Uticaj industrijskih akcidenata u namenskoj industriji na bezbednost u Republici Srbiji

Rade Slavković¹, Aleksandar Dumić², Marko Gnjatović¹

¹Univerzitet „Union-Nikola Tesla“, Fakultet za inženjerski menadžment, Bulevar vojvode Mišića 43, rade.slavkovic@fim.rs

²Univerzitet odbrane, alekdum977@gmail.com

³Univerzitet „Union-Nikola Tesla“, Fakultet za inženjerski menadžment, Bulevar vojvode Mišića 43

Apstrakt: Bezbednost ljudi i imovine osnovna je premisa poslovanja svakog preduzeća. Bezbednost kao značajna funkcija menadžmenta organizacije, naročito dolazi do izražaja u preduzećima koja se bave proizvodnjom eksplozivnih i zapaljivih materija. U kategoriju bezbednosno rizičnih preduzeća spadaju i preduzeća namenske industrije. Ove konstatacije su se potvrdile u bliskoj prošlosti kroz nekoliko industrijskih akcidenata koji su imali ozbiljne posledice. Bezbednosna ugroženost ovih preduzeća se ogleda pre svega u osetljivosti pojedinih proizvodnih i tehnoloških procesa u pogledu mogućeg nastanka požara, eksplozija isticanja opasnih gasova i tečnosti, zatim u količinama i osetljivosti eksplozivnih i zapaljivih materija koje svakodnevno učestvuju u procesima proizvodnje. Uzimajući u obzir navedeno jasno se nameće zadatak preventivnog delovanja i sprečavanja nastanka akcidenata odnosno umanjivanja efekata njihovog eventualnog ispoljavanja (ukoliko se dogode).

Sušтина ovog rada ukazuje na problematiku sagledavanja najkarakterističnijih industrijskih akcidenata koji su se dogodili u namenskoj industriji iz aspekta njihovih fenomenoloških obeležja, sa ciljem izvlačenja određenih zaključaka kao pouka. Kao najznačajnija, obrađena su pitanja prevencije akcidenata i aktivnosti subjekata bezbednosti u pogledu preventive i otklanjanja posledica. Takođe izdvojeni su zaključci proizašli obradom ove veoma složene i u savremeno doba veoma aktuelne problematike, a koja zahteva punu pažnju svih subjekata bezbednosti u državi, kako bi se sprečile izuzetno opasne, pa čak i katastrofalne posledice po objekte bezbednosti u Republici Srbiji.

Ključne reči: akcident, bezbednost, eksplozija, preventiva, industrija.

Influence of industrial accidents in defense industry on security in the Republic of Serbia

Abstract: The security of people and property is one of the basic premises of the business of each company. Security as an important function of management of the organization, particularly evident in companies engaged in the production of explosives and flammable substances. In the category of security risk companies are the defense industry companies. Recently, these findings have been confirmed through several industrial accidents with serious consequences. Security vulnerability of these companies is reflected primarily in the sensitivity of certain production and technological processes in terms of exposure to destructive influences and possible occurrence of fire, explosion of a hazardous gases and liquids. Reasons for increased surveillance and a higher safety level can be found in the volume and sensitivity of explosives and flammable substances on a daily basis participate in the processes of production. Considering aforementioned clearly imposes the task of preventive action and preventing accidents and diminishes the effects of their possible manifestation (if they occur).

This paper considers the most characteristic of industrial accidents that have occurred in the defense industry from the point of view of their phenomenological characteristics, with a view to identifying the causes of these phenomena and take measures to correct them, in order to prevent repeated and similar events. As the most relevant, addressed the issues of prevention of accidents and safety activities of operators in terms of prevention and elimination of consequences. Also, paper presents singled out the conclusions derived by treating these very complex and in modern times most of the current problems, which requires the full attention of all security subjects in the country, in order to

prevent extremely dangerous and even disastrous consequences for security facilities in the Republic of Serbia and the destruction of valuable and scarce resources.

