retinoic receptor (RXR). The VDR / RXR heterodimer, in turn, forms a complex with vitamin D binding protein (VDR) and a co-regulatory protein that bind with a vitamin D reactant element in the promoter region of target genes, which allows regulating the transcription of tissue-specific genes [7]. The genomic pathway leading to changes in gene transcription takes from several hours to several days [8]. Although the effect of active 1,25 (OH) 2D on target cells primarily reflects genomic activity, more recent data indicate the presence of an additional non-genomic signaling mechanism through the membranes associated with the steroid-coupled rapid response receptor (MARRS), which leads to a faster response, from seconds to several minutes [9, 8]. This mechanism has been suggested in a variety of tissues, including the intestines, bones, parathyroid glands, liver, monocytes, and pancreatic beta cells [3, 10]. At the same time, VDR signaling is also associated with the expression of the CYP19 (aromatase) gene, which functionally unites vitamin D with the family of reproductive steroid hormones [11, 12]. An important role in the biological action of vitamin D is also played by the enzymes CYP27B1 and CYP24A1, which regulate the synthesis and catabolism of the vitamin in the liver and kidneys.

Studies investigating the supply of vitamin D in the population in various countries have shown a high prevalence of vitamin D deficiency in both northern and southern regions. Data collected from the North American National Health and Nutrition Examination Survey has recorded a 4-fold increase in the prevalence of vitamin D deficiency in the US population over the past 10-15 years [13]. Thus, it is alarming to find that populations with the highest physiological requirements for vitamin D — pregnant women, newborns, children and adolescents — are also at high risk of vitamin D deficiency [14].

Suboptimal dietary vitamin D intake, increased environmental pollution, lifestyle changes (limiting sun exposure), and a concomitant increase in sunscreen use due to carcinogenic alertness are considered as causes of a vitamin D deficiency pandemic. The inverse relationship between serum 25 (OH) D levels and body mass index (BMI) is also well described. Although the “cause and effect” of this relationship is unclear, obesity is recognized as an independent risk factor for vitamin D deficiency. One mechanism for lowering circulating 25 (OH) D levels in overweight and obese people is the sequestration of a fat-soluble vitamin in adipose tissue. The rising prevalence of obesity may partly explain the upward trend in vitamin D deficiency, which in turn may itself be a contributing factor to the rise in the obesity pandemic. There is a point of view that secondary hyperparathyroidism arising as a consequence of vitamin D deficiency stimulates the activity of 1-α hydroxylase, contributing to a compensatory increase in the level of 1,25 (OH) 2D. Recent in vitro experiments have shown that 1,25 (OH) 2D induces an increase in the concentration of calcium ions within adipocytes, which in turn can stimulate lipogenesis and inhibit lipolysis. One hypothesis for obesity is associated with abnormal as well as decreased signaling of the leptin receptor. In mice with removed leptin receptors, it has been shown that leptin and its related receptor can also regulate renal synthesis of CYP27b1 and 1,25 (OH) 2D [10].

There is no unified data on the optimal level of 25 (OH) D measured in blood serum. However,

according to most experts, the normal content of 25 (OH) D in blood serum is 25-40 ng / ml, D-vitamin deficiency is at 20-10 ng / ml, and D-deficiency is at a level less than 10 ng / ml. ... Intoxication with vitamin D is observed when the level of 25 (OH) D is higher than 150 ng / ml [11].

The term D-hormone deficiency mainly denotes a decrease in its intake and formation in the body of 25 (OH) D and 1a, 25 (OH) 2D3, as well as a violation of its reception.

Large-scale studies in recent years have revealed a link between vitamin D deficiency and the prevalence of a number of diseases. An association of the risk of developing cancer and autoimmune diseases with vitamin D deficiency and geographical latitude has been noted. To date, the expression of vitamin D receptors has been found in cancer of various localizations: melanoma, breast cancer, adenocarcinoma of the colon, endometrial and prostate cancer, bladder cancer, and the relationship of these diseases with vitamin D deficiency is being actively studied [3,11].

There is growing scientific evidence that increasing your vitamin D intake reduces your risk of chronic disease. For example, it has been shown that prescribing vitamin D in a dose of 2000 IU / day to children in the first year of life reduces the risk of developing type 1 diabetes mellitus by 80% over the next 20 years. In addition, children in the same cohort who had vitamin D deficiency during their first year of life had a 4-fold increased risk of developing type 1 diabetes. Increasing vitamin D intake lowers the risk of developing rheumatoid arthritis [7,11].

