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SERBIAN ARMED FORCES UNITS SECURITY MEASURES DURING CHEMICAL ACCIDENTS CAUSED BY NATURAL CATASTROPHES

Abstract: *Chemical accidents can occur due to the occurrence of undesired events in the functioning of the plant (technogenic accidents) during the war conflicts with the planned action of the enemy in the objects of the process industry (destruction of chemical plants), but also as a result of natural disasters (earthquakes or floods). In these circumstances, besides civilian structures, units of the Serbian Armed Forces, which are in the immediate vicinity of the plant, may also be involved. The consequences that result from the destruction of chemical plants can significantly aggravate the functioning of the local community and military units. Problems have been noticed in this paper, one of the ways of securing the units of the Serbian Armed Forces during the destruction of chemical plants is shown, and proposals for procedures for reacting in these circumstances.*

Key words: facilities destruction, tactical units, security, consequences removal

INTRODUCTION

Emergency situations caused by natural disasters affect many human lives on a daily basis, and in various ways destroy and degrade the environment, directly or indirectly, causing great material damage and losses. The risk of catastrophes exists in every society and their occurrence in one region can cause damage in another region, because they are not locational. The consequences of natural disasters can also be damage of to large plants, which leads to the emission of harmful substances into the environment.

No country, regardless of the level of development, can ignore the risks and dangers of natural disasters and other forms of destructive activity on humans, plants and the environment. Total losses, either indirect or direct, are billions of euros. The Republic of Serbia has systematically regulated the safety of its citizens and the establishment of organized protection of the population in situations when they are affected by opportunities that hinder or prevent the regular functioning of the society and are caused by the effects of natural disasters. This paper presents the role and method of reacting the Serbian Army to the occurrence of rightful events due to the emergence of natural disasters, with special emphasis on chemical hazards. Roles and obligations are described before, during and after the occurrence of an unwanted event whose occurrence is treated as a consequence of a natural disaster and the considered advantages and disadvantages of the existing system.

MILITARY AND ACCIDENTS

Accidents are possible at all times and in different places, especially in the areas where chemical plants or storages for dangerous chemical materials (DCM) are located and where the traffic and transport of dangerous and harmful substances. The consequences that can occur (big human and material losses) have imposed a need for the implementation of adequate security measures against chemical accidents [1].

In peacetime, the Serbian Armed Forces (SAF), as an integral part of the society, deployed in the appropriate space can be endangered by the consequences of the chemical accident. In this case, the procedures for protecting people, equipment, facilities and land are similar and to a certain extent aligned with the operation of the competent civil authorities. In SAF there are appropriate regulations and instructions in which are provided procedures, measures and tasks for securing of commands, units and institutions from the accident and are given the basis of the organization of such security with the aim of preventing surprises, creating favorable working conditions, and preserving operational and functional abilities [2].

In war, the situation is far more complicated, since the number of causes of the chemical accident increases considerably. In addition to characteristic, peaceful chemical accidents, the effects of chemical weapons on chemical plants are possible, random and planned. Also, the state of war largely limits the possibility of protection and makes it difficult to take measures to remedy the consequences of such destruction. This issue is supported by the statement of the increasing orientation of combat actions towards urban areas,

where the most commonly concentrated chemical plants [3].

During natural disasters, the effects on the local community can be very high. Similarly as during the war, the possibility of preventive and proactive action in progress and immediately after a natural disaster has been significantly reduced. Also, some of the natural disasters, such as earthquakes and floods, can affect factory plants, thus enabling the emission of harmful substances into the atmosphere or air, endangering civilians and the army. When it comes to the third mission of the SAF (support to civilian authorities in countering threats to security), the tasks are aimed at providing support and assistance to civilian authorities. This is directly related to the natural and industrial hazards and consequences of an accident that pose an increasing threat to the development of society.

HAZARDS AND CONSEQUENCES OF DAMAGE OF TO CHEMICAL PLANTS

A chemical accident can happen in peace, but also in war. Since the notion of an accident implies - coincidence, an unexpected event, for war conditions, more appropriate term is destroying chemical plants. It includes planned, deliberately induced war destruction of chemical plants with the aim of causing human and material losses and environmental degradation for a longer or shorter period of time. The accidental character of a real event is much more suitable for natural disasters. The earthquake in the market area can damage the chemical plant and cause the emission of harmful substances into the environment. Flooding in the coastal area may cause the chemical plant to submerge, and cause the emission of harmful substances into watercourses. The SAF units may also be exposed to all these actions.

