

MECHANICAL DEMINING

The solution for a mined world



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Introduction

I. The landmine problem

- There are 110 million landmines laid around the world.
- Mines claim 25.000 victims per year.
- Every twenty minutes a man, woman, or child is killed or mutilated by a mine.
- Statistically every thousandth attempt to clear a mine by hand ends in death or severe injury.



1. The originators of the problem

- Numerous governments ordered and financed the production and laying of mines.
- The arms manufacturing industry developed and produced landmines at the instruction of these governments.

2. Effects and victims

- Mines are found in previous war zones. They are usually covered by bushes and grass and have become invisible deadly traps.
- They kill or mangle men, women, and children and endanger animal populations.
- They prevent the return of refugees back to their homelands.
- They destroy the structure of society.
- They prevent economic and socio-economic development by hindering access to key resources.

3. General conditions within mined areas

- There are over 344 different types of personal and anti-tank mines of which 70% contain no metal and cannot be found by metal detectors.
- Most mine fields are scattered with other metal, iron, and steel objects which makes conventional detection almost impossible.
- Mine fields differ in size and density of laid mines.
- These deadly traps are often overgrown and hidden by vegetation.
- While producing mines worth billions of dollars, the manufacturers forgot about future demining solutions.
- They forgot about the misery and danger people would face after their conflicts are over.



II. Present demining technology

Hand demining, done with metal detectors, prodders (needles), and shovels, is still the only method that is propagated by UN mine experts.



Hand-demining is unsuitable

- Terrible accidents are a common threat.
- It does not achieve the intended goal, because not all mines can be detected and cleared on fields that have been searched.
- It is extremely expensive.
- It is extremely slow.
- Hand-demining cannot solve the problem of a mined world, because at current speed more mines are laid than cleared.

Despite this UNMAS (United Nations Mine Action Service) claims that manual demining is a "safe standard procedure". Annex II of their regulations demands 99,6% safety and is defined as follows:

"From 1115 mines laid, the tolerance for the manual demining method stands at 5 *unexploded mines* throughout the whole cleared area. These 5 mines are not considered as a clearance failure."

The UN authorities know that this method is unreliable and unsuitable.

The affected countries continue however to use UNMAS standard operating procedures as a basis to develop their own guidelines.

This always costs victims during and after demining operations.

III. The Krohn Mechanical Mine Clearance System - KMMCS



The KMMCS is the first and only functioning Mechanical Mine Clearance System in the world.

The KMMCS is capable of destroying all mines on almost any terrain.

- Only one of our machines clears about 30.000 m² of land *per day* completely free of mines and explosive ordnance.
- This is 10.000 times more effective than hand-demining.
- At only 10% of the cost.
- We guarantee 100 % clearance.
- With no loss of life or injury.

- Not one single functioning mine or dangerous explosive ordnance has ever been found on land after we have cleared it.
- The machine can easily manage a gradient of up to 40 degrees.
- Strong natural plant cover like bushes or even trees or solidly frozen soil are no obstacle.

**The KMMCS
is the fastest, safest, and cheapest system
in the world.**

Performance

1. Technical data



- The KMMCS can be used on all kind of terrain except massiv rock.
- Thickly covered terrain, with bushes and trees up to 30 cm trunk diameter and also solidly frozen soil are no obstacles.
- It can easily manage a gradient of up to 40 degrees (\cong 80 percent - upwards and downwards).
- The working speed is between 1,5 and 2,5 km/h.
- The working width is 3 m.
- The working depth ranges continuously from 0,20 to 0,50 m.
- The weight of approx. 35 tons is distributed by the chain drive assembly to a value equal to a human footprint, so that wet and muddy undergrounds can also be cleared.
- The machine is tested and certified for all known mine types containing up to 10 kg TNT.

