Man In India, 97 (20) : 495-511

A NEW APPROACH FOR A SPECIAL ASSESSMENT OF THE WORKING CONDITIONS AT THE PRODUCTION FACTORS' IMPACT THROUGH FORECASTING THE OCCUPATIONAL RISKS

Nail Khaditovich Abdrakhmanov[*], Nadezhda Vyacheslavovna Vadulina[*], Artyom Vasilyevich Fedosov[*], Sumbul Mutalovna Ryamova[*] and Emil Shamilevich Gaysin[*]

Abstract: A special assessment of working conditions is a unified complex of consistently carried out actions for the identification of harmful and/or dangerous factors of the production environment and the labor process and the assessment of their impact on the employee taking into account the deviation from the actual standard values. It is aimed at determining the presence of harmful and dangerous factors of the production environment that affect the safety and the health of the workers. The initial identification of the occupational risks for each workplace and the employee is made within the special assessment of working conditions. However, the procedure of a special evaluation of working conditions makes it impossible to predict occupational risks. In this article the analysis of existing methods of a special assessment of the working conditions according to the Order of the Ministry of Labor # 33H of January 24, 2014 has identified the shortcomings. The methods for assessing the occupational risks, taking into account the impact factors of the production environment and the labor process in the work have been considered. In accordance with the requirements of the Federal law "On special assessment of working conditions" #426-FZ of 28.12.2013, existing methods and relevant regulations, the assessment of working conditions of the workers of the petrochemical complex, who are exposed to harmful production factors, with the subsequent forecast of occupational risks has been carried out. The need to assess the level of the impact of the emerging risks in the workplace on the basis of the analysis of the impact of the identified harmful and hazardous production factors has been considered.

Keywords: A special assessment of working conditions, the factors of the labor process, harmful and dangerous production factors, working conditions, the level of the occupational risk, the acceptable level of the occupational risk.

INTRODUCTION

The purpose of the analysis of the existing methods of a special assessment of working conditions (herein after SAWC) is to improve the methods of SAWC. For the identification of problems in the current methodology it is necessary to examine the current methodology of SAWC and to identify drawbacks, as well as to propose a new approach to SAWC with the forecast of the occupational risks.

According to the Federal law of 28.12.2013 #426-FZ (ed. 13.07.2015) "On special assessment of working conditions" (The Federal Law #426, 2013) a special assessment of working conditions is a single complex of consistently carried out actions for the identification of harmful and (or) dangerous factors of the production

[*] Ufa State Petroleum Technological University, Russia, Republic of Bashkortostan, 450062, Ufa, Kosmonavtov Str., 1

environment and the labor process (herein after - harmful and (or) dangerous production factors) and the assessment of their impact on the employee taking into account the deviation of the actual values from the specified ones by the authorized Government of the Russian Federation the Federal body of the Executive power standards (hygienic standards) of working conditions and the application of means of individual and collective protection of workers.

The legal framework in the field of SAWC includes the Federal law "On special assessment of working conditions" of 28.12.2013 #426-FZ (edited on 13.07.2015); the Federal law "On the amendments to certain legislative acts of the Russian Federation" in connection with the adoption of the Federal law "On special assessment of working conditions" of 28.12.2013 #421-FZ; the Federal law "On the amendments to article 11 of the Federal law "On the individual (personified) accounting in the system of compulsory pension insurance" and the Federal law "On special assessment of working conditions" of 01.05.2016 #136-FZ (The Federal Law *"*On the amendments to certain Legislative Acts of the Russian Federation in connection with the adoption of the Federal Law "On special assessment of working conditions"" of 28.12.2013 N 421-FL, 2013).

In the special assessment of working conditions as the primary risk assessment first of all it is necessary to determine the presence of harmful and dangerous factors of the production environment that affect the safety and health of workers (The Federal Law #125, 1998). The initial identification of occupational risks for each workplace and a concrete employee is done within a special assessment of working conditions.

However SAWC procedures are only enough to analyze the impact of production factors, but do not allow to predict them. Therefore the introduction of a system of the occupational risk management on SAWC materials has been proposed.

A METHOD OF A SPECIAL WORKING CONDITIONS' ASSESSMENT BY THE FORECAST OF OCCUPATIONAL RISKS

Main Provisions of Conducting a Special Assessment of Working Conditions

SAWC procedure is performed according to the Order of the Ministry of Labor #33H, of 24th of January 2014 "On approving the methodology for special assessment of working conditions" (The Order of the Russian Federation Ministry of Labor # 33n, 2014).