Keywords: Accident, Industry, Explosion, Safety, Environment

1. Introduction

In each area, including a work environment, where there are explosive and incendiary devices, there is a potential risk of possible occurrence of the effects of explosions and turbulent combustion, which would lead to endangering humans safety and property. In order to reduce these opportunities to a minimum, or its complete elimination and thereby increase the safety of humans and property, take all possible actions and measures which are the responsibility of certain organs of the Ministry of Defense in cooperation with the Ministry of Interior in charge of the Emergency Management Sector (Directorate of Risk Management).

The Ministry of Defense is required to undertake certain activities and measures to protect members of Serbian Armed Forces of the effects of explosion of the explosive devices. The protection measures and actions which are going to take and to extent will depend on the method and the way those will be made assessment of the security risk to humans and property from the effects of the explosion of explosive devices, and will also depend on how the content is objective and impartial. Therefore, the responsible service in the function of the Ministry of Defense finds the best mechanisms to evaluate the actual situation of vulnerability of humans and property from the effects of the explosion of explosive devices in the workplace. In these fields of work is possible then in a short period of time the crisis situation arise, unless there is constant vigilance and preparedness (prevention) to organize appropriate timely intervention.

Prevention of accidents and elimination of the consequences of accidents is particularly important in the field of defense industry, where the Ministry of Defense has a crucial role. This uniqueness is reflected primarily in the sensitivity of certain production and technological processes in companies of the defense industry in terms of the potential of fire, explosion of a hazardous gases and liquids, then the amount and sensitivity of explosives and flammable substances on a daily basis participate in the processes of production, deactivation and laboration various hazardous substances and finished products.

The aforementioned objects of the defense industry, in particular in the new era of more prominent asymmetric threats, particularly vulnerable to terrorist threats to the aspect, where the consequences of threats such facilities may be just as disastrous in terms of the classical industrial accident (the adversity) and the aspect of sabotage or diversion.

Possible accidents in the defense industry is not affected negatively only to members and assets of enterprises of the defense industry and the Ministry of Defense and the Serbian Armed Forces, but also can directly affect the entire population and infrastructure in their immediate environment and indirectly, the long term and the entire security community in the Republic of Serbia. Among other such violent activities endangering the security of facilities dedicated industries negatively affect the reputation of the security subjects and the country as a whole, because it suggests that security subjects are unable to preventive activities of detecting and preventing the occurrence of such phenomena.

2. Basic concepts of industrial accidents and safety

As a social phenomenon, science or theory, security is the subject of philosophical thought, and organizational sciences. For Thomas Hobbes security is the most fundamental value. There is no doubt that security is one of the most important human needs which satisfy other needs (freedom of individuals or social groups, the needs in the field of economic and other activities). Such a definition of safety is present in theoretical writings on management in organizations from the beginning of the last century, where it is treated as one of the basic conditions for the functioning of organizations (Kekovic and Nikolic, 2006).

Due to the complexity of the concept and the phenomenon of ubiquity, security is taken as cognitive and experiential framework for understanding the complex multidimensional risk today. At the same

time bearing in mind the legality of the appearance and change of the physiognomy of risk, the complexity of their causal links, latent and manifest the nature of hazards.

It is generally accepted that the concept of security today has become much more complex than it was during the "Cold War", and it is primarily due to the development of the globalization process. The concept of security today includes traditional (freedom from fear and from threats of physical violence) and new items (food safety, water safety, environmental protection, fear of the virus, terrorism). The United Nations say that the emphasis now is not only to protect the borders of a sovereign state, but also to protect from everyday worries. Today, people are more afraid of what would have to happen in a "free" and "secure" society of their completely militarily protected by the state, but from that to their territory could attack another country, or it could happen some cataclysmic event, such as a nuclear war. Today, new security risks related to income security and workplace, health care, environmental security and protection from violence, starvation or disease.

Development of technologies, rising competitive challenges in markets around the world, the struggle for natural resources and geopolitical dominance, increase in all types of crime and the emergence of new, intensifying the presence of various intelligence services and the increasing espionage in various segments of social, civil and economic activities, are some reasons which today more attention is paid to security segment especially in organizations engaged in economic activities.

It is no longer a question of whether the security management needs or not. Today this area is a matter of survival and is therefore the role of the security management all the more pronounced especially in areas where security management is not is a basic form of management, but also in function of preservation and growth of the organization, especially in those organizations which represent a very important factor in the economic security of the state (Talić and Talić, 2011; Vuruna et al., 2017).