How is it possible that vitamin D can have such a wide range of therapeutic effects? The fact is that VDRs are present in most cells and tissues of the body, and 1,25 (OH) 2 D is one of the most powerful regulators of neoangiogenesis and growth of both normal and cancerous cells [11,4]. It is likely that with an increase in vitamin D intake or exposure to sunlight, there is an increase in the blood concentration of 25 (OH) D over 30 ng / ml, which is so necessary for maximum extrarenal synthesis of 1.25 (OH) 2D in various tissues and cells of the body. including the colon, mammary glands, prostate, lungs, activated macrophages and parathyroid cells, is reasonable. The local production of 1,25 (OH) 2D is considered important for the retention of cell growth and possibly prevents the transformation of a normal cell into an autonomous and uncontrolled cancer cell [11,8].

Since VDR and 1α-hydroxylase are found in reproductive tissue, including the ovaries, uterus, placenta, and pituitary gland, an association of vitamin D with reproductive health is clear. There is evidence that vitamin D has a definite effect on IVF outcomes, the development of polycystic ovary syndrome (POS) and endometriosis, and overall steroidogenesis in healthy women. In a study of 84 infertile women undergoing IVF, women with higher serum and follicular fluid 25 (OH) D levels were more likely to become clinically pregnant after IVF, and high vitamin D levels improved the results of controlled ovarian hyperstimulation. [11,10].

Polycystic ovary syndrome (POS) is the most common endocrine disorder in women of reproductive age. POS is characterized by increased secretion of androgens by the ovaries and adrenal glands, symptoms of hyperandrogenism, insulin resistance, an increased risk of developing type 2 diabetes, menstrual and reproductive disorders in women. Overall, POS is the most common cause of anovulatory infertility in women [4,12]. Studies concerning vitamin D supply in patients with POS have shown a direct relationship between vitamin D levels and metabolic disturbances, insulin resistance, increased body mass index (BMI), triglycerides, total testosterone and dehydroepiandrosterone in the blood. Research is currently underway on genes involved in the synthesis, hydroxylation and transport of vitamin D in POS. Vitamin D supplementation or vitamin D3 analogs have positive effects on insulin secretion, lipid profile, glucose and C-peptide reduction, menstrual cycle, and follicular development. The presence of obesity in patients was a significant factor in these studies. An association between vitamin D levels and insulin resistance was observed only in obese patients. Lower serum levels of 25 (OH) D3 were found in obese women with POS (13.1 ± 3.9 ng / ml), while in non-obese women it was significantly higher (20.2 ± 8.4 ng / ml). ml). Perhaps it is obesity, but not the presence of POS, that determines this deficiency [6,12].

There are data on the association of endometriosis with the metabolism of vitamin D and there are two arguments in favor of the existence of such a relationship: VDR and 1α-hydroxylase are present in the endometrium and, possibly, the endometrium serves as a site of extrarenal synthesis and an object of exposure to vitamin D. Since endometriosis is associated with significant immune disorders , it can be assumed that vitamin D is involved in local immunosuppression in the development of endometriosis. It should be noted that a significantly higher concentration of VDR and 1α-hydroxylase receptors was found in the endometrium of women with endometriosis compared to healthy women, with a different content of vitamin D-binding protein. It is this protein that is directly related to the stimulation of macrophage activity. This finding could explain the effect of vitamin D on local immunosuppression promoting endometrial cell implantation.

The study of the role of vitamin D in pregnancy is of particular interest. It has been shown that 1,25 (OH) 2 D3 regulates the release and secretion of human chorionic gonadotropin in syncyotrophoblast and increases placental production of sex steroids. It

turned out that calcitriol promotes the transport of calcium to the placenta, stimulates the release of placental lactogen, and also regulates the expression of HOXA10 (a gene that determines the development of genital organs) in stromal cells of the human endometrium. Expression of HOXA10 is of some importance for the development of the endometrium and improves the susceptibility to implantation [9]. The serum vitamin D level of women in the third trimester of pregnancy is 2 times higher than that of non-pregnant women.