With the help of instrumental measurements in the process of SA of WC the following production factors are estimated:

- physical (light environment, noise, vibration, aerosols predominantly fibro genic action, ionizing and non-ionizing radiation, electromagnetic field)
- chemical

- biological
- the severity and intensity of the labor process

Prior to the entry into force of the Federal law #426-FZ of 28.12.2013 the injury risk assessment was carried out for all the working places. At present this factor is evaluated according to the requirements specified in the normative documents prescribed in the Decree of the RF Government "On the approval of workplaces' list in the organizations performing separate types of activity in relation to which a special assessment of working conditions is carried out taking into account the features specified by the authorized Federal Executive authority" of 14 April 2014 #290.

According to the assessment of the measurement results (research) of the factors in the workplace the class of working conditions has been specified. Working conditions by the degree of hazard and (or) dangers are subdivided into four classes - optimal, permissible, hazardous and dangerous labor conditions (The Order of the Russian Federation Ministry of Labor # 33n, 2014):

- optimal working conditions (class 1) are the conditions under which the impact of harmful and (or) dangerous production factors on the employee misses or the levels of exposure of which do not exceed the levels set by the standards (health standards) of working conditions and those specified as safe for a human being, and there are predispositions for maintaining a high level of the employee efficiency;
- acceptable working conditions (class 2) are the conditions under which the worker is exposed to harmful and (or) dangerous production factors, the levels of exposure of which do not exceed the levels set by the standards (health standards) of working conditions, and the employee's modified functional state of health recovers during the holidays or towards the following working day (shift);
- hazardous conditions (class 3) are the working conditions in which the levels of exposure to harmful and (or) hazardous production factors exceed the levels set by the standards (health standards) of working conditions, including:
    1. subclass 3.1 (harmful working conditions of the 1-st degree) are the working conditions under which the worker is exposed to harmful and (or) dangerous production factors, after that a modified functional state of the worker's health recovers, as a rule, for a longer period than the beginning of the following working day (shift), increasing the risk of health failure;
    2. subclass 3.2 (harmful working conditions of the 2-nd degree) are the labour conditions under which the worker is exposed to harmful and (or) dangerous production factors, the exposure levels of which can

cause persistent functional changes in the body of the worker, leading to the emergency and development of the early forms of occupational diseases or mild occupational diseases (no loss of the working capacity) that occur after a prolonged exposure (ten years or more);

3. subclass 3.3 (harmful working conditions of the 3-rd degree) are the working conditions under which the worker is exposed to harmful and (or) dangerous production factors, the exposure levels of which can cause persistent functional changes in the body of the worker, leading to the emergency and development of mild and moderate forms of occupational diseases (with the loss of the working capacity) during the period of employment;
4. subclass 3.4 (harmful working conditions of the 4-th degree) are the working conditions under which the worker is exposed to harmful and (or) dangerous production factors, the exposure levels of which may lead to the emergency and development of severe forms of occupational diseases (with the loss of the working capacity) during the period of employment;

– dangerous working conditions (class 4) are the conditions under which the worker is exposed to harmful and (or) dangerous production factors, the exposure levels of which in the course of a working day (shift) or part of it are able to create a threat for the life of the employee. The fact of these factors may lead a high risk of acute occupational diseases in the period of employment.

Methods of the Occupational Risks' Forecast

SAWC procedure is not enough to forecast the production factors' impact. It is therefore proposed to introduce the calculation of occupational risks according to the SAWC results. In this case the need to assess the level of the emerging risks' impact on the basis of the analysis of the identified harmful and hazardous production factors' impact has been foreseen. (Malyshev, 2008).

The use of the occupational risk assessment is convenient to the quantitative definition of the extent of this risk. The degree of the professional risk in the conventional scheme is calculated as the product of three components – the impact, the probability and the consequences of the occurrence. The use of the rating assessment of the specified occupational risk parameters based on the corresponding assessment scale allows to obtain a quantitative degree of the risk, which in its turn makes it possible to react properly to the risk and take the appropriate steps to eliminate it (Timofeeva, 2014). When determining the degree of the risk all the stages of work are covered: from the preparatory process to the stages of their execution and completion.

