VÉDELEM TUDOMÁNY
KATASZTRÓFAVÉDELMI ONLINE TUDOMÁNYOS FOLYÓIRAT

József Kersák, Péter Pántya

OPPORTUNITY FOR TECHNICAL DEVELOPMENT IN THE FIELD OF PRACTICAL TRAINING IN CASE OF TECHNICAL RESCUE

Abstract

Today, due to the horizontal and vertical development of the urbanization, civilization and/or natural disasters are destroying to an unprecedented extent. Their extent and intensity also pose a threat to human life and material goods. Due to the development of technologies, it is necessary to improve certain segments of the protection systems (for example Fire Protection, Civil Protection, Industrial Safety). Such development can be education, qualification or even the practical training described by the authors in the paper. This type of research cannot be limited to the domestic level and development. In a wider sense, it is necessary to do research and adapt the so-called "best practice" directions that have already been accepted internationally, thus making the defence more effective.

Keywords: firefighting and technical rescue, tree fall, storm damage, tension of wood parts, practical training

MŰSZAKI FEJLESZTÉSI LEHETŐSÉG A MŰSZAKI MENTÉS GYAKORLATI KÉPZÉSÉNEK TERÜLETÉN

Absztrakt

Jelen korban az urbanizáció horizontális és vertikális térnyerésével a civilizációs és,- vagy természeti eredetű veszélyek, katasztrófák eddig nem tapasztalt mértékben fejtik ki hatásukat. Lefolyásuk, illetve intenzitásuk, az emberi életre, anyagi javakra jelentő veszély miatt, a technológiák fejlődésével párhuzamosan az alkalmazott védelmi rendszerek (Tűzvédelem, Polgári Védelem, Iparbiztonság) bizonyos szegmenseit fejleszteni szükséges. Ilyen fejlesztés

lehet az oktatás, képzés és a jelen cikkben érintetten különösen a gyakorlati tréning területe. Ez a vizsgálati irány nem szorítkozhat csak a hazai kutatásra, fejlesztésre, tágabb értelemben szükséges a nemzetközileg már bevált és alkalmazott, a „best practice” irányok kutatása és adaptálása, mindezzel hatékonyabbá téve a védekezést.

Kulcsszavak: mentő tűzvédelem, fa kidőlés, elemicsapás viharkár, farészek feszültsége, gyakorlati képzés

1. INTRODUCTION, HISTORY

Monitoring studies of the firefighting and technical rescue carried out within disaster management operations can be well applied to determine the qualitative and quantitative hazards. This is a part of the risk assessment in Hungary [1]. Based on the result, it is possible to predict the defence directives. Professional and voluntary fire departments must have a high level of competence in order to eliminate the interventions professionally. In many cases, firefighters have to work in extreme situations [2]. The conditions are others than what civilians are used to. In order to acquire professional practical knowledge, practice-oriented preparation is required.

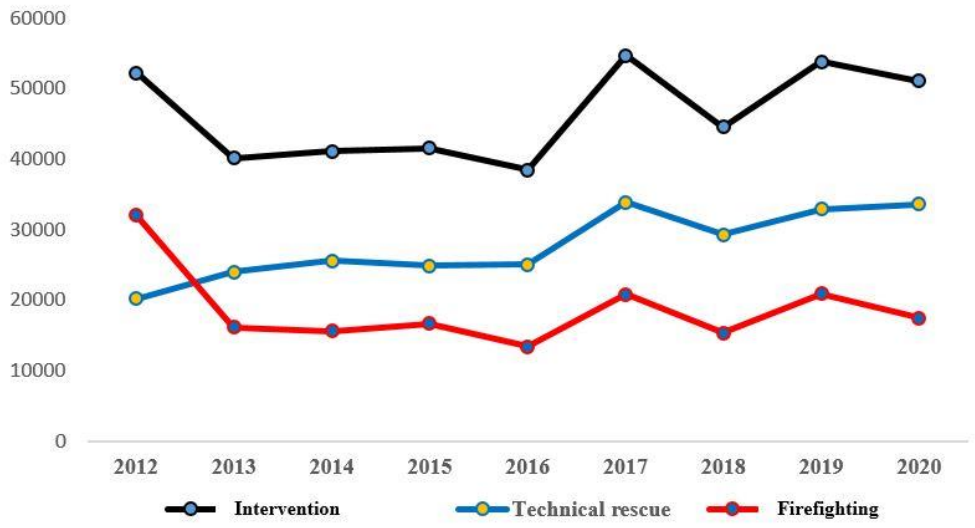

Figure 1- Type and classification of the interventions. Created by Kersák József Zsolt [3]

