INNOVATION IN LABOR PROTECTION

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Abstract. Information on the latest measures to train employees in safe methods of work in the presence of industrial hazards has been analyzed in the article. New approaches to the development and use of new types of employee training and coaching are presented. Possibilities of using a mobile device with special software tools to prevent emergencies have been considered.

Keywords*:* modern technologies, mobile devices.

Анотація. У статті проаналізовано інформацію щодо новітніх технологій проведення навчання та тренінгів з поведінки у надзвичайних ситуаціях.. Тренінг можна здійснити завдяки мобільних пристроїв, телефонів, смартфонів, планшетів, навігаторів і спеціально розроблених пристроїв. Наведено нові підходи під час моніторингу умов праці та технічного стану розробки та важкодоступного устаткування

Introduction. At present, at any enterprise, the issue of ensuring labour safety and protection for the further preservation of the health of workers remains very relevant. The working population cannot be healthy without labour protection, and no enterprise can develop without healthy workers. Therefore, without compliance with labour protection laws, as well as without modernizing measures to ensure safe working conditions, effective business development is impossible. It follows that upgrading safety measures is as important to business owners as it is to employees.

Problem statement. In 2019, 422 Ukrainians died from industrial injuries. This, in turn, is 3.2% more compared to 2018 [1]. Such sad statistics are caused not only by accidents at enterprises, but also by neglect of labour protection laws.

According to the data for three quarters of 2019, the Social Insurance Fund of Ukraine registered 3270 victims of industrial accidents. Of these, 286 were fatally injured [2].

The main circumstances that resulted in occupational diseases are: imperfection of mechanisms and working tools – 21.9%, imperfection of the technological process – 20.1% and non-use of personal protective equipment – 10.1% of the total.

Objectives. In our time, technical progress means expanding the range of products manufactured. This implies the use of technological processes hazardous to personnel at enterprises. That is why it is so important to introduce some innovative technologies in labour protection. On the one hand, this will help preserve the health of the working staff, and on the other hand, the employer will receive the desired result.

Methods and results. Modern technologies in the field of labour protection are based on the use of new approaches to the analysis of information. First of all, information on accidents and injuries at work is considered on the basis of risk theory and the creation of new preventive measures to minimize industrial risks and hazards.

In turn, the personnel must know that the risks of the occurrence and

development of hazardous situations are really present, imagine what development scenarios and the scale of emergency situations are possible and what factors contribute to the development of accidents.

Let's take a look at some of the innovations currently being implemented. One of the areas of innovation in labour protection, which has been rapidly developing in recent years, is the use of tracking devices

Tracking is designed to determine the position and orientation of a real object, such as a human head, in a virtual environment using several degrees of freedom. Determination of the position and orientation of a real object in space is determined using special sensors and markers. Sensors remove a signal from a real object as it moves and transmit the received information to a computer.

Also, one of the innovative solutions is an electronic bracelet that allows you to record the actions of manual workers, in particular, staff of cleaning companies. The device takes into account the acceleration in different planes and gives the total result. That is, it shows the intensity of labour. Thus, the bracelet is effective at the stage of training a new employee. Cleaning companies teach workers how to bend down correctly, how to lift a bucket. This concerns labour protection, because it is the prevention of occupational diseases.

Recently, Global Positioning System (GPS) technologies have become widely used in the mining industry. The technology allows the head of the enterprise to remotely monitor the operation of the entire fleet of mining machinery and equipment of the mine in real time. Remote monitoring and control can help prevent collisions, deaths and accidents caused by poor visibility from the cab of dump trucks and other mining vehicles [3].

Barrick Gold has installed approximately 3,500 collision avoidance systems on mining machines around the world. In order to determine the degree of driver fatigue, it was proposed to equip the cabs of heavy equipment with special devices that control the movement of the operator's eyes, the electromagnetic radiation of his brain and even the movement of his face.

