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THE RELATIONSHIP BETWEEN THE DEVELOPMENT OF A SAFETY CULTURE AND THE IMPLEMENTATION OF SAFETY REQUIREMENTS IN ORGANISATIONS

Purpose. To establish the relationship between the development of a safety culture in an organisation and the fulfilment of occupational safety requirements.

Methodology. To solve the tasks set, we use the method of scientific synthesis, which allows us to obtain new knowledge as a result of combining previously dismembered parts of the subject into a single whole, to determine mutual expectations in occupational health and safety (OHS) management systems (MS).

Findings. It is proposed to determine the level of safety culture of an organisation on the basis of five stages: indifference, reaction, dependence, independence, interdependence, which characterises a change in the awareness of employees of the organization to fulfil the requirements for OHS of employees. A process for determining the level of safety culture is proposed by identifying the attitude to the fulfilment of OHS requirements by an OHS specialist, a manager of a unit (organisation), employees' self-awareness and mutual assistance of employees to fulfil OHS requirements. The coefficient of fulfilment of the requirements for OHS of employees in a conditional unit was calculated, which allows determining the stage of development of safety culture and the contribution of each employee to the development of safety culture. A distribution of preventive measures to improve OHS level, based on the level of development of safety culture, is proposed.

Originality. The relationship is identified between the coefficient of compliance with occupational safety requirements and employee health and the stages of development of safety culture, taking into account the impact on employee compliance from managers of a units, OHS specialists, self-awareness and mutual assistance through weighting coefficients.

Practical value. Recommendations are developed to increase the effectiveness of OHS MS by strengthening the implementation of OHS requirements by changing their attitude to OHS issues, by introducing preventive measures in accordance with the development of safety culture.

Keywords: *risk, safety culture, occupational injuries, management decisions*

Introduction. Understanding of safety culture is a prerequisite for the successful management of any organisation [1]. It determines the peculiarities of the organisation's production, economic, investment and financial activities [2]. In addition, depending on the development of safety culture in the organisation, appropriate tools are formed to solve important tasks related to changes in the internal and external environment of the organisation [3]. One of such urgent tasks faced by every organisation is to reduce the level of injuries and occupational diseases, which requires a change in the attitude of each employee to fulfil the requirements in the field of OHS. The formation of the appropriate attitude of employees is influenced by the safety culture, which affects the behaviour of employees through heuristics and semiotics [4]. Hence, there is a need to apply best practices that include a common/individual language/knowledge, acceptable technical solutions, shared values, views, explicit/implicit symbols, shared experiences, social customs and social norms, 'meaning maps' that help to increase the level of compliance with OSH requirements [5], as well as to choose the best approach for making effective management decisions in the field of OHS.

Literature review. Unfortunately, the issue of the relationship between the stages (levels) of safety culture and the effectiveness of the OHS MS has not received much attention. At the same time, there is a significant number of studies on assessing the impact of safety culture on qualitative changes in their MS, which allows one to ensure the financial flexibility of

the organisation [5], to create conditions for making decisions on the development of the enterprise's strategy based on the situation in the relevant market of production activities [6, 7]. Studies on the development of safety culture in organisations are also presented [8]. In particular, attention is drawn to the clarification of the definition of the maturity of safety culture [8], as well as the tools for its growth [9]. In [10], the authors show the relationship between the development of an organisation and its safety culture, which will lead to a reduction in occupational injuries. However, the author limited himself to describing the models and did not provide specific actions to apply certain approaches to assess risks at different levels of safety culture. By the way, it is the awareness of the level of culture that allows to reduce injuries: through support of employees; fulfilment of safety requirements, by accumulating appropriate funds intended to support the sphere of labour safety [11]. The most common model of safety culture maturity is the Bradley Curve [12], which divides all organisations into four stages: "reactive", "dependent", "independent", "interdependent". Understanding the stage of development of the safety culture, it is possible to predict the level of injuries and, consequently, the financial losses of the organisation. At the same time, the Bradley Curve does not allow us to characterise the level of safety culture at the stage of an organisation's inception, when safety issues are not paid attention to. An important issue is to ensure the effectiveness of managerial decision-making at different stages of the development of safety culture, the authors note [13]. To do this, it is necessary to determine the key indicators that will allow assessing the level of development of the safety culture. For example, the authors