Figure 1 illustrates the types of interventions between 2012 and 2020. It can be seen that the technical rescues show an increasing trend. Researcher, László Teknős examined in his paper the interventions between 2012 and 30/09/2017 based on the data of the Central Inspectorate for Disaster Management [4] [5]. From the figure, he stated the following: "It can be read that in 2012, the fires showed exceptionally high values. In the other years, the values are significantly lower, no unusual "added value" can be measured [6]. The authors reached the same result in connection with the fires in 2012 as the findings of László Teknős. The number of the technical rescue shows a higher trend again from 2013. Increased case numbers have multi-component factors, as sometimes large case numbers are also influenced by meteorological events.

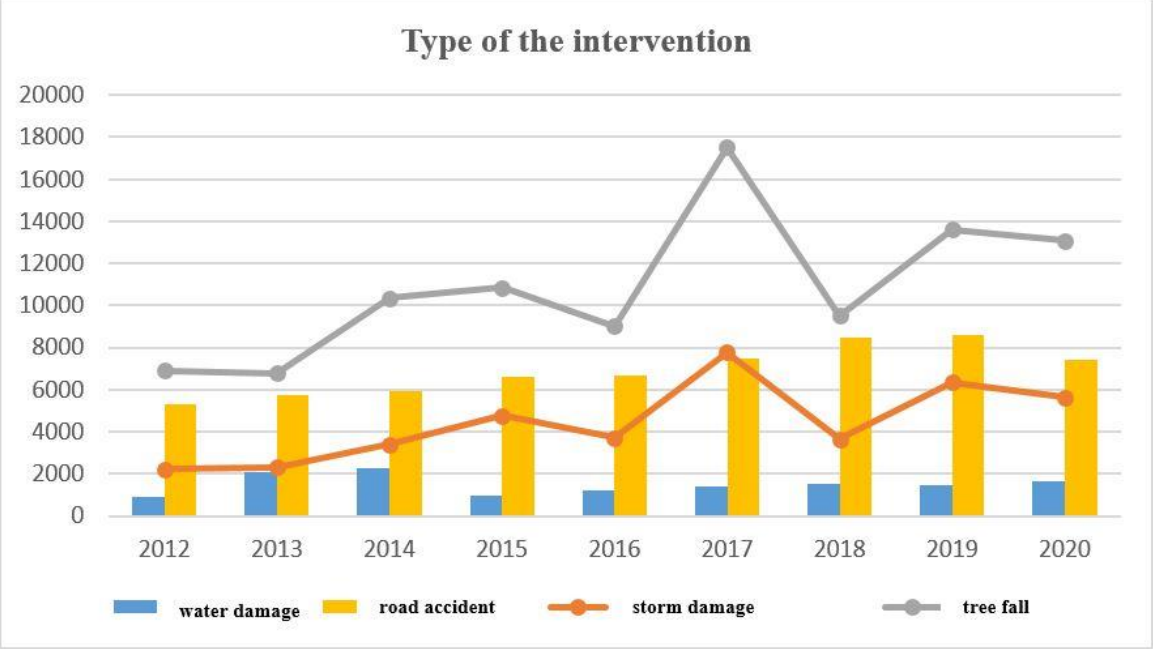

Figure 2 –Type of the intervention. Created by: Kersák József Zsolt [3]

Figure 2 shows that, storm damage and tree falls show a large number of cases, therefore the development of the given task deserves priority. The majority of the natural disasters like storm damage, tree falls and water damages are results of meteorological and natural events. It can be observed that the cause of the damage is the extreme weather conditions in the given area. Based on the investigations, it can be stated that the increase in the number of basic cases (technical

rescues) increases cyclically depending on the weather conditions. Anthropogenic effects cannot be ruled out either[1]. For example, in case of a tree fall or storm damage, inadequate self-care means that the owner did not cut back the damaged parts of the tree, thereby contributing in part to the event. Another characteristic of events is that in some cases they occur in large numbers (for example storm damage). In case of mass events, it is necessary to prepare for a long intervention time, usually using a lot of force and equipment. Overall it can be stated that the disaster response is usually complex and dynamic. This is done in a non-repetitive environment, so it requires appropriate testing and practical methods [7] [8] [9].