Observer helmets. The use of monitoring systems using wearable devices helps to solve three problems at once. The first is online tracking of employees: their exact location inside and outside industrial buildings and facilities is determined, their presence in hazardous areas is monitored, and the presence of PPE is checked. The medical unit allows monitoring the vital signs of an employee. Sensors online determine the heart rate, take an ECG, measure pressure and body temperature. If the permissible limits of employee health indicators are exceeded, the system immediately notifies the operator, who can take prompt measures to provide assistance to the person.

In addition to monitoring location, satellite terminals can be used to monitor the technical condition of heavy equipment. Telemetry monitoring systems that monitor how equipment is used and maintained give dispatchers the ability to assess health (running time and engine health), schedule maintenance, and provide preventive operator training.

Developments such as the “smart helmet” with a telemetry module from

Human allow the employee to be calm about his health and life.

If a worker is in danger, a high degree of emergency is determined, a deviation from the norm, the module instantly communicates with a single cloud platform and transmits information. The helmet also monitors the health indicators of the employee, the temperature in the working area, the content of harmful impurities in the air or the concentration of explosive gases. SafePitch experts recommended that the company configure the module's functionality for sustainable human behavior and signal any employee behavioral deviations that can lead to injury.

During the operation of innovative systems, flaws were identified, and the optimal composition of a set of gadgets was experimentally determined. For example, it turned out that the accuracy of the readings from the blood pressure sensor varies depending on the physical activity of the person at the time of measurement. And instead of a helmet, it is sometimes more convenient to use devices that are attached to a vest: when a person enters a room where it is not necessary to wear PPE, he takes off his helmet, and part of the system's functionality is lost, while employees wear vests almost constantly [4].

Main advantages. Tracking can be carried out using mobile devices, phones, smartphones, tablets, navigators and specially designed devices.

Faced with an emergency, maintenance personnel using a mobile device with special software tools can diagnose, find out the causes of the emergency and transfer the data to the analytical center, and then, using the instructions contained in the same device or provided by remote specialists, make repairs.

With the help of portable devices, labour protection specialists have the opportunity to monitor working conditions and significantly speed up the process of issuing passes or permits for access to a particular area. The specialists of the already mentioned company "Barrick Gold" have developed and implemented at a plant in Papua New Guinea a system of fencing potentially dangerous equipment, in particular a belt conveyor, from unauthorized access using an electromagnetic field: if someone enters a certain area, an alarm is triggered around the machine.

In 2017, as evidenced by the social report of the Norilsk Nickel company, the costs of labour protection measures in 2017 amounted to 8.7 billion rubles, the cost per employee – 114 thousand rubles. Only for the purchase of personal protective equipment – respirators, gas masks, glasses with light filters, special suits and much more – Norilsk Nickel in 2017 allocated 2.6 billion rubles [5].

In August 2013, the Economist Intelligence Unit (EIU) surveyed 50 mining executives. The survey showed that about 70% of them are confident that mobile devices prevent and reduce accidents and accidents; 76% said mobile technology enabled their companies to respond more quickly to actual and potential incidents; 74% of managers believe that mobile technologies save the lives of workers [3].

Main disadvantages. An integrated, systematic approach to the entire range of preventive measures in the field of labour protection, as provided for in the implementation of innovative processes, is not adequately provided.

The main disadvantage of introducing innovative solutions to preserve the health of working personnel is still the economic aspect. For example, developing a

collision avoidance system cost Barrick Gold over $ 17 million. That is why, unfortunately, many company leaders refuse to implement such expensive technologies, all the same exposing their employees to unnecessary risk.

Conclusion. After analyzing innovative solutions, it can be argued that this direction has been developing quite intensively recently. Innovations in labour protection include both organizational solutions aimed at improving the personnel training system for knowledge of labour protection norms and rules using training and computer technologies, and the introduction of monitoring of technological processes.

Equally important is the provision of personnel with tracking devices and personal protective equipment. The market for personal protective equipment offers many innovative solutions aimed at improving the protective properties of workwear, footwear, disinfectants, and flushing agents. All of the above allows you to preserve the health of the working staff.

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