Undesirable events can occur on the production sites itself, but also in the chemical reservoirs, warehouses of raw materials and finished products, pipelines, vehicles for the transport of dangerous goods (tanks, wagons, ships) and various auxiliary facilities. The consequences of natural disasters, even in Serbia, could have taken on the unimaginable consequences that certain facilities containing hazardous substances were not defended (for example, in Šabac). Also, the near past points to all the unscrupulousness of the enemy and the situation that can arise in the deliberate destruction of various factories, including chemical plants [4].

In general, it can be said that the risk of occurrence of unwanted events in chemical plants by type, intensity and size depends on:

- DCM physical-chemical properties and toxicity;
- DCM released quantities;
- distance of the plant from the settlement or SAF units;
- land characteristic;
- meteorological conditions (soil and air temperature, wind speed and direction, vertical air stability ...);
- the organization readiness, as well as the appropriate authorities for undertaking preventive measures and measures to eliminate the consequences of a the accident and
- the unit's ability to take protective measures and eliminate consequences.

Potentially the biggest and most dangerous sources of danger are:

- gases and vapors - ammonia, nitrogen and sulfur oxides;
- sulfur dioxide, carbon monoxide, and carbon dioxide, chlorine, fluorine, phosgene, hydrogen sulfide and volatile hydrocarbons;
- inorganic and organic acids (sulfur, nitric, hydrochloric, fluoride hydrogen, vinegar, ants ...);
- hydroxides (sodium, potassium, ammonia);
- organic solvents and other compounds (benzene, toluene, o-oxylol, methanol, formaldehyde, phenol, acetone, nitro benzoyl, aniline, chlorinated hydrocarbons and organic phosphorus compounds);
- from the group of metals and non-metals: arsenic, mercury, zinc, lead, cadmium ... and their compounds, then nitrates and phosphates and
- from the pesticide group: herbicides, insecticides, fungicides and defoliants [5].

The most sensitive chemical plants are in basic, then in processing chemistry, petrochemicals and refineries, metallurgy and transport. Unfortunately, chemical plants in the Republic of Serbia are mainly located in large urban areas, so potential problems can occur in peace, during natural disasters or in the course of warfare.

Chemical substances are generally very sensitive to heat, moisture, mixing with other substances, impact, etc. This also indicates the high sensitivity of chemical plants in combat operations and when exposed to the effects of natural disasters, when they can easily be damaged.

When considering the possible consequences of damage to chemical plants, account should be taken of the primary affected area (PAA) and the subsequently affected area (SAA). The destruction of chemical plants in combat operations would happen with or without an explosion, and depending on the type of DCM, it would cause an instant or gradual release of matter into the atmosphere. In the immediate vicinity of the chemical plant, in PAA, very high fatal concentrations of poison in the atmosphere would be created, with pronounced contamination (aerosol, droplets, etc.). In such conditions, there may be interactions between different compounds and the formation of new toxic substances. The Secondary affected area is characterized by the formation of a contaminated cloud that can be affected by large spaces, (Figure 1), which is similar to war poisoning.

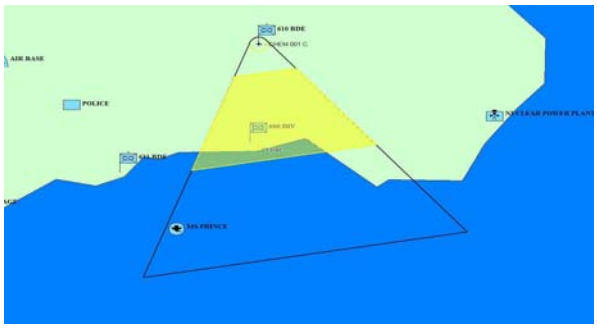

Figure 1. *Graphic representation of the situation after chemical accident using the NBC ANALYSIS software [6]*

In peacetime conditions, during a natural disaster, damage to chemical plants is similar to the above. Earthquake can cause the emission of harmful substances off the factory plant, most often in the air, while floods can lead to aquatic emissions, The fatal effect is mainly related to these substances in the immediate vicinity of the damaged plant, but the adverse effects of intoxication can thus be significantly increased.