Safe systems are those that are pre-protected, so that upon occurrence of certain incidents system remains protected. When it comes to performance and handling of ordnance, not only during the laboration, but also during handling, transport and storage, there is no absolute security, but it is set in relation to a particular danger or threat. Reaching a certain level of security, while laboration worker acquires additional security required for manipulating and working with resources.

Pyrotechnic safety system is an integrated set of organizational and tactical - technological measures and procedures aiming to the possibility of any damage and the result are reduced to an acceptable level in production plants and warehouses.

Security of the protected objects (for the manufacture, storage and transport of ordnance) and the reasons of protection are apparent and have a higher surface potential of the enormous harmful effects. Specifics of fire and explosion of ordnance in relation to other dangerous events only reinforce the reasons of protection:

- fires and explosions occur very quickly, without any prior warning signs, which would provide more time for rescue and evacuation,
- most of the explosions creates a very strong impactor, sonic, thermal effects in accordance with the purpose of ordnance - destroying and killing of,
- material destruction and damage caused during accidents are enormous,
- exact causes of fires and explosions usually can not be determined. As an aggravating factor in citizenship with complete ignorance and lack of understanding in all aspects of a dangerous weapon.

The accident, according to the standards of the European Union, is a sudden occurrence of a large emission, fire or explosion as a result of unplanned events within a particular industrial activity, which occurs within or outside the network including one or more of the chemicals (Group of authors, 2008). According to the Law for the Protection of Environment of Republic of Serbia, synonymous with the term "accident" is "crash", which comprises a sudden and uncontrolled event or series of events, which occurs non-controlled, spilling or scattering of dangerous substances in the production, transport, use, transport, processing, storage, disposal, or storage of long-term inadequately.

The causes of accidents are the subjective and objective character: inattention employees, force majeure, uncontrolled technical requirements, etc.

The technical and technological incidents can occur in (Becelic, 2008):

- installations for the production and processing of hazardous substances,
- plants that manipulate dangerous substances,
- storage of hazardous materials,
- traffic during the transportation of hazardous materials,
- landfills where they can find dangerous substances.

Basic features of technical and technological accidents are (Jeremic et al., 2008):

- accidents comes suddenly, usually at night and often in batches, accidents are quite unpredictable with respect to place, time, type and location, especially when it comes to an accident involving hazardous substances,
- have a lot of specifics, given the possibility of occurrence and the scope for people, working and living environment,
- quite frequently, and in addition to stopping the process of uncontrolled release of hazardous substances, result of repair is difficult and requires a long-term process,
- at the site where the accidents are mostly related to fixed installations and transport,
- security of chemical accidents in peace requires complex measures (monitoring, protection, removal of consequences) and reaction, namely response to the accident according to pre-defined protection plans.

Risk is the probability of occurrence of a certain harmful effect on humans, property or living and working environment in a given time, as a result of the realization of some danger or situations, or the occurrence of accidents. Acceptable risk is the accident with a high probability that it will occur, but with negligible consequences (Jovanovic, 2007).

When working with ordnance all elements of risk are defined in advance, or at least most of them, and have taken precautions in case of accidents is not the result or they are kept to a minimum. The biggest problem that occurs when laboration ordnance is a condition in which the employee is located. His psychological, physical, moral and spiritual condition can be decisive, because it is certainly more likely to be a fault in the system occur due to human error, but due to the cancellation of a machine. The level of psycho - physical quality and level of education of the people engaged in completely determines the complexity of work with ordnance.

In Table 1. are shown causes of the industrial accidents (Kekovic and Nikolic, 2006).

Table 1. Causes of Industrial Accidents
CAUSES OF INDUSTRIAL ACCIDENTS

Unsafe conditions (insufficient lighting in the workplace, exposure to extreme temperatures, inadequate protection when working with machinery or hazardous materials, electrical installations)	Unsafe actions (negligence by workers, organizations and manufacturers)	External causes (fire, chemical emission, the emission of toxic gas or radiation, the error in the organization, the human factor, the abnormal operating conditions, the natural forces, external factors, errors in a software system)	Internal causes (equipment, toxic chemicals, hazardous materials, human error)
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From the above it is clear that the danger to humans and the environment, and therefore by the state of human security, can cause various industrial accidents.

