



- [Editorial](#)
- [Focus](#)
- [Feature](#)
- [Making it Personal](#)
- [Book Review](#)
- [Special Report](#)
- [Notes](#)
- [Profiles](#)
- [R&D](#)
- [News Briefs](#)

Mechanical Demining: From 1942 to the Present

by Pehr Lodhammar [Geneva International Centre for Humanitarian Demining]

Although demining machines have been in existence since 1942, they were not used in the field of mine action until about the early 1990s. Demining machines were initially only used by the military. With the growing number of casualties stemming from landmines, especially among civilians, it became necessary to employ machines for humanitarian purposes. From the first demining machine constructed in early 1942 to the present, tremendous improvements have been made.



Imperial War Museum

Close-up view of the revolving drum and chains at work on a Matilda Scorpion flail tank. 17 April 1942.

The first demining machine is believed to have been developed by Major Abraham du Toit, a South African soldier and engineer. In early 1942, he was sent to England to refine a demining machine prototype he had constructed in

South Africa.

Before leaving for England, du Toit discussed his ideas with Captain Norman Berry, a British mechanical engineer. Berry conducted his own unofficial experiments with flails in Libya before providing the results to another British officer at an army workshop in Egypt. This collaboration resulted in the development of the Matilda Scorpion, a [Matilda tank](#) fitted with a rotor mounted on two arms at the front. The rotor carried 24 flails and was driven at 100 revolutions per minute by a 105-horsepower Ford V8 engine. A second engine was fitted with an armored box mounted on the right side of the tank. This box included space for a crew member, who operated the flail.

A number of these vehicles were produced and became operational in October 1942 when they were used in the Second Battle of El Alamein (23 October to 5 November 1942). Although the clearance speed was slow, the Scorpion operators were able to conceal the machines from German soldiers because of the huge dust cloud they formed; however, the dust cloud also blinded and affected the breathing of the drivers, so crews had to wear gas masks in order to breathe.



Demining machine in action.
Photo courtesy of Valer Repko

The first flails were not as successful as expected. They were unreliable, with frequent breakdowns. Problems were also encountered with the heat and dust, a problem encountered with flails today. The first Matilda Scorpion was followed by several similar machines such as the Mark II, III, IV and V versions of the Scorpion. Version V was mounted on the Sherman tank.

Other flails that followed included the Matilda Baron and the Sherman Crab. The Crab ran on the tank's main engine, had 43 flail hammers and included a rotor for cutting barbed wire to prevent the flail from getting entangled. The flail also had a mechanism to ensure that it followed ground contours and had extra protection in the form of a blast shield. This flail did not clear all mines and could only move at very low speeds; however, the Crab was used during and after the D-Day landings and allowed the Allied Forces to advance through the German minefields.

Up to the end of the 1980s, demining machines were only used by the military. In the early 1990s, however, the need for demining machines for humanitarian purposes was recognized, and the machines were introduced into countries such as Afghanistan and Angola. Initially, military carriers were used, but later purpose-built carriers were developed.¹ Early machines were often clumsy, unreliable and underpowered. The clearance results also fell below the minimum United Nations' requirement.

Present

Today, varieties of demining machines are available on the open market and are much improved. Some have been produced in relatively large numbers, while others have been made in limited series or only as single machines. The Geneva International Centre for Humanitarian Demining's *Mechanical Demining Equipment Catalogue 2008*² includes 42 different demining machines; however, there are also several others available, including those that are locally constructed. Local demining machines were not included in the Catalog since they are only produced in very small quantities, i.e., only one or two machines.

Demining machines include various types of mine-clearance machines, ground-preparation machines and mine-protected vehicles. There are flails, tillers and combined systems. In addition, there are double flails, rollers, rock crushers, soil disrupters, mowers, brush cutters, slashers and magnets. There are also combinations of the above-mentioned tools. Cabins are now protected with state-of-the-art armor plating and outfitted with air conditioning.

International standards for mechanical demining involve rigid testing of demining machines. In addition, the market is demanding complete, after-sales service packages and delivery of spare parts within days to some of the remotest locations in the world.

The practice in the demining community has been that all mechanical demining be followed by manual deminers or mine-detection dogs; however, as the quality of available machines improves, this is changing. In June 2008, two *Comité Européen de Normalisation* Workshop Agreements for mechanical demining were published: one for quality management and assurance/quality control for mechanical demining; the other for follow-on processes, after the use of demining machines. The latter states the following: “Follow-on operations after technical survey may not be required if the machine does not encounter a hazard, and has been proven capable of detecting and destroying similar expected hazards in similar conditions. If a machine does encounter a hazard, then follow-on will be required in all but exceptional cases. The specific follow-on activity can only be determined at the site—and would normally be either by manual demining or mine-detection dogs. The specific area for follow-on operations will be determined on the site on a case-by-case basis.”³

Three more International Mine Action Standards are under development, in addition to IMAS 09.50 Mechanical Demining. The new IMAS will include operator safety, quality management and the application of mechanical demining machines.

In 2008, the GICHD published the seventh edition of the *Mechanical Demining Equipment Catalogue* and *A Guide To Road Clearance*.⁴ *The Mechanical Demining Handbook* was published in 2008. Beginning in 2009, a mechanical demining reference library will be available on the GICHD website. The reference library will include most documents related to mechanical demining that have been published over the years and will be available to all interested in mechanical demining.

As seen above, demining machines have evolved enormously since 1942. The GICHD will continue to follow and assist in the further development and improvement over the coming years. 🌹

Biography



Pehr Lodhammar is Mechanical Project Officer with the GICHD and joined the GICHD in February 2008. He is working with mechanical mine-clearance projects with the GICHD. Prior to starting with the GICHD, Lodhammar worked as a project manager supporting the Iraqi Kurdistan Mine Action Agency with the United Nations Office for Project Services. Before starting with mine action in 1999, he was a military engineering officer specializing in Explosive Ordnance Disposal for 10 years.

Endnotes

1. The carrier refers to the type of machine on which the flail is mounted.
2. *Mechanical Demining Equipment Catalogue 2008*. GICHD. <http://www.gichd.org/en/gichd-publications/mde-catalogue/>. Accessed 25 February 2009.
3. *CEN Workshop Agreement 15044*. July 2004. <http://www.gichd.org/fileadmin/pdf/publications/CWA%2015044-2004%20-%20T%26E%20of%20Demining%20Machines.pdf>. Accessed 8 December 2008.
4. *A Guide to Road Clearance*. GICHD. <http://www.gichd.org/gichd-publications/guide-to-road-clearance/>.

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