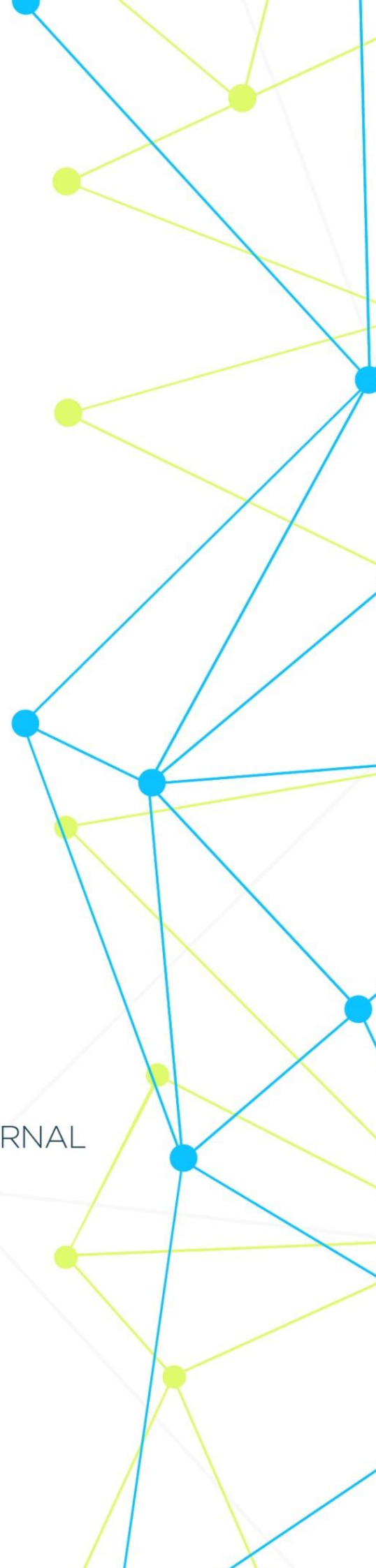


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Results of assessment of class and degree of harmfulness of working conditions of medical workers, indexed by complexity and severity of the work process

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Abstract

The article presents the results of the study of working conditions of the workers of the Gissar oil and gas field in the Kashkadarya region of Uzbekistan, with the definition of the complex of unfavorable production factors at the main.

According to studies, it was found that the body of workers in oil and gas production is affected by a number of adverse factors: the presence in the air of the working area of chemicals, noise, vibration, adverse microclimate, especially heating in the warm period and cold in winter, insufficient and uneven lighting, increasing stressful nature of the labor process. The impact of the above-mentioned production factors on the body of workers can cause the development of occupational and occupational diseases.

Keywords: Oil and gas industry, working conditions, meteorological conditions, chemical factors, noise and vibration.

In the light of structural transformations in the economy of the Republic of Uzbekistan, aimed at modernization and technical re-equipment of industries and enterprises, the most complete and efficient use of the rich natural potential of the country, the formation of export-oriented and import-substituting industries, the oil and gas industry occupies a priority place. The modern level of working conditions is characterized by improvements in technology and equipment.

However, we do not imagine it is possible to completely exclude the negative impact of production factors on the body of workers. In the process of labor activity persons working in the oil and gas industry come into contact with components of multisulfur oil and oil products, physical factors and heating microclimate, which has a very adverse effect on the health of workers [4, 5].

Earlier studies on the health of the population employed or residing in the territory of oil refining areas revealed its negative changes at the level of neurological status and skin [1, 6, 18]. In view of this situation, the management of oil and gas refineries began to pay special attention to the problem of environmental protection and public health [3]. Numerous studies indicate that the impact of adverse working conditions on workers can be manifested by an increase in general medical morbidity, reduced life expectancy, early aging, increased mortality [8, 13]. It is known that chemical factors present at oil refineries have an adverse effect on the health of workers [11].

The authors have studied working conditions and labor protection of oil workers in Kazakhstan. They established that the number of injured at work remains quite high and it is connected with such factors as production culture, technological and production discipline, availability of individual protective equipment, availability of special clothes and special footwear, good work organization [12]. Industrial injuries are still high in the industry, the main causes of which are considered to be the deterioration of production technology, weakening of departmental control, reduction of labor protection services at enterprises, depreciation of fixed assets, reduction of funding for safety [7].

In order to preserve and protect the environment it is necessary to restore natural resources, it is necessary to carry out environmental control in the oil companies for emissions of pollutants, for water discharges, for the development of fauna and flora [9]. According to some authors, acidic products of some chemical industries, penetrating by air into the body, undoubtedly affect the cell membranes of the body, primarily red blood cells. Workers of these enterprises have the most significant changes, reflecting the adaptation reactions to harmful industrial factors [10].

