

THE PERSONNEL HEALTH MANAGEMENT IN THE SYSTEM OF WORKPLACE LABOR CONDITIONS COMPLIANCE CERTIFICATION

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Summary: In one of the industrial facilities of the Republic of Kazakhstan, which includes offices, laboratories, and vessels, workplaces labor conditions compliance certification (WLCCC) [6] has been performed. This work has made an analysis and risk assessment of occupational diseases development on the example of physical factors impact. The legislation of the Republic of Kazakhstan does not prescribe the obligatoriness for such an assessment. Methodological approaches have allowed to quantify the positive impact on the personnel health while performing measures to improve labor conditions, reduce the risks of occupational diseases of personnel, identify and reduce the hazard class at industrial facility.

Keywords: risk, assessment, physical factors, health, personnel, hazard class, labor conditions.

Introduction. Recommendations for Risk Assessment of impact from physical factors on personnel health are developed by experts from different countries [3, 7]. The legislation of the Republic of Kazakhstan does not prescribe the obligatoriness for such an assessment. Theoretical and practical relevance remains unclear.

Relevance. Risk assessment of air pollutants impact on human health was developed by the EPA – the United States Agency for Environmental Protection. Initially it was published by the U.S. National Research Council in 1983 [1, 8]. The universality of the theory is due to its applicability for workplaces and residential areas. Method limitation - health impact assessment only from chemical substances, excluding physical, biological and psycho - physiological impacts.

Law of the Republic in Kazakhstan No. 188-V dated April 11, 2014 [5], adopted the concept of risk reduction at hazardous industrial facilities without quantitative assessment criteria. "Methodological Recommendations" [3] (hereinafter referred to as - MR No.46) determine milestones to quantify the risk of occupational diseases development among personnel, hazard class of an industrial facility. However, there is no methodology of development of risk management measures and assessment of their efficiency, which limits the practical use of this concept.

The aim of the study was to develop the methodological approaches to quantitative assessment of the effectiveness of measures to improve labor conditions: to analyze and assess the risk of occupational diseases development with personnel on the example of physical factors

impact, to determine – hazard class for each industrial facility, and to assess the efficiency of measures developed.

Objectives of the study were:

- to find methodological approaches to the calculation of the risk of occupational diseases development on the example of physical factors impact on employees health from industrial facility, to determine the hazard class of industrial facilities.

- to offer a methodology of dynamic assessment of effectiveness of measures to improve labor conditions developed on the basis of results of WLCCC.

- determine the model of continuous improvement of labor conditions as developing and continuously functioning at an enterprise.

Methods of the study. Methods of mathematical and theoretical analysis were applied to calculate the risks of physical factors impact on the employee health. The analytical method was used to develop measures to mitigate risks. Also, the method of assessment of the economic effectiveness while implementing measures developed during the first year after certification.

Results of the study. It was established that out of 223 employees of the industrial facility, where workplaces certification was completed, 165 people work in the optimal and acceptable labor conditions. Harmful labor conditions by the physical and psycho-physiological (severity, intensity of labor) impacts of hazard class 3.1 were identified at 26 workplaces, hazard class 3.2 – at 22 workplaces.

Harmful labor conditions were identified by impact factors:

-electromagnetic fields (EMF). Hazard class 3.1 – was identified at 11 workplaces, and hazard class 3.2 – was indentified at 18 workplaces.

-noise. Hazard class 3.2 in terms of labor conditions was identified at 4 workplaces;

-illumination. Hazard class 3.1 was identified at 13 workplaces;

- high temperature. Hazard class 3.1. was identified at 2 workplaces;

Action Plan was designed for each harmful occupational factor detected to mitigate the impact, and to ensure personnel with personal protective equipment.

Calculation of labor conditions hazard index entire industrial facilities (LCHI) - was made according to the formula (1) of the MR No.46:

$$LCHI = \frac{(\sum_i^7 n_i \times R_i)}{N_p} \quad (1), \quad \text{where,}$$

n_i - the number of workplaces in the industrial facility in the i - labor conditions class.