The forecast of occupational risks is based on the use of the results in accordance with the methodology of a special assessment of the working conditions of labor. (The order of the Ministry of Labor #33H of January 24, 2014).

To assess the degree of compliance of labor conditions to the regulations and the degree of the deviations' impact on the human body from the normative values of the working conditions' factors we commonly use a six-point system (Yenikeyeva, Gaysina, 2014)., A detailed description is given in Table 1.

TABLE 1: TABLE OF THE RATING ASSESSMENT OF THE FACTORS OF THE PRODUCTION ENVIRONMENT AND THE LABOR PROCESS

Characteristics of working conditions	*Definition of working conditions (according to the 426-FZ)*	*Rating*
Optimal working conditions	1	1
Acceptable working conditions	2	2
Not quite favourable working conditions	3.1	3
Unfavourable working conditions	3.2	4
Rather unfavourable working conditions	3.3	5
Superextreme, critical working conditions	3.4	6

The higher the rating, the more dangerous and harmful the impact on the human body is.

For example, it is necessary to take into account the psychophysiological dependence on the actual values of these factors. In this case the rating assessment (x) of the production environment and the labor process factors are used. The results of the quantitative assessment studies of the production environment on the individual factors in their isolated impact are shown in Table 2. The presented dependence has been obtained from the psychophysiological research of the "irritation — a feeling" type (Timofeeva, 2014)."

The results of a special assessment of working conditions are used in the function of the rating assessment for each unfavourable factor of the production environment, accordingly the given rating depends on the class of working conditions in conformity with Table 1 (Abdrahimov, 2014).

Besides assessing the risks of particular types of factors it is necessary to consider the additivity principle for the generalized risk level assessment.

$$R_{nc} = 1 - \prod_{i-1}^{n} S_{nc_i} \tag{1}$$

where, ***n*** is the number of the environmental factors considered;

S_{nc_i} – is the safety level by the i-th production environment factor, which can be defined by the formula:

TABLE 2: TABLE OF PSYCHOPHYSICAL DEPENDENCIES FOR DETERMINING THE RATING ASSESSMENT OF THE PRODUCTION ENVIRONMENT AND LABOR PROCESS FACTORS

Name of the factor	*Unit of measurement*	*The estimated psychophysiological formula*	*The value of the physiological index n*
1	2	3	4
Noise	dB	$x = x_0 \times 10^{((n/10) \cdot (L - Lпду))}$	0.3
One-off maximum mass of manually transported cargo	kg	$x = 0{,}194 \cdot M^n$	1.45
General dynamic physical load per shift	kJ	$x = (A_д^n) \cdot (10^{3.93})$	1.45
Static physical load during the shift	H*c	$x = (A_{cT}^n)/(10^{2.529})$	1.45
Harmful chemicals	mg/m^3	$x = x_0 \cdot (C/C_{пдк})$	0,55 — for substances 3rd and 4th graders danger
The air temperature in the cold period of the year while working outdoors	°C	$x = (-0{,}333) \cdot (T_x^n)$	1
The air temperature in the warm period of the year while working outdoors	°C	$x = (x_T^n) \cdot (C/C_{пдк})$	1.6
Illumination of workplaces	lx	$x = E_0 \cdot ((E_H/S_ф)^n)$	1.2
The size of the workplace	m^2	$x = x_0 \cdot ((S_H/S_ф)^n)$	1.15
The value of the current touch	mA	$x = (I^n) \cdot (10^{2.13})$	3.5
Technological vibration	dB	$x = x_0 \cdot 10^{((n/20)(L - Lпду))}$	0.77

$$S_{nc_i} = \frac{((x_{max} + 1) - x)}{x_{max}} \quad (2)$$

where, x_{max} – is a maximum rating value accepted as $x_{max} = 6$;

x_i – is the rating for the i-th environment factor defined by the formula in Table 2, or by the conditions of work class in accordance with the Methodology.

It is important to consider the safety level of the production environment related to the working experience:

$$S_{nc} = \prod_{i-1}^{n} S_{nc_i} \quad (3)$$

THE FORECAST OF PROFESSIONAL RISKS WITH THE PRELIMINARY ASSESSMENT OF WORKING CONDITIONS FOR OIL REFINERY WORKERS

Let's perform the professional risk assessment forecast of working conditions for the employees of the refinery: the processing pump operator, the operator of technological plants, the equipment repair fitter and the car driver. (Fedosov, Vadulina, Ryamova, Novikov, Hizbullina, 2015).