Vitamin D deficiency causes a number of adverse pregnancy complications: hypertension and especially preeclampsia (PE), an increase in the frequency of caesarean section and spontaneous preterm birth, the development of bacterial vaginosis in early pregnancy, and gestational diabetes mellitus. Preeclampsia is one of the most common obstetric complications and contributes significantly to maternal and fetal morbidity and mortality. Although the etiology is not entirely clear, impaired trophoblast invasion, low placental perfusion, endothelial dysfunction, and oxidative stress are the mechanisms underlying preeclampsia. The presence of vitamin D and its receptors in the placenta, as well as the ability of vitamin D to modulate immune, inflammatory and vascular reactions, allow substantiating the role of vitamin D deficiency in pregnant women in the pathogenesis of preeclampsia. High vitamin D levels in women are associated with a lower incidence of preeclampsia and lower blood pressure. A 25 (OH) D3 content during pregnancy of less than 20 ng / ml is associated with a 4-fold increase and less than 15 ng / ml with a 5-fold increase in severe preeclampsia. A study of 23,423 nulliparous women in Norway showed a 27% reduction in the risk of PE in women who received 400-600 IU of vitamin D per day compared with women who did not receive the supplements [11].

While the role of vitamin D in the development of hypertensive conditions during pregnancy is not in doubt, the study of the relationship of vitamin D with gestational diabetes mellitus (GDM) gives conflicting results. In a study in women with vitamin D deficiency in the early stages, the risk of developing GDM was found to be 2.66 times higher than in pregnant women with normal vitamin D levels. Two other studies failed to identify an association between vitamin D content and the subsequent risk of GDM [11 ,ten].

There are convincing data on the association of vitamin D deficiency with an increase in the frequency of caesarean section in pregnant women. A recent observation found a 4-fold increase in the likelihood of caesarean section in women with low vitamin D (<13.5 ng / ml) at the time of labor compared with women with higher vitamin D. D on the contractile activity of the myometrium. Myometrium contractility depends on the release of ionized calcium in muscle cells, and this process is regulated by vitamin D [8].

Activated T and B lymphocytes also have a VDR, and therefore 1,25 (OH) 2D is a very effective modulator of the immune system. Vitamin D is able to inhibit the proliferation of T-helper 1 (Th1) and limit the production of cytokines such as interferon gamma (IFN-γ), interleukin-2 (IL-2) and tumor necrosis factor-alpha (TNF-α). On the other hand, vitamin D induces type 2 T-helper cytokines, which have a protective effect on pregnancy. Given these immune effects of vitamin D, it has been suggested that vitamin D may act as an immune regulator during implantation and play an important role in reproductive function. In early pregnancy, the trophoblast produces and responds to vitamin D, which has a local anti-inflammatory response and induces the growth of decidual tissue for a successful pregnancy [12,7].

A recent study showed a 17% increase in preterm birth rates among black women without concurrent chorioamnionitis with vitamin D levels <15ng / ml. In a cohort of 82,213 singleton infants, they found evidence that vitamin D and seasonal exposure to sunlight are related to preterm birth. The prevalence of spontaneous preterm labor (SPD) was lowest among women who conceived in summer and fall, and highest at early pregnancy in winter and spring. Research has provided compelling evidence that adequate vitamin D may protect against premature birth [12,11]. A retrospective study by Japanese authors found lower values of 25 (OH) D among women who were hospitalized for preterm labor early in the third trimester of pregnancy [13.1].

What is the link between vitamin D deficiency and preterm labor? It can be mediated by other complications of pregnancy - preeclampsia, placental insufficiency and bacterial vaginosis, in the development of which the role of vitamin D deficiency has been practically proven. At the same time, the potential of vitamin D in a key influence on the parameters of innate immunity, systems and regulation of the activity of cellular immunity may be of independent importance in reducing the risk of SPR. It is possible that vitamin D can reduce the risk of SPR by decreasing the activity of the myometrium.