3. Importance of preventive activities

Production of arms and military equipment in the Republic of Serbia is proportional to the needs of the Army and the possible export business. Production that is harmonized organizational and technological means mixed and complex industrially technology (base - chemical, chemical - technological, electro - chemical, electrical, mechanical, etc.). Risks in such manufacturing processes are a reality and a duty to be reduced to a minimum.

Explosive substances which are used in the manufacture of armaments and military equipment (AMQ), which we believe to cause the greatest risk, during the actual manufacture and integration of, including the storage and use, can be classified into the following categories: explosive materials, propellants, rocket fuels (solid and liquid), the liquid oxidizers rocket propellant, pyrotechnic mixture (Jovanovic, 2007).

Basically, in terms of prevention of occurrence of accidents in the defense industry, as well as preventive activities in other areas of industry, represents a set of activities and measures that enable the prevention of emergency situations or harmful effects of industrial accidents caused by such disasters, and as such prevention represents a huge moral imperative (Berisa et al., 2015).

Effective prevention is always preferable, but reaction in the event of an accident, because it significantly reduces human suffering and economically more justified. Procedures and preventive measures to prevent the occurrence of miraculous situation and mitigate the effects can be: engineering - construction, urban - planning, economic, institutional and social.

Prevention is the set of measures and actions to be taken to a potential accident place to prevent and reduce the probability of accidents and potential consequences, and consist in an adequate spatial planning and zoning (determining the protection zone and the safety zone); making the analysis of the accident risk and giving opinions and approvals on them; selection of those technologies that allow a greater degree of protection, reducing transport needs of hazardous substances and reduce the emission of pollutants of living and working environment; timely elimination of all identified technical - technological defects; maintenance work - the technological discipline at the required level; comparative maintaining the patency of all the roads and passages within the hazardous installations; the application of technical means and equipment for detection and protection; control and monitoring and control system security; reviewing existing technology and improve its security; review the location of individual plants; reviewing and improving existing means of personal and collective protection and decontamination; reviewing the planning, training and practicing employed and cooperation with specialized authorities and organizations at all levels; information may be jeopardized through the middle and the media.

Prevention measures to prevent and reduce the possibility of an accident in the arms industry include measures in the design and construction (envisaged and implementing spatial planning, design and construction of facilities and installations); technical - technological measures (planned and implemented by selecting production technology, technological equipment, process control, etc.); fire protection measures (provided for in the security and protection, detection and identification of danger, warning, and response to danger); organizational measures (measures provided for the purpose of training and training people to manage and respond to accidents); other measures (protective outside the surveillance complex, notification, evacuation, emergency response, etc.). These measures can be viewed from the aspect of preventing further deterioration of the situation and reduce the risk but when it comes to accidents. The dimensions shown are in that it can be carried out in an explosion ordnance (EO) and the chemical contamination would be the following: panic prevented to avoid major accidents, and the result of; employees quickly and safely leave the danger zone or the object; the evacuation of injured workers being taken into account to avoid injury to rescuers; call the medical support and provide first aid to the injured; if as a result of the explosion appears to be the localized fire.

4. Entities security activities in the field of prevention and elimination of the consequences of industrial accidents

Basic security entities that act as a preventive and after the occurrence of accidents in plants of the defense industry are: 1) First of all the highest and direct managers (directors, managers drive leaders as individual technological units, etc.); 2) Qualified persons and groups in charge of safety at work, fire protection and environmental protection; 3) An executive authority from the composition intended for the company response of emergency (firefighting team, the rescue team, the medical team, the forces for the emergency evacuation of personnel and resources et al.); 4) Forces for emergency response in case of accidents are outside companies, which are part of the organizational units of the MoD and SAF or civilian structures, which have adequate forces (fire - rescue units, the forces of the Emergency Management Sector of Ministry of Interior, medical institutions, the crisis staffs local board, search and

rescue teams to detoxify people and decontamination agents, forces to block access to the site of accident - Ministry of Interior authorities, utility companies with appropriate equipment).

