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PROBLEMS OF DEMINING DEOCCUPIED TERRITORIES

The world history of military conflicts has left behind millions of unexploded mines, ammunition and other explosive objects. These objects pose a serious threat to the civilian population and hinder the development of the destroyed regions. The real challenge was the identification and removal of these objects, and here demining becomes the most important branch of humanitarian activity. In the past, demining was mostly done manually - people manually searched for and removed explosive objects during dangerous work. It was very dangerous and sometimes ineffective. Over time, manual and mechanized demining methods appeared, which improved the situation, but the risks remained high. [1]

The purpose of the work: the study of demining in its various aspects: past, present and future. Determine how demining affects the safety of the population and the development of war-torn regions. Innovations in this field and opportunities for their further implementation.

Methods, materials and research results. Demining techniques: Manual demining is one of the most traditional methods of detecting and destroying landmines. This method involves the use of specialists who thoroughly inspect the site for the presence of mines. [2]

The process of manual demining includes the following stages:

1. Search: Deminers, equipped with metal detectors, inspect the area in search of mines or other explosive devices. This can be a very slow process, as every square meter of land needs to be thoroughly tested.

2. Detection: If the metal detector detects something suspicious, the deminer marks the location and uses various tools, such as probes, to carefully detect whether the object is a mine.

3. Destruction: If a mine is detected, the deminer either defuses it on the spot or uses an explosive charge to detonate it in a controlled manner.

4. Inspection: After an area has been inspected and cleared of mines, it is inspected again to ensure that no mines have been missed.

Manual demining is a time-consuming and dangerous process, but in some cases it may be the only option, especially in difficult or inaccessible terrain.

Fig.1 – Manual demining

Machine demining is an effective method of detecting and destroying mines on large areas of land. This method uses special machines that can detect and destroy mines. This is how machine demining works:

1. Detection: Mine clearance vehicles can be equipped with metal detectors or ground penetrating radars to detect mines.

2. Destruction: One of the methods of mine destruction is a flail (a metal beam system with a forged chain or cable suspension), which is installed on the front of the machine. A demining flail uses a rotating drum with a forged chain suspension to detonate or detonate a mine on the surface or underground.

3. Safety: Demining machines are usually used in such a way that they are protected from a mine explosion. They can be remotely controlled, reducing the risk to humans.

It is important to note that although machine demining can be quick and effective, it cannot always be used. For example, on very steep slopes or in areas with a lot of natural obstacles, machine clearance may not be possible.

Fig. 2 – Machine demining

The use of robotics for demining is becoming more common as it reduces the risk to human life. Different types of robots can be used depending on specific conditions and needs. Here are some ways robots can be used for demining:

1. Recognition and detection: Robots can be equipped with sensors and scanners to detect mines. This may include metal detectors, ground-penetrating radars or systems for chemical analysis.

2. Destruction of mines: After detecting a mine, some robots are able to destroy it on the spot. This can be done by blasting, using high water pressure, or other methods.

The use of robotics allows work to be done faster and safer, as robots can work in conditions that would be too dangerous for humans. However, not all minefields can be easily handled by robots, and in some cases humans are necessary.

Drones are becoming an increasingly important tool in the demining process. They can be used for different tasks, depending on their equipment and configuration.

It should be noted that although drones can increase the efficiency and safety of the demining process, they cannot completely replace humans. The decision to use drones depends on specific conditions and requirements.

The organization APOPO, founded in Belgium, has developed a unique method of using rats for demining. These "miner rats," known as HeroRATs, are trained to detect mines and other explosive devices.

Here's how the process works:

1. Training: Rats undergo thorough training from a young age. They learn to associate the clicking sound with getting food, and then they learn to look for the specific smell of the explosive.

2. Search: Rats that have been trained to detect mines are then used in a location where mines are known to be present. They move around a patch of land, using their keen sense of smell to detect the presence of explosives.

3. Identification: Rats are able to identify the specific location where they detected the smell of explosives. They stop and start scratching the ground to show exactly where they found the mine.

4. Demining: After identifying a potential mine location, demining specialists arrive at the site and carefully destroy the mine.

The main advantage of using rats is that they don't weigh enough to cause the mine to explode. They are also very fast and effective in detecting explosives.

Conclusions. Demining is a problem that has accompanied humanity for centuries. The history of demining shows the terrible consequences of wars and conflicts. Modernity has brought with it new methods and technologies that facilitate the work of heat exchangers, but the problem is far from solved. Millions of mines remain in the territories, threatening the lives and safety of the civilian population. Future demining will require a combination of efforts by governments, scientists and the public. Developing new technologies, raising awareness and educating people about the dangers of landmines and increasing funding for demining are key components of a successful fight against this problem. Demining remains a pressing global issue today and joint efforts are needed to ensure the safety and well-being of people around the world.

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