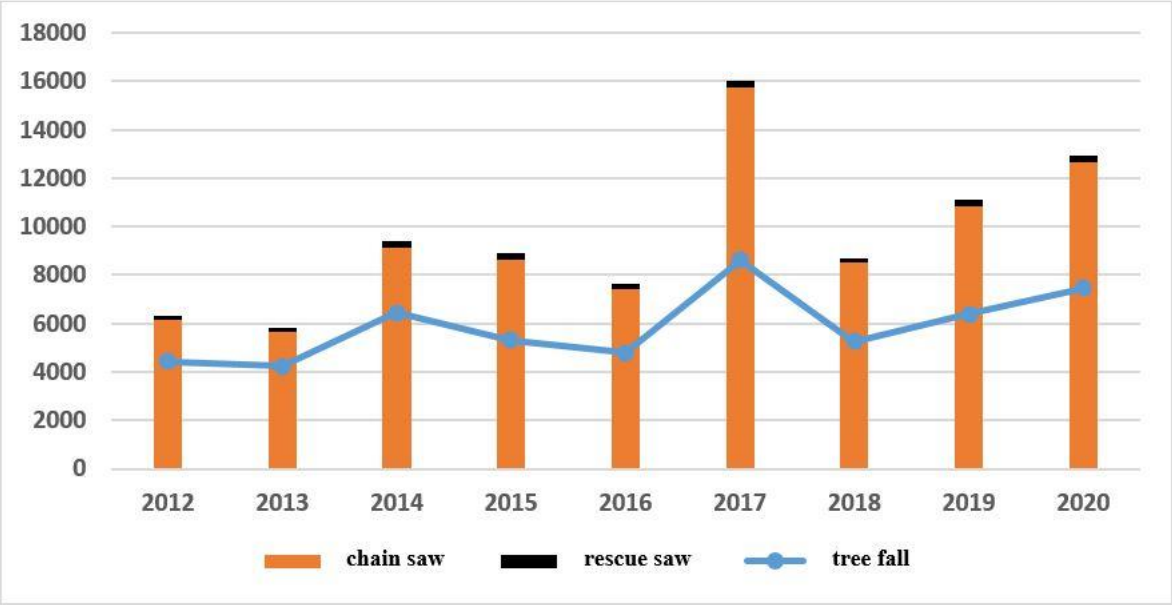

Figure 3- The use of chainsaw, rescue saw. Created by: Kersák József Zsolt [3]

Figure 3 illustrates the use of the chainsaw and rescue saw in case of tree falls between 2012 and 2020. It can be stated that the use of the rescue saw is minimal compared to the chainsaw. This is probably due to the fact that the rescue saw is only used in special cases, such as in case of cutting the walls or the concrete. The use of a chainsaw is very high in the examined period. It can be observed that in parallel with the increase in the number of cases of tree falls, its use also increases. Rescue saws are primarily planned for rescue services (such as fire departments or disaster management). Rescue saws should only be used by experienced people in case of

[1] Impact caused directly or indirectly by human activities.

rescue operations because, in addition to handling the chainsaw, other conditions and hazards must be judged. Its use requires special techniques. The chainsaw is relatively more common than this, its application is for cutting the wood or woody plants.

2. METHOD

When writing the paper, the authors kept in mind the statement made by János Bleszity and co-authors. The essence of it is that "technical research in the field of disaster management should serve to increase society's resilience to disasters, reduce its vulnerability as well as to return to normal operation as soon as possible and to increase the flexibility" [10]. Because of the current pandemic situation, the authors avoided the personal contacts during their research. There was an online contact and consultation with German experts, and the results of the digitized relevant literature and the previous research were processed into the present research.

3. SPECIAL CUTTING TECHNOLOGIES IN CASE OF INTERNAL MECHANICAL STRESS TREES

After a violent windstorm, the trees lean against each other or are trapped between each other, it is often difficult to assess the direction and extent of the internal or mechanical stress in the tree. In all cases, it is necessary to provide enough time to assess the situation, although this time is not always available. To reduce the weight, removing the branches from the tree crown provides a more transparent work area. Consideration should also be given to whether the mechanical stress can be reduced by cutting back the tree or cutting the crown of the tree [11].