2. Field of application



- Redevelopment of military training areas - e.g. at the US-Combat Maneuver Training Center, Hohenfels. Here 500.000 US\$ were saved by using the KMMCS on an area of 10 ha in comparison to the work of the "specialists" of the bomb disposal team with their arduous, timespending and dangerous manual work.
- Milling of fire fighting corridors for the prevention and fighting of forest fires. (Please see picture on the left of employment in Weißwasser / Germany)
- Recultivation of burned forests. With Krohn's forest mill the full volume of burned material is equally worked into the ground.
- Preparation of land before replantation of important economic crops.
- Redevelopment of contaminated areas
Please see the picture on the left where we have used the machine's deep mill function to dig a one meter deep trench.
- Preparation of building sites, for houses, pipelines, power supply lines and streets.

The KMMCS has proved these extensive capabilities on several thousand hectares all over Europe.

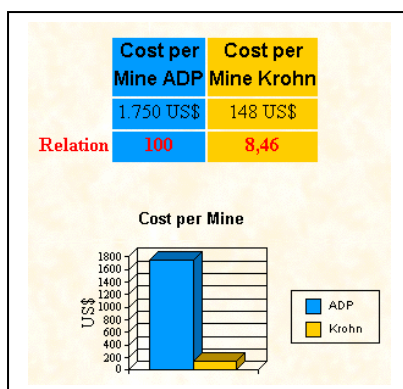
3. Comparison between mechanical and manual demining

Only one of our machines clears about 30.000 m² of land (= 4 football fields) *per day*. This land is then completely free of mines and explosive ordnance.

This is 10.000 times more effective than hand-demining.

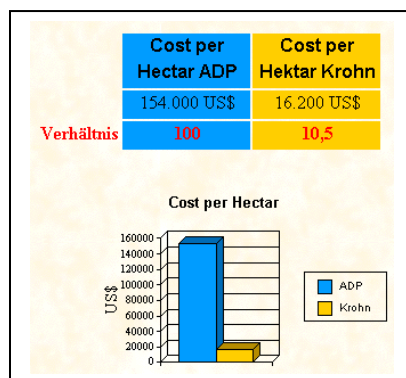
A group of 10 hand-deminers would need about 2,5 years to clear the same area that the KMMCS can clear in one day. There are only very few trained manual deminers available at those sites.

Statistically every thousandth attempt to clear a mine by hand ends in death or severe injury. The KMMCS clears the whole terrain without any loss of life or injury.



Cost per mine:

At a comparable sized and mine affected area in Mozambique the KMMCS's working costs were only 8.5 % of those for manual demining done by ADP*.



Cost per hectar:

At a comparable sized and mine affected area in Mozambique the KMMCS's working costs were only 10.5 % of those for manual ADP demining.

	Performances ADP			Performance Krohn		
	20 Months	500 Man	54 ha	6 Weeks	35 Man	56 ha
	40.000 Manweeks			210 Manweeks		
	0,00135 ha/Manweeks			0,266 ha/Manweeks		
	13,5 m ² /Manweeks			2667 m ² /Manweeks		
Relation	100			19756		

*ADP: Accelerated Demining Program = UN hand-demining

Examples of our work



The KMMCS searches, finds and destroys mines of all kinds.



Vegetation of up to 30 cm in diameter and more is no obstacle and gets embedded into the soil.



The KMMCS can easily manage gradients up to 40° forwards or backwards.

Detonation tests with up to 9 kg TNT did not cause any damage.

The driver is not endangered even by stronger explosive charges.



Clearing of explosive ordnance on military training areas

Clearing of explosive ordnance on military training areas in industrialised countries is much more expensive than hand-demining in the “Third World”. In comparison the savings due to the deployment of the KMMCS are dramatic and in contrast to usual clearing the KMMCS prepares the soil for recultivation. Even strong natural plant cover is dispersed into the ground.



Destruction of several kinds of ammunition at the US-Combat Maneuver Training Center near Hohenfels in Bavaria, Germany.



In Germany alone there are about 250.000 ha of military training areas that are contaminated with dangerous ammunition.