R_i - the numerical value of i - labor conditions hazard class (for hazard class 1 - value 1 is taken; for hazard class 2 - value 2 is taken; for hazard class 3.1 – value 4 is taken; for hazard class 3.2 –

value 8 is taken; for hazard class 3.3 – value 16 is taken; for hazard class 3.4 – value 32 is taken; for hazard class 4 - value 64 is taken);

N_p - the total number of workplaces in the industrial facility.

Labor conditions hazard index for one workplace of hazard class 3.1 and 3.2 by EMF factors has been determined.

The quantitative value of the index does not depend on harmful factor and is defined by labor conditions hazard class. The next step is to specify the levels of risk of occupational diseases for personnel by all factors impacting on workplaces (Table 1).

Table 1 Level of Risk of Occupational Diseases, Depending on Labor Conditions Hazard Index (LCHI) at the Enterprise

LCHI	The level of risk of occupational diseases at the industrial facility
$LCHI = 1$	No risk
$LCHI \leq 2$	Negligible (tolerable) risk
$2 < LCHI \leq 4$	Low (minor) risk
$4 < LCHI \leq 8$	Medium (significant) risk
$8 < LCHI \leq 16$	High (intolerable) risk
$16 < LCHI \leq 32$	Very high (intolerable) risk
$32 < LCHI \leq 64$	Ultra-high risk

Determining LCHI at industrial facilities.

Table 2 Determining Hazard Class at Industrial Facility

Level of risk of Occupational Diseases development	LCHI	Characteristics of labor conditions hazard class
Very high risk	Class I	Industrial facility is of extremely high hazard level
High (intolerable) risk / very high (intolerable) risk	Class II	Industrial facility is of high hazard level
Medium (significant) risk	Class III	Industrial facility is of medium
Low (minor) risk	Class IV	Industrial facility is low hazard level
No risk/negligibly minor (tolerable) risk	Class V	Industrial facility of minor hazard level

Results of calculations based on the results of WLCCC and after the first year of implementation of measures are shown in Table 3.

Table 3: Evaluation of Labor Conditions Hazard Index (LCHI) per One (1) Employee and Entire Industrial Facility in Dynamics

Labor Conditions Hazard Class	LCHI per 1 workplace	Level of risk of occupational disease development for employee	IHWC on AWWC in the Company	Hazard Class of industrial facility for the Company	ILCHI for the Company for the year-end	Hazard class of industrial facility for the Company
At any harmful factor of Class 3.1	4	Low (minor) risk	1,17	Negligibly minor (tolerable) risk	0,47	Industrial facility of minor hazard level
At any harmful factor of Class 3.2	8	Medium (significant) risk	1,04	Negligibly minor (tolerable) risk	0,97	Industrial facility of minor hazard level

Thus, it should be noted the effectiveness of measures and «sensitivity» of the methodology used for assessment.

Estimated data of level of risk of occupational diseases for 1 employee following our study are changed from low (minor) to medium (significant) risk. However, when assessing the risk to the company, this difference was reduced to a negligible minor (tolerable) risk. Assessment of the occupational health and safety system of in the company was made according to the following criteria [2, 7]:

- Increased level of security: the more effective decrease in the highest risks, the more efficient will be measures;
- Latitude impact: the more the number of risks or safety of a larger number of persons is covered by measures the more they will be effective;
- Compliance with the requirements: measures which comply with the requirements shall subject to implementation;
- Adding flexibility to work: If the flexibility of labor due to measures has increased, it should be implemented, although the impact on safety is small;
- Cost-effectiveness: the best measures are not necessarily expensive;
- Very often remarkable results are achieved by minor improvement, almost free of charge;
- Undoubtedly, this assessment boosts the practical relevance of risk assessment of harmful industrial factors impact on personnel health.

CONCLUSIONS

The methodical approaches developed (Figure 1) enable to:

- assess the risk of occupational diseases from harmful factors with personnel;
- determine the hazard class of the industrial facility;
- assess the effectiveness of measures taken to improve labor conditions in the dynamics while implementing scheduled activities, including the removal and mitigation of risks with personnel occupational diseases;
- model is applicable for the assessment of chemical, physical and any other harmful factors identified WLCCC and quantified by LCHI;
- model is considered as a developing and continuously existing system in the enterprise that ensures monitoring of the effectiveness of measures implemented on a phased basis to improve labor conditions.