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of work [14] insist on conducting an assessment based on the relationship between employee engagement and improved safety performance. At the same time, the most interesting indicators are those that will reveal the impact of various socio-psychological phenomena on employee behaviour, especially on the compliance with the requirements of OHS [12, 15]. The analysis of literature shows that the most common characteristic of the maturity of safety culture in organisations is the Bradley Curve. It is built on the basis of a set number of incidents. However, its construction at a particular enterprise is associated with significant difficulties in determining a sufficient number of incidents that constitute statistical significance. Hence, there is a need to find alternative solutions. One of them is to replace the definition of the number of incidents with the number of non-compliance with the requirements on OHS by employees, as one of the main indicators leading to an accident. To solve this problem, as one of the elements of the identified problem of finding (developing) best practices for changing employees' awareness of OHS, it is necessary to establish the relationship between non-compliance with OHS requirements and the stages of development of safety culture in organisations.

Purpose. The purpose of the article is to establish the relationship between the development of a safety culture in an organisation and compliance with OHS requirements, which will allow selecting the best practices for changing the attitude of employees to compliance with OHS rules.

To achieve this goal, four tasks need to be solved:

- first, to establish the relationship between the compliance with OHS requirements by employees and the corresponding stage of development of the safety culture, which will characterise the change in the awareness of the organisation's employees;

- secondly, to develop a process for improving the level of safety culture, taking into account changes in the attitude of the OHS specialist, manager of unit (organisation), self-awareness of employees and the mutual assistance of employees to meet OHS requirements;

- thirdly, to provide an example of determining and calculating the coefficient of compliance (non-compliance) with OHS requirements by employees.

Methods. To solve the tasks set, we use the method of scientific synthesis, which allows us to obtain new knowledge as a result of combining previously disaggregated parts of the subject into a single whole. The subject is understood as a set of management tools for finding an effective solution in organisational MS. The parts under study include employee behaviour, which is the product of the interaction between various factors of the production environment and individual characteristics of a person, as well as the worldview. We will assume that an increase in the effectiveness of the organisation's OHS MS is achieved by raising the level of the organisation's safety culture, which is characterised by the level of compliance with OHS requirements. A positive perception of OHS requirements by employees, which appears due to a change in their awareness, i.e. a decrease in indifference to safety, creates conditions for the transition to the next stage of development. This leads to the need to change the relation (attitude) to the implementation of labour safety requirements focused on the result – reducing injuries and morbidity. Also, the interaction between the organisation and employees is used to analyse costs and benefits to create a win-win situation [16]. It is noted that safe behaviour cannot be implemented without the influence of leaders [17]. Employees who learn from their responsible leaders tend to support them and try to do their best to ensure safety in the workplace, thus ensuring appropriate performance.

Results. To solve the first task, let us assume that there are five levels of safety culture in organisations: indifference, reaction, dependence, independence, and interdependence. To determine the level of development of safety culture in an or-

ganisation, we propose to determine the degree of compliance (non-compliance) with the OHS requirements by employees, which will establish the relationship between the development of the safety culture in an organisation and compliance with OHS requirements. The existence of such a relationship is confirmed by a number of scientific studies presented in the analysis [18, 19], which states that the maturity of the safety culture in an organisation is characterised by many different factors, including the fulfilment of OHS requirements.

Based on our own experience in analysing OHS audits, we present the characteristics of the stages of safety culture development, taking into account changes in the attitude of employees to compliance with OHS requirements (Table 1):

- **'indifference'** – the management is afraid of inspections by supervisory authorities, reacts painfully to production stoppages and penalties; the staff comply with OHS requirements at the level of acquired reflexes, and do not violate requirements instinctively, to varying degrees, out of a sense of self-preservation, not because they know them; there is no OHS specialist or he/she is practically not involved in OHS issues, only records accidents, most of the organisation does not care about fulfilling safety requirements; to move to the next stage of safety culture development, it is necessary to provide continuous training of employees, create an occupational safety service, and introduce effective control by an OHS specialist;

- **'reactive'** – the management does not influence employees to comply with OHS requirements; the personnel partially comply with safety requirements due to a sense of self-preservation, not because they do not know them; an OHS specialist is practically alone in dealing with OHS issues; to improve the level of OHS, it is necessary to introduce systems for stopping hazardous work or automatic shutdown of hazardous production processes, as well as the use of video control; to strengthen control over compliance with safety requirements, state and public authorities can be involved;