Accidents/emergencies can be prevented by applying appropriate preventive and corrective measures. In this sense, there are a number of procedures laid down in the relevant guidelines on the treatment of hazardous substances that act preventively so as to prevent unwanted situations.

Immediate preventive measures to prevent the fire would be: noted signs of prohibition, warning and danger in a prominent position; provide fire extinguishers and hydrants; regularly to control mobility of roads; all clearly marked fire roads; conduct regular staff training and assessment in the field of fire protection; in an obvious place to put a brief introduction of response in case of accidents (explosions, fires) with equipment which is necessary; on the fuel station, engine vehicle must be turned off while refueling; tanks cleaned regularly of a precipitate that results in filling the fuel, in the longer of the same; regular inspection apparatus for dispensing fuel (Kekovic et al., 2010).

Direct prevention measures when working with inflammable liquids and hazardous substances are (Markovic et. al, 2013) properly stored flammable materials; for storage use a secure, hermetic packaging in which there is no risk of breakage, spills, etc.; ensure safe transportation of fuel or other flammable liquids to the place of work; refueling (warehouses) carry out the prescribed protection measures; ensure that storage to be away from the place of work; dangerous substances should not be stored near heat sources; dangerous substances should not be stored in warehouses built of flammable material; dangerous substances should not be stored near combustible materials; the storage temperature maintained within the given range, depending on the type of hazardous substances; warehouse must have adequate ventilation; in an obvious place put a brief introduction of emergency response as well as information about the equipment that is necessary and empty container (adequately decontaminated) always kept separate from full containers.

Prevention measures in order to prevent occurrence of the explosion of munitions, explosive materials that include (Mladjan, 2009) every operation with a dangerous (explosive) substance has to be performed precisely at the prescribed technological process; workers must be physically and mentally healthy and trained (theoretical and practical) for the proper execution of work operations; in the workplace should be noted user operation; prescribe general measures of protection (electrical installation in the EX protection, use nosparking tools, adequate protective clothing and footwear, protective masks and other measures).

In case of emergency, which can directly cause any adverse effect on the safety and health of humans, the immediate superior of the drive in which there was an emergency interruption of the work process, turns off the power supply and act in accordance with the established plan. The most urgent is the rescuing of injured or endangered humans and given first aid. Then organize transport to health institutions where providing adequate health care. Then, provide material resources and performs normalization of working conditions. Very important is the rehabilitation of the environment if there is a substantial threat to her. First aid performed by employees of enterprises of the defense industry that have undergone appropriate training. If there is a need to invite and professional emergency services. For the rehabilitation of the consequences and bringing working conditions in normal operation formed special teams of trained persons in such situations.

Reaction accidental release the following (Cvetanovic, 2015): for the neutralization of hazardous materials that caused the chemical accident, use appropriate chemical substance for neutralizing them, which is situated in all the objects which may give rise to a chemical accident; use personal and collective protective equipment; act in accordance with a previously prepared response plans in case of accidents (for chemical accidents) - which must be displayed in all facilities in which may cause chemical accidents.

Reaction in case of spills of dangerous substances boils down to this: to prohibit access to the open flame and sparking tools; sprinkle spilled liquid with sawdust or sand yellow. When the dust (sand) and filled with liquid, pick up the shovel into containers or drums intended for it and upload the stored waste materials; in the event of a major spill notify the director, the manager, referent of fire protection (RFP), Department of FP, referent for the protection of the environment (RPE), and a referent for security and safety (RSS) and further treated according to their detailed instructions; act in accordance

with a previously prepared response plans in case of accidents (for spills of hazardous substances) - which should be installed in all buildings that may spill of hazardous materials.