Research and Assessment of the Factors of the Labor Process Having Impact on Workers

As a result of the conducted researches it has been determined that among the complex of unfavorable production factors having impact on the employees, the priority is attributed to noise (Sokolova, 2013). In the workplaces the pump (compressors) operators are subjected to noise with the general level from 80 to 105 dBA, the operators are subjected to it in the range of 65-85 dBA, the fitters to 75-95 dBA. According to the enclosures of Order 33H method, the classification of the working conditions under the influence of noise factors exceeding 50% of the work shift (at an acceptable level not exceeding 80 dBA) the drivers have class 3.3; the plumbers have class 3.2, the operators have class 3.1. Air pollution of production premises of oil and gas production areas is caused by hydrogen sulfide (the indices make up 0.15–3 mg/m^3 on average), sulfur dioxide (1,1–8,1 mg/m^3), hydrocarbons (17-156 mg/m^3), mercaptans (0.1 to 0.9 mg/m^3) and other harmful substances in the concentrations not exceeding the maximum allowable concentration for each substance or slightly exceeding the maximum concentrations: general hydrocarbons (325– 329 mg/m^3), sulfur dioxide (22.5 mg/m^3) (Sokolova, 2013). Among the operators and machinists the shift-average concentrations of chemicals in the workplace air working conditions correspond to class 2, with the maximum indices exceeding the maximum permissible concentration (herein after MPC), to class 3.1.

In the assessment of the microclimate of industrial premises, it has been determined that in the machine rooms during the cold and warm periods of the year an uncomfortable microclimate was observed in approximately 80% of the cases. In the fixed workplaces of the machinists' cabs and operators' rooms the microclimate parameters corresponded to the optimal values. The general assessment of working conditions, taking into account the microclimate of the drivers corresponds to class 3.1 and that of the fitters' corresponds to class 2.

In the zones of stay of a car driver (the car, the garage) the following factors were evaluated: the air of the working zone (from the exhaust fuel and lubricants and the exhaust gases), the noise from the car engine, the general and local vibration in the process of driving, the microclimate, the severity of the labor process taking into account a lengthy stay in the working pose of "sitting" as well as the intensity of the labor process. From the assessment conformity to the regulatory requirements of the investigated factors it has been determined that the final class of the driver's working conditions is 2.

For all these categories of workers the factor "illumination of the working area" is not regarded as harmful, because it does not correspond to the conditions specified in the Enclosure to the Order of the Ministry of Labor #24н of January 20, 2015.

The results of the measurements of the harmful factors at the workplaces are given in the form of small minutes with the indication of the regulatory documents setting admissible normative values of the assessed factors (Tables 3, 4 and 5).

TABLE 3: THE PROTOCOL OF NOISE ASSESSMENT IN THE WORKPLACES

Measured factor	*Industrial noise*
Regulatory documents specifying the procedure of measurements and assessments and regulatory MPC, a maximum permissible levels (hereinafter MPL)	– Order of the Ministry of Labor of Russia #33H, of 24 January 2014; – GOST R ISO 9612-2013 Acoustics. Measuring noise to evaluate its impact on a person. The measurements' method in the workplaces

Name of the workplace/position (profession)	*The source of noise*	*Actual value (average, based on measurements during the shift), dBA*	*Standard value, dBA*	*Class of working conditions*
The machinist of technological pumps	Compressors, pumps, air coolers	80-105	80	3.3
The operator of technological plants	Compressors, pumps, air coolers	65-85	80	3.1
The fitter of the equipment repair	Fitting tools, grinder, air gun	75-95	80	3.2
The driver of the car	The car engine	65-75	80	2.0

TABLE 4: THE PROTOCOL OF THE WORKING ZONE AIR ASSESSMENT

Measured factor	*Chemical*
Regulatory documents specifying the procedure of measurements and assessments and the regulatory PC, MPL	Execution measurements technique of harmful substances mass concentration in the air of the working zone by the gas analyzer GANK-4; GN 2.2.5.1313-03 Maximum permissible concentrations of harmful substances in the air of the working zone