- **'dependence'** – the management understands that OHS legislation must be complied with and requires it from subordinates; the staff are formally trained, but if the manager and OHS specialist do not see it, they may violate the requirements of the OHS regulations; the manager and OHS specialist are involved in safety issues and have influence on workers to comply with the requirements of the OSH regulations; to improve OHS, it is necessary to create an environment of a fair organisational culture that encourages employees to report hazards and incidents to reduce occupational risks; when planning and implementing safety measures, it is necessary to involve all stakeholders to share experiences and support various initiatives;

- **'independence'** – the management demonstrates commitment to the ideas of OHS by personal example, constantly learns new management tools (risk and opportunity management, game-based learning), voluntarily implements modern occupational safety standards (ISO 45001, and others) not required by law, considers occupational safety as a priority area of development; employees are aware of the importance and comply with occupational safety rules themselves, adhere to safe behaviour in the workplace; the manager and OHS specialist and employees are aware of the importance of and have a significant impact on the implementation of OHS requirements; to maintain the appropriate level and further develop the safety culture, it is necessary to form an institution of transformational leaders who would motivate employees to comply with the requirements through personal charisma and intellectual abilities to ensure appropriate motivation of employees to improve production processes;

- **'interdependence'** – the management sees OHS as a key value of the enterprise and, in particular, imposes OHS requirements when selecting contractors, as well as in the enterprise, pursues a policy of openness – they are ready to share experience and best practices in the field of OHS; the staff are proud to be involved in a common cause – OHS, strive to work without injuries and incidents; the manager, OHS spe-

The relationship between the stages of safety culture and measures to improve safety compliance

Stages of safety culture	Characteristics of the stages of safety culture development	Attitudes towards OHS	Measures to improve compliance with OHS requirements
Stage I. 'Indifference'. <i>Instincts</i>	Instinctive safety; no OHS engineer; indifference to the implementation of safety rules by managers and employees	1. OHS is not monitored by an OHS officer. 2. Due to the heavy workload of the manager, the requirements of regulatory legal acts on OHS are hardly fulfilled. 3. Due to limited financial resources, the manager saves on safety issues and staff training	1. To create conditions for effective control by an OHS specialist. 2. To organise safety awareness days to raise awareness of safety requirements 3. To introduce modern briefings with the involvement of employees
Stage II. 'Reaction'. <i>Instincts, supervision of OHS specialist</i>	Formal compliance with requirements and norms; savings on OHS issues; an OHS engineer is not concerned with OHS issues, only registers accidents	1. The requirements of regulations on OHS are partially fulfilled. 2. Insignificant funds are allocated for tools and measures for labour protection. 3. The search and implementation of methods to prevent the occurrence of dangerous events, in particular, risk management, begins. 4. Training on OHS is conducted	1. To create a practice of linear bypassing of dangerous workplaces. 2. To implement a risk management process. 3. To involve employees in the development of OHS measures. 4. To create conditions for the prevention of dangers (motivational measures)
Stage III. 'Dependence'. <i>Instincts, supervision of OHS engineer management control</i>	Management's commitment to OHS issues; fear/discipline; rules, instructions, training; beginning; introduction of the procedure for managing OHS in the field of OHS	1. The search and implementation of methods to prevent the occurrence of dangerous events, in particular, risk management, begins. 2. Training on OHS is conducted. 3. Control over OHS is ensured. 4. A modern OHS MS is created and implemented	1. To create an environment of fair organizational culture that will prevent the emergence of dangerous factors. 2. To create a process for reporting all incidents. 3. To conduct behavioural audits. 4. To provide feedback to employees regarding safety goals
Stage IV. 'Independence'. <i>Instincts, supervision of OHS engineer, management control personal initiative</i>	Increasing self-awareness regarding safety; personal value, self-care; practice, habits, recognition of personal merit; conscious implementation of the risk management procedure	1. Control over OHS is transferred to professional OHS management. 2. The requirements of regulatory legal acts on OHS are met. 3. A corporate culture of labour safety is being formed	1. To create an institution of transformational OHS leaders. 2. To form teamwork according to the rule of one team – one decision. 3. To create labour safety committees
Stage V. 'Interdependence'. <i>Instincts, supervision of the OHS engineer, management control, personal initiative team</i>	The management has a priority on OHS issues; helping others to comply with the rules; interests of others; contribution to the common cause; caring for others; collective pride and commitment of workers to mutual assistance in meeting safety requirements	1. The level of safety culture increases due to self-awareness, mutual assistance and support of each other by employees. 2. Methods for preventing the occurrence of dangerous events are applied, in particular, change management	1. To provide support for employee initiatives to improve OHS MS

cialist and employees are aware of the importance of mutual assistance in meeting the requirements of OHS.

