

## **IMPROVEMENT PROCESSES OF SELECTION, TRAINING AND DEVELOPMENT THE PERSONNEL ON COAL MINES**

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**Abstract:** At the enterprises of Coal Business-block DTEK ENERGO LLC (CBB), a standard “Methods for selecting employees by management level” was developed and implemented. A description of the suitability groups for psychophysiological examination is given. Groups 1, 2, 3+ assume admission to hazardous work / hiring; groups 3-, 4 - performing actions according to the algorithm or refusing to hire. Priority psychophysiological qualities by types of hazardous work are given. A description is given of the psychophysiological qualities and risks when an employee is in the risk zone at the workplace. Common risks with reduced psychophysiological qualities include injuries, accidents and reduced effectiveness and the ability to control the production process. As a result, the manager receives information about the risk of hiring, being at the employee’s workplace.

**Key words:** coal mine, personnel, selection, training, development, psychophysiological examination, risk.

### **1. INTRODUCTION**

One of the main measures to improve safety is the introduction OSH management systems based on risk management, which is regulated by a number of international standards [1-3].

As part of the OSH management system functioning at the CBB enterprises a number of procedures and techniques have been developed and implemented aimed at

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improving OSH: the procedure for identifying hazards and risk assessment at labor safety; the procedure of classification, analysis and reaction to dangerous actions; the methodology of assessment of coal mines managers in the labor safety [4-6].

At the same time, injuries and accidents at enterprises are still at a fairly high level. One of the main causes of accidents and injuries is violation of standards (safety rules, instructions, regulations, etc.) of mining operations by workers.

All this requires improving the processes of selection, training and development of CBB personnel, an integral part of which is psychophysiological examination.

## 2. IMPROVEMENT PROCESSES OF SELECTION, TRAINING AND DEVELOPMENT THE PERSONNEL

At the CBB enterprises a standard “Methods for selecting employees by management level” was developed and implemented.

The main procedures of the standard are given in table 1.

Table 1. Main procedures of the standard

Personnel level	1. Verification of formal requirements	2. Psychophysiological examination	3. Assessment of the development level of competencies, general assessment of experience and motivation (HR)	4. Professional testing	5. Assessment of experience, knowledge, skills (head)	6. Assessment of propensity for violations + interviews with the security service	7. Conformity assessment	Total time for selection (hour)
The time to use the tool, hour	0,5	2	1	1	1	1,5	1	
Students (under the DTEK Generation program)	referral / recommendation from the university	-	-	-		as part of Medot	-	3

<b>Enterprise</b>	<b>Workers</b>	application form / employment history	√	interview with HR	√	interview with the head	as part of Medot	-	7
	<b>Specialists of industrial enterprise (IE)</b>	resume screening / employment history	-	electronic competency testing	√	interview with the head	as part of Medot	-	5
	<b>IE initial managers</b>	resume screening / employment history	-	electronic competency testing	-	interview with the head	as part of Medot	-	5
	<b>IE middle managers</b>	resume screening	-	interview with HR	-	interview with the functional and immediate head	as part of Medot	-	5
<b>Cation center (CC)</b>	<b>Specialists of CC</b>	resume screening	-	interview with HR	√	interview with the head	as part of Medot	-	6
	<b>CC initial managers</b>	resume screening	-	interview with HR	-	interview with the head	as part of Medot	-	5
	<b>CC mid-level managers</b>	resume screening	-	interview with HR	-	interview with directors	as part of Medot	Thomas technique	6
	<b>Top manager (CC directors, 1st level of management of IE)</b>	resume screening	-	interview with HR	-	interview with directors	as part of Medot	Thomas technique	6

*currently working*

*currently working, but needs refinement / systematization / unification*

*planned according to initiatives*

Between stages 2 and 3, 5 and 6, 6 and 7, the candidate may be rejected.

Psychophysiological examination (PPE) is a generalized assessment of the psychophysiological capabilities of an employee regarding the effective implementation of a specific type of activity and psychophysiological suitability for performing hazardous work.

