

ZRÍNYI MIKLÓS
University of National Defence

Doctoral Council

RAJMUND KUTI, Fire Guard Major

**Special Opportunities for the Use of Water Fog Extinguishing Devices
and
the Research of their Efficiency in the Field of Fire Extinguishing and Damage
Elimination**

Author's Review and Official Reports on the doctoral (PhD) thesis entitled above

Budapest

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Consultant:

Lt. Col. Dr. László Földi, (PhD)

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THE EXPRESSION OF THE SCIENTIFIC PROBLEM

Looking back at the years passed away since the change of regime we can determine that because of the established circumstances the work of the fire brigade and the organisations dealing with damage elimination has become significantly more complex and responsible. The dangerous and complicated industrial technologies, the increasing value concentration and the rise of the endangerment of civil population require of the built-in fire protection and extinguishing devices to be efficient, and of the fire brigade's extinguishing-technical rescue operations to be fast, professional and successful.

It has been proved about many extinguishing material that they have environment damage effects. Therefore, following the principles of UNWEO, the alternative fire protection technologies, technical devices have to take out worldwide the damaging systems, including the ones using halon. With our European Union membership, the environmental protection, environment safety respects have come into prominence more and more even in our country. Thus, due to the severity, the use of environment friendly fire fighting material (e.g. water) has come to the front again. In Hungary, the fire brigade uses drinking water for fire fighting in approximately 90% of the cases during actions.

The special use of water can be made possible with the relatively new water fog devices whose application has not really spread yet in our country, although their efficiency, economicalness and minimal use of water in comparison with traditional fire extinguishing techniques is remarkable. According to my view, the cause of the not proper use of mobile water fog generators used at fire stations is that there is relatively limited special literature in Hungarian about these devices and there is not proper educational material either. Moreover, it is also a problem to fulfill chemical exemption tasks. The use of mobile water fog generators can be a solution to this problem.

With the help of my thesis I would like to clarify the actuality and importance of this topic, I would like to contribute to the spread and acceptance of this new, more economical, safer and measurably more environmental friendly way of fire fight.

RESEARCH AIMS

- To prove that the use of mobile water fog devices for standard and special aims, as well as the prevention and reduction of environmental damages is insurable based on the results of scientific research.
- To search, identify and analyse the specific descriptions, regulations, norms and other material of knowledge in connection with water fog devices to make requirements for systems and procedures be unambiguous.
- To try experiments expediently and to examine scientifically the possibilities of the standard and special use of available mobile water fog devices as well as their concrete extinguishing, exemptional, damage preventional and eliminational capacity and efficiency, starting from complex safety, knowing full demands connected to the professional field, based on process system and network view, using practical experience and theoretical results.
- To recommend to connect mobile water fog devices with existing and planned institutional and functional systems, based on effect surveys, taking the results of the tests into consideration.
- To suggest completing and modifying *Installation Rules* issued with BM OKF Action supplement No. 37/2003, elaborating exemption steps using mobile water fog devices to supply a defect.

RESEARCH METHODS

- **As a general method**, I am making a systematic, comparing, evaluating analysis after the search and identification of the relevant specific literature background, which is the basis of my conclusion.
- **As a specific method**, I am making appropriate experiments using the available mobile water fog devices, knowing the relevant foreign experience, and I am evaluating the results in a complex way.
- **As an individual solution**, I am proving my hypotheses based on the results of the experiments planned by myself.

SHORT DESCRIPTION OF THE COMPLETED RESEARCH IN CHAPTERS

In **Chapter 1**, I have introduced the general, physical, chemical features of water fog produced from the oldest fire fighting material, water, and I have examined its possible use for fire fighting.

I have surveyed the conditions of the formation of water fog. I have analysed the fire extinguishing effects of water fog aerosol in details, I have pointed out the complex extinguishing mechanism of water spray produced with certain water fog generators.

I have been dealing especially with the features of water fog jet produced with some pipe types and I have introduced the jet types in details.

In **Chapter 2**, I have introduced the legal and standard requirements (searched and collected by myself) in connection with water fog devices. I have revealed the imperfection of the national regulation.

I have collected, systematized and then described the general features of water fog devices through the introduction of available regular types. I have surveyed the possible use of different water fog devices.

