ZRÍNYI MIKLÓS
UNIVERSITY OF DEFENCE
ARMY ENGINEERING PhD SCHOOL

THESIS

Lauer János
Lieutenant-colonel

The title of the PhD dissertation:

The clearing of scenes contaminated by hydro-carbons and their derivatives from the aspect of the primary intervening fire brigade units

Consultant:
Dr. (PhD) Vincze, Árpád
Assistant Professor
Doctor (PhD) of chemical sciences

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SUBSTANTIATING THE CHOICE AND THE RELEVANCE OF THE TOPIC, STATING THE SCIENTIFIC PROBLEM

It is well-known that crude and oil products contaminate the environment very badly, which causes a more and more serious problem nowadays.

Oil-contamination may make the soil unfertile and it might be a real danger to the water resources if it reaches deeper ground layers.

This problem has to be taken into consideration even in the long run, as damages to oil-tankers and underground containers might seriously contaminate the environment.

Tank vehicles and tank wagons might be damaged during transportation, which means that under certain circumstances hydro-carbons and their derivatives can contaminate the environment. The real danger of oil products is that they are very persistent, that is they fragment very slowly, and they are able to spread on huge surfaces to contaminate large water- and soil-surfaces. Films or oil layers developing on these surfaces hinder the living creatures in the water or soil from breathing, which causes the deterioration of the environment. Crude contamination of soils, subsoil waters and surface waters is given a special emphasis at scenes where these waters provide drinking water resources.

A relatively small amount of contamination (e.g. 100 mg/m^3 petrol) is enough to give the water a bad smell and taste. Other flammable additives and contaminants may accumulate in low-lying cellars, basements, underground cable tunnels and ducts for services and they might even cause fires or explosions.

Bad damages and contaminations can be caused by oil-bearing contaminants that get to the surface due to explosions or blow-outs while drilling oil- or gas-wells.

Liquid oil-products may also cause surface- and subsoil-water contaminations due to failures at industrial units or containers that are defectively insulated, corroded or leaking. (An interesting piece of information from the USA: “according to the Department of Environmental Protection, in 1991 more than 200 000 out of the 1.5-2 million tanks that are in use in the USA are leaking”)

Different products of the petroleum industry, crude-oil fractions, additives, fragmentation products, other contaminants and some of their components are carcinogen and rather toxic after a longer period of contact.

As I have already mentioned, pipelines for crude and its distillate products might cause serious contamination if they are broken. Quick and expert intervention can greatly reduce the extent of soil contamination.

From the point of view of soil contamination, continuous leakages are considered more dangerous than pipe-breaks or tank bloating as the former is usually detected only when the contamination has affected a large area and has reached the sub-soil waters.

Besides accidents that happen during transportation either in tank vehicles or in tank wagons, contamination can occur during flow-through.

Oil products that pollute the environment may come from oil-bearing wastes (dead oil, engine oil, oil sludge from tanks, worn-off oil-cooled transformers, oil-bearing detergents and sludge) that are not stored properly. In case of these wastes, one has to be aware of the fact that besides their oil content further additives and contaminants (detergents and toxic heavy metals) might pollute the environment as well.

Along railway lines it is very frequent for different oil products and organic solvents to get into the environment due to defects to tank wagons.

To carry out investments in the petroleum industry it is essential to work out more and more established studies on environmental protection, focusing on geology, hydrology and pedology as well as forecasting the possible consequences of accidents that might happen.

It is the units of the fire brigade, who arrive first at the scene of the contamination. Their speed of work and competency is of essential importance as for the reduction of contamination risks and the efficiency of further decontamination. It is not enough to emphasise this responsibility of the fire brigade.

It is necessary to work out a procedure, in which the speed and the efficiency of the intervention can be proved scientifically.

The intervention of the above mentioned units is of basic importance from the point of view of the final outcome of the damage. The fire brigade needs to possess the relevant pieces of information, both about the environment and about the contaminants, to be able to decide on the appropriate steps of their intervention. It is essential to choose the optimal tools and technologies and carry out the intervention in a well-prepared way.