Studies on the study of hygienic assessment of working conditions of gas industry workers revealed early changes in the nervous system in workers. The author found that natural gas has a toxic effect on the central nervous system with the development of astheno-neurotic syndrome or vegetative dystonia [2, 15]. The degree of toxic damage of the nervous system, as well as in other occupational diseases, is determined by the length of service at the enterprise.

Of the complex of adverse production factors the chemical components prevailed: hydrogen sulfide, hydrocarbons, ethylene glycol, ammonia, monoethanolamine, which in some shops exceeded the maximum allowable concentrations (MAC) on the average values, but their maximum values in some samples significantly exceeded the MAC [17].

Despite the improvement of oil exploration and oil production technologies and the improvement of working and living conditions of shift workers, in most cases their working and living conditions associated with exposure to climatic and production factors are harmful and dangerous [9]. Temperature factor, physical loads, high air humidity are dangerous for workers' health. A group of authors proposed a developed and tested system of industrial preventive medicine, taking into account the specifics of gas industry and extreme climatic conditions of high northern latitudes, which gives an opportunity of targeted prevention of diseases and recovery of workers' health, prolongation of professional longevity [12, 16].

Research Objective: Assessment of working conditions and levels of harmful factors at the main oil and gas production sites of Gissar.

Research material and methods: The main unfavorable factors of the working environment in oil and gas production are chemical and physical (noise and vibration) factors, as well as unfavorable meteorological conditions. Taking into account the purpose of the study, we studied the main chemical factors in the working areas as a factor determining the functional state of the digestive organs.

Study of working conditions of workers engaged in extraction, processing and transportation of natural gas was conducted according to SanPiN № 0141-03 «Hygienic classification of working conditions according to indicators of harmfulness and hazard of factors of industrial environment». Concentration of chemical substances in the air of working zone of Gissar oil and gas production fields was determined in accordance with GOST 12.1.005, and the results were evaluated in accordance with the requirements of SanPiN RUz №0209-06 «Sanitary rules and hygienic requirements for oil industry».

Noise was evaluated on the basis of SanPiN RUz №0325-16 «Sanitary norms of permissible noise levels in workplaces», and vibration was evaluated on the basis of SanPiN RUz №0326-16 «Sanitary norms of general and local vibration in workplaces».

Results and their discussion: We studied the working conditions of workers at modern oil and gas producing branches of the republic by the example of one of the largest divisions of LUKOIL Uzbekistan Operating Company, South-West Gissar. The Southwest Gissar project includes seven fields, of which the main ones are Adamtash, Gumbulak and Dzharkuduk-Yangi Kyzylcha, as well as several other areas. The fields are located in the mountainous regions of the Kashkadarya region, near the border with Tajikistan, and in addition to gas contain oil and condensate reserves.

Noise and vibration parameters at the main objects of Gissar field are presented in Table 1.

The table shows that the objects of special noisiness (85-110dBA) are the site of gas extraction and treatment Adamtash (94,0±1,41 dBA), oil and gas extraction shop (92,0±1,38), industrial and technological service (92,2±1,5 dBA), gas extraction and complex treatment area Gumbulak - Jarkuduk (94±1,52 dBA). Noise level at the above-mentioned objects exceeds MPL from 10 to 15 dBA.

Table 1.

Noise level at the oil and gas production sites
 Gissar field

№	Measurement location	Maximum permissible level	Equivalent sound level, dBA (M±m)	Class of working conditions
1	Oil and Gas Production Shop	80	92±1,38	3.2
2	Production and technological service	80	92,2±1,50	3.2
3	Chemicalization Department	80	75±1,67	2
4	Chemical and analytical laboratory	80	72±1,15	2
5	Transportation section	80	82±2,07	3.1
6	Gumbulak-Jarkuduk production and	80	94±1,52	3.2

	comprehensive gas treatment facility			
7	Adamtash gas production and treatment section	80	94±1,41	3.2
8	Pipeline and metering units operation section	80	84±2,43	3.1
9	Central dispatch service	80	75±2,88	2
10	Instrumentation, Control and Metrology Department	80	75±3,16	2
11	IT and Communications Service	80	72±1,36	2
12	Technological equipment repair unit	80	85±3,49	3.1
13	Mechanical-repair shop team	80	78,2±1,39	2

At the transport section, as well as in the sections of operation of pipelines and metering units, on repair of technological equipment and repair-technological workshop brigade, a slight increase of the maximum permissible level of noise is observed, on average from 82±2,07 to 85,0±3,49 dBA. At the other facilities and sites (chemicalization team, chemical-analytical laboratory, central dispatcher service, instrumentation and metrology site, communication service) the noise level is lower than the permissible level by 5-15 dBA.

