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The parameters of the optimal method of water transport to forest fires

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Abstract

The basic requirement for fast localization and following extinguishing of a forest fire is securing enough supply of water through suitable transport of water. The basic methods are water shuttle operation through tanker trucks and long-distance transport of water by hose lines and portable pumps. Nowadays beside of this classic methods, different combined methods of transport are used and a modern method with a high-capacity pump. In the article I deal with each method of transport of water to forest fires and I am comparing them according to possibility of their deployment. The decisive parameters for deployment of single methods of transport are mentioned and based on the created models of transport of water, the optimal method is suggested for given conditions of environment.

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1. Introduction

Transport of water for extinguishing forest fires, mainly in extremely difficult terrain, represents a difficult issue in tactics of fires extinguishing. Tactics of fire is affected not only with terrain but also with many more factors. Specific characteristic of the situation on the seat of fire determines the choice of method of transport. During the fire the sufficient respectively lack of extinguishing agents is for determining the success of intervention.

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1.1. Conditions of choosing the water transport

The first and important operation at this kind of fires is research based on which we determine the area of the fire, the speed and the direction of spreading, we detect the available water sources and choose the method of fire attack, water transport and proper access roads for the needed forces and means. Availability of terrain is set by topography of environment, current climatic and meteorological conditions and parameters, which affect the availability for firefighting technics and machinery or people motion. The steepness of slope, natural obstacles and quality of forest roads is important. The network of forest roads is often insufficient or completely absent. Forest roads are unmaintained, broken or inaccessible. Forest roads are narrow, muddy [1].

Before the start of extinguishing of a forest fire it is necessary to make an analysis by which the tactic of the intervention is determined.

The analysis of determining situation is affected by these parameters:

- technical conditions of the location of fire – slope steepness, wind conditions, weather,
- analysis of the fire – area of the fire, speed, direction of spreading, availability of terrain,
- identifying the availability of sources of water,
- estimation of future development of the situation; where and how fast will the fire spread,
- identifying the places, where the fire will naturally weaken (rocks),
- determining the possible future threats and growth of critical factors,
- estimation of possible consequences of single operations,
- estimation of necessary forces and means, evaluation of available forces and means,
- determining the number of intervention sectors,
- options of choosing the appropriate tactics of extinguishing [2,3].

2. Methods of water transport

The basic methods of water transport by ground appliance are:

- Long-distance transport by hose lines: from pump to pump, with high-capacity pump or the pond system.
- Using mobile fire appliance and firefighting technics: water shuttle operation, transport of water to the place of the incident.
- Combined water transport: combination of previous methods.

2.1. Long-distance water transport

The basic form of long-distance water transport using hose lines is water transport from engine to engine. By this method pressure hoses are used which are connected into a hose line, used to supply the seat of fire with water. For pumping the water it is necessary to use pumps, which gives pressure to overcome the distance from the source to the place of fire attack. The disadvantage is that because of the influence of big pressures on the beginning of the line, the hoses can tear up and the continuity of supply will be lost [4,5].

With suitable connection of pumps it is possible to use hydrodynamic properties of the flow of water and reach big rates of flow. If more transport hose lines are made, the size of the flow of water multiplies. While it is necessary to sum up the conditions which has influence on transport of water by hose lines [4]:

- influence of the character of terrain on the transport,
- system of connection and placement of pumps, quantity and types,
- source of water,
- method and path of lining the hoses,
- system of supply with fuel for long-term interventions,
- number and type of fire pumps and armatures,
- number of operating crew.

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