

INDUSTRIAL SECURITY FROM ASPECT OF PEOPLE'S SAFETY ON THEIR WORKING PLACE

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Abstract: In defining the industrial security more security aspects are included which are critical for the normal functioning and development of any industrial capacity. The safety of the people who are included in the working process, is inevitably connected with the risk of injuries, illness and uncontrolled events which result with damage and material, financial and human loss. Numerous industrial hazards are hidden and unknown and they cannot be estimated and managed. That is why they represent a potential for accidents. Most of the industrial accidents are the result of accidental human mistakes caused by factors which are **mainly predictable** and can be prevented or managed if there exists a culture of safety, high level of safety standards and strict abidance, but also political action for improvement and prevention of recurring accidents.

Keywords: industrial security, industrial accidents, industrial hazards, risk, working environment

Introduction

The contemporary concept of security, which surpasses the national military security, is focused on the ability or the inability of the state institutions to protect its citizens. That enables identification of all the safety risk, in all of the segments of living and functioning. In that context, the technological development and the industrialization (that inherently affect the safety of the people and pose a constant threat) create technology related risks, and so do the technological processes in the industrial production, which are a constant health and safety threats, not only for the employees, but also for the people living in the closer or the more remote area. The industrial accidents, which are mostly human errors and caused by their wrong actions in the process of the industrial production, have the most direct impact. In cases like these, the risks are a real safety threat (although they are being discarded as a side effect of the technological development) and they should raise the awareness for the need to respect and abide the global occupational safety standards and their implementation in the national regulations in all the countries.

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1. Industrial safety and risks

In the modern industries, safety plays a crucial role in the development and functioning. The safety system should ensure efficient protection of the overall assets and people who work there, from the numerous risks in the industrial production. Therefore, the definition of industrial safety covers many of its aspects: safety from attacks and burglaries, financial safety, safety from theft and disclosing undercover information, safety of the drives, safety of the employees, safety of the material goods and the entire asset, and many more. The aim is to make a safety system that would be efficient in detecting the risks, their prevention and adequate response, while providing optimal protection of the workers, the goods and the entire working process. That means that the industrial safety covers:

- assessing the safety risks of the industrial capacity;
- safety measures for safety and protection
- measures and procedures as response to liabilities that threaten the industrial safety

The industrial safety is a broad term because it covers the prevention and protection from multiple risks and threats which might, or might not be specific for the industrial production, but may still result in material and/or human losses and injuries. All the risks include the possibilities for unfavorable events or events that have an unfavourable outcome. As a matter of fact, risks are possibilities for injuries and losses, and are measured by their probability of them happening. In the Law on Occupational Safety and Health (Службен весник на Р.М. бр. 60/2012) the risk is defined as a possibility for injuries, illness or any health hazard on the worker, as a result of occupational threat. But, the risk in the industrial production has other forms as well: financial risk, fragility risk, risk of economic losses, risk of thefts, natural disasters, fires and the like, operational risk, and others. The risks are mostly events that are unpredictable and uncontrolled that result in damage and losses, and they can be external (physical, cyber-attacks, natural disasters) or internal (sabotage, industrial accidents that result in fire, explosions, leakages, and other). (Салтировска, 2016:125).

The process of industrial risk management begins by identifying the goods that are endangered, proceeds by assessing the probability of risk, then, calculating the costs of the risk and the costs of the safety measures to minimize or eliminate the risk entirely. A possible scenario is developed and based on the probability of the events in the scenario, and then the probability of the risk is assessed. Based on the assessment, costs are calculated, depending on which, the safety measures will be strengthened. (Салтировска, 2016:125). It has to be emphasized that safety system of one industrial capacity can never be fully secured, because they are many and of varying nature. Still, the system has to be capable of including all the risks, especially those that have high level of probability to happen. The risk management is an ongoing process, where the safety measures are constantly revised and the next steps are constantly redefined, so that continuous precaution will be maintained, and the false sense of security is avoided.