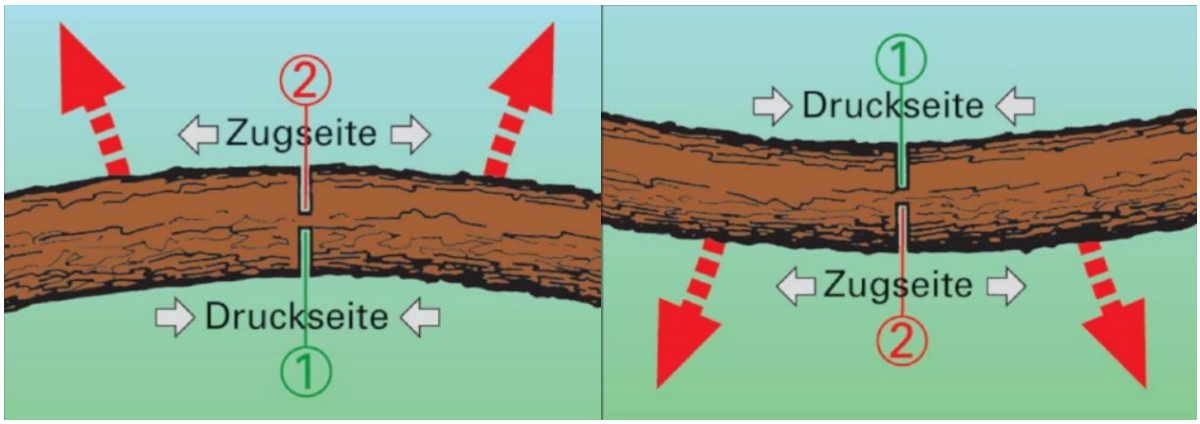

Figure 4- The cutting technique in case of live wood parts. Source: [12]

The Figure 4 shows the technology of sawing the live parts of the wood. The part marked with a white arrow shows the direction of the tension, based on this we distinguish the drawn side and the depressed side. On the drawn side, the arrows are in opposite directions, and on the depressed side, they are facing each other. The red arrows show the ejected direction of the tree; in each case they move in the direction of the drawn side. The numbers show the order of the cuts, in each case the so-called “facilitating” cut must be started on the depressed side. Cutting procedure: the incisions must be started first on the depressed side. It requires a lot of attention because if the cut is too deep, the chain saw head can get stuck. The next step is to continue the cutting on the drawn side in order to reduce the tension. Then the person who is operating the saw (in case of partial lateral stress in the tree) must always be stood on the pressed side at the moment of the complete cutting. This prevents the operator from being injured if the wood is ejected [12].

4. DEVELOPEMENTS AND SUGGESTIONS

Firefighters regularly use chainsaws during an intervention in case of natural disasters, storm damage and tree falls. During such interventions, the wood parts are under internal mechanical stress, therefore the response requires special knowledge and cutting technology [13]. An obstacle is that the interveners only encounter with wood parts under internal mechanical stress during their work, so in other cases they cannot practice the cutting techniques.

Figure 5- Structure simulating the stress of wood parts. Created by József Kersák, Dresden 11.10.2019.

As a development option, it is recommended to use a structure simulating the internal or mechanical stress of wooden parts in practical training for professional and voluntary organizations [14]. An equipment such as that is shown in Figure 5 would provide a high level of preparedness for firefighters in case of an intervention [13] [15] [16]

The authors propose a physical implementation of the structure and also a team test. For this purpose, the Hungarian specifics and the possibility of applying the completed structure are also taken into account.

5. SUMMARY

Professional and volunteer firefighters need to have a high level of theoretical and practical knowledge in order to eliminate the interventions professionally. There are interventions, where the response is usually complex and dynamic. If it is not done in a repetitive environment, it requires appropriate testing and practical methods. It was found that compared to the number of fires, technical rescues show an increasing trend. The type of intervention interpreted within the technical rescues and the number of tree falls and storm damage show a very high value. The use of a rescue saw has been proven to be minimal compared to a chainsaw, the main reason for that is the special applicability of the rescue saw. On the other hand, the use of a chainsaw, shows a very high value in the examined period. It can be observed that with the increase in the number of tree falls, the use of the chainsaw increased as well.

In case of tree falls, natural disasters and storm damages, the parts of the tree are under internal mechanical stress. This requires special knowledge and cutting technology from the firefighters. An obstacle is that the interveners only encounter with tree parts under internal mechanical stress during their work, so in other cases they cannot practice the cutting techniques [17]. The authors stated that, based on international examples, the use of a simulation structure that measures the mechanical stress of tree can be a great help to the firefighters. The use of a structure simulating the mechanical stress of tree can provide a high level of preparation in practical training for the professional and voluntary organizations. Researches like this will also serve the sustainable aspects of the disaster management in the future [18].

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