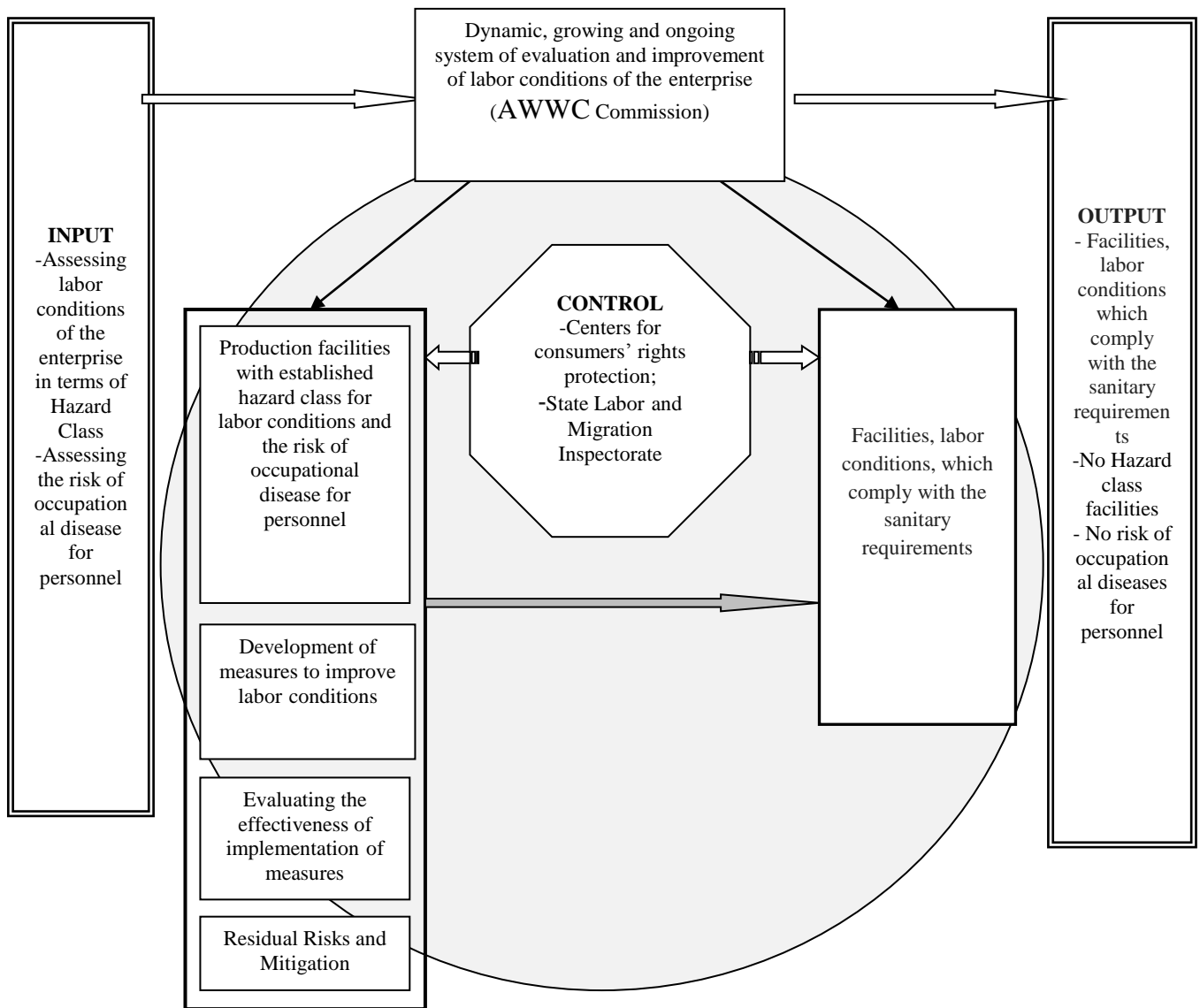


Figure 1 Methodological Approaches to the Personnel Health Management in the System of Workplace Labor Conditions Compliance Certification

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