Primary intervention means a series of actions, which is started when the damage is reported and lasts until the scene of the damage is stabilised or the long-lasting process of decontamination is started. The parts of this process are reporting to the on-duty officer of the fire brigade, ranking the event on the basis of the information provided, selecting the appropriate alarm-stage, procession to the site, intervention after arrival to prevent the contamination from spreading, localising it, exempting the scene from contamination partly or fully. In case of damages caused by hydro-carbons and oil products these actions include the prevention of spreading and leakage, the collection of hydro-carbons from the environment into a container and preventing further contaminants from getting into the environment. The primary intervention of the fire brigade to stabilise the state of the damaged scene and prepare it for the long-lasting decontamination process determines the further steps to be taken and the efficiency of decontamination. Quick and immediate reaction raises several questions for the primary intervening fire brigade units.

THE AIMS OF THE RESEARCH

In order to be able to develop the efficiency of the activity taken by primary intervening fire brigade units after averages caused by hydro-carbons and their derivatives, I have set the following aims:

Taking the above mentioned facts into consideration, I have set the following scientific aims:

1. **To define the term ”primary intervention of fire brigade units” from the point of view of extinguishing averages caused by hydro-carbons and their derivatives.**

2. **To analyse the behaviour of the contaminants in soils, subsoil waters and surface waters contaminated by hydro-carbons and their products, from the point of view of primary intervening fire brigade units. To determine the parameters of the contaminant and the environment influencing the primary intervention of fire brigade units.**

3. **To systematise the technologies and materials that can easily be used by the fire brigade units during primary intervention in case of averages.**

4. **To create a database for the operating range of the primary intervening fire brigade units. This database should list the hydrocarbon pools having fixed storage tanks together with data that provide essential pieces of information in case of an average for the primary intervening fire brigade units.**

5. **To work out a fast-response classification system for the primary intervening fire brigade units that would help their job and make it more effective in case of an average.**

RESEARCH METHODS

To fulfil the aims set in my dissertation I used the following research methods:

My basic research method was to study, systematise and analyse the relevant technical literature.

Relying on my 15-year-long experience and my studies, I offer a method for experts of primary intervention in case of hydro-carbon averages.

Data gained from different resources have been compared, critically analysed and synthesised and analogies have been looked for to lead to algorithms that facilitate primary intervention.

During my research I studied both Hungarian and foreign publications and the latest results of other researchers.

The technical literature I used was provided by the Library of the University of Veszprém (now called Pannon University), the Library of the Zrínyi Miklós University of Defence, the Library of the BM KOK (the Education Centre of the Ministry of Home Affairs), the Department of Environmental Technology of the University of Veszprém, the Department of Environmental Protection of the Zrínyi Miklós University of Defence, Elgoscar environmental protecting ltd., Biogén environmental protecting ltd. and the Fire Station of Veszprém County.

I could get a good deal of help from periodicals on fire and catastrophe protection (Védelem, Tűzvédelem and its former counterparts), relevant periodicals on defence (Belügyi Szemle, Környezetvédelem) and foreign periodicals (Fire & Rescue). Besides Hungarian and foreign conferences, I could find useful information on the Internet as well.

It was of vital importance in my opinion to get deep information from the field of fire protection that is in immediate connection with my topic. These pieces of information come from my studies, my work experience and my research.

Another important thing was to get relevant information from connecting fields, such as environmental protection and water conservancy. To be able to meet this requirement I attended the faculty Environmental Engineering at the University of Veszprém.

I also used several case studies in connection with clearing contaminated areas.

I paid a close attention to the hydro-carbon averages that happened in the recent past.

I consulted Hungarian and international experts dealing with clearing contaminated areas.

I have taken part in study trips to get an insight into the applied technology (mostly in terms of materials selected) of clearing soils contaminated by hydro-carbons.

To meet my targets successfully I mostly used the inductive method of scientific cognition. This was justified by the way in which I intended to analyse the topic and by my research aims that require a wide-scale analysis, a deep comparison and the usage of description.