Our measurements of vibration at the main working places showed the following: the parameters of general vibration were depending on the technical features of the equipment (power, number of revolutions and shocks). The highest frequency of vibration was detected on the transport area for car drivers, in the premises of the repair-mechanical workshop on the working places of the foreman for repair of technological equipment, fitter for repair of technological installations and general machinist the level of general vibration exceeded MPL from 10 to 36 Hz (tab. 2.).

Table 2

Vibration levels at workplaces
Oil and Gas Production Field Gissar

Shop, work place	Type vibration/ category	Direction actions	Maximum permissible level, dB	Equivalent corrected vibration velocity level, dB	Duration of exposure (hours %)	Class of working conditions
1	2	4	5	6	7	8
Transport area						
Driver of the car (passenger car)	I	General	107	88	80	2
		Local	112	104		2
Operator of truck lifts and hydraulic elevator	II	General	101	104	80	3.1
		Local	112	108		2
Hydraulic crane operator	II	General	101	109	80	3.1

		Local	112	107		2
Operator of mobile steam dewaxing units	III «a»	General	92	104	80	3.2
		Local	112	105		2
Operator of mobile compressor	III «a»	General	92	105	80	3.2
		Local	112	107		2
Operator of a bulldozer	II	General	101	106	80	3.1
		Local	112	108		2
Cementing machine operator	III «a»	General	92	88	80	2
		Local	112	104		2
Repair and mechanical workshop team						
Master of repair of technological equipment	II	General	101	65	20	2
Technological systems fitter	II	General	101	65	60	2
General machine operator	III «a»	Local	112	92	60	2
Automotive mechanic	III «a»	Local	112	92	60	2

In all workplaces of the transport section the level of local vibration was low by 2-8 dB in relation to MPL (112 dB). In the repair-mechanical workshop team the highest vibration frequency was observed in the rooms and workshop for repair of technological equipment, the fitter for repair of technological installations was lower than the MPL by 36 Hz, and in the workplace of the electric welder the local vibration level was higher by 3-20 Hz (MPL - 115-128 Hz).

Study of meteorological conditions during the observation period in the oil and gas production industry, which was carried out in the following areas: oil and gas production shop; production and technological service; chemistry team; chemical and analytical laboratory; tractor shop; production and comprehensive gas treatment; gas production and treatment area; pipeline operation; central control room; metrology area; IT service; mechanics repair of process equipment; repair and mechanical workshop team. Changing meteorological conditions were conducted 3 times during the working day: at 800, 1200 and 1600 hours at the field workplaces.

At investigated sites of oil and gas extraction industry in the hot period of year (July) there were sharp changes of indicators of physical factors (temperature, relative humidity of air, speed of air movement). At the same time, in the workshops of oil and gas production and in other open sections the air temperature during the day (1600 hours) was at the level of 36,8 – 42,8°C, at other closed sections the air temperature ranged from 25,8±0,26 to 26,8±0,22°C. Relative humidity in the above (closed) sections ranged from 15,4 to 18,2%, and air velocity from 1,1 to 1,2 m/s. The study of the microclimate of workplaces in open areas showed that the maximum air temperature during the warm season ranged from 38°C to 42°C. Relative humidity,

the highest in the morning hours (29%). The speed of air movement was determined on average at 1,0-3,7 meters per second.

We conducted a study of the chemical composition of oil and gas for the content of hydrogen sulfide, nitrogen oxide, carbon monoxide, hydrocarbon, sulfur dioxide and ammonia in the workplace in the oil and gas production industry in the study areas. The air environment in the working zone of the main facilities (oil and gas production shop, production and technological service, gas production and preparation sections, process equipment repair section) of oil and gas production industry was contaminated with a complex of chemical harmful substances. Concentrations of hydrogen sulfide, nitrogen oxide, hydrogen oxide and hydrocarbon sulfide also increased at the main sites, which exceeded MPL from 1.5 to 4.32 times. At the other sites, the content of chemical substances was within less or permissible norms.

Conclusion: Conducted studies of working conditions of workers in the oil and gas field Gissar Kashkadarya region of the Republic of Uzbekistan is characterized by a complex of unfavorable production factors: the presence in the air of the working area of chemicals, noise, vibration, unfavorable microclimate, especially heating in the warm period and cold in winter, which can cause a negative impact on the body of workers.

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