To address the second task, we propose a five-step process for improving the level of safety culture, taking into account the influence of the OHS specialist and the manager, as well as through self-awareness and mutual assistance of employees in meeting OHS requirements during their work tasks (Fig. 1).

To solve the second task, we offer a five-step process of increasing the level of safety culture, taking into account the influence of the occupational safety specialist and manager, as well as, due to the self-awareness and mutual assistance of employees in fulfilling occupational safety requirements, during their performance of production tasks (Fig. 1).

At the first step of this process, audits (inspections) on OHS at the workplaces of units are planned, which determine the limits of permissible and appropriate behaviour of employees in the performance of labour obligations. Taking into account the characteristic features of the stages of the safety culture, there is also a need to determine the weighting factors of the influence of the OHS specialist, the head of the division (organization), as well as the employees themselves regarding the fulfilment of safety requirements. To do this, a group of experts with appropriate education and work experience in managing divisions are involved, they process questionnaires of all employees to determine personality traits (extroversion, agreeableness, conscientiousness, neuroticism and openness to experience). These features, through various combinations, affect human behaviour

tiousness, neuroticism and openness to experience). These features, through various combinations, affect human behaviour

Step 1. Conducting audit(s) of compliance with OHS requirements. Report on the audit(s)

Step 2. Analysing the results of the audit(s) and determining the compliance rate with OHS requirements:

$$S_m = NB / N$$

Step 3. Determination of the coefficient of compliance with OHS requirements based on the established value.

Stage of development of safety culture in the organisation:
 ✓ Indifference; ✓ Reaction; ✓ Dependence; ✓ Independence;
 ✓ Interdependence.

Step 4. Justification of protective and preventive measures in accordance with the identified stage of development of the safety culture in the organisation.

Step 5. Preparing for a new OHS audit to determine the effectiveness of the preventive measures implemented, which allowed us to move to the next stage.

Fig. 1. The process of improving the safety culture according to the stages of the Bradley Safety Curve, taking into account the impact of the OHS specialist, manager, self-awareness and mutual assistance of employees in meeting safety requirements

[20], his perception of safety [21] and the ability to take risks when performing production tasks [22]. Neuroticism describes a person's emotional stability and tolerance of negative influences. Extraversion assesses a person's social behaviour and includes personality traits such as assertiveness, adventurousness, and optimism. Conscientiousness characterizes purposefulness of behaviour, which depends on the ability to organize and carry out consciously and clearly set tasks. Openness determines a person's desire to engage in new experiences and is characterized by developed imagination and insight. Agreeableness characterizes the ability to help each other, which is expressed through trust, altruism, kindness, affection. To determine the weighting factors of influence, a well-known questionnaire (BFI-10) [23] was used, which is grouped into 5 scales: extraversion (*E*); agreeableness (*A*), conscientiousness (*C*), neuroticism (*N*), openness to experience (*O*).

The evaluation takes place separately for each scale using the construction of a personal profile (NEOAC), the severity of personal factors for each scale varies from 2 to 10 points. The determined average result based on the results of expert research was divided by 100 to obtain weighting factors.

The second step of this process involves analysing the results obtained through evaluation, the coefficients of compliance with OSH requirements using the formulas

$$S_{ii} = NR/N;$$

$$S_{FRi} = 1 - S_{ii} = NU/N,$$

where S_{ii} is the initial coefficient of compliance (excluding the influence of the OHS specialist, manager of the unit, self-awareness and mutual assistance); S_{FRi} is the coefficient of fulfilment of requirements, NR is the number of fulfilled requirements (determined from the reports of audits, supervision or self-assessment); N is the total number of OHS requirements considered during the supervisory audit or self-assessment; NU is the number of unfulfilled requirements (determined from the reports of audits, supervision or self-assessment).

At the same time, the total value of the coefficient of compliance with OHS requirements, taking into account the influences of the manager, OHS specialist, the employee's self-awareness and mutual assistance, is proposed to be determined by the formula

$$S_{fi} = S_{ii} \cdot \left(1 + g_{s^s} + g_{m^s} + g_{s^s} + \sum_{i=1}^n g_{w^s} \right),$$

where S_{fi} is the final coefficient of compliance (including the influence of OHS specialist, manager of the unit, self-awareness and mutual assistance); g_{si} is the weighting factor of the influence of OHS specialist on each worker; g_{mi} is the weighting factor of the influence of a unit manager on each worker; g_{wi} is the weighting factor of the influence of workers' self-awareness of fulfilling OHS requirements; g_{wi} is the coefficient of perception of influence by workers.

