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DIGITAL TRANSFORMATION IN ENSURING OCCUPATIONAL SAFETY IN THE OIL AND GAS INDUSTRY

V. SAMUSEVICH

The University of Civil Protection of the Ministry for Emergency Situations of the Republic of Belarus

Y. BULAUKA

Polotsk State University, Belarus

The analysis of the used digital tools of integrated solutions for ensuring occupational safety has been carried out. It has been demonstrated that modern digital information and communication technologies have specific features and perform some of the functions of occupational safety specialists, which allow relevant services to switch to a new algorithm for ensuring occupational safety at work.

Keywords: occupational safety, digital tools.

Introduction. On the basis of the analysis of the global level of occupational injuries, experts of the International Labor Organisation have come to the conclusion that there are approximately 340 million registered work accidents each year of which 2.3 million are fatal, every minute 4 people die from work-related injuries and diseases. About 650 thousand deaths per year are registered in the working area from exposure to hazardous substances alone. The economic damage to society from adverse and hazardous working conditions is up to 4% of the world GDP. At the same time, it is well known that one dollar of the funds invested in the improvement of working conditions at a production site makes a profit of about \$2.6 [1-8].

Results, their discussion and perspectives. According to official data of the National Statistical Committee of the Republic of Belarus, the total number of victims of industrial accidents has grown in the organisations of the Belneftekhim company over the last three years of observation. The dynamics of occupational injuries at the organisations of Belneftekhim obtained according to the data [9] is shown in figure 1. The main causes of accidents at work in the organisations of Belneftekhim are the same as elsewhere in the country, namely: violation of labour protection requirements by the injured; personal negligence; unsatisfactory organisation of hazardous work; violation of labour protection requirements by other workers.

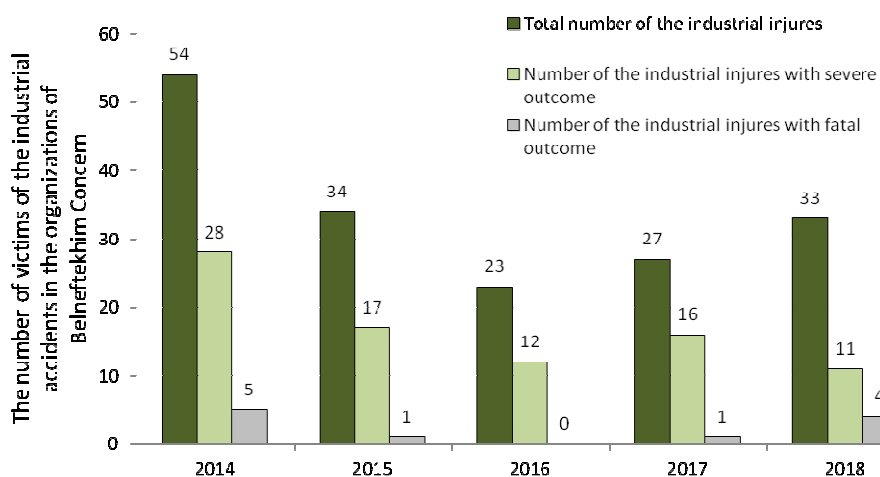


Figure 1. - The number of the injured in industrial accidents at the organisations of the Belneftekhim company

The unstable situation in the field of occupational safety and health at large industrial enterprises makes it necessary to reduce the risk of industrial injuries through the development and implementation of more efficient preventive measures [6-8]. The era of digital economy, "Industry 4.0", and the development of the Internet of things, dictate the need for growth of IT and Smart-development ("Smart Technology") in various enterprise management systems, including occupational health and safety management systems.

Technology, Machine-building

The development of preventive measures to reduce the number of industrial injuries and occupational diseases requires of specialists in the field of labour protection to take into account and systematically study a large flow of information, to be able to analyse complex industrial situations, to predict events and provide timely information and balanced decisions on expediency of implementing certain preventive measures. This causes the necessity to use digital tools of integrated solutions for ensuring occupational safety and health. The analysis of the current state of this issue has determined the purpose of this study. We have analysed modern digital tools of integrated solutions used to ensure occupational safety at work, and they can be ranked by areas of activity [6-8]:

1) *Occupational health and safety training*: Olimpoks system (OOO A-P, Russia), OLIMPOKS training and controlling system and OLIMPOKS: Instruction system (OOO "TERMIKA", Russia), online training system LMS (Learning Management System) and VR (Virtual Reality) simulators (VRC CROC, Russia); VR-training, employee training system using virtual reality (Cerevrum Inc., jointly elaborated in Russia and the United States of America) and others.

2) *Control over compliance with occupational health and safety requirements*: "Production Control" integrated system of work safety (ISWS) ("Vizitech" company, Russia), mobile phone application "I am an inspector" (Rostrud, Russia).

3) *Organisation of work on occupational safety (automated working station (AWS) for occupational safety specialists)*: "Occupational safety" for 1 C: Enterprises 8 (Inform Service Group, Russia), "1C. Production safety. Occupational safety" (INTERS, Russia), online service ("Abie System", Russia), information management system "Industrial safety and labour protection" (OOO "BREALIT", Russia), cloud service "MyObject" (Living core, Russia), AWS Occupational safety (ODO "Expertcentre", Belarus), system ^{Q4} Safety (Engica, USA). It should be noted that on the Russian market alone there are more than a hundred specialised AWS products which allow to reduce time for planning and organisation of work, to process large amount of information faster and to simplify labour-consuming monotonous work.

4) *Prevention of accidents*: "Smart" video analytics (Russian CROC, DSSL and other companies), "Electronic medical examination system" (EDISON, Russia)

5) *Personal protective equipment (PPE)*: "Smart" hardhat (several companies: Human, ROSOMZ, Softline), other wearable devices (MTS and Megafon, Russia)

Digital simulators and equipment simulators, 3D virtual reality technology for skills training implemented in the process of training for occupational safety specialists can significantly improve the efficiency of staff training by creating an interactive learning environment as close to the real as possible. Replacing the traditional form of instruction by Smart-Technology is feasible due to the higher capacity of the visual sensory system compared to the auditory one. The visual perception of information activates the right hemisphere of the brain, which forms figurative thinking that promotes the transfer of information into the subconscious memory. The use of mobile applications allows users, regardless of the location of an employee, to properly prepare for the test of knowledge on occupational safety, passing trial tests, even staying offline.

Conclusion. The analysis of the used digital tools of integrated solutions for the purpose of ensuring occupational health and safety at work has shown that these technologies are already mandatory and necessary tools for occupational health services, especially at facilities in the oil and gas industry, characterised by increased explosion and fire hazards. Digital innovations are characterised by extensive functionality and are applied in various areas of work in the field of occupational safety.

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