2. Industrial dangers and risks of accidents and disasters

The contemporary industrial societies are constantly filled with danger to the health and safety of people. Dangers include anything that has the potential to cause injuries and illness of the people, and the risk is the actual chance of that happening. In the industrial production the risk is constantly present, because the dangers are many, and people face them on a day-to-day basis. Part of the dangers are latent, they cannot be assessed and controlled, thus becoming potentially an accident (Салтировска, 2016:136). However, most of the dangers are visible, people feel them and are vulnerable to them because they have an overt effect on their health and safety. Such are:

- dangers from the waste emissions (carbon dioxide, water pollution, dust particles emission, contaminated drops and other hazardous particles, industrial gases and liquids, and other);
- dangers from heat emissions that cause heat waves, skin damages, burns and other;
- dangers from noise pollution, which distract, disturb, damage the hearing, and disrupt the normal communication;
- dangers from radiation (light, heat or radio frequency, ionizing or non-ionizing from the radioactive equipment and materials);
- dangers from the latent energy, which is released as a result of a free fall, explosion, and other;
- dangers from vibrational energy that causes injuries on the hands and the back, while making loud noise at the same time;
- dangers from fires caused by the flammable industrial materials, oil tanks, and other, which can cause explosion when in contact with certain chemical substances;
- dangers from the corrosion of the pipes or the vessels, which can cause leakage of the material stored in them;
- dangers from the lack of additional exits in case of an accident or a disaster;
- dangers of unsafe entry in an area that is toxic, unvented, or highly stuffy and unaerated;
- dangers of the transport procedures, maintenance, unfinished work that will cause misunderstanding because of lack of communication, design errors, and other;
- dangers from the carelessness of the people who are used to constant dangers, feel comfortable and start losing focus, which eventually leads to faults, which lead to accidents (Wong, 2010:49-73)

Despite the fact that the number of industrial dangers is big, according to some theories almost 90% of the accidents area caused by human error (Поленакović, Чолоска, Наумовска, 2012:225). Those are not deliberate errors (unless they are act of terrorism) and

are not always direct, because the factors that led to their occurrence may be the main cause. Such are:

- Poor working environment, which is one of the most common factors for human error (Службен весник на Р.М.бр. 60/2012). The working environment is a "space where the work is done, working place, working conditions, working processes, social relations, as well as other influence from the surrounding area". The working conditions should provide efficient functioning without distractions and exhaustion. They include ideal working temperature, suitable lighting, aeration, noise control, dust particles emission, chemical evaporation and other pollutants, machines designed according to the physiological characteristics, mental capacity and skills of the operators, their education and their work experience.
- Exhaustion due to work overload is also another very common factor for human error. Work overload refers to executing multiple tasks at the same time by a limited number of workers and work time extension. In that case, there is either work under stress or a decline in productivity. The exhaustion is also related to sleep deprivation, lack of rest time, stress, tedious repetitive work, poor working environment, huge work load, not enough nutrition and hydration, medical conditions, and other. As a result of exhaustion there is a lack of focus and reaction, decline in the ability to make decisions, decline in the motion control, headaches, vertigo, arrhythmia, pain in the body, and many other negative side effects that result in delayed response, especially in sudden and unplanned situations. This is certainly a risk of errors that may lead to accidents at the work place. (Wong, 2010:88)
- The psychological element-emotional state, thoughts and feelings because of private or work-related problems, can also result in lack of focus and motivation, and with the willful ignoring of the given instructions. This, of course, is not to be justified, but it has to be detected and certain measures have to be taken. The psychological element is connected to the mental capacity (the amount of work load and the nature of assignments a person can deal with), sense of comfort, skills acquired, and routine that enables the operator to work without thinking or to find a shortcut in the procedures that breaks the rules of working, and other.

The human error is an unwanted human decision or behavior that has the potential to decrease the efficiency and the safety at work. Although the errors are mostly connected to the operator, accidents can also be the result of the errors made by the manager, by the system designer, by the maintenance staff. That means that the poor management, inadequate working conditions or the equipment design can also be factors that contribute to creating risks that lead to accidents. Accordingly, the human errors can be classified into:

- Errors because of oversight during the working activities,
- Errors because of a false work instruction,
- Consecutive errors (because of executing working tasks outside of the standard procedure), and

- Time errors (because of either too fast or too slow job execution) (Салтировска, 2016:140)

Efficiency in human error managing refers to understanding the abilities and the limitations of the operators during certain tasks, adjustment to the working environment, the ability of the manager to prevent and to deal with the errors, awareness of the employers and the employees of the significance of occupational safety and health, and creating culture for industrial safety, which is a sum of the overall behavior of all the employees at all levels of an industrial complex. The aim is to reduce the risk of human errors, and by that reducing the risks of injuries and accidents to a minimum. (Поленаковиќ, Чолоска, Наумовска, 2012:228-230).