Deficiency of vitamin D deserves special attention with a predisposition to a spectrum of diseases of infectious etiology, including bacterial vaginosis (BV). Disruption of the normal balance of vaginal microflora with an increased growth of anaerobic bacteria leads to an increase in the production of pro-inflammatory cytokines, prostaglandins and phospholipase A2 [13,7]. The relationship between BV and vitamin D status was studied in a study of 3,500 women (pregnant and non-pregnant). A decrease in vitamin D (25 (OH) D <30 ng / ml) has been identified as an independent risk factor for BV in pregnant women. Bodner et al. in a

prospective cohort study of 469 pregnant women in the first trimester showed that the mean serum 25 (OH) D concentration below 11.8 ng / ml was detected in bacterial vaginosis, while in women with normal vaginal microflora it was more than 16 ng / ml. Approximately 57% of women with low 25 (OH) D levels (<8ng / ml) suffered from persistent BV compared with 23% of women with normal (> 30 ng / ml) serum vitamin D levels [14.5]. These studies clearly show an association between vitamin D deficiency and BV in pregnant women, which increases the risk of miscarriage by 7 times.

Available evidence points to a biologically significant role for vitamin D in women's reproductive health. In addition to classic diseases such as osteoporosis and osteomalacia, vitamin D deficiency in women is beginning to be associated with lower fertility and an increased risk of adverse pregnancy outcomes. However, the results of studies examining the relationship between 25 (OH) D levels and the incidence of adverse pregnancy outcomes are not always unambiguous. The reason for this is the small sample size, inadequate control of external factors, and significant heterogeneity of the studied populations [14,13]. The optimal reproductive serum 25 (OH) D3 levels, especially during pregnancy, for the nonclassical effects of vitamin D are unclear. The solution is likely to be large-scale randomized clinical trials with practical public health outcomes.

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Impact Factor:					
	ISRA (India) = 4.971	SIS (USA) = 0.912	ICV (Poland) = 6.630
	ISI (Dubai, UAE) = 0.829	РИНЦ (Russia) = 0.126	PIF (India) = 1.940
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SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 30.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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THE SPIRITUAL AND PRACTICAL SIMILAR POINTS OF YOGA AND SUFISM

Abstract: *The main aim of choosing of the very subject about the "similar points of world religions" is connected with the view-point given below in article regarding the struggle against the wide spread terrorism throughout the world. In this condition, as we think, the present article may explain to the readers such a logical truth, that in spite of variety of races, nations and religions peoples are not strange to one another. Because, according to Veda's speech: «**Vasudhaiva kutumbakan** – The hole world is one family». The same idea can be seen also in **Holy Qaran** in the form of community : "كَانَ النَّاسُ أُمَّةً وَاحِدَةً – Mankind were one community". Here should be taken into consideration also, that the below mentioned "special steps" of Yoga and Sufism may give certain knowledge about the religious-philosophical would-outlook of the both teachings. Moreover, on the basis of presented information in case of interest one can try to make as theoretical as well as practical exercises of Yoga or Sufism in the field of meditation.*

Key words: *Al-a'lam, Al-mukhtasar, aticukh, maqaman, javkhar, dharana, zuhd, farq, sabr, solik, zubdat, goon.*

Language: *English*

Citation: Nizametdinov, N. G. (2020). The spiritual and practical similar points of Yoga and Sufism. *ISJ Theoretical & Applied Science, 10 (90),* 386-388.

Soi: http://s-o-i.org/1.1/TAS-10-90-66 ***Doi***: crossref https://dx.doi.org/10.15863/TAS.2020.10.90.66

Scopus ASCC: *1212.*

Introduction

It's known that in order to bring to light the similar points of any two different religious teachings, it would be logical to remind the following point of view of a sufist Mansur Khallaj related with the main principle of comparative study of re-ligions:

"***All religions are different twigs of the same Tree***". Because our pragmatic analysis also concern to the conglomerate of the "Two twigs" situated for the first sight so far from each other as Yoga and Sufism.

Actually, Indian philosophic thought is so ancient and at the same time so modern, that it comprehends by its logical round all periods – past, present and future of the world i.e. from its creation up to the end. And this process according to the interpretation of Hinduism having reached its last point reverts back to the initial position and starts again. It means, the creative activity of God is like Him-self constant and forever. Therefore the rebirth conception of the very religion is explained in accordance with the law of eternity of the life circulation, where everybody is a particle of Gad's first creation Brahma.