PPE has the following objectives:

1. To reduce the level of professional unsuitability of staff to saving life and health of employees.

2. To reduce temporary and financial losses on adaptation / training of a new employee, staff turnover.

A description of the suitability groups for PPE is given in table 2.

Table 2. Description of professional suitability groups for PFE

PPE group	Description of PPE group	Comments
1	According to the professionally important psychophysiological qualities (PPQ), fully meets the professional requirements for performance (the type of work is indicated). May be allowed to perform (the type of work is indicated).	-
2	According to the professionally important PPQ, meets the professional requirements for performance (the type of work is indicated).	-
3+	May be allowed to perform (the type of work is indicated).	Recommended with warnings, subject to re-examination after 1 year.
3-	In terms of priority PPQ, they are minimally consistent with professional requirements for a specific activity. Conditionally not recommended for hazardous work.	<p><b>1st condition</b> The total number of reduced priority PPQ 50% or more with a common assessment for the types of work: 1; 9 - less than <b>46,0</b> 2-8; 10-13 - less than <b>47,5</b></p> <p><b>2nd condition</b> At least 1 priority PPQ has an assessment below the limit for types of work: 1; 9 – <b>32,0</b> 2-8; 10-13 – <b>32,5</b></p>
4	According to professionally important PPQ, does not meet the professional requirements for performance (the type of work is indicated). It is not recommended to admit to performance (the type of work is indicated).	-

Groups 1, 2, 3+ assume admission to hazardous work / hiring at CBB IE.  
Groups 3-, 4 - performing actions according to the algorithm or refusing to hire at CBB IE.

Algorithm of actions with employees 3-, 4 PPE groups includes:

1. Selection based on the results of the Final act of a professional examination:

- offer of vacancies;
- transfer with the consent of the employee;
- dismissal according to the current legislation, in case of disagreement.

2. Transfer to a unit that excludes unacceptable types of hazardous work:

- offer of vacancies;
- transfer with the consent of the employee;
- performance by the head of the unit of mandatory actions.

3. Retraining for a profession with acceptable types of hazardous work:

- offer of vacancies;
- referral for retraining with the consent of the employee;
- performance by the head of the unit of mandatory actions.

4. Rehabilitation / support activities:

- psychological trainings;
- psycho-physiological supportive training;
- professional periodic training;
- control examination (the necessity and the term are determined by the

psychologist).

The following obligations are imposed:

- referral to rehabilitation and support activities;
- in-depth instruction before work (when issuing a work order);
- refusal to be appointed as a work manager (senior worker);
- work in pairs (not mentoring);
- the formation of balanced teams;
- monitoring and recording violations of labor safety, labor discipline.

The following goals are pursued:

- restoration of trained PPQ;
- the formation of awareness to take into account the development level of the

PPQ in production activities;

- motivation to study less developed PPQ.

The algorithm assumes:

1. Be sure to exclude the following factors before PPE:

- passage of PPE after a night shift, the duration of rest after work should be at least 12 hours;

- feeling unwell;
- taking potent / sedative drugs;
- alcohol / drug intoxication, etc.

2. Get conclusions on the results of PPE from psychologists for data analysis (the necessity and feasibility of re-passing the PPE is being worked out).

3. Identify vacancies in the enterprise.





10. For engineering workers: work related to neuro-emotional stress (air traffic dispatchers, dispatchers, energy systems management)												
11. Work associated with the drilling, production and processing of oil, gas, condensate and their preparation for transportation and storage												

For PPQ 1-3 - supporting training is performed after reaching 45 years.

PPQ 4-10 - do not give in to training, are leveled by periodic professional training.

PPQ 11, 12 - amenable to correction in psychological training.

A description of the PPQ and the risks when an employee is at the workplace in the risk zone is given in table 4.

General risks with reduced PPQ:

1. Injury, accident rate.
2. Decrease in efficiency and ability to control the production process.

The implementation of mandatory actions by the immediate supervisor includes:

- participation of a subordinate in the "Rehabilitation" program (health center);
- in-depth instruction before work (when issuing a work order);
- refusal to appoint a subordinate as a work manager (senior worker);
- the work of a subordinate in a pair (not mentoring);

- formation of balanced brigades / shifts by the PPE results;
- monitoring and fixation violations of labor safety, labor discipline.