In **Chapter 3**, I have examined the fire extinguishing abilities of mobile water fog devices with combustion engine. There have been made some extinguishing experiments planned by myself, having been carried into effect by trained firemen of the Professional Fire Brigade of Győr in a given number, under my constant supervision.

The (new) results have been recorded, compared and analysed.

In **Chapter 4**, I have surveyed the possibilities of chemical exemption at the fire station and I have revealed its limits. I have analysed the requirements to the establishment of the exemption place, and I have concluded that the regular instrument set is incomplete, so I have suggested supplying the needed equipment. I have also examined the chemical exemption training of the force, I have pointed out the problems and suggested correcting the training.

I have examined the mobile water fog devices on the basis of exemption respects. On the basis of the results of the comparing research, I have chosen the most suitable available instrument, then I have proved the suitability of water fog devices to chemical exemption during a complex damage elimination – exemption practice.

SUMMARY OF CONCLUSION

Considering the present situation it is obvious that the new millennium has brought new requirements and along them new tasks, and in their realization a serious task falls on experts interested in the development of devices, the search of extinguishing material and in their use.

In my thesis I have pointed out the fact that water fog devices and the technology itself are used to an inadequate extent according to their importance in our country.

I have concluded that the research and improvement of water fog devices have further possibilities that have to be revealed.

In my thesis I have introduced the development of extinguishing with water, the essential background to produce and use water fog and the technical devices using the method of comparison, emphasizing the need of development.

I have proved that the use of water fog devices has opened new prospects in the history of fire fighting.

I have made fire fighting experiments and practice using water fog devices with combustion engines, proving their extreme effectiveness.

I have examined the changes in the security of the world, and I have concluded that water, which is a security factor itself, is of outstanding importance from the point of life and possession security, so its environmental and safety conscious use for fire fighting aims needs increasing caution. I have come to the conclusion that measurably less extinguishing water is sufficient for effective fire fighting during the use of water fog devices, thus the environmental damage will be to a lesser degree.

I have called the attention to the exemptional imperfection experienced during fire fighting activities happening in the presence of dangerous material, I have made experiments in connection with the suitability of water fog devices to exemptional tasks.

I have chosen the appropriate device for exemption, I have proved the advantages of its use in practice, and I have elaborated the steps of the use.

Above the mentioned, the forming, improving, spreading and wide use of the new exemptional ability at fire stations depends mainly on the extent of budget rate spent on development.

NEW SCIENTIFIC RESULTS

1. *Using the results of my own experiments*, I have proved the effectiveness of mobile water fog devices and I suggested using them in practice.
2. Using the functional connection of my *self-planned*, unique foam mixing pump I have made the regular mobile water fog device used at the fire station of Győr suitable to extinguish with foam.
3. I have *stated* and *chosen* from different regular mobile water fog devices, then I have *proved* during *experiment* and *practice* that the mobile water fog device having the parameters shown in chart 3 of my thesis is *suitable* for exemptional tasks.
4. I have *worked out* a chemical exemption procedure using a mobile water fog device with the determined parameter, I have *suggested* modifying *Installation Rules* issued with BM OKF Action supplement No. 37/2003, and inserting the material of knowledge and methodology of the chemical exemption procedure worked out by myself.
5. I have *stated* that the material of knowledge and methodology of the chemical exemption procedure is missing from the training system of fire fighting and disaster defence, so as a supply to a defect I have *suggested* building the new type of procedure shown in my thesis into basic and intermediate education of firemen as well as into the BSc and MSc education of ZMNE majoring fire fighting and disaster defence and adapting it to other specific fields.

RECOMMENDATION

On the basis of the facts expressed in my PhD thesis, I suggest:

1. introducing water fog devices shown in my thesis to fulfill exemptional tasks at fire stations.
2. completing *Installation Rules* issued with BM OKF Action supplement No. 37/2003 and inserting the steps worked out by myself into point 2.5.
3. taking the facts expressed in my thesis into consideration during the training of firemen.
4. I recommend the device introduced in my thesis to the responsible leaders of the actual Ministry of Local Governments, Ministry of Health Care, Ministry of National Defence and National Health and Health Officer Service as well as the

later legal successor and the proper authorities, for disinfection tasks following different pandemic emergencies (e.g. swine or bird influenza).