The value of the coefficient of perceived influence is determined by assessing external and internal factors that influence employees. External factors include (salary, education, marital status, job satisfaction, self-motivation, motivation, etc.), and internal factors include the personality traits discussed above. Each of these factors is assessed using the developed questionnaires, using a Likert scale ranging from 1 ('not relevant to the employee') to 7 ('clearly relevant'). We suggest using the following formula

$$g_x = PA/TQ,$$

where PA is the number of positive answers to the questions in the questionnaire; TQ is the total number of questions in the questionnaire.

The average score per item was used to represent each attribute.

At the third step of this process, we determine, based on the established value of the overall coefficient of compliance with OHS requirements, the stage of development of the safety culture, which takes into account the indicator of employees' attitude to OHS (Table 2).

The fourth step is to justify protective and preventive measures in accordance with the identified stage of safety culture and implement them. It should be noted that the recommendations made to improve the safety culture at the enterprise provide for the transition from one stage to another until the appropriate level of compliance with safety requirements is achieved.

At this step, two tasks can be solved at once. The first is to justify measures to move to a new stage of safety culture development (Table 2). The second is to determine the competencies of manager of the unit, OHS specialist, and the employees' self-awareness of the need to comply with the OHS requirements. The latter allows us to select individual programmes for personal development.

As a final step, prepare for a new OHS and safety audit to check the effectiveness of the implemented safety measures and make sure they are effective.

To solve the third task, it will give an example of calculating the coefficient of compliance with OHS requirements, which would allow us to determine the stage of safety culture by the Bradley Curve. To do this, let us consider a conventional enterprise where six compressor unit operators work in shifts with a site manager under the supervision of a safety specialist. To determine the overall coefficient of compliance with OHS requirements, we will develop an appropriate checklist for conducting an audit to verify compliance by operators (Table 3). It was conducted in accordance with the requirements of ISO 19011. The questions for developing the checklist are formed in accordance with the requirements of the OHS instructions for compressor unit operators in force at the enterprise. A fragment of the checklist with the determination of the coefficient of compliance of one of the employees is shown in Table 3.

A group of five experts (heads of various departments of the enterprise) with relevant education, work experience, advanced training, etc. were involved to determine the weighting factors of the influence of the OHS specialist, a manager of a unit, self-awareness and mutual assistance of employees in meeting OHS requirements. Based on the BFI-10 questionnaires, the experts determined the level of development of five personality traits, taking into account the conscientiousness of fulfilling their duties to comply with OHS requirements. An example of the values of the weighting coefficients is shown in Table 4. To establish the coefficient of attitude towards compliance with OSH requirements, an additional questionnaire was developed to determine the impact of salary, education level, marital status, job satisfaction, and self-motivation on the above requirements. The results are presented in Table 5. Based on the data presented in Tables 3–5, the coefficient of

Table 2

Interrelation of coefficients of compliance (noncompliance) with OHS requirements by workers

No.	Level of coefficients		Bradley Curve stage
	Failure to comply with OHS requirements	Comply with OHS requirements	
1.	more than 0.7	less than 0.3	Stage 1 'Indifference'
2.	from 0.6 to 0.7	0.3–0.4	Stage 2 'Reaction'
3.	from 0.3 to 0.6	0.4–0.7	Stage 3 'Dependence'
4.	from 0.01 to 0.3	0.7–0.99	Stage 4 'Independence'
5.	less than 0.01	more than 0.99	Stage 5 'Interdependence'

Table 3

A fragment of the audit checklist for determining the coefficient of employee compliance with OHS requirements

No.	The requirements are defined in the company's OHS procedures	Employees – P_i					
		P_1	P_2	P_3	P_4	P_5	P_6
		Yes “+”/No “-”	Yes “+”/No “-”	Yes “+”/No “-”	Yes “+”/No “-”	Yes “+”/No “-”	Yes “+”/No “-”
General requirements							
1.	B_1	+	+	+	+	+	+
...
Safety requirements before starting work by a compressor operator							
25	B_{25}	+	+	+	+	+	+
..
Safety requirements during work of a compressor operator							
55	B_{55}	+	-	-	-	+	-
..
Safety requirements after work is performed by a compressor operator							
75	B_{75}	+	+	+	+	+	-
..
Safety requirements if a compressor operator in a case of emergency							
91	B_{91}	+	+	+	+	+	+
..
124	B_{124}						
Total – ‘Yes’		123	122	114	118	120	123
Total – ‘No’		1	2	10	6	4	1
Employee compliance rate with OHS requirements		0.99	0.98	0.92	0.95	0.97	0.99
The rate of non-compliance with OHS requirements by an employee		0.01	0.02	0.08	0.05	0.03	0.01