An anti-tank mine, a bazooka round, and a 90 mm handgrenade with a wall thickness of 5 mm of cast iron – before clearing.



The destroyed ammunition, harmless shrapnel – after clearing.

After the clearing process people can walk on the demined fields safely.



The most important reports and performance data for the KMMCS from 1992 to 2004:

14th June 1992

A test with anti-personal mines under the supervision of the Julius Tischer Anhaltinische Fabrik in Schoeneberg near Magdeburg, Germany.

Conclusion in short:

“Nothing opposes the employment of the milling machine for mine clearing operations.

An endangerment for the driver of the milling machine or the environment cannot to be recognized.” (Julius Tischler)

*

15th October 1992

A test with anti-personal mines under the supervision of the Julius Tischer Anhaltinische Fabrik in Schoeneberg near Magdeburg, the BMVg (Federal Ministry of Defence of Germany) and the BAM (Federal Institute for Material Research and Testing).

Conclusion in short:

“The milling machine is the most effective tool for the fight against anti-personal mines.” (Pioneer School, Munich)

*

22nd December 1992

A test with anti-personal mines under the supervision of the Federal Institute for Material Research and Testing in Horstwalde near Berlin.

Conclusion in short:

“The combination of milling machine, chisel cultivator and windrower is to be regarded as the most favorable procedure concerning clearance security and economy.” (Federal Institute for Material Research)

*

16th February 1993

A test with dummy anti-personal mines in Wiesenfeld under the supervision of the German Federal Defence Ministry.

Conclusion in short:

"The procedure offers at least the same clearance security as the plow procedure and thereby promises a time saving effect that should not be underestimated in its size." (Pioneer school and technical school of the army for civil engineering)

*

08th March 1993

The German Federal Ministry of Defense gives the GRV (The society for the recultivation and utilization of real estate) permission to clear mines on the inner German border.

Conclusion in short:

"In comparison to other methods of clearance the personnel needed is reduced from 25 to 6 men or less and success increases substantially. This method meets the official safety requirements." (Internal report of the contractor - GRV)

*

16th June 1993

The German Department for Geophysics examined the environmental compatibility of the milling procedure at a site on the inner German border.

Conclusion in short:

"This milling procedure is to be used wherever the conditions permit it, and in relation to the plowing procedure offers the following advantages:

- Calculable exposure of time.
- Smaller personnel requirements.
- Higher probability of discovery.
- No endangerment of the personnel.

These characteristics would be arguments for the employment of the milling machine." (The pioneer school and civil engineering technical school of the army, special staff ATV)

*

17th September 1995

In a test in Moamba/Mozambique under the supervision of the UNDP-ADP for anti-personal mines.

Conclusion in short:

"No functional mines were found." (UNDP-ADP)

*

18th September 1995

A test in Mozambique.

Conclusion in short:

"The test with the KMMCS in Mozambique was successful.

With this newly developed mine clearing technology it will become easier, faster, and safer to clear mines.

By passing this test the KMMCS has proved that it is the most effective mine-clearance system available today." (Press statement by the German Ministry of foreign affairs)

*

05th and 06th May 1996

In a test in Sabie, Mozambique under the supervision of the UNDP-ADP 264 anti-personal mines were professionally laid. 260 mines were totally destroyed and 4 mines were so badly damaged that they did not represent any more danger.

Conclusion in short:

According to the definition of the UN for manual demining this test was 100% effective.

*

25th August 1995 to 02nd October 1996

Clearing in Moamba and Sabie (Mozambique) with anti-personal mines under the supervision of the National Mine Clearance Commission of Mozambique (CND).

Conclusion in short:

Approximately 150 hectares (1.5 million square meters) were cleared from anti-personal mines in 100 nine-hour working days. Over 20.000 mines were destroyed.

The German Ministry of Foreign Affairs and the Mozambique National Clearance Commission officially confirmed the 100% clearance of this area.

Since then the area has constantly been used agriculturally by the civil population. No mines have ever been found.