A SUMMARIZED DESCRIPTION OF THE ANALYSIS CARRIED OUT

In the introduction of my dissertation I explained why this topic is relevant, I circumscribed the important role of the primary intervening fire brigade units and I defined the way I use the term clearing concerning contaminations caused by hydro-carbons. My dissertation consists of three chapters.

1ST CHAPTER

In the first chapter I deal with the role of the primary intervening fire brigade units at the scene of averages caused by hydro-carbons and their derivatives. I give a definition of primary intervention of fire brigade units. I examine and analyse the properties (both physical and chemical) of hydro-carbon products, I look for connections that have further effects on primary intervention. I also examine the properties of the contaminated agent, such as the soil, the subsoil water and the surface water, their connection and inter-reaction with the contaminant and the processes that influence the primary intervention. Furthermore, I examine the migration of hydro-carbons at the scenes of contaminations. At the end of the chapter I draw conclusions.

Conclusions:

The primary task of primary intervening fire brigade units when arriving at the scene of an average caused by hydro-carbons and their derivatives is to localise the contaminant, to prevent it from further discharge and to neutralise the contaminants that have already got into the environment. This process is the primary intervention of fire brigade units, which means an activity carried out on the surface (surface decontamination), under the surface (under surface decontamination, or at both scenes at the same time. The aim of this activity is to prevent further contamination from getting into the environment by eliminating the source of contamination, localising the contamination and decontaminating the site partially or fully. The ones who carry out this action is the primary intervening fire brigade units.

Although the **water-solubility** of hydro-carbons is an important parameter, it is not inevitable from the point of view of primary intervention. However, it is of basic importance during the long-term clearing of the scene, when it is necessary to take into consideration that a certain amount of hydro-carbon derivatives might be found in the elements of the environment and they have to be cleared from there.

The **density** of the oil-products affects their vertical and horizontal movements. This process is inessential from the point of view of the primary intervention of fire brigade units, but it is important to know the density of the contaminants on the course of the long-term clearing process.

From the aspect of the movement of hydro-carbon and oil-products, it is not important to know the **wetting ability** of crude derivatives, but it is important to know the details of the capillary forces if one wants to find out details of the mobilisation of immobile oil-contaminants in case of long-term contaminations. If crude or its derivatives get into the environment –from the aspect of their mobility–, it is essential to consider interfacial forces between solid surfaces and liquids or gases, or between solid surfaces and non-mixing liquids. The combination of these interfacial forces determines the watering ability of soil particles and the capillary pressure in porous agents.

Although the triple inter-reaction of the **viscosity**, the ambient temperature and the water-content of the recipient soil affects the rate of infiltration, these data are not important for the primary intervening fire brigade units. It is enough to determine the **kinematic viscosity** of the contaminant from an already existing data-base when the contaminant itself is identified and then conclusions can be drawn regarding its infiltration, which is also affected by the soil-structure.

The data in Table 8 make the fact understandable, that petrol is faster, while other oil-products are slower to permeate into the soil in case of the same hydraulic descent.

Because of the **fugacity** of hydro-carbons it is relatively easy for the primary intervening fire brigade units to detect the scenes contaminated by hydro-carbons, as even a very low concentration of hydro-carbon derivatives can be smelled. Furthermore, it is easy to identify certain products having typical smells, such as petrol and kerosene.

Although the knowledge of the **dielectric constant** of the contaminating oil-derivative is not of a great help during the primary intervention, it is an important data on the course of the encircling and the long-term clearing of the site.

When an average takes place, the hydro-carbon concentration of the liquid-phase in the soil is far from the ideal, equilibrium concentration, which can be measured under laboratory circumstances. This means that the amount of contaminants solved during the first phase of the average is not as much as it could be under ideal circumstances. This is caused by the fact that crude and oil-products cannot mix steadily, as there is no process that would mix them. This process is only facilitated by diffusion, which is long-lasting. This is very advantageous from the aspect of primary intervention as non-dissolved contaminants can easily be neutralised.