It should be noted, that there is similar understanding in Sufism regarding the essence of Brahma. As a proof of above mentioned we can quote the following lines from "***Zubdat ul-khaqyiq*** – The cream of Truth" written by Azizuddin Nasafiy: "***The first of all God created Jawkhar – "Rukhi-avval***" (Initial soul) **[3:5p.].**

Further Hinduism confirms, that entering of immortal soul from the one into another body together with the new form and nature with lucky or unlucky fate, depends on how one completed his life duties in the former birth according to the responsibility of belonged caste. In other words, in every next birth man or woman can be rewarded or punished due to activities during the lifetime.

The idea of "reward" in Hinduism being a promotion in cast or in other fields of the life, even can be also a freedom from the rebirth for further joining with Brahma. As for Sufism, the very explanation is

concreted more clearly: "If the soul becomes perfect in quality, after the separation it returns to the world of invisible Mind" **[3:5p.].**

In Hinduism in case of "last punishment" man with his sins may fall down to the lower stage of the birth by losing human rase and entering into the body of animals. In this concern shree Krishna said:

"When the man has a new garment he naturally throws the old one and abso-lutely the same happens with the soul during the death. O, lovely son of Koonty, man, who are born again and again con not come near to Me and at the end they obtain the lover form of life **[1:112p.].**

From this precept is clear, that demons in each birth as a seed of their heredity, unless entered into the body of animals constantly fall dawn and dawn. Conse-quently, peoples should live precisely according to religion in order to be free from the next entering into another body – from the continuation of births.

In fact, the incarnation of soul in different forms of existence can be observed in Sufism also:

"***He who did not trust in God, recognize the Prophet and follow saints can not be man even in spite of his outside shape. And there is no way for animals in the world of Truth – the upper destination of pure peoples***".

Generally the immortal soul as a particle of the supper Soul is available every-where in spite of time or place like salt in the see water, where even a drop is salty. In accordance with this presence, as in "Bhagavad-Gita" has been noted, that "***Every body is a small Ishvar*** – god". Or as Ibn Arabi described: "***Every one as is small space like "Al-a'lam" and "Al-mukhtasar"*** (small world), ***who reflects God's symbol and qualities"*[5:12p.].**

In this case we can face with such a question: "If so, haw it can happen, that man becomes sinful?" The answer to this question in Hinduism is arqued by life conditions: "***Man lives under the influence of low "goon" – qualities surrounded by attractions. As a rule, all negatives of the man is the result of not recognizing of God and these circumstances make him to be under the impression of low "goons" which constantly draw the mind to obey to the needs of body. Even-tually, when the mind starts to obey the unlimited desires of low qualities, it falls a victim to illusions of the material world named "Maya".***

In Hinduism the process of achieving the divine qualities is considered through the whole life struggle against the low "goons" and victory over them. If man could be successful to save himself from "Maya", he will be free from sins and have chance to live in the consciousness of Krishna. For this aim Yogi must follow "eight steps" of purity and perfection by constant training. They are:

1.***Yama*** – self control.

2.*Niyama* – completion of activities allowed by religion only.

3. *Asana* – physical perfection.

4.*Pranayama* – regulation of breathing and being imperceptible in activities.

5.*Pratyahara* – control of mind and sense.

6.*Dharana* – concentration of mind – meditation.

7.*Dhayana* – brightening of soul.

8.*Smadhi* – peace in transcendental condition.

After the mastering of perfection Yogi will be able to know himself completely and feel pure sensation. He will enjoy the happiness of world of perfect feelings. Now having been sure that he already "stands on his foots" in this position and no think can make Yogi to worry because of his readiness for all unwanted cir-cumstances. The same power will help him to break the material ties with the world and feel himself from the shackles of "***Maya***" and to reach the divine grand of "***Atisukh*** – over happiness as well as "***Khal***" in Sufism.

As per perfection of soul there nine stages of "Maqamat– stages" for Solic – purple in Sufism. They are:"

1.***Tavba*** – the throwing all bad habits and improving perfect qualities.

2.***Vara*** – the locking of tongue, eye and ear from actions prohibited by religion.

3.***Zuhd*** – the continuation of ***Vara*** including diet for not allowed foods, drinks and renouncement from sense of material property.

4.***Faqr*** – the consideration of himself less than a particle and belonging to God as His property.

5.***Sabr*** – the living with patience and control of temptations.

6. ***Khaf*** – the condition when soul is in doubt or under the impression of Evil.

7.***Rajo*** – the hopefulness and freedom from hesitations what makes soul more near to God.