Name of the workplace/ position (profession)	*Name of harmful substances*	*The actual concentration (average, based on measurements during the shift), mg/m^3*	*MPC, mg/m^3*	*Class of working conditions*
The machinist of technological pumps	H_2S	0.15 – 3	0.01	3.1
	SO_2	1.1 – 8,1	10	
The operator of technological plants	C_2H_5SH	0.1 – 0,9	1	3.1
	C_nH_{2n+2} ($C_1 - C_{10}$)	325 – 329	900/300	
The fitter of the equipment repair	H_2S	<0.15	0.01	2.0
	SO_2	<1.0	10	
	C_2H_5SH	<0.5	1	
	C_nH_{2n+2} ($C_1 - C_{10}$)	<300	900/300	
The car driver	C_nH_{2n+2} ($C_1 - C_{10}$)	<150	900/300	2.0
	NO_2	<1	2	
	CO	<10	20	

The final assessment of the refinery employees working conditions showed that working conditions of machinists belonged to the class 3.3; those of the fitters-to class 3.2 and of the operators –to class 3.1. The prior unfavorable factors of the production environment for operators were: the industrial noise, the chemical pollution of the working environment; for fitters they were: noise, the chemical pollution and hard work. Table 6 contains the classes of working conditions for every assessed factor and the rating in conformity with Table 2.

Calculation of the Safety Levels and Risk Levels in the Workplace

Using the results of the rating for each workplace the safety levels have been calculated for each i -factor of the production environment according to the formula 2, and the generalized levels of safety according to the formula 3 (Table 7).

TABLE 5: THE PROTOCOL OF THE WORKING ZONE MICROCLIMATE ASSESSMENT

Name of the workplace/ position (profession)	*Air temperature (h 0.1-1.5 m), ºC*		*TNS-index (heat load of the environment (h) 0.1-1.5 m), ºC*		*Velocity of air (h 0.1-1.5 m), m/s*		*Humidity, %*		*Class of the working conditions*
	Actual value	*Standard value*	*Actual value*	*Standard value*	*Actual value*	*Standard value*	*Actual value*	*Standard value*	
The machinist of technological pumps Category - IIa	27.3 27.3	18-27 18-27	25.37 25.30	<25.2 <25.2	0.2	≤0.3	39	15-75	3.1
The operator of technological plants Category - IIa	26.2 26.3	18-27 18-27	-	<25.2 <25.2	0.2	≤0.3	43	15-75	2.0
The fitter of the equipment repair Category - IIb	25.8 26.0	16-27 16-27	-	<24.0 <24.0	0.2	≤0.3	53	15-75	2.0
The car driver Category Ib	26.0 26.1	20-28 20-28	-	<25.9 <25.9	0.2	≤0.3	49	15-75	2.0

TABLE 6: A SUMMARY TABLE OF WORKING CONDITIONS' CLASSES BY THE ASSESSED FACTORS AND THE RATING IN TABLE 2

The name of the workplace	*Class of working conditions* / *Score*									
	Illumination	*Noise*	*Microclimate*	*Vibration general/ local*	*Aerosols predominantly fibro genic action*	*Chemistry*	*Electromagnetic field*	*Severity*	*Tension*
The machinist of technological pumps	–	3.3 / 5	3.1 / 3	–	–	3.1 / 3	–	2.0 / 2	–
The operator of technological plants	–	3.1 / 3	2.0 / 2	–	–	3.1 / 3	–	2.0 / 2	–
The fitter of the equipment repair	–	3.2 / 4	2.0 / 2	–	–	2.0 / 2	–	3.1 / 3	–
The car driver	–	2.0 / 2	2.0 / 2	2/2 / 2/2	–	2.0 / 2	–	2.0 / 2	2.0 / 2

TABLE 7: THE RESULTS OF THE SAFETY LEVELS' CALCULATION AND GENERALIZED SAFETY LEVELS FOR THE ASSESSED WORKPLACES

The name of the workplace	S_{nc} *for the i-th production factor (formula 1)*									S_{nc} *(formula 3)*	*The final class of working conditions*
	Illumination	*Noise*	*Microclimate*	*Vibration general/ local*	*Aerosols predominantly fibro genic action*	*Chemistry*	*Electromagnetic field*	*Severity*	*Tension*		
The machinist of technological pumps	–	0.33	0.67	–	–	0.67	–	0.83	–	0.12	3.3
The operator of technological plants	–	0.67	0.83	–	–	0.67	–	0.83	–	0.31	3.1
The fitter of the equipment repair	–	0.5	0.83	–	–	0.83	–	0.67	–	0.23	3.2
The driver of the car	–	0.83	0.83	0.83/ 0,83	–	0.83	–	0.83	0.83	0.27	2.0