**Table 4. Description of the main PPQ and risks when the employee is at the workplace in the risk zone**

<b>Priority PPQ</b>	<b>Description of PPQ</b>	<b>Risks in reducing PPQ / risk</b>	<b>Correction option</b>
Attention	Concentration of thoughts, vision, hearing on a specific object or process	Does not notice a critical change in the situation, which leads to disruption of the production process.  If unexpected sound / light effects occur during operation, it can be involuntarily distracted by the stimulus, which threatens with temporary inaction or incorrect action.  Decreased ability to simultaneously successfully perform several different actions and quickly switch from one action / object to another.  Decreased ability to focus on an object or process, while being distracted from everything else.	Yes
Reaction to a moving object	Reaction to a specific position of a moving object. It is characterized by the accuracy of the eye and the speed of response.	Slowing down the production process up to a complete disruption of the sequence.	Yes
Sensorimotor reactions	Motor reactions in response to known and unfamiliar signals: sound, visual, taste, olfactory, tactile (touch, environmental pressure). They are characterized by response time, accuracy, and variability.	Decrease in speed and accuracy of actions when responding even to familiar signals.  Decreased ability to see and use different responses to signals for which the employee is not prepared in advance.	No

Closed space orientation	The ability to independently correctly position objects (tools, equipment) and oneself, based on limited information regarding spatial and temporal parameters	Loss of time for orientation in space in non-standard situations (in particular, when searching for the exit direction), which reduces the speed and accuracy of operations.  Incorrect correlation of the body position, workspace, tools.	No
Fatigue	Decrease in working capacity under the influence of intensive or long work.	At the end of the shift, increased risk of erroneous actions and the occurrence of traumatic situations.  Slowing physical activity, mental activity.  Weakening of determination, endurance, self-control, accuracy and coordination of movements.  Memory impairment.  Fussiness and rhythm disorder, drowsiness are possible.	No
Space orientation	Determination by a person of his position in space using the idea of the placement of objects and the distances between them.	Incorrect correlation of the body position, workspace, tools.  Loss of balance, fall.  High probability of injury, accident.	No
Stress resistance	The criterion for stable behavior and successful achievement of goals in a complex emotional environment. Represents the ability of a person: - maintain operability and orientation in an emergency / non-standard environment, - to endure intellectual, emotional, physical overload for a long time.	Loss or impairment of existing skills.  Decrease in the level of control of one's own emotional manifestations.  Slowing down actions up to the development of stupor or vice versa impulsive, untimely actions / decisions.  Decreased to complete loss of decision-making ability.	Yes



Actions with PPE for several types of hazardous work are given in table 6.

Groups 1, 2, 3+ are passing. Groups 3 and 4 are non-passing. The combination of passing and non-passing groups is possible both in the case when there are more non-passing groups than passing groups, and in the case if there are more passing groups than non-passing groups or equally.

Table 6. Actions for PPE for several types of hazardous work

PPE group	Recruitment	Professional examination
1; 2	Unquestionably fit for hazardous work. Admitted to the next stage of selection.	Unquestionably fit for hazardous work
3+	Suitable for hazardous work. Admitted to the next stage of selection. Repeated passage of PPE after 1 year by type of work.	Suitable for hazardous work. Repeated passage of PPE after 1 year by type of work of the group.
There are more non-passing groups than non-passing or equally	<b>At the discretion of the head:</b> - refuse employment or - to revise the place of work or profession (from HR the current list of vacancies, from LPS - the determination of the possible place of work under the PPE conditions)	<b>Conclusion:</b> 1; 2 - suitable for hazardous work. 3-; 4 - unsuitable for performing hazardous work by type of work. 3+ - repeated passage of PPE after 1 year by type of work. <b>Actions:</b> - implementation of mandatory actions by the immediate supervisor; - to revise the place of work or profession (from HR the current list of vacancies, from LPS - the determination of the possible place of work under the PPE conditions).
There are more non-passing groups than passing	Refuse employment	<b>Conclusion:</b> 1; 2 - suitable for hazardous work. 3-; 4 - unsuitable for performing hazardous work by type of work. <b>Actions:</b> - implementation of mandatory actions by the immediate supervisor; - to revise the place of work or profession (from HR the current list of vacancies, from LPS - the determination of the possible place of work under the PPE conditions).
3-; 4		<b>Conclusion:</b> 1; 2 - suitable for hazardous work. 3-; 4 - unsuitable for performing hazardous work by type of work. <b>Actions:</b> - implementation of mandatory actions by the immediate supervisor; - to revise the place of work or profession (from HR the current list of vacancies, from LPS - the determination of the possible place of work under the PPE conditions).