Table 4

Determination of weighting factors for compliance with OHS requirements

No.	The type of influence	Weighting values determined by experts							
		1	2	3	5	6	7	8	CP
1.	Influence of OHS specialist	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2
2.	Influence of manager of unit	0.4	0.5	0.5	0.5	0.3	0.5	0.3	0.4
3.	Influence of employee self-awareness	0.5	0.7	0.6	0.6	0.5	0.4	0.6	0.5
4.	Influence of employee mutual aid	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1

Table 5

Determination of the coefficient of perceived impact on compliance with the requirements of the OHS regulations

No.	The type of influence	Employee perception of impact					
		P_1	P_2	P_3	P_4	P_5	P_6
1.	Influence of OHS specialist	1.1	1.1	0.5	1.1	1.4	0.48
2.	Influence of manager of unit	0.9	0.9	0.9	1.1	1.1	0.8
3.	Influence of employee self-awareness	0.8	1.0	1.6	0.6	0.8	0.6
4.	Influence of employee mutual aid	0.8	0.8	0.8	1.5	0.8	0.8

compliance with OHS requirements was calculated using formula (3), taking into account all the effects of S_{fi} and the attitude of employees, a safety specialist and a unit manager to safety issues. The results of the calculations are shown in Table 6. According to the results of the calculations, it can be concluded that the initial coefficient of compliance with the requirements on OSH by employees ranges from 0.34 to 0.43, which is typical for the 2nd stage of the safety culture ‘Response’, while the final coefficient, taking into account the influence of OHS specialist, manager, self-awareness and mutual assistance of employees in matters of OHS, is in the range of 0.921–0.989, which characterises the 5th stage of the safety culture ‘Independence’.

As a result of the analysis of the data in Table 6, it is recommended to provide ongoing training for employees on OHS, strengthen control over compliance with OHS requirements, and involve employees in finding ways to improve the production process, creating conditions for preventing hazards.

Fig. 2 shows a diagram of the distribution of influence on the implementation of safety requirements by employees, an OHS specialist, and a department head, which allows us to understand the competence of all employees and the degree of their involvement in solving safety issues.

The analysis of the diagram shows that the greatest contribution to the formation of a safety culture is made by the level of mutual assistance of employees, which is at the level of 0.3–0.8, which allows identifying proactive employees and forming

Example of calculating the impact of the OHS compliance factor

Stage	Matrix of influence	Employees						
		P_1	P_2	P_3	P_4	P_5	P_6	
Stage 1	Initial compliance rate with OHS requirements by employees, S_i^I	0.4	0.4	0.3	0.4	0.4	0.4	
Stage 2	The weight of the OHS specialist's influence on the compliance with OHS requirements by employees, $g_{si} = 0.21$ (Table 4) taking into account the coefficient of employee perception of influence (Table 5)	0.2	0.2	0.1	0.2	0.3	0.1	
	The rate of compliance with OHS requirements by employees, taking into account the influence of OHS specialist on employees, $S_i^{II} = S_i^I \cdot (1 + g_{si})$	0.5	0.5	0.374	0.492	0.481	0.473	
Stage 3	The weight of the manager's influence on the compliance of employees with OHS requirements, $g_{mi} = 0.35$ (Table 4) taking into account the coefficient of employee perception of influence (Table 5)	0.3	0.3	0.3	0.4	0.4	0.3	
	Compliance rate with OHS requirements, taking into account the impact of the OHS specialist on employees, $S_i^{III} = S_i^I \cdot (1 + g_{si} + g_{mi})$	0.6	0.6	0.476	0.656	0.629	0.602	
Stage 4	The weight of the impact of employees' self-awareness in fulfilling OHS requirements by employees, $g_{ei} = 0.50$ (Table 4) taking into account the coefficient of employee perception of influence (Table 5)	0.4	0.5	0.8	0.3	0.4	0.3	
	Compliance rate with OHS requirements based on employee self-awareness, $S_i^{IV} = S_i^I \cdot (1 + g_{si} + g_{mi} + g_{ei})$	0.8	0.8	0.748	0.779	0.777	0.731	
Stage 5	The weight of the impact of mutual assistance on the compliance with OHS requirements by employees, $g_{ai} = 0.13$ (Table 4) taking into account the coefficient of employee perception of influence (Table 5)	0.1	0.1	0.1	0.2	0.1	0.1	
	Employee 1, P_1	g_{e1}	0.0	0.039	0.034	0.041	0.037	0.043
	Employee 2, P_2	g_{e2}	0.04	0.001	0.034	0.041	0.037	0.043
	Employee 3, P_3	g_{e3}	0.04	0.039	0.000	0.041	0.037	0.043
	Employee 4, P_4	g_{e4}	0.08	0.078	0.068	0.000	0.074	0.086
	Employee 5, P_5	g_{e5}	0.04	0.039	0.034	0.041	0.000	0.043
	Employee 6, P_6	g_{e6}	0.01	0.004	0.003	0.004	0.004	0.000
	$\sum g_{ei}$		0.21	0.199	0.173	0.168	0.189	0.258
The final compliance rate, taking into account all impacts, $S_{fi} - S_{fi}^V = S_i^I \cdot (1 + g_{si} + g_{mi} + g_{ai} + \sum g_{ei})$		0.99	0.99	0.92	0.95	0.96	0.98	