Danger for SAF units that will prepare and perform activities near damaged chemical plants can cause certain consequences. Therefore, the general working or combat conditions are changed

The most common consequences of the destruction of chemical plants are:

a) in PAA: intense human intoxication, severe droplet contamination of material assets, objects and land, and the occurrence of specific fires;

б)) in SAA: moderate intoxication, and contamination with aerosols and vapors of the wider territory.

Depending on the type and quantity of released hazardous materials, meteorological and other conditions, it can also occur demolition in the center of the PAA, panic in units and population, more permanent pollution of the environment and other. When it comes to units of the Army, it is necessary to ensure their work and prevent major damage to chemical plants.

UNITS RESPONSE ON TO SECURING FROM CHEMICAL FACILITY DESTRUCTION

Damage or destruction of chemical plants can affect the activities of SAF tactical units (make it difficult to make a decision, postpone the execution of the task, request a plan, disrupt the continuity of operations in war or peace, etc.), causing losses, the intoxication of personnel and contamination of equipment and objects.

The most important measures and activities of the command of the tactical unit in the domain of security against the negative effects of damage or destruction of chemical plants are:

a. collecting data on dangerous substances in chemical plants in the regions where the units are located;

b. assessment of the risk of occurrence of unwanted events in the regions where the units are;

c. the use of teams for securing from chemical accidents or recruiting of new members in war (if necessary);

d. training of officers, commands and units for implementation of protection and security measures.

Data collection needs to be established:

- types and quantities of dangerous substances and their safety status (whether the tanks are buried, whether there is a possibility of displacement, discharge into watercourses, etc.),
- physical - chemical characteristics of materials,
- manipulating DCM and transporting the same to chemical plants and in them,
- the DCM's impact on people and the environment,
- their behavior in case of damage to the object (size of the PAA, formation of the contaminated cloud and its range, depending on the forecasted meteorological conditions, stability, etc.),
- getting acquainted with the Chemical Abatement Plan,
- way of aligning the activities with the competent authority in the chemical state.

The assessment of the risk of occurrence of adverse events in chemical plants in the regions where the units are located, in principle, includes:

- units vulnerability estimation,
- assessment of the units ability to implement security measures against the effects of hazardous substances from a concrete chemical plant,
- the territory assessment,
- meteorological conditions assessment,
- Primary affected area assessment,
- Secondary affected area assessment,
- assessment of possible consequences ,
- assessment of the capabilities of chemical enterprises and civil protection units in the territory.

On the basis of the performed assessment, conclusions are drawn which, in principle, contain:

- the name and location of the chemical plant, the type and quantity of hazardous substances in it,
- available time for notification - alerting and unit protection measures,
- possible effects on live power, mobile assets and the environment,
- state of equipment for personal and collective protection and elimination of consequences,
- measures taken by the competent authorities in the chemical plant,
- the ability of the unit to reduce the consequences of unwanted events, in cooperation with enterprises, to the extent that will ensure the continuity of performance of work tasks.

The filling of an existing team for the security of chemical accidents in peace to new members is an important activity of the unit and is reflected in the need for its continuous functioning, bearing in mind that the eventual occurrence of an accident in the areas in which the unit is located is in a significant and specific problem for units command. It is necessary that the team, on the basis of a comprehensive assessment, submit to the commander a proposal for solving the problem. The team as a whole and each member of its competence undertakes measures to increase the operational and functional capabilities of the command and units. For this purpose, several variants are being developed for taking measures and engaging forces for possible cases of undesirable consequences (war in the wake of war or major miraculous events in peace).

Training of officers, commands and units for the implementation of security and protection measures is a permanent task of SAF units. The basis for training is the regular training of commands and units for conducting combat operations in the conditions of application of weapons of mass destruction, supplemented with new contents specific to security from the occurrence of unwanted events at chemical plants. Officers and command training is realized through familiarization with hazards, probable effects, security organization, as well as applied training of command, where the modeling of possible situations trains the officers and controls their capabilities. In particular, the team for securing from chemical plant destruction is being trained, focusing on applied forms of training for specific tasks in providing a unit of securing from chemical plant destruction such as: situation assessment, calculation of possible effects, an organization of elimination of consequences, etc.

The training of professional soldiers and units is realized through getting to know the danger of chemical plant destruction and its effects, as well as by practicing concrete actions and procedures for protecting people and movables and eliminating consequences [7].