Reaction in case of an explosion of hazardous materials is the following: if came to explosion (detonation), it is very important to prevent a panic that could lead to even bigger and fortunately consequences; workers need fast and safe way to leave the building in which the explosion occurred; after explosion immediately begin the evacuation of the injured people, and the take care to avoid injury to rescuers; call the ambulance, while providing first aid to the injured; if as a result of explosion of fire occurs, it should be localized and prevent them from turning into a new detonation; special attention to the fact that in case of fire and explosion release different toxic gases: carbon monoxide, nitrogen gas, hydrogen sulfide, sulfur dioxide and others, so that the rescuers and firemen must be equipped with appropriate means of personal protection (masks, clothing, etc.); act in accordance with a previously prepared response plans in case of an accident (explosion of hazardous materials and munitions) - that should be installed in all buildings which may explode ordnance.

5. Characteristic examples of industrial accidents in defense industry in the Republic of Serbia

According to the International Labor Organization in 2008, statistics occurrence of industrial accidents in the world 6,000 people a day, or 2.2 million people die each year due to accidents in the workplace or as a result of the outcome of occupational diseases. Out of this number, there were 350,000 deaths due to the occurrence of accidents in the workplace.

Various industrial accidents in the defense industry in the Republic of Serbia, and before that in the FRY is reflected in the following (Cvorovic, 1999):

- On June 23rd 1995 there was an explosion at the facility Vinifleks factory "Grmeč" in Zemun and on that occasion 11 workers died and 10 workers were injured;
- On June 21st 1996 due to fire in defense industry "Prva Iskra" in Baric claimed the lives of two workers;
- On December 3rd 1997, due to a fire in the defense industry "Milan Blagojevic" in Lucani have killed three workers and seven were injured;
- On May 29th 2006, there was an explosion in the defense industry "Prva Iskra" in Baric and on that occasion that killed three workers and injured three workers;
- On September 4th, 2009, four powerful explosions in the gunpowder department of defense industry "Prvi partizan" in Uzice, when handling powders, killing seven workers and thirteen workers were injured;
- On May 10th 2010, in a weaker explosion at a defense industry holding corporation "Krusik" in Valjevo were lightly injured two workers;
- On December 27th 2010, there was a series of explosions caused by a fire at the facility for laboraciju ammunition in the defense industry "Sloboda" Cacak, no one was hurt but it caused great material damage;
- On September 21th and June 25th 2012, in the defense industry "Milan Blagojevic" in Lucani was an explosion on the presses for the production of double-base propellants, and on that occasion there was an injury to workers;
- On May 15th 2015, the defense industry holding corporation "Krusik" in Valjevo during testing lighter hand grenade explosion occurred and it was 7 injured workers;
- On February 28th 2017, at the Technical Repair Bureau of ammunition in Kragujevac there was a fire and explosion UBS prepared for overhaul, where killing 4 members and 25 members of the Bureau were injured and hospitalized.

Following analysis of all the above accident in the defence industry there is found that the majority of accidents result of the human factor, namely: non-compliance with workers defined technological procedures unconscientiousness and discipline in the performance of highly hazardous and charge operations, the transition to a routine for certain operations, and the absence of the required level of attention, lack of workflow control by direct supervisors, as well as by higher levels of management. In addition to these factors important role and those who are not a direct consequence of human factors, such as: insufficient elaborate security measures in particular technological procedures, certain working machines and drives do not provide a sufficient level of protection of the people, not provided clear and

effective procedures and procedures for the formation of accident, people not trained to the extent necessary to work in a safe manner, as well as procedures in accident and emergency situations.

6. Conclusion

The emergence of industrial accidents in the defense industry, particularly in the case of large-scale accident could have extremely negative effects and be dangerous to life and health, infrastructure facilities and resources, the living and working environment. There is no doubt that the effects of industrial accidents leave only short-term but especially long-term adverse effects on the environment and prevention is imperative in all serious considerations of industrial accidents. Preventive measures, as pointed out, should be given special attention and carry them continuously, continuously review and improve them. It is especially important to keep abreast of modern technical - technological solutions in the defense industry in the immediate environment and the world, to raise the level of protection and security of human and material resources and in accordance with its own normative, organizational, technical, material and financial capacities to plan and implement the same in own enterprises of the defense industry.

Experience in the field of potential causes and the danger of industrial accidents must be constantly exchanged the entire security society, ie. beyond the borders of national countries, and the same in the future procenname install, optimize and improve the system, which contain processes and technologies for the production, storage and transportation of hazardous, especially explosive and flammable substances.

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