a leadership institute with their participation to further strengthen the implementation of OHS requirements.

From the analysis of Table 6, it is possible to build a dependence of the levels of safety culture on the compliance with OHS requirements by employees (Fig. 3), which allows us to characterise the level of compliance with OHS requirements.

Thus, at low levels of safety culture, it is recommended to apply preventive measures that do not depend on the employee (emergency system for stopping hazardous work, automatic shutdown system, automatic notification system, video monitoring, etc.), which requires special attention and support from state and public regulatory authorities and organisations.

At an average level of safety culture (dependence), preventive measures can be applied that require an employee to un-

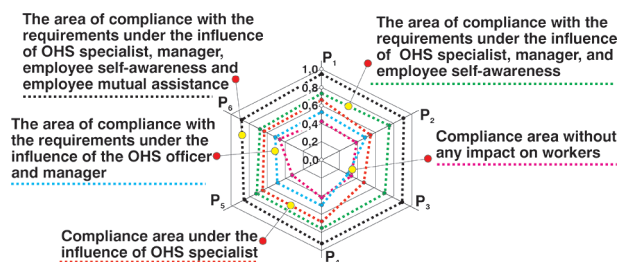


Fig. 2. Zones of compliance with OHS requirements for individual workers, taking into account the influence of the OHS specialist, manager, self-awareness and mutual assistance of employees

derstand the need to comply with safety rules (safety audits, developmental training, etc.) through planning and implementation, with the involvement of all stakeholder organisations to share experiences and support various initiatives. With a high level of safety culture, it is necessary to apply practices that promote mutual assistance, mutual support, and mutual assistance, which will help ensure full compliance with the requirements of OHS.

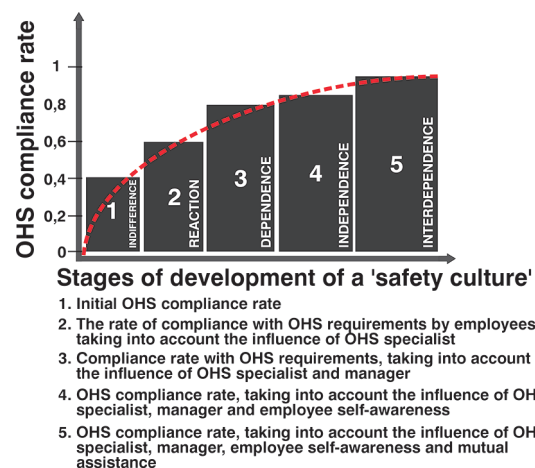


Fig. 3. Dependence of safety culture levels on compliance with OHS requirements by employees

Discussion. So, there is a certain connection between the attitude to OHS and the stages (levels) of safety culture. And obviously, when deciding on the search for effective tools to achieve the set goals, it is necessary to pay attention to the environment in which employees work. Let us take, for example, behavioural audits on OHS [24, 25]. This practice has become widespread and is perceived as a kind of life jacket when the safety culture is ‘drowning’ [26]. However, behavioural audits are effective in companies where people not only respect the OHS requirements, but are also inclined to dialogue, i.e. a stable positive image of success and harmony has been formed [27]. At the same time, at the Indifference or Reaction stage, conducting behavioural audits will not provide the appropriate results. For these stages, it is more suitable to create interactive safety instructions: if you see sparks, turn off the power supply, notify the repairmen. Researchers of organisational cultures of companies point out that the most important components of its formation include the values and principles that prevail in the enterprise [28]. For example, K. Cameron believes that ‘organisational culture is manifested in what is valuable to it, which affects the style of leadership, language and symbols, procedures and everyday norms’ [23]. This allows us to understand how stereotypes are formed that will affect safety culture and hence formulate appropriate development programmes [29].