To perform tasks securing from damage to chemical installations due to war or natural disasters (rescue, evacuation, first aid, disinfection, decontamination), special teams for the elimination of consequences and unit (medical, traffic, firefighting, CBRN, engineering etc.) are trained. Training in the implementation of certain actions and procedures is carried out with existing (formative) means of protection and decontamination and local resources, if the unit has them.

General protection measures are carried out by all SAF members in accordance with the tasks and responsibilities of the missions assigned. General measures are realized by: reconnaissance, using personal and collective protection tools, power maneuver, dosimetry control, organization of control and protection services and decontamination [8]. Additional activities are:

- pointing first and emergency medical help,
- establishment of a disrupted system of command and unit regulation (if necessary),
- fire extinguishing (if caused by the effects of dangerous substances) - Figure 2,
- removing obstacles and clearing ruins - Figure 3,
- and the execution of chemical decontamination (people, movables and objects) - Figure 4.

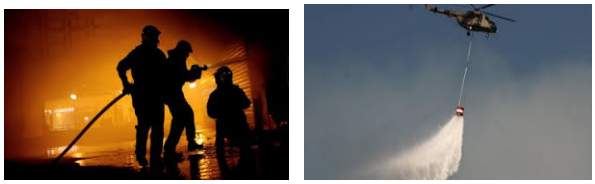

Figure 2. *Fire extinguishing (from ground and air)*

Figure 3. *Deforestation of ruins using engineering assemblies*

Figure 4. *Chemical decontamination of mobile assets*

Measures for removing consequences must be pre-planned (planned), organized organically and according to the goal, place and time. The personnel who implement them must be trained and trained in different variants of the treatment of adverse effects [1], [9].

CONCLUSION

When considering combat actions in contemporary conflicts, the problem of damage to chemical plants during natural disasters or in war conditions, with certain human and material losses and long-term consequences for the environment, is inevitably imposed. In this case, the unit's unit, during the preparation and execution of activities, plans, organizes and implements certain measures.

The effects of damaging or destroying a chemical plant are similar to a chemical attack, and by some manifestations even complex. The region in which the units are located may spatially cover the chemical plant or be in its vicinity. Security from the occurrence of

unwanted events at chemical plants during the execution at the level of the tactical unit is managed by the team for securing from chemical plant destruction. In particular, the measures that the team plans and organize in order to eliminate the possible consequences of the rightful events, in particular: pointing out first and emergency medical help, firefighting and chemical decontamination [10].

When considering the effects of the elimination forces, a key problem was detected, a large variety of hazardous substances that can be found in the combat area, which prevents the standardization of methods and training of military units. On the other hand, all of them have forces in the territory, for a concrete chemical plant. Therefore, the activities of the SAF units must be coordinated with the measures of the special teams of chemical plants and authorities in the territory, so that they are the carrier of the activity, and that the units of the SAF help in this, first of all, as support for the implementation of complex and dangerous activities [11], [12].

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BIOGRAPHY

Srđan Rutić was born in Kruševac, Serbia, in 1975.
He received the diploma in CBRN Military Academy and the Ms.C. degree in Environmental Protection from the University of Nis, Faculty of Occupational Safety.
His main areas of research include WMD protection, CBRN Terrorism, Military, etc.
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OBEZBEĐENjE JEDINICA VOJSKE SRBIJE PRILIKOM HEMIJSKIH AKDICENATA IZAZVANIH PRIRODNIM KATASTROFAMA

Srđan Rutić, Dejan Inđić

Rezime: *Hemijski udesi mogu da nastanu usled pojave neželjenih događaja pri funkcionisanju postrojenja (tehnogeni udesi), u toku ratnih sukoba planskim dejstvom neprijatelja po objektima procesne industrije (razaranje hemijskih postrojenja), ali i kao posledica prirodnih katastrofa (zemljotresa ili poplava). U ovim okolnostima pored civilnih struktura mogu biti zahvaćene i jedinice Vojske Srbije koje u neposrednom okruženju postrojenja izvode svoje aktivnosti. Posledice koje nastaju razaranjem hemijskih postrojenja mogu značajno otežati funkcionisanje lokalne zajednice i jedinica vojske. U radu je su razmatrani problemi obezbeđenja jedinica Vojske Srbije prilikom razaranja hemijskih postrojenja i dati su predlozi postupaka za reagovanje u ovim okolnostima.*

Ključne reči: razaranje postrojenja, taktičke jedinice, obezbeđenje, Vojska Srbije.