Using the additivity principle let's calculate the generalized risk level for each workplace according to formula 1. The maximum risk level admissible is calculated

on the condition that all the production environment factors exerting the impact on the worker in the course of the employment, reached the best level. It means that all the assessed factors in a certain workplace could be admissible (Table 8).

(The Guidelines "On the occupational risk assessment of the workers' health. Organizational and methodological aspects, principles and criteria" of 24.06.2003 N G 2.2.1766-03(2003), that is, all the assessed factors at the specific workplace could be admissible (Table 8).

Basing on the deviation levels of the actual professional risk levels from a maximum admissible one we may assess the occupational disease risk.

The account of the quantitative degree of the risk at the combined effect of production factors allows to assess the safety level in case of production factors impact to a deeper extent and to consider the amount of compensations stipulated for harmful working conditions, in summing up the SAWC results specified in the Labor Code of the Russian Federation (Yenikeyeva, Gainullina. 2014). The requirements to the provision of guarantees and compensations for harmful working conditions are prescribed in the following articles of the Labor Code (The Federal Law #197, 2001):

Article 147 "The remuneration of the employees employed in harmful and (or) hazardous working conditions": the Minimum wage increase of the employees employed in harmful and (or) dangerous working conditions, makes up 4 percent of the tariff rate (the salary) stipulated for different types of work in normal working conditions.

Article 117 "An additional annually paid leave to the employees employed in harmful and (or) hazardous working conditions": the additional annually paid vacation is granted to the employees whose labor conditions at the workplaces belong to harmful working conditions of the 2nd, 3rd, or 4th degree or hazardous working conditions.

The minimum duration of the additional annually paid leave for the workers specified in the first paragraph of this article, is within 7 calendar days.

Article 92 "Shortening of the working time duration" for the employees whose labor conditions of whom at the workplaces by the results of SAWC are related to harmful working conditions of the 3rd or 4th degrees or hazardous working conditions the working time is no more than 36 hours a week.

The data of this article, however, set the requirements only to the minimum amount of compensation that allows an employer, at the varying degrees of harm (for example the employees having class 3.1 and 3.3) to establish one size of the additional remuneration of 4 per cent by the SAWC results (The Federal Law #136, 2016). Therefore, after the introduction of SAWC into the methodology of the forecast procedure of occupational risks it is advisable to amend the payment which will depend not only on the working conditions' class but on the total calculated of the professional risk deviation level from the maximum admissible risk level.

TABLE 8: THE RESULTS OF THE GENERALIZED RISK LEVEL CALCULATION AND MAXIMUM ADMISSIBLE LEVEL OF THE GENERALIZED RISK

The name of the workplace	*R_{nc} the generalized risk level (formula 1)*	*The maximum admissible level of the generalized risk*	*The deviation of the actual level of the professional risk from the maximum admissible, %*	*The final class of working conditions*
The machinist of technological pumps	1-0.12=0.88	1-0.83·0.83·0.83·0.83=0.53	66%	3.3
The operator of technological plants	1-0.31=0.69	1-0.83·0.83·0.83·0.83=0.53	30.2%	3.1
The fitter of the equipment repair	1-0.23=0.77	1-0.83·0.83·0.83·0.83=0.53	45.3%	3.2
The car driver	1-0.27=0.73	1-0.83·0.83·0.83·0.83·0,83·0.83·0.83=0.73	0%	2.0

SAWC RESULTS WITH THE HELP OF THE OCCUPATIONAL RISKS' FORECAST

By the SAWC results, as a rule, it is required to make up the plan of events that improve working conditions (Onishchenko, 2013). For example, in the workplace of the machinist of the technological pumps and operator of the process plants it should be the design and installation of a new general ventilation system, or introduction of the improved means of an individual protection of the respiratory organs, introduction of acoustic screens in the serviced shops, with noisy equipment, as well as mandatory periodic medical examinations according to the Order Of The Health Ministry of Russia of 12.04.2011 #302H (ed. of 05.12.2014) "On the approval of harmful and (or) dangerous production factors' and work lists which prescribe to conduct compulsory preliminary and periodic medical examinations (surveys), and the Order of carrying out obligatory preliminary and periodic medical examinations (surveys) of the workers on heavy work and those working in harmful and (or) hazardous working conditions" (The Order of the Russian Federation Ministry of Health and Social Protection # 302n, 2011).