In case of contaminations caused by crude or oil-products, it is important for the primary intervening fire brigade units to know the **soil-structure** of the scene, as different structures of the soil cause different rate of flow-off and infiltration.

It is also of vital importance to know the **subsoil-water parameters** (the streamline and the water-level fluctuation of the subsoil-water) of the contaminated area, as they affect the migration of the contamination.

The main accumulation site of the hydro-carbon contamination is the oil lens floating on the surface of the water, the investigation of which does not belong to the job of the primary intervening fire brigade units.

It is vital to have information about the **amount of precipitation** at the contaminated area, which might help to draw a conclusion regarding the water-content of the soil. The retarding capacity of wet soils is rather low, which enables the oil-contaminants to cover longer distances both horizontally and vertically.

If there is a chance for the contamination to reach the subsoil waters, it is necessary to know the depth of the capillary zone, as the contaminants spread and remain in this layer for a longer period of time. This process is of secondary importance from the aspect of the primary intervention.

While in case of soil contamination only a relatively low amount of oil-content adsorbed to the soil particles can be detected, free oil components accumulate in the capillary zone and their movement is limited by the capillary force.

Analysing the characteristics of oil-products I found that it is enough to place the contaminant in the right group of materials and find out its type (e.g.: petrol-type, gasoline-type, etc.) In practice it is often possible to decide on the basis of smell. To define the exact identity of the oil-product is important in long-term decontamination, as different materials react in different ways when meeting elements of the environment, such as soil, sub-soil waters and surface waters.

In case of averages caused by crude derivatives there are four important parameters to be considered:

1. the type of the contamination
2. the type of the contaminated soil
3. the state of soil moisture
4. the state of sub-soil water-level.

2ND CHAPTER

In the second chapter I summarised the aim of extinguishing technologies and the aspects of their selection. I systematised the materials that can be effectively used on the course of the primary intervention. At the end of the chapter I made statements regarding the aims set.

Conclusions:

The clearing process connected to contaminations caused by oil-products can be divided into to groups. The first group contains the immediate actions, where unexpected, non-planned actions are to be completed. This covers the elimination of the cause of the contamination and the localization of the contamination. To fulfil the special requirements only specially trained teams or units can be put into action. The second group contains a long-lasting job of decontamination, which might even last for months or years, and does not belong to the competence of the primary intervening fire brigade units. In

this case, environmental pollution usually originates from long-term misuse. This kind of decontamination is to be completed by specialised enterprises. It is not the subject of my dissertation to analyse these tasks.

The most important facts to be considered when selecting the technologies to be used on the course of primary intervention:

- The examination of the possibility of the spreading of the contamination
- Partial clearing (e.g. exploitation of the oil lens)
- Partial or complete disposal of the contaminated area.

When selecting the appropriate technology, it is important to consider the social and economical factors of the area separately but at the same time in close connection with each other.

The clearing process of contaminated areas is well-regulated by law. Fire brigade units have to act as primary forces if the contamination occurs due to an accident during transportation. The most frequent cases are when the transporting vehicle suffers an accident (crash, overturn or derailment) due to which the container tank (the tank itself, the isolating cock, etc.) gets injured, which lets oil-products flow into the environment. The break of oil-pipes is to be handled as any other problems happening during transportation.

There is a wide range of materials which can be used in case of contaminations caused by oil-products still there is no single algorithm to be followed in case of averages. Among the equipment of the municipal fire brigades mostly traditional materials, such as sand and perlite, can be found all over Hungary. However, there is a trend to standardise the content of the containers used by the chemical- and technical-rescue teams. Standardisation has already yielded its result in some aspects, such as special adsorbents, pumps and containers, which can be used very effectively at primary intervention. As one of the most important tasks of the primary intervening fire brigade units is the localisation of the contamination, the time factor (the length of time between the accident and the primary intervention) is of special importance and it is closely related to the success of the action.