*

26th June 2000 until 29th July 2000

Mine clearance at the Hohenfels Combat Maneuver Training Center

Conclusion in short:

200.000 m² were cleared.

*

Autumn 2000

Mine clearance at Gera and Brandenburg (Germany).

Conclusion in short:

340.000 m² were cleared.

*

21st August 2000 until 15th December 2000

In a test in Ceretinci, Croatia under the supervision the CROMAC (Croatian Mine Action Center) 10 anti-personal mines, 5 anti-tank mines, 7 spring mines, 1 Rob 75, and 19 PM1 anti-tank mines were laid on an area of about 113,000 m² under controlled conditions and destroyed.

Test result in short form:

After clearance 10,5 ha were searched and no dangerous explosive ordnance were found.

"The KMMCS is suitable for the mechanical treatment of mined land.

It can be used on all soil categories (category I to V). The best results are obtained with the soil categories III and IV (plain agricultural soil).

It overcomes all kinds of vegetation (low, high).

The driver works in an armored cab that protects him from all kinds of anti-tank mines.

In one ten-hour-working day the mine clearance machine can clear 25.000 to 30,000 m² of mined land. (Depending on the degree of mining, the kind and density of the vegetation, the soil category and the provided logistic support.)" (CROMAC)

*

08th August 2001

Near Tenja, Croatia, under the supervision of the Dinamid company 30 TM3 anti-tank mines were destroyed.

Result of the manual search by the manual deminers:

After the clearance on an area of 105,000 square meters behind the machines no dangerous explosive ordnance were found.

*

December 2001 until January 2002

Near Tenja, Croatia, under the supervision of MKA Deming 5 anti-tank mines were destroyed.

Result of the manual search by the manual deminers:

After the employment of the machines on an area of 50,000 square meters with 20 degrees frost and frozen soil no dangerous explosive ordnance were found by hand-deminers.

*

December 2001 until January 2002

Near Ivankowo, Croatia, under the supervision of MKA Deming anti-tank mines and stick mines were destroyed.

Result of the manual search by the manual deminers:

After the employment of the machines on 298,000 square meters of land no dangerous explosive ordnance were found.

*

01st March 2002 until October 2002

In Croatia under the supervision of MKA Demining anti-tank mines and anti-personal mines were destroyed.

Result of the manual search by manual deminers:

After the employment of the machines on an area of 150 ha 40 manual deminers then searched it centimeter for centimeter with metall detectors and found no dangerous explosive ordnance.

Summary

The KMMCS cleared about

2.600.000 m²	in Croatia
1.500.000 m²	in Mozambique
240.000 m²	at the Military training area in Gera (Germany)
<u>200.000 m²</u>	at the Hohenfels Military training area (Germany)
<u>454 ha</u>	

International demining experts have performed complex searches on our demined terrain.

Not a single functioning mine or dangerous explosive ordnance has ever been found on land after we have cleared it.

These facts have been certified by the UN and the German government.



AUSWÄRTIGES AMT
Gz.: 300-440.70/3.1 MOS

Bestätigung

Das Auswärtige Amt bestätigt, daß die Fa. Krohn im Auftrag des Auswärtigen Amtes 1995 und 1996 in Mosambik mechanische Minenräumeinsätze durchgeführt hat.

Die für die Abnahme geräumter Flächen als "minenfrei" in Mosambik zuständige Nationale Kommission für Entminung (CND) hat die Räumung einer Fläche von insgesamt 144,95 ha durch die Fa. Krohn bestätigt und darüber Abnahmezertifikate ausgestellt.

Bonn, den 6. Juni 1997

i. A.

Dr. Mulack
Vortragender Legationsrat I. Kl.



Translation:

The German Foreign Ministry certifies that the Krohn Company has performed mine clearance activities in Mozambique from 1995 to 1996 on behalf of the German Foreign Ministry.

In Mozambique the Commission for National Demining (CND) has certified that the Krohn Company cleared about 144,95 ha of mined terrain. The cleared area has been certified to be "mine-free".