To monitor the effectiveness of the proposed measures implementation for the reduction of the identified risk levels it is proposed to calculate the collective dose capacity J of unfavorable effects of working conditions' factors:

$$J = \sum_{j=1}^{m} \sum_{i=1}^{n} x_{ij} \times N_{ij} \quad (4)$$

where, m is the number of shops (sites) at the enterprise;

n is the number of the considered working conditions' factors in the shop (site);

x_{ij} is the rating of the i-th factor of working conditions;

N_{ij} is the number of employees under the influence of the i-th factor.

Let's calculate the collective dose capacity unfavorable of the effects of the working conditions' factors for a definite group of the workplaces at the plant in Table 9.

Finally, the collective capacity of the working conditions' unfavorable effects' dose in the organization makes up:

$J = (5 \times 8 + 3 \times 5 + 3 \times 8) + (3 \times 5 + 3 \times 5) = 109$ man-points, while at the labor conditions relevant to the admissable ones, it could be $J = (2 \times 8 + 2 \times 5 + 2 \times 8) + (2 \times 5 + 2 \times 5) = 62$ man-points.

The deviation is about 76 percent.

Basing on the professional risk deviation level from a maximum admissible one it is possible to assess the occupational disease risk.

TABLE 9: AN EXAMPLE OF THE COLLECTIVE DOSE CAPACITY OF THE UNFAVORABLE EFFECTS OF THE WORKING CONDITIONS' FACTORS AT THE ENTERPRISE

Shop (workplaces group)	*Identified hazardous and harmful production factors*	*The starting rating evaluation xij*	*The number of employees under the impact of the ij - th dangerous and harmful production factors*	*Preventive measures to eliminate dangerous and harmful production factors*
Shop 1	1. Increased noise	5	8	The introduction of acoustic screens directly in the service area of pumps. The use of enhanced PPE (personal protective equipment)
	2. Increased temperature of the surrounding production environment	3	5	Installation of a new air conditioning system or air spraying. The establishment of the working hours regulations with breaks.
	3. Excessive concentrations of harmful substances in the air of the working zone	3	8	Installation of a new general ventilation system. The use of the advanced personal respiratory protection (means of individual protection of the respiratory organs)
Shop 2	1. Excessive noise	3	5	The introduction of acoustic screens directly in the service area of pumps. The use of enhanced PPE (personal protective equipment)
	2. Excessive concentrations of harmful substances in the air of the working zone	3	5	Installation of a new general ventilation system. The use of the advanced personal respiratory protection (means of individual protection of the respiratory organs)

CONCLUSION

The introduction of a special working conditions' assessment of the calculation procedure of the safety level related to the working experience into the methodology gives you an opportunity to forecast the risk and take the appropriate measures to eliminate it.

The use of the rating assessment of the production factors' impact based on the corresponding rating scale provides a quantitative degree of the risk with a combined effect of the factors due to which it is possible to assess the safety level in the production factors' impact to a deeper extent. The quantitative degree of the professional risk with a combined effect of the factors requires the introduction of a differentiated the amount of compensations for harmful working conditions, in conformity with the SAWC results depending on the total allowance of the acceptable risk level from the actual one. This requires the study of the problem of introducing the amendments to the legislative documents which regulate the requirement amount of compensation. The development plans of this study comprise the calculation of the changes introduction efficiency in the SA WC method in the economic terms, as well as the studies of the normative documents in effect, related to the main legislative SAWC base, which must be subject to the appropriate adjustments.

References

Abdrahimov, Y.R., Fedosov, A.V., Makulova, D.R., Hudayberdin, R.R. (2014). The analysis of the changes in the procedure of the working conditions' assessment at the workplaces. The electronic scientific journal Oil and Gas Business, 2, 383-391.

Akhiyarov, E.R., Yenikeyeva, T.M. (2012). Studying the effect of a combined action of the harmful factors on the refinery workers, 62-th scientific-technical conference of students, graduate students and young scientists of USPTU. Ufa: Ufa State Petroleum Technological University, pp. 59-60.