3.Prevention of the most frequent risk of industrial accidents

In the industry there are many risky situations that need to be assessed and managed so as to prevent any kind of unwanted situations. Every industrial danger has the potential to result in injuries, diseases, and accidents that range from minor to catastrophic. The risks, depending on their severity and their level of probability to happen, have to be eliminated or controlled through the process of risk management. To achieve that there are number of regulations, conventions, instructions, manuals, and other documents that the corporate management has to abide. The goal is to prevent the eventuality of risk, and with that strengthening the safety. Safety is the ability to fulfill criteria for successful decrease and control of the risk, within the framework of the circumstances to use and maintain the means that lead to safety. However, these means can be an additional financial burden to the management, so the necessity of insurance is often neglected when actually needed. The risk management is costly, so it is often associated with the company's loss or gain. The risks are often ignored, and the accidents that have already occurred are often disregarded as an incentive to take precaution of them happening again, even though the costs of the accidents are huge (human life losses, diseases, work delay, profit decrease, decrease in productivity and motivations, lost confidence, and other).

Risks have many forms, but when it comes to industry the most frequents risks are those of fire, leakages, and explosions, because in the industrial processes flammable materials, liquids, gasses, explosives, toxins, radioactive, or pressured gasses are either used, produced or are by-products. The preventive and protective measures must be started as early at the onset of the project documentation for construction of the industrial object, ensuring maximum resistance and adequate protection of the workers and the property of the building itself. Therefore, international standards (ISO) are implemented, as well as the European standards and regulations of the international association NFPA, national standardization (MKS), normative within the framework of the Law for storage and protection from explosive liquids and gasses, Law for protection from explosive materials, Law for trafficking of explosive materials, and Law for chemicals, then measures for protection against fires, explosions and hazardous materials assigned in numerous regulations. The constructive measures for protection cover:

- Fire resistance, which will enable protection of the construction system for a certain time period;

- Limitation and prevention of fire spreading, in order to enable evacuation and saving lives, as well as saving the material goods;
- Provision of space for free access of fire trucks from at least two sides of the industrial object, accessibility to the floors, safety holders on the outer walls of the object, stairs and horizontal fireproof obstacles on the roofs, evacuation stairs (inside and outside), communication inner spaces with marked edges, outside access to the roof with fixed ladders, open water pools at least one meter deep placed outside of the exits of the object, exit doors for evacuation and windows that are easily opened on the inside, automatically stable devices for creation of water curtains between the objects, vent, and air-conditioning that switch off and on automatically, fireproof wall, floor and ceiling materials, signaling, audible and lighting alarms, fire extinguishers, and installations with automatic or manual activation for extinguishing fire with water, carbon dioxide, foam, dry powder, and other chemicals, depending on the nature of the fire. (Rulebook for safety measures from fires, explosions, and dangerous materials, Службен весник на Р.М. бр. 81/18).

Respecting and following the standards for projecting and building of the industrial objects consistently, means greater safety of the workers, since the object itself enables their protection in case of an accident that might result in fire, explosion, or chemical leakage. The building materials in the object, the installation, devices and equipment, will increase the sense of security on the workplace, because if there is an accident, they will enable them with safe evacuation and protection of the rescue teams.

However, it has to be pointed out that the prevention measures cannot entirely eliminate the possibility of accidents. There will always be risks from accidents, since there is not one hundred percent security. Hence, it is important that measures for reducing the effects of a possible accident are planned beforehand. The speedy reaction in case of an accident is greatly effective on the effects and its aftermath. The first few minutes of the incident will decide whether it will turn into a disaster or not, and the escalation could be prevented by adequate training and drills that will ensure better preparation for the control of the incident. (Wong, 2010:250-251). Security should be an inherent part of the industrial design and production. One should know what to do in case of an accident or a disaster, how to react, but also to be able to react quickly in case of emergency. These measures may seem irrelevant because they are never used, unless an accident occurs. But their monitoring and testing is of vital importance, so as to enable their functionality and efficiency in case of an accident or a disaster.