An example of the Conclusion on several types of work is given in table 7.

The mandatory conditions for filling in the computer base for determining the 3+ or 3- PPE group and for subsequent automation are as follows:

1. For each type of work - a separate line, you must copy the data in accordance with the number of investigated types of hazardous work.
2. The PPE group can be determined only after entering the data by the psychophysicologist in the "Reduced indicators" field.
3. Year of birth should be entered in the format - year of birth (as indicated in the headers of the database).

**Table 7. Example of the Conclusions on several types of work**

<b>Conclusion (hiring)</b>		
<b>Hazardous work type</b>	<b>PPE group</b>	
5	3-	- suitable for hazardous work by type of work 2; 10 workers; - unsuitable for performance of hazardous work by type of work 5; 4. <b>At the discretion of the head:</b> - refuse employment or - to revise place of work or profession.
2	3+	
10 workers	2	
4	3-	
<b>Conclusion (professional examination)</b>		
<b>Hazardous work type</b>	<b>PPE group</b>	
5	3-	- suitable for hazardous work by type of work 2; 10 workers; - unsuitable for performance of hazardous work by type of work 5; 4; - repeated passage of PPE after 1 year by type of work 2; - implementation of mandatory actions by the immediate supervisor; - to revise place of work or profession.
2	3+	
10 workers	2	
4	3-	

### 3. CONCLUSIONS

At the CBB enterprises, a standard “Methods for selecting employees by management level” was developed and implemented.

A description of the suitability groups for PPE is completed. Groups 1, 2, 3+ assume admission to hazardous work / hiring. Groups 3-, 4 - performance of actions according to the algorithm or refusal to hire.

Priority PPQ by types of hazardous work are identified.

A description of the PPQ and the risks when the employee is at the workplace in the risk zone is completed. General risks with reduced PPQ are injuries, accidents, reduced efficiency and the ability to control the production process.

The types of hazardous work with reduced priority PPQ are allowed.

The manager in the Conclusion should receive information about the risk of hiring, being at the employee’s workplace:

- with reduced professionally important PPQ;

- with an accentuated personality type (recommendations will be developed later).

### REFERENCES

- [1.] ISO 9001:2015 *"Quality management systems - Requirements"*.
- [2.] OHSAS 18001:2007 *"Occupational health and safety management systems - Requirements"*.
- [3.] ISO 45001:2018 *"Occupational health and safety management systems — Requirements with guidance for use"*.
- [4.] **Shevchenko V.G., Nosál D.A.**, *Procedure for hazards identification and risk assessment at labor safety*, Geo-Technical Mechanics, 2018, Vol. 141, 190-203.  
<https://doi.org/10.15407/geotm2018.141.190>.
- [5.] **Nosál D.A., Shevchenko V.G.**, *Procedure of classification, analysis and reaction to dangerous actions*, Geo-Technical Mechanics, 2018, Vol. 143, 143-152.  
<https://doi.org/10.15407/geotm2018.143.143>.
- [6.] **Nosál D.A., Shevchenko V.G.**, *Method of assessment of coal mines managers in the labor safety*, Geo-Technical Mechanics. 2019, Vol, 149, 77-88.  
<https://doi.org/10.15407/geotm2019.149.077>.