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Mine Resistant Boots

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Mine Resistant Boots

The task of demining is highly dangerous. Deminers and humanitarian workers are at risk to injury every time they step onto a minefield. Jiri Chladek and the Zeman Company have developed a special boot to reduce risks incurred when stepping on landmines.

Independent Research & Development

Dr. Chladek's Independent Development

Dr. Chladek began work geared at solving the problems of foot protection in 1997. First, he collected different materials appropriate for armor construction and then prepared a number of different flexible armours. The armours differed in material, thickness and width of layers, and technology of layer connection.

Each sample was then tested by explosion. As testing charges were used, boosters were made from TNT, PETN and Semtex. In accordance with the results of previous steps, new test samples were obtained and a sole was made. After successful trials with different explosive charges, there appeared a clear request: co-operation with a boot producer is necessary. It was necessary to know which material and which technology can be used for resistant boots production.

In 1998 Zeman Shoe Ltd. also started R & D work concerning mine resistant boots. During the preliminary stages they used available information from abroad and experience from tests carried out in the United States. Zeman Shoe Ltd. based development on a sole with a special shape that contained an aluminium insert for moving explosion gases away from the boot.

A final prototype was prepared for tests in spring 1999. These tests showed that their direction in R & D blast resistant boots was successful. The boots did not have the required protection level. During the tests they also obtained some interesting findings:

• Sole shape is not so important and it has minor effects on protection level.
• Blast construction must not contain any metallic parts.
• It is necessary to find appropriate testing methods (there are no international standards).

After the tests, the company found it necessary to find an expert experienced in explosives and explosion protection. Representatives of Zeman Shoe Ltd. met with Dr. Chladek, independent expert in explosives, at the exhibition IDET 99 and a new era in R & D of blast protective boots successfully began.

Testing

The main problem concerning testing is the lack of international standards. During the preliminary period each sample was loaded by a wooden box filled with sand and soil with a total mass around 50 kg. Later a few different steel legs were used, but the results showed that these tests did not meet the R & D requirements. Useful results were obtained when "wooden man" (blocks of wood) with a mass of around 65 kg was used. Trials with charges exploded in front of the boots simulated a situation when the user kicks the unexploded ordnance. The boots were independently tested at the Institute for Testing and Certification of Mines Resistant Boots.

Table I. Result of tests

<table>
<thead>
<tr>
<th>CHARGE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE</td>
<td></td>
</tr>
<tr>
<td>Zeman AM</td>
<td>total destruction of boot and leg—AMPUTATION</td>
</tr>
<tr>
<td>Zeman AM</td>
<td>damaged heel</td>
</tr>
<tr>
<td>Zeman AM</td>
<td>damaged heel and part of sole</td>
</tr>
<tr>
<td>Zeman AM</td>
<td>heavily damaged heel, inner part of boot</td>
</tr>
<tr>
<td>Zeman AM</td>
<td>minor damage of heel</td>
</tr>
</tbody>
</table>

The combined efforts of Jiri Chladek and Zeman Shoe Ltd. were able to intro
The Landmine Menace: The Great Humanitarian Challenge

On the basis of the conflict scenarios and the resultant threat, it is necessary to develop methods and means to eliminate the threat. Simply using available tools is not always easy. What is necessary is to optimally combine existing detection and clearance methods and, if necessary, to develop new, promising technologies in a targeted manner.

by Thomas Himmler, Institut Dr. Förster

Introduction

Lien Ta had just started to repair the irrigation ditch in his field when an explosion shattered the tranquility of the early morning. One small step on the wrong spot wiped out the life of this farmer. A family lost a member of its community and children lost their father and the security of their existence.

Regardless of whether a farmer fills his field in Vietnam, a woman in Afghanistan fetches drinking water from a well or children in Bosnia go to school, they should all be able to do this on safe ground and on safe footpaths. But this is far from the case. Even years after conflicts and wars have almost disappeared into oblivion, the menace from landmines and UXO in these areas is extreme.

The United Nations is aware of over 60 affected countries in which the civilian population is still constantly threatened by hidden mines. Estimates extend from 60 to over 100 million mines laid during times of war and conflict. In many areas, the number of items of UXO still substantially exceeds the number of mines.

Where are the Problems?

Well, minefields may be laid anywhere; not only level and easily accessible areas may be mined, but also slopes, road embankments, wooded areas, desert areas or beach areas, even front yards. One further factor is extreme infestation with pests, which are sometimes designed to be carrier-free and must be clearly detected. In addition, many of the areas are covered by vegetation that grows back constantly or is subject to constant change as the result of erosion or floods.

The detection tasks required will largely be performed by metal detectors and, to the above-mentioned methods and method combinations are advanced enough to a stage at which they can be introduced on a large scale. Here as well, further advances have been made in recent years.

The existing Continuus Wave (CW) and Pulse metal detectors in use worldwide have undergone substantial development. They are thus still the method that most widely covers the listed requirements of practical use.

In the majority of cases, metal detectors based on eddy-current technologies are used for near-surface detection today. Regardless of whether they are handheld, individual sensors or large-area sensors, they are sometimes designed to be carrier-free and must be clearly detected. In addition, many of the areas are covered by vegetation that grows back constantly or is subject to constant change as the result of erosion or floods.

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