LIST OF THE CANDIDATE'S PUBLICATIONS IN CONNECTION WITH THE TOPIC

Articles in foreign language publication:

1. Rajmund Kuti – László Földi: Possible use of mobile water fog generators for decontamination tasks, AARMS Volume 8 Issue 1 (accepted for publishing)

Articles published in journals:

2. Kuti Rajmund – Földi László: Exemption using mobile water fog devices, Védelem (ISSN: 1218-2958) 2007/2. 46-48. p.
3. Kuti Rajmund: Survey of damage elimination possibilities of terror actions Védelem (ISSN: 1218-2958) 2007/3. 34-35. p.
4. Kuti Rajmund: Experience of a practice based on terror actions Védelem (ISSN: 1218-2958) 2007/4. 34-35. p.
5. Kuti Rajmund: Programme for flood activities, 2007 <http://www.vedelm.hu/tanulmanyok>
6. Kuti Rajmund: New dimension of exemption tasks Bolyai Szemle 2007/1.
7. Kuti Rajmund – Zólyomi Géza: Dealing with accidents with dangerous material Védelem (ISSN: 1218-2958) 2008/4. 14-15. p.
8. Kuti Rajmund – Földi László: New possibilities of water fog devices, Hadmérnök Online Volume 3 Issue 2, 2008, 60-66.p.
9. Kuti Rajmund: Use of exemption material after dangerous material actions 2008, <http://www.vedelem.hu/tanulmanyok>
10. Kuti Rajmund: The specialties of fire guard training in Austria, Védelem (ISSN: 1218-2958) 2008/6. 30-31. p.

Scientific competition essays:

1. Kuti Rajmund: Practical advice to fire fighting plans, Scientific Essay, BM OKF, Budapest, 2003.
2. Kuti Rajmund: Analyses of the practical possibilities using mobile water fog devices, BM OKF Dr. Balogh Imre Memorial Competition 1st prize, Budapest, 2005.
3. Kuti Rajmund: Planning problems of technical exemption OTDK essay 3rd prize, ZMNE Budapest, 2006.
4. Kuti Rajmund: Possible use of water fog using modern mobile devices, OTDK essay 1st prize, ZMNE Budapest, 2006.

Lecture notes:

1. Kuti Rajmund: Features of foam producing material, Notes, Fire Station of Győr 2004.
2. Kuti Rajmund: Technical Exemption I-II., Lecture Notes, ZMNE Budapest, 2007.
3. Kuti Rajmund: Technical rescue vehicles, rescue devices Lecture Notes ZMNE Budapest, 2007.

PROFESSIONAL CV OF THE CANDIDATE

Personal details:

Name, address: Rajmund Kuti, fire guard major 3 Akácos utca, 9171 Győrújfalu

Place and date of birth: Szőny, Hungary 1 January 1969

Marital status: married to Piroska Kopócsi, a son, Rajmund (2003)

Education:

present day: PhD student, Zrínyi Miklós University of National Defence, Budapest,
Military Technical Doctoral School

2006: Zrínyi Miklós University of National Defence, Budapest,
field of study: disaster defence, degree with honors

2001: University of Pécs, Pollack Mihály College Technical Department,
specialty in fire protection, degree with honors

since 1997: BM TKI different special courses

1987: Jókai Mór Secondary School, Komárom

Professional experience, place of work:

since 2002: Professional Fire Station of Győr, Hungary

1997-2002: Professional Fire Station of Komárom, Hungary

Positions: 1997 – 2001: assigned fireman, then different positions

2001 – 2003: deputy duty commander

2003 – 2007: duty commander

2007 – chief lecturer on fire prevention

2008: commanded for 5 months, Board of Defence, Győr, Hungary

since 2009: chief lecturer of advantage on fire prevention

Professional scientific work:

BM OKF Scientific Council, competition, extra prize (2003)

BM OKF Dr. Balogh Imre Fireman Memorial Competition, 1st prize (2005)

ZMNE ITD Conference, 2nd prize (2005), ZMNE ITD Conference, 1st prize (2006)

ZMNE National TD Conference, 1st and 3rd prizes (2006)

several other prizes and places from different scientific and professional competitions of ministeries

guest lecturer: ZMNE Institute of Chemical and Disaster Defence, NYME Department of Agriculture, Institute of Environment

Language knowledge:

Certificate of State Language Exam in German, level: B2, oral and written, with military supplement

Language Exam in Russian, level: B1

Certificate of Language Exam in English, level: B1, oral

Certificate of Language Exam in English, level: B1, written

Budapest, 25th August, 2009

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