4.Preventive measures for increasing the safety of the workers during the work process

As it was previously mentioned, the workers during the work process may face numerous dangers and factors (dust, noise, gasses, high temperatures, vibrations, and other) that increase the risk of errors while working, which may result in work place accidents, and could still affect their health and safety. Poor working conditions often have a negative effect on the environment, which have to be taken into consideration and there should be constant work on the raising of the personal and the public awareness for the need to protect the environment by creating a safe and healthy working environment. Prevention is the most efficient if

it begins at the very beginning of the organizing of the work processes by implementing the standards for safe working conditions. The following stages should include control measures that include the engineering, administrative, and other controls and measures for eliminating or preventing the dangers and risks during the working process. All the measures should be adjusted towards the participants of the working processes, because every one of them is faced with certain liabilities which are specific for their workplace. The final goal is to promote and maintain the physical, psychological, and social welfare of the workers, to balance the work and the workplace with the physiological and psychological abilities of the worker, to protect the health and increase the overall security of everyone at the workplace. The right to live is a basic human right and it is therefore a basic human right to work in place free of risks to their health and to their safety. Maintaining the safety and the health has its reflection on the economic aspect of the story, because it provides financial and material savings for the employees (medication expenses, decreased working capability, and other), for the employers (fines for not following the standards, medication compensations, decreased productivity, and other), and for the state institutions that compensate the medication by exploiting the sources of the social security funds, and generally in the repairing of the consequences of possible accidents. Because of its vital importance, this area is regulated by national laws and legal acts that determine the standards and the measures for security and health at work, and the obligations of all of the subjects involved in the working process.

There are many laws and legal acts in the Republic of North Macedonia that aim at improving (directly or indirectly) of the protection and safety of the workers at work, and that cover multiple aspects of this area: Law on Occupational Safety and Health, Health Care Law, Labour Relations Law, Pension and Disability Insurance Law, Construction Law, Law on Labour Inspection, and other.

The Employers implement the occupational safety and health measures according to the Law on Occupational Safety and Health, by following the principles of:

- Avoiding risks,
- Assessing the risks that cannot be avoided,
- Risk management from the very beginning,
- Work adjustment according to the workers capabilities,
- Choice of personal protection equipment,
- Choice of chemical substances and preparations,
- Choice of work and production methods,
- Health maintenance and strengthening,
- Adjustment to the technical and technological development,
- Replacement of the hazardous materials with less or not hazardous materials,
- Development of a completely safe strategy that encompasses technology, workplace organization, working conditions, interhuman relations, and factors that affect the working environment,

- Emphasizing the collective safety measures instead of the individual ones,
- Provision of suitable instruction manuals, instructions, and notifications for the employees (Службен весник на Р.М. бр. 60/2012).

The employer is obliged to:

- Prepare and execute a safety statement for each individual employee, based on the dangers that have been identified, and the risks that have been assessed associated to their particular workplace;
- Execute the worker's right (via the union representative and the representative of the Occupation Safety and Health) to participate in the assessment of the risks and improving the work conditions;
- Provide access to the workplaces that are exposed to certain type of danger, only for the workers who have been given specific work instructions on those specific workplaces;
- Secure the working equipment with clear signaling and danger warnings, and also provide instructions for safe work;
- Hire authorized health institution to do professional health services;
- Provide safety measures against fire;
- Provide first aid measures and evacuation in case of danger;
- Execute training of the workers for occupational safety;
- Provide equipment for personal protection of the employees;
- Do regular check ups of the working place and the equipment;
- Monitor the workers' health condition;
- Provide and supply the necessary equipment for evacuation, rescuing, fire and first aid, to the people who are trained and assigned to do the activities;
- Establish evacuation and rescue plan, familiarize the entire staff with it, and execute evacuation and rescue drills at least once every two years;
- Provide training in first aid to the employees (at least one of twenty employees should be trained in first aid, fire extinguishing, evacuation and rescue);
- Give appropriate instructions for fast and efficient evacuation in case of an emergency;
- Keep the workers informed about any kind of occupational risk and the safety measures needed to control those risks and to eliminate the hazardous consequences;

- Inform the authorities within 48 hours in case of death, collective accident, injury that disables a worker to come to work for longer than three days, and generally, inform the workers about any kind of occupational risk;
- Keep track of the professional training and advancement of the worker about occupational safety, to keep track of the control of the working equipment, keep track of the researches conducted about the possible occupational risks (physical, chemical, biological, microclimate), of the regular health check-ups and their occupational illnesses, injuries and death tolls.