At the same time, at the ‘Dependence’ stage, everything happens at the will of the manager. If the manager demands safety training, everyone will take it. Employees try to follow the rules, some out of fear of punishment, and others motivated or consciously. However, it is difficult to imagine initiative, leadership, creative ideas that contradict the rules and are difficult to implement at this level, so this level is attractive, i.e. there is a procedure for involving employees in the relevant processes.

The ‘Independence’ stage is characterised by a creative approach, a desire for something more than what is prescribed in the occupational safety rules. We observe that the employee not only participates in the procedure, complies with the established requirements, but also approaches occupational safety issues creatively, thinking: what else can I do to avoid incidents? [30].

The ideology of safety culture is in line with the principles of continuous improvement, when the area of responsibility of each employee extends not only to himself but also to all work processes. This is where dialogue and agreements are formed – ‘Interdependence’.

The further development of safety culture research is to establish the impact of compliance with OHS requirements on the level of occupational risk, which will reduce uncertainty when choosing preventive or protective measures to control equal risk.

Conclusions.

1. The article proposes to determine the level of safety culture of an organisation on the basis of five stages: indifference, reaction, dependence, independence, interdependence, which characterises a change in the awareness of employees of the organisation to fulfil OHS requirements.

2. The process of determining the level of safety culture by identifying the attitude to the fulfilment of OHS requirements by safety specialist, manager of unit (organisation), self-awareness of employees and mutual assistance of employees to fulfil OHS requirements is proposed.

3. The coefficient of compliance with OHS requirements in a conditional unit was calculated, which allowed determining the stage of development of safety culture and the contribution of each employee to the development of safety culture.

4. The distribution of preventive measures to improve OHS, based on the level of development of safety culture, is proposed.

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Взаємозв'язок розвитку культури безпеки та виконанням безпекових вимог в організаціях

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Мета. Полягає у визначенні залежності між етапами розвитку культури безпеки та коефіцієнтом виконання вимог охорони здоров'я й безпеки праці працівників.

Методика. Для вирішення поставлених задач використано метод наукового синтезу, що дозволяє отримати нові знання, у результаті об'єднання раніше розчленованих частин предмета в єдине ціле, щодо визначення взаємного очікування в системах управління охороною здоров'я та безпекою праці працівників.

Результати. Запропоновано визначати рівень культури безпеки організації на основі п'яти етапів: байдужість, реагування, залежність, незалежність, взаємозалежність, що характеризує зміну усвідомленості співробітників організації до виконання вимог охорони здоров'я й безпеки праці працівників. Запропоновано процес із визначення рівня культури безпеки праці через виявлення ставлення до виконання вимог охорони здоров'я й безпеки праці працівників фахівцем із безпеки праці, керівником підрозділу (організації), самоусвідомлення працівників і взаємодопомоги співробітників до виконання вимог з безпеки праці. Проведено розрахунок коефіцієнта виконання вимог охорони здоров'я й безпеки праці працівників в умовному підрозділі, що дозволив визначати етап розвитку культури безпеки та вклад кожного співробітника щодо розвитку культури безпеки праці. Запропоновано розподіл запобіжних заходів із підвищення безпеки праці, виходячи з рівня розвитку культури безпеки праці.

Наукова новизна. Полягає у визначенні залежності між коефіцієнтом виконання вимог охорони здоров'я й безпеки праці працівників та етапами розвитку культури безпеки праці з урахуванням впливів на виконання вимог працівниками від керівників організації, фахівців з безпеки праці, самоусвідомлення та взаємодопомоги, через вагові коефіцієнти, що встановлюються на основі експертних опитувань.

Практична значимість. Полягає в розробці рекомендацій для підвищення результативності системи управління охороною здоров'я й безпекою праці працівників за рахунок посилення виконання вимог до охорони здоров'я та безпеки праці працівників шляхом зміни їх ставлення до цих питань і запровадження запобіжних заходів відповідно до розвитку етапів культури безпеки праці.

Ключові слова: ризик, культура безпеки праці, виробничий травматизм, управлінські рішення

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