8.***Tawakkal*** – leaning upon God in all situations in spite of whatever happens.

9.***Rizo*** – the pure soul comes out from the influence of material world and enters into God's agreement.

So in the last stage of study Yogi and Solik will not have any objection on the destiny given by God and become free from angry, worry, fear, offence and so on.

If to describe this condition in one sentence – Yogi and Solic thanks to the God will be ready to bear all kind of difficults and problems.

And now we will try briefly to explain the "Atisukh" of Yoga together with "Khal" condition of Sufism. According to the view-point of Yogi and sufies "Atisukh" or "Khal" comes not only after the completion of "step by step" study, it may come at once, making the soul shineful under the pure shower of rays. So, after the testing once in a life the divine rays lasted for a moment, Yogi and Solik try to feel the very pleasant instant every time. Besides all above

mentioned, there are additional points also, which once again confirm the availability of certain similar points between Yoga and Sufism:

1.Yogi in the result of "Atisukh" may be honored with the "Ras – divine juice". Regarding this special "honor" Sufism says, that sometimes Solik completely forgets himself like "Sukr – "dead drunk" by "Shrab-i antakhur" – like pure wine.

2. The divine rays may decrease or disappear unless soul will be absolutely free from all negatives. And during this process the "vacuum" of decreased or disap-peared divine rays are filled with the feeling of proud that soul is going more and more to be near to God.

3.Inspiration in the fields of creation, when Yogi or Solik stays along with God.

4.***Dharana*** (Yoga) and ***Muraqaba*** (Sufism) as meditation in both teachings means concentration of mind on God.

5.In the longest way of reaching of final aim in both teachings is needed the guidance of teacher – ***Guru*** or ***Peer***.

6."***Bhagavad-Gita***" notes: "***Who turned into inside of himself,... he realized God".***

7. "***Khadis-I shareef***" notes: "***Who realized himself, he realized God***".

At the end the only question to which we have to answer is: Why and by what reason so called similar points of the world religions should be studied?

To our mind, as above said, in the condition of struggle against the terrorism the comparative study of the religious doctrines undoubtedly will help to realize once again the divine Truth, that God is One and charitable for all races, nations, who have different religions. By the way, the factor of variety is one of reflection of the beauty of God's will and might.

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Impact Factor:						
	ISRA (India)	= 4.971	SIS (USA)	= 0.912	ICV (Poland)	= 6.630
	ISI (Dubai, UAE)	= 0.829	РИНЦ (Russia)	= 0.126	PIF (India)	= 1.940
	GIF (Australia)	= 0.564	ESJI (KZ)	= 8.997	IBI (India)	= 4.260
	JIF	= 1.500	SJIF (Morocco)	= 5.667	OAJI (USA)	= 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2020 **Issue:** 10 **Volume:** 90

Published: 30.10.2020 **http://T-Science.org**

QR – Issue QR – Article

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ACCOUNTING AND ANALYTICAL SUPPORT FOR INTERNAL AUDIT OF FIXED ASSETS IN COMMERCIAL ORGANIZATIONS

Abstract: *this article presents arguments that justify the need for regular procedures for the control of fixed assets. The influence of factors such as the degree of automation of accounting data, the human factor, the specifics of internal reporting and accounting policies on the reliability of indicators is justified. Requirements are formulated for the need to perform analytical procedures when conducting an internal audit of fixed assets.*

Key words: *internal control, internal audit, control procedures, fixed assets, accounting and analytical support of control.*

Language: *English*

Citation: Xudoyberganova, S. K. (2020). Accounting and analytical support for internal audit of fixed assets in commercial organizations. *ISJ Theoretical & Applied Science, 10 (90),* 389-392.

Soi: http://s-o-i.org/1.1/TAS-10-90-67 ***Doi***: https://dx.doi.org/10.15863/TAS.2020.10.90.67

Scopus ASCC: *2000.*

Introduction

Fixed assets are labor assets that are used for more than one year. An overview of fixed assets as an economic category, their accounting and analysis of the effectiveness of their use are very important points in the work of each organization. Since, a more rational and complete use of fixed assets of the enterprise contributes to the improvement of all its economic indicators: increasing capital productivity, increasing labor productivity, increasing output, reducing its cost, saving capital investments. The structure of fixed assets is shown in figure 1 [1, p. 4].