The workers have the right and obligation to care about their own personal health and safety, to give suggestions, opinions, and remarks about their improvement, to refuse a job that might represent a danger they are not informed about, or certain safety measures are not taken, to demand that the danger is removed, to follow the measures for correct and safe use of the working equipment, to follow the measures for occupational safety and health, to wear the personal protection gear, and to give notification of any flaw, danger or incident that might jeopardize their safety and health. (Службен весник на Р.М. бр. 60/2012).

Within the framework of the Occupational Safety and Health Program, a Strategy for Occupational Safety and Health 2020, called "Healthy Workers in Safe and Productive Workplaces" is established, and it refers to protecting worker's life, health and work efficiency, as well as avoiding injuries at work, or illnesses connected to the workplace. The Strategical Framework of the Strategy is consisted of: Vision, Strategic approach, Principles, Main goal, Expected results, Interventions, National priorities, Key challenges, and Monitoring, Evaluations, and Notification.

The Vision of the Strategy is "healthy workers working in safe and productive workplaces, a strategical approach that has to provide everything that includes the involvement of the entire society, i.e., all of the segment of the community, and all the key partners that will make the Vision real and feasible.

The Strategical principles of action (prevention, promotion, responsibility, involvement, feasibility, optimization, and professionalism) mean building and maintaining of the National Prevention and Safety Culture that implies respecting the right to a safe and healthy environment at all levels, which can be established by respecting the rights, responsibilities and obligations of all the subjects involved. That means that prevention has the greatest priority.

The intervention approach that includes the efficient regulation, adequate stimulations, development of the capabilities, appropriate management, social dialogue, better design and technologies, researches, and evidence, is necessary for the sustainable development and improvement of the occupational safety and health. Actions are executed for each of these goals, but the following are defined as priorities:

- Open and efficient legal framework, that will be continuously monitored and adapted to the legal framework of the EU "Health 2020" and other international legal regulations;
- Continuous build up, strengthening, and advancement of the administrative capacity and human resources, as well as improvement of their efficacy and efficiency;
- Occupational safety and health education;

- Reinforcing the role of the Occupational Safety and Health Council;
- Improvement of the health insurance of the workers, including promotion of their health, and prevention from professional illnesses and workplace injuries;
- Research and development;
- Indicators and information system in the maintenance of the occupational safety and health; and
- International collaboration.

The Strategy points out the following elements as key elements in the realization of the actions: changes of the work and the society, increase of the insecurity at work, occurrence of the urgent health problems and illnesses, increased number of small and middle businesses, and the demographic changes of the work force.

In the end, the most important chain in the strategical framework is the monitoring and evaluation of the measures and actions drafted in the Action Plan for Occupational Safety and Health, as well as regular notification of the National Council for Occupational Safety and Health.

Conclusion

Industrial safety covers prevention and protection from numerous risks and threats that may result in/or human injuries and losses. Therefore, the risk assessment should cover all the risk groups such as: occupational safety and health, fire risks, explosives and hazardous materials, natural disasters risks, industrial accidents and catastrophes, environmental risks, information and information systems security risks, financial risks, legal risks, and other. It is of crucial importance to prevent and control the high-level risks. Among those, according to the frequency and probability to occur, because of the character of the industrial production, are the industrial accidents. The numerous industrial dangers are a constant challenge to the risk of the occupational safety and health, and one of the main risks for the industrial accidents. The employers and the engineers have the obligation to recognize them, to emphasize them so that they are crystal clear to everyone, and to take measures for their decrease and elimination. On the other hand, the people because of neglect (which may be the result of certain factors that have an unfavorable effect on the conditions and the opportunities for clear judgement and decision making) make mistakes that may lead to workplace accidents; hence the occupational safety and health is one of the top priorities in creating safety culture in the industry. Many of the accidents that occurred before may have seemed inevitable, but the factors that led to their occurrence are mostly predictable, and could have been prevented or adequately managed. Because of that, numerous regulations and instructions for occupational safety and health have been put into action, which the corporate management should abide to, whereas the occupational safety and health services should contribute to the safety by following and implementing the instructions for risk reduction and occupational safety and health enhancement. According to the legal regulations, the employer is under obligation to ensure the occupational safety and health of the workers, by taking adequate protective measures, by choosing adequate occupational and production measures, by providing information and training for the workers, and by providing adequate organization and other means for realiza-

tion of the all the preventive and operational measures and actions. The main goal is for the planned measures and actions to provide development and advancement of the occupational safety and health, and for them to be adjusted to the changeable circumstances, in order to improve the current state of affairs.

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