Fedosov, A.V., Vadulina, N.V., Ryamova, S.M., Novikova, A.I. and Hizbullina, A.A. (2015). Measuring a level of a harmful factor . Ufa: USPTU.

Malyshev, D.V. (2008). Method of complex professional risk assessment. Risk analysis issues, 3, 40-59.

Onishchenko, G.G. and Zaitseva, N.V. (2013). Actual directions of social and hygienic monitoring and the analysis of the health risks. Perm: Federal Research Centre for Medical preventive risk management technologies of the public health workers.

Small, K.R., Milohov, V.V., Minko, V.M., Rusak, O.N., Faust, S.A., Tsaplin, V.V. and Tsvetkova, A.D. (2014). Research commentary on the law of the special assessment of labor: St-Petersburg: Federal State Autonomous Educational Institution of Higher Education "Saint Petersburg State Polytechnic University".

Sokolova, M.M. (2013). Reducing the risk of the occupational diseases among the workers of the petrochemical complex: problems and expertise of RT enterprises. Herald of the Kazan State Technological University, 22(16), 1-5.

The Federal Law "On the introduction of the amendments into Article 11 of the Federal Law "On the individual (personalized) registration in the system of compulsory pension insurance" and the Federal Law "On a special assessment of the working conditions"" of 01.05.2016 N 136-FL. (2016). Rossiyskaya Gazeta, 6965.

The Federal Law "On the amendments to certain Legislative Acts of the Russian Federation in connection with the adoption of the Federal Law "On a special assessment of the working conditions"" of 28.12.2013 N 421-FL. (2013). Rossiyskaya Gazeta, 6272.

The Federal Law "On a special assessment of the working conditions" of 28.12.2013 N 426-FL. (2013). The Assembly of the Russian Federation, 52. Art. 6991 ed. of 01.05.2016.

The Federal Law "On compulsory social insurance against industrial accidents and occupational diseases" of 24.07.1998 N125-FL. (1998).

The Federal Law "The Labor Code of the Russian Federation" of 30.12.2001 N 197-FL. (2017).

The Guidelines "On the occupational risk assessment of the workers' health. Organizational and methodological aspects, principles and criteria" of 24.06.2003 N G 2.2.1766-03(2003).

The Order of the Russian Federation Ministry of Health and Social Protection "On the approval of lists of harmful and (or) hazardous production factors' and works' lists, which prescribe to conduct a compulsory preliminary and periodic medical examinations (surveys) and the order of carrying out the compulsory preliminary and periodic medical examinations (surveys) of the workers employed in a heavy work or those working in harmful and (or) dangerous working conditions" of 12.04.2011 N 302n , (2012), Rossiyskaya Gazeta, 73.

The Order of the Russian Federation Ministry of Labour "On Amendments to the procedure for a special assessment of the working conditions and the details of the harmful and (or) hazardous production factors, approved by the order of the Ministry of Labor and Social Protection of the Russian Federation from January 24, 2014 number 33n" of 20.01.2015 N 24n. (2015). The official internet-portal of the legal information. Date Views 14.02.2017 www.pravo.gov.ru.

The Order of the Russian Federation Ministry of Labor "On the approval of the procedure of a special assessment of the working conditions" of 24.01.2014 N 33n. (2014). Rossiyskaya Gazeta, 6343.

The Russian Federation Government Resolution "On the approval of the workplaces' list in the entities engaged in certain activities where a special working conditions' assessment is carried out, taking into account those ones specified by the authorized federal executive body features" from N 290. (2016).

The Assembly of the Russian Federation, 17.

Timofeeva, S.S. (2014). Methods and technology assessment of the occupational risks: practical work for the undergraduates in "Technosphere safety". Irkutsk: Irkutsk State Technical University Publishing House.

Yenikeyeva, T.M., Gainullina., L.A. (2014). Studying the promising methods for the occupational risks' assessment. Occupational safety in industry, 11, 75-78.

Yenikeyeva, T.M., Gaysina, I.I. (2014). The analysis of the occupational diseases of the workers of the oil and gas producing companies. The 65-th scientific-technical conference of students, graduate students and the young scientists USPTU. Ufa: Ufa State Petroleum Technological University, pp. 291.