The concept of fixed assets, their classification and evaluation

The concept of the basic means, their classification and evaluation

Fixed assets – part of the organization's property (assets).

When accepting assets for accounting as fixed assets, the following conditions must be met at one time

• use in the production of products when performing works or providing services, or for the management needs of the organization;

• use for a long time (more than 12 months);

• the organization does not intend to resell these assets in the future;

the ability to bring the organization economic benefits (income) in the future.

Fixed assets are classified according to various criteria: by composition and purpose, by direction of use, by degree of use, by ownership, and others.

By composition and purpose, fixed assets are divided into the following groups: land plots, natural resources, buildings, structures, machinery and equipment, vehicles, production and household inventory, working and productive livestock, perennial plantings, and other types of fixed assets.

The accounting unit for fixed assets is an inventory item.

An inventory item of fixed assets is an object with all devices and accessories, or a separate structurally separate item designed to perform certain independent functions, or a separate set of structurally articulated items that represent a single whole and are intended to perform certain work

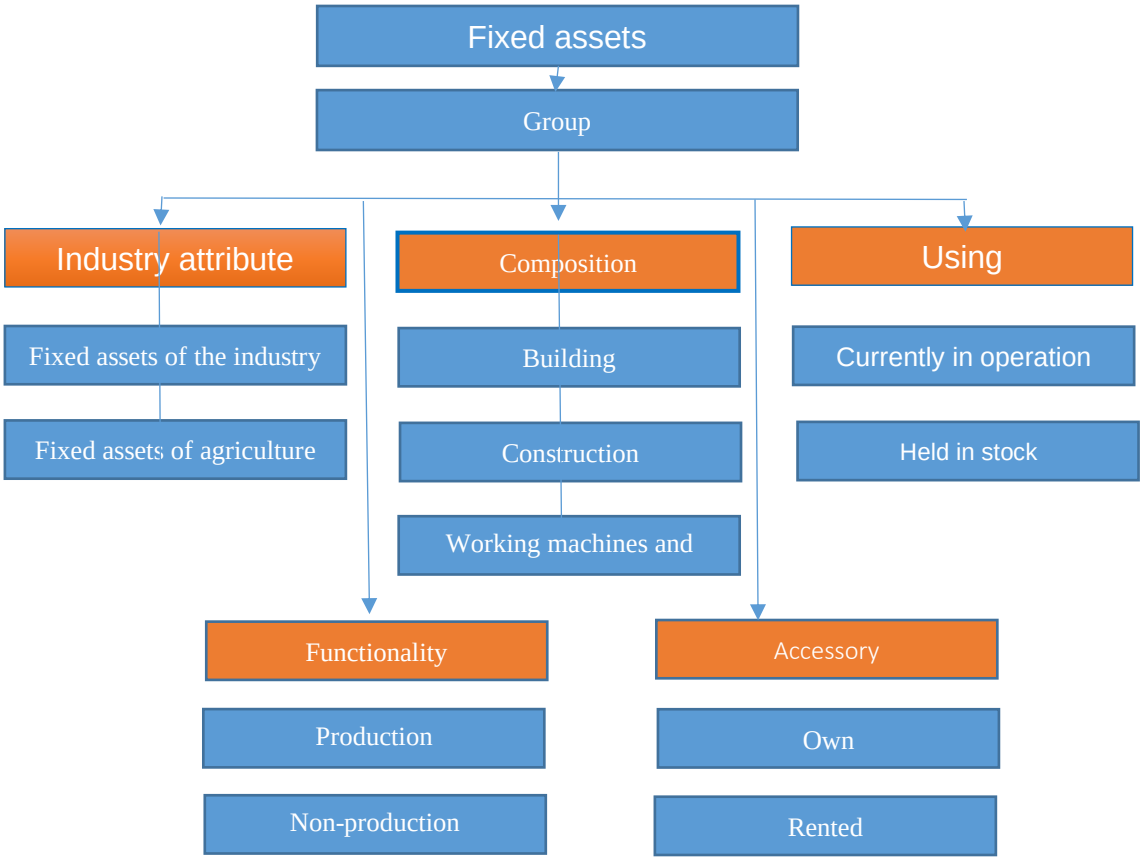

Figure 1. Structure of fixed assets

There are three types of valuation of fixed assets:

- initial, which is formed at the time of entry into operation of the object;
- replacement – the cost of purchasing or building an object based on current prices at the time of revaluation;
- residual value is an estimated value defined as the difference between the original (replacement) cost and wear and tear. Fixed assets are recorded at their residual value in the balance sheet.

Items of fixed assets worth no more than 10,000 sums per unit or other limit set in the accounting policy based on technological features, as well as purchased books, brochures, etc. publications are allowed to be written off for production costs (sales expenses) as they are released into production or operation.

The steps of the analysis of fixed assets

A well-chosen method of analysis of fixed assets (hereinafter-AF) will allow you to monitor the composition and condition of production and non-production funds in a timely manner. This will also help to increase the efficiency of AF usage if competent management decisions are made based on the data obtained as a result of analysis.

For this analysis, the best approach is the method of chain substitutions, which will study the influence of various factors on the change in the effective value — the cost of the asset.

There are the following factors that affect the change in the cost of the enterprise AF:

receipt and / or commissioning;
disposal (disposal, liquidation);
revaluation.

The cost of fixed assets is positively affected by the receipt and revaluation, and negatively by the disposal of fixed assets and their markdown.

Stages of AF analysis:

Collecting information about all operating systems available in the enterprise.

Analytical study AF:

analysis of the state of;

the analysis of the dynamics;

the analysis of security.

Processing of analytical data and summarizing the results.

Development of measures to improve the efficiency of AF use.

Control over the implementation of management decisions.

When collecting information, you should immediately structure your existing operating systems by grouping them by usage profile (production and non-production). Production operating systems should, in turn, be divided into active and passive. Analysis of the structure of funds will allow you to further identify the potential for improving the efficiency of use, if you optimize their structure by re-evaluating their role in the production process.

Analysis of the state of fixed assets

The main objectives of the analysis of the state of the AF are:

study of structural composition and movement AF, degree of renewal, disposal and the technical condition of assets — this calculated the coefficients of updates, divestiture, growth, wear, shelf life;

study of factors that affect the effectiveness of AF application - calculated indicators of capital return and capital intensity;

identification of the degree of influence of extensive / intensive factors, study of the efficiency of AF use in time and power - coefficients of extensiveness/intensity of loading;

elucidation of the impact of labor resources on the volume of output — stock, energy and mechanical strength;

factor-by-factor analysis of capital productivity and search for reserves to increase it — shift rates, downtime, average hourly output, etc.

Analysis of the dynamics of fixed assets

The purpose of the analysis of AF dynamics is to study the volume, patterns, and efficiency of capex use. To do this, indicators are analyzed in dynamics for several periods, most often at the beginning and end of the period. Based on the results of correlation of this information, the relative and absolute values of the dynamics of the cost of fixed assets are calculated.

Analysis of the availability of fixed assets

To analyze the security of the AF, it is necessary to compare the actual availability of machinery and equipment with the planned need sufficient for the smooth running of business activities of the enterprise. When calculating the planned demand for equipment, all technological and organizational features of production are taken into account.

As a result of comparing the actual availability with the planned need, you can calculate what the company needs for additional equipment (how many units and what equipment is missing). Then, opportunities are sought to fill the gap — for this purpose, methods are analyzed:

obtaining the missing AF, based on the time of their use — a decision is made on whether to purchase, lease or lease;

exemption from unused (inefficient, unnecessary) operating systems in the enterprise — for this purpose, a decision is made to sell or lease.

When analyzing the security of fixed assets, the following indicators are analyzed:

capital strength;

technical equipment;

use of production capacity at the enterprise.

If the security of the enterprise is estimated for the future, then it is necessary to analyze the indicator of capital intensity in the reporting period and the planned volume of output. If you multiply these values, you will get the cost of the AF required to ensure the planned volume of output.

The OS analysis methodology allows you to systematize approaches to regular assessment of the state, structure, and movement of production assets. Such regular monitoring will not only improve the efficiency of AF use, but also in the future monitor the adequacy of equipment to meet production plans.

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Signed in print: 30.10.2020. Size 60x84 1/8

«Theoretical & Applied Science» (USA, Sweden, KZ)
Scientific publication, p.sh. 29.375. Edition of 90 copies.
http://T-Science.org E-mail: **T-Science@mail.ru**

Printed «Theoretical & Applied Science»