On the surface of soil and water the primary intervening fire brigade units can localise the contamination caused by hydro-carbons but they cannot do so in case of underground contamination.

By enumerating the materials that can be used in case of contaminations caused by oil-products I wanted to emphasise the numerous combinations of the possible tools. The special decontaminating materials selected by the primary intervening fire brigade units determine the efficiency and the success of the intervention.

From the adsorbents it is the oil-selective ones that can be used the most effectively by the primary intervening fire brigade units, as these materials are of hydrophobic character, they are water-repellent and they only occlude oil and oleaginous materials. Their effectiveness is increased by the fact that they are able to bind oil even from the surface of water.

It is very important to have special and universal adsorbents among the tools of the primary intervening fire brigade units, because they are appropriate and effective in case of oleaginous and aqueous materials (e.g. when oil and water mix). Besides, they can be used indoors and at dry outdoor scenes alike.

In my opinion, the increasing amount of hydro-carbons used by the industry, their transportation and storage causes an ever-increasing danger of accidents and environmental hazards. During the actions to be taken in case of accidents it is necessary to have primary intervening fire brigade units, which are equipped by special, high capacity equipment and adsorbents. Compared to traditional materials, like sand or perlite, a very small amount of these materials can bind a lot of contaminants and they can be used in case of a wide scale of materials.

The time factor (the length of time between the accident and the primary intervention) is of special importance and it is closely related to the success of the action. To be able to select the most appropriate technology to be used, it is vital to have enough information about the local specialities and to know the present and future function of the contaminated area.

In case of oil-contamination, it is essential to prevent the oil-body from spreading either horizontally or vertically. I analysed the decontamination process for contaminations caused by oil-products and taking place on water-surfaces. I considered the main connections between the physical and chemical properties of oil from the aspect of decontamination. In case of averages taking place on surface waters are carried out as shown in chapter 2.2. In this case primary intervening fire brigade units are involved.

The special decontaminating materials selected by the primary intervening fire brigade units determine the efficiency and the success of the intervention. It is important to emphasise that only previously tested materials are allowed to be used.

The increasing rate of hydro-carbon production, transportation, storage and usage cases an ever increasing risk of accidents as well. That is why primary intervening fire brigade units should use high-capacity adsorbents following standardised principles.

In my opinion, in the future special materials should be used for decontamination and a very small amount of these materials should be able to bind a lot of contaminants. These binding materials are ideal if they can be used in case of a wide scale of materials.

From the point of view of primary intervention, it is the most effective to use adsorbents due to their special characteristics. I defined what characteristics should be considered when selecting materials for primary intervening fire brigade units. These are as follows: surface, density, adsorption capacity, hydrophobity, oil-binding capacity, spreadability, type of material.

3RD CHAPTER

In the third chapter I analyse the detection and reporting of contaminations, I make a suggestion that a system should be established to facilitate primary intervention.

I work out a staging system to help select the appropriate type of intervention in case of averages caused by hydro-carbons and their derivatives. At the end of the chapter I draw conclusions from the results of my research.

Conclusions:

It is very dangerous when oil-products get into the environment, so this process should be prevented. On the other hand, experts have to be prepared for averages and their consequences. The role of the primary intervening fire brigade units is basic, as the expertise of the reaction and the intervention and their speed can decrease the damages to a great extent. Cutting down on the time necessary to react and intervene can facilitate the implementation of the above mentioned aims. There are four main groups to be formed on the basis of the actions taken to decontaminate the scene of an accident in case of contaminations caused by hydro-carbons and their derivatives. The groups are as follows:

1. Prevention
2. Detection
3. Staging
4. Decontamination

To be able to analyse the connection between the primary intervening fire brigade units and the decontamination process, I defined (not in this chapter) the term “primary intervention of fire brigade units”. The teams to carry out this process are the “the primary intervening fire brigade units”.

The primary agent of intervention, the fire brigade, needs a data-base, which lists the hydro-carbon pools with fix storage tanks in its operating range. These pieces of information are vital in case of an accident causing contamination. A classification system is needed for the primary intervening fire brigade units, which can simplify and facilitate the selection of the necessary actions. The classification of contaminations caused by hydro-carbon derivatives is a rather simple risk-analysis, the basis of which is the interaction of the different forms of contaminations, the geo-hydrological environment and the risks arising.

The primary intervening units, those of the fire brigade, need a database that lists the hydro-carbon pools with fix storage tanks in the relevant operating range to provide basic information for the case of an average caused by hydro-carbons and their derivatives.

SUMMARISED CONCLUSIONS

The environmental polluting effects of hydro-carbons and their derivatives are well-known and they cause more and more problems. Oil-contamination can make soils unfertile and if they reach deep layers, they might endanger the drinking water resources as well.

The success of the primary intervention following the detection of an average caused by hydro-carbons and their derivatives may affect the expenses and further tools of the decontamination. The primary task of primary intervening fire brigade units when arriving at the scene of an average caused by hydro-carbons and their derivatives is to localise the contaminant, to prevent it from further discharge and to neutralise the contaminants that have already got into the environment. It is necessary and urgent to increase the efficiency of the primary intervening fire brigade units.

The time factor (the length of time between the accident and the primary intervention) is of special importance and it is closely related to the success of the action. It is necessary to begin and carry out the primary intervention in an expert way, in the shortest possible time after the occurrence of an average. Primary intervening fire brigade units still do not have a method that would enable them to rate the contaminations and to select the most appropriate decontamination method. To be able to do so, it is important to the basic pieces of information influencing the method of primary intervention.

In case of soil contamination, a contaminant (liquid) with a low kinematic viscosity infiltrates at a higher speed (into the very same soil) than one with a higher kinematic viscosity. On the basis of this statement, I can say that petrol derivatives and aromatic diluting agents are faster than water, while diesel oil, kerosene and other, more viscous materials are slower to infiltrate into underground soil layers. Consequently, from the point of view of the primary intervention, it is enough to rank the contaminant into a group and to identify the type of contamination (e.g.: petrol-type, gasoline-type, etc.) and it is not necessary to know its exact chemical composition. This usually can be decided by smelling and there is no need for expensive, instrumental analysis. The exact composition of the contaminant is only needed during the long-term decontamination process.

To be able to judge the migration of the contaminant in the soil, besides the knowledge of the material itself, it is important to know the type of the soil, the moisture content of the soil, the level and the current direction of sub-soil waters and the fluctuation of its level. From the precipitation of the time before the average, conclusions can be drawn regarding the state of the moisture content of the soil.

All in all it can be stated that from the aspect of primary intervention of fire brigade units, it is satisfactory to know the type of the contamination, the type of the contaminated area and the state of the moisture content of the soil and the level of sub-soil waters. For all these, I think it is necessary to create a database for the operating range of the primary intervening fire brigade units. This database should list the hydrocarbon pools having fixed storage tanks together with data that provide essential pieces of information, and could provide a quick access to a part of the information the intervening units may need.

The clearing process of contaminated surface water areas is well-regulated by law. Fire brigade units have to act as primary forces if the contamination occurs due to an accident during transportation. The most frequent cases are when the transporting vehicle suffers an accident (crash, overturn or derailment) due to which the container tank (the tank itself, the isolating cock, etc.) gets injured, which lets oil-products flow into the environment. The break of oil-pipes is to be handled as any other problems happening during transportation.

There is a wide range of materials which can be used in case of contaminations caused by oil-products, still there is no single algorithm to be followed in case of averages. Among the equipment of the municipal fire brigades mostly traditional materials, such as sand and perlite, can be found all over

Hungary. However, there is a trend to standardise the content of the containers used by the chemical- and technical-rescue teams. Standardisation has already yielded its result in some aspects, such as special adsorbents, pumps and containers, which can be used very effectively at primary intervention.

The special decontaminating materials selected by the primary intervening fire brigade units determine the efficiency and the success of the intervention. From the point of view of primary intervention, it is the most effective to use adsorbents due to their special characteristics. I defined what characteristics should be considered when selecting materials for primary intervening fire brigade units. These are as follows: surface, density, adsorption capacity, hydrophobity, oil-binding capacity, spreadability, type of material. It is important to emphasise that only previously tested materials are allowed to be used.

Using the above mentioned results, I managed to work out a classification system to facilitate the selection of methods and tools used by primary intervening fire brigade units in case of averages caused by hydro-carbons and their derivatives.

Scientific results

On the basis of my dissertation I have formed the following scientific results:

1. **I have defined the term "primary intervention of fire brigade units" in case of averages caused by hydro-carbons and their derivatives. This process means an activity carried out on the surface (surface decontamination), under the surface (under surface decontamination), or at both scenes at the same time, with the aim of preventing further contamination from getting into the environment by eliminating the source of contamination, localising the contamination and decontaminating the site partially or fully.**
2. **I have pointed out that from the aspect of the primary intervening fire brigade units, it is enough to know the type of the contaminant, the type of the contaminated soil, the sate of the moisture content of the soil and the level of sub-soil waters.**
3. **I have made a suggestion that primary intervening fire brigade units should use special materials instead of traditional materials, such as sand or perlite when localising contaminations so that they could achieve better efficiency. I have also stated the points to be considered when selecting these materials.**
4. **I have suggested creating a database for the operating range of the primary intervening fire brigade units. This database should list the hydrocarbon pools having fixed storage tanks together with data that provide essential pieces of information in case of an average caused by hydro-carbons and their derivatives.**
5. **To improve the efficiency of primary intervening fire brigade units I have developed a fast-response classification system for averages caused by hydro-carbons and their derivatives.**

Recommendations

On the basis of my dissertation I recommend fitting the algorithms, important from the aspect of the primary intervention described in my dissertation, in the syllabus of the training courses for fire fighters employed at municipal fire brigades and outlining the fast-reaction classification system at courses for voluntary and institutional fire-chiefs.

I recommend that the primary intervening fire brigade units should apply the classification system worked out in my dissertation. I recommend rethinking the standardization of special decontamination packages used in case of contaminations caused by hydro-carbons and their derivatives, using the form described in my dissertation.

The results developed in my dissertation could be included in the training of fire fighters and engineers of environmental technology.

I think that the information I gathered, systematised and analysed can be of great help to the experts dealing with this topic in practice.

Last but not least I believe that my dissertation backs the improvement of professional municipal fire brigades.

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Lauer János

List of scientific publications

Presentations at conferences

1. LAUER, JÁNOS: The decontamination of soils, subsoil waters and mud contaminated by hydro-carbons and their derivatives (PhD Conference, November 2001.)
2. LAUER, JÁNOS: Fire prevention of listed monuments (The Ministry of National Cultural Heritage – Safety Protection Conference, June 2003.)
3. LAUER, JÁNOS: Fire-protection of forests in Veszprém County (5th Conference on Fire-protection, June 2003.)
4. LAUER, JÁNOS: The legal background, the operation and the resources of catastrophe prevention (Hungarian Army, Training course for chief officers, September 2003.)
5. LAUER, JÁNOS: The facts and possibilities of clearing areas contaminated by hydro-carbons and their derivatives (6th Conference on Fire-protection, June 2004.)
6. LAUER, JÁNOS: A complex action-plan for the safety of Veszprém County (The General Assembly of Veszprém County, May 2005.)
7. LAUER, JÁNOS: International consultation organised by the Ministry of Home Affairs – informing the inhabitants about the nuclear, radiological and chemical-biological threats (EU Solidarity Program, May 2005.)

8. LAUER, JÁNOS: Further fire-protection of listed monuments (7th Conference on Fire-protection, May 2005.)
9. LAUER, JÁNOS: Handling and extinguishing fires in civil engineering firms (Bramac Ltd. – Crisis practice, September 2005.)
10. LAUER, JÁNOS: The actual tasks and legal regulations of serious industrial accidents caused by hazardous materials (Institute for Environmental Development in Central and Eastern Europe, Regional Conference, October 2005.)
11. LAUER, JÁNOS – DR: ZÖLD JÁNOS: The connections between the global climatic changes and the experience in Veszprém County from the aspect of catastrophe-prevention (VAHAVA Project, Regional Discussion Forum, October 2005.)
12. LAUER, JÁNOS: Problems and technologies of clearing areas contaminated by hydro-carbons and their derivatives (International Conference on the Prevention of Transportation and Industrial Accidents, October 2005.)
13. LAUER, JÁNOS: The experience of handling emergency situations in civil-engineering firms (Conference on Emergency Management Technology, October 2005.)

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1. LAUER, JÁNOS: *Clearing soils contaminated by hydro-carbons and their derivatives* (*Katasztrófavédelmi Magiszter Könyvek*, 2001., pp.30-46.)
2. LAUER, JÁNOS – DR.PROF. SOLYMOSI, JÓZSEF – DR. VINCZE, ÁRPÁD: *The safety analysis of hazardous industrial plants* (ZMNE Homepage, *Fiatal Kutataók Írásai,* 2002.)
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22. LAUER, JÁNOS: *The top-guns of space warfare and their application* (Study, ZMNE Department of War-technology, 1999.)
23. LAUER, JÁNOS: *A review of fire-protection techniques* (Study, ZMNE Department of War-technology, 1999.)
24. LAUER, JÁNOS: *Fire-risk* (Study, ZMNE Department of War-technology, 1999.)
25. LAUER, JÁNOS: *Preparation for handling hazardous situations* (VÉDELEM, 2006. /2. p. 34.)

Others

1. Lecturer at the Gábor Dénes Technical College, at the Faculty of Safety Management, since 2000.
2. Lecturer at the University of Veszprém, 2005.
3. Lecturer at the training course for fire-men organised by the Chief Administration for fire protection in Veszprém County, 2005.
4. Lecturer at the training course for voluntary fire-men organised by the Chief Administration for fire protection in Veszprém County, 2005.
5. Lecturer at the training course for chief voluntary fire-men organised by the Chief Administration for fire protection in Veszprém County, 2005-2006.
6. Lecturer at the Secondary Technical School of Police-officers, Csopak, 2004.
7. Consultant for college students writing their thesis on topics in connection with fire-protection, since 2000.

CURRICULUM VITAE

Personal particulars

Name, rank:	**Lauer János, Lieutenant-colonel**
Place of birth:	**Veszprém**
Date of birth:	**17th October 1967**
Mother's name:	**Mihály Ilona**
Marital status:	**married with three children (András, János, Barnabás)**
Address:	**8443 Bánd, Kossuth L. u. 2/1**
Telephone:	**88/576-052**
Mobile:	**20/9336-655**

Schools

1982-1986	**Secondary Technical School of Chemical and Information Tehcnology (Veszprém)**
1987-1990	**Ybl Miklós College of Civil Engineering Faculty of Fire Protection (Budapest)**
1994-1998	**Technical University of Budapest, Faculty of Civil Engineering (Budapest)**
1998-2001	**Zrínyi Miklós University of Defence Faculty of Management (Budapest)**
2001-2005	**Zrínyi Miklós University of Defence PhD course (Budapest)**
2002-2005	**University of Veszprém Faculty of Environmental Engineering (Veszprém)**

Work experience

1990-1992	**Fire Station, Ajka** **- Head of Department of Fire-extinguishing**
1992-1994	**Chief Fire Station of Veszprém County** **- Head of Department of Prevention, Head of the Press Department**
1995-2000	**Chief Fire Station of Veszprém County** **- Chief prevention official, Head of the Press Department**
2000-2004	**Chief Catastrophe-prevention Institute of Veszprém County** **- Head of the Department of Prevention, Head of the Press Department**
2004-	**Chief Catastrophe-prevention Institute of Veszprém County** **- Assistant manager**

Languages

German – advanced level
English – elementary level

2006-05-04

Lauer János, lieutenant-colonel