

### Mine-Guzzler demining machine



Developed by:



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Following Attachments are included in this summary of the Mine-Guzzler demining machine

1. RYBRO\_prod\_spec[1].pdf
2. Cromac tests.pdf
3. Bofors Letter.pdf
4. ITEP Mine Guzzler Report.pdf

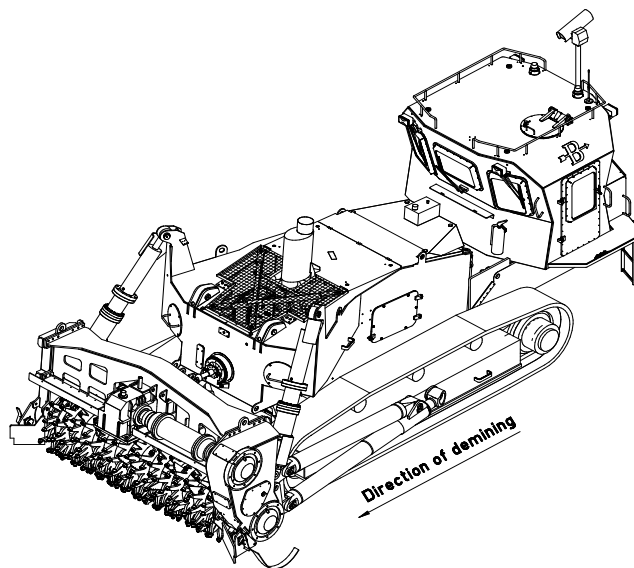
## Description of the System

The machine was developed by BAE Systems Bofors AB in Sweden. The optimized demining vehicle has been redesigned and is based completely on commercial components for ease of maintenance, repair and high accessibility of spare parts. The new owner is Rybro International Limited, who continues to work in cooperation with BAE Systems Bofors AB.

The Mine Guzzler demining machine:

- is able to detonate or destroy AP and AT landmines;
- is a non-flail type technology;
- is survivable or field repairable from a 7kg TNT equivalent mine blast;
- is ground engaging to a depth of no less than 30 centimeters;
- is transportable, reliable, maintainable, and logistically supportable in third world mine affected countries; and
- has an operators cab which provides sufficient protection for survivability of the occupants against the indirect effects of a 7kg of TNT equivalent explosives as well as being operated by a remote control.

The Mine Guzzler is based on a double track arrangement of Caterpillar. A demining tiller is located on hydraulic supports at the front of the vehicle and powered by a 640 kw engine with hydrostatic drive. The complete vehicle is fully protected against fragments from detonation of mines and UXO. Any plates that become damaged can be easily replaced in the field by oxyacetylene cutting and welding. Each vehicle can be equipped with a spare roller to enable the demining work to continue while a tiller is undergoing repair. A complete tiller change can be effected in less than 30 minutes using the hydraulic supports to lift the tiller for access or to load/unload the roller onto a transport vehicle.



The 53-tonne Mine Guzzler may be operated either by remote control using onboard television cameras or from the protection of the driver's cabin. This is further protected against fragments by a raised armoured superstructure. The driver's cabin is designed to

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withstand detonations from 12 kg of explosives (TNT). The Mine Guzzler is made up of four parts – the protected cabin, the chassis, the engine compartment and the tiller unit. These can all be easily disassembled for transportation if required. This facilitates transport in countries with poor road infrastructure. The rotator can be replaced by a blade to allow the machine to be used as an armored bulldozer.

It should also be mentioned that the two earlier prototypes from BAE Systems Bofors AB used the same tool fitted on a Leopard tank chassis. The experience from these tests has resulted in the present design. The tank chassis is too soft and does not give the same stable platform of the Mine Guzzler allowing the automatic depth system to work. This situation would be the same if placing any tiller tool on a carrier with rubber wheels, especially if the tool hits the ground from above like the Mine Guzzler.

### Clearance methodology

The vehicle drives forward into the suspect area by revolving the tiller unit. It rotates clockwise with a speed up to 190 rpm. The demining tiller, which can be angled to follow ground undulations, is adjustable for depth and automatically maintains the depth set. The tiller comprises a series of circular plates fitted with tungsten carbide teeth around their outer perimeter, which either causes the mines (anti-personnel and anti-tank) to detonate or breaks them into small pieces. The Mine Guzzler can clear anti-personnel and anti-tank mines to a depth of 50 cm and over an effective width of 3 m. Maximum demining speed is 4km/h depending on ground conditions.

The clearance is not hindered by vegetation as can be seen on below pictures.



### Engine, fuel and oil

A caterpillar C27 640kw engine powers the Mine Guzzler with 800-litre diesel capacity. The tiller unit does not have a separate engine. The hydraulic oil capacity for the tracks is 235 litres, while the lift and tilt system requires 70 litres. During two tests in Germany in October 2000, the average fuel consumption was 70-90 litres per hour.

The engine can be replaced with another engine that meets any required exhaust emission.

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### Factory support

The main components (engine, tracks, filters, etc.) are from Caterpillar. The special parts can be ordered either from Caterpillar agents or directly from Rybro International.

The Mine Guzzler from a service and maintenance perspective is a 90% heavy construction machine built with Caterpillar components. The Mine Guzzler is very similar to a bulldozer having its customized separation of tool, engine and cabin. The tool, maintenance of the tool, and handling of the machine can be brought to any Caterpillar dealers where they are represented. Rybro International will always be ready to give 2<sup>nd</sup> line technical support if necessary; however, primary service and repairs will be made through the local service organization.

Training, spare parts catalogue and comprehensive manuals in English are part of the delivery package. Training can be provided locally or in Sweden prior to shipment.

### Maintenance and support

The Mine Guzzler design is based on using as many standard parts (off-the-shelf) as possible. The engine and tracks as well as the engine control, filters and main components in the hydraulic system are from Caterpillar. The reason for keeping a custom built body combined with standard parts is to combine the best available access to service and spare parts while maximizing machine performance. The mechanical drive and the separation of tool, engine and cabin that reduces any acceleration forces from being transferred from the tool into the machine could only be achieved with the design as chosen on the Mine Guzzler. The position of the cabin, as far back as possible from any danger, is also of major importance compared to alternative locations closer to the tool resulting in less protection for the operators in the cabin.

The primary consumables and vital parts on the machine are standard Caterpillar parts and components not needing any additional training for the Caterpillar dealer/ organization.

Daily maintenance is performed by the machine operator. Repairs can be carried out in the field, assuming oxyacetylene cutting and welding equipment is available. Recommended operators for the machine are one trained and experienced heavy machine operator and one manual deminer. The machine can easily be operated by one operator. The tiller teeth are constructed from extremely tough tungsten carbide steel.

### Tests and evaluations

In May-June 2000, the Mine Guzzler was tested in Croatia together with CROMAC. A minefield of 80,000m<sup>2</sup> was cleared. The machine passed the CROMAC test. The cooling problem mentioned in the Cromac tests has since been solved<sup>1</sup>.

In October 2000, a comparative test with five different machines was carried out by the BWB (Bundesamt für Wehrtechnik und Beschaffung) on behalf of the German Army. The Mine Guzzler achieved the best overall results.

In February 2001, the machine was tested by the Egyptian Armed Forces in Egypt. The test was performed in live minefields in Hurghada and Safaga.

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<sup>1</sup> See Bofors Letter.pdf

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Copies of the German and Croatian test reports which support claims that the proposed system meets the system performance specification are attached.

Beside the above tests with live AT and AP mines the machine has also been tested in Sweden using plastic dummy mines. Reports from these tests are in Swedish Language and can be sent on request.

### Reported limitations and strengths

#### Strengths<sup>3</sup>

The Mine Guzzler is designed to destroy anti-personnel and anti-tank mines.

Mine Guzzler can easily cope with thick vegetation as well as individual trees up to 20 cm in diameter<sup>2</sup>.

Good daily efficiency of the machine during clearing operations<sup>2</sup>.

#### Limitations<sup>3</sup>

The Mine Guzzler is a large, tracked vehicle.

Over long distances on deployment to minefields it will require transporting by low loader.

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<sup>2</sup> Cromac Test Report

<sup>3</sup> Geneva International Center for Humanitarian Demining - Mechanical Demining Equipment Catalogue 2006

## Mine-Guzzler demining machine

### Technical Specification

	Weight	Length	Width	Height
<b>Complete vehicle</b>	<b>51 000 kg</b>	<b>8 570 mm</b>	<b>4 540 mm</b>	<b>3 936 mm</b>
<i>Undercarriage</i>	<i>20 000 kg</i>	<i>6 740 mm</i>	<i>3 340 mm</i>	<i>1 515 mm</i>
<i>Cabin</i>	<i>4 000 kg</i>	<i>2 305 mm</i>	<i>3 050 mm</i>	<i>2 395 mm</i>
<i>Power pack cassette</i>	<i>10 000 kg</i>	<i>4 350 mm</i>	<i>2 930 mm</i>	<i>2 700 mm</i>
<i>Demining attachment and shock absorber units</i>	<i>2 000 kg</i>			
<i>Demining unit</i>	<i>15 000 kg</i>	<i>1 725 mm</i>	<i>4 340 mm</i>	<i>2 555 mm</i>
<i>Demining roller</i>	<i>7 000 kg</i>	<i>3 475 mm</i>	<i>1 200 mm</i>	<i>1 200 mm</i>

CLEARING/WORKING WIDTH:	3 ,150 MM (ADDITIONAL 700 MM WITH THE ALWAYS ATTACHED PLOWS)				
WHEELS/TRACKS (DESCRIPTION):	NUMBER OF TRACK PLATES PER SIDE 52 TRACK PLATE TYPE 3 RIDGES TRACK PLATE WIDTH 550 MM				
GROUND BEARING PRESSURE (KPA)	99 KG/DM <sup>2</sup>				
HILL CLIMBING ABILITY (IN DEGREE):	+/- 15° DURING DEMINING +/- 30° DURING TRANSPORT				
NUMBER OF CHAINS/CHISELS/TOOLS:	405				
BEAT PATTERN (HITS PER SQM) AT DIFFERENT OPERATING SPEEDS					
	1 km/h	1,5 km/h	2 km/h	2,5 km/h	3 km/h
HITS PER SQM	3158	2105	1579	1263	1053
LENGTH OF CHAINS/TOOLS:	BETWEEN TUBE AND TEETHS 300 MM				
DIAMETER OF DRUM:	1, 200 MM				
ROTATION SPEED:	190 RPM				
CLEARANCE/WORKING DEPTH IN VARYING TERRAIN:	100-500 MM CLEARANCE DEPENDING ON SETTING. IN VERY HARD TERRAIN IT IS RECOMMENDED NOT TO GO DEEPER THAN 300 MM CLEARANCE DEPTH. STANDING STILL THE MACHINE CAN CLEAR DOWN TO 700 MM.				
WORKING SPEED (SQM/H)	LIGHT SOIL/ MEDIUM VEGETATION	MEDIUM SOIL/MEDIUM VEGETATION	HEAVY SOIL/ DENSE VEGETATION		
	9 000 SQM/H	6 000 SQM/H	3000 SQM/H		
CONTROL OF CLEARANCE/WORKING DEPTH:	ACTIVE DEPTH HOLDING SYSTEM USING SENSORS ON EACH SIDE GIVING SIGNALS TO HYDRAULICS THAT CONTROL THE CLEARANCE DEPTH KEEPING IT ON PRESET LEVEL AT ALL TIMES.				
ENGINE:	CAT C27, 27L, 12 CYLINDER DIESEL ENGINE				
ENGINE POWER AT THE FLYWHEEL	EFFECT AT 2 100 R/MIN 641 kW (860 HP)				
POWER AT THE WORKING TOOL	EFFECT AT 2 100 R/MIN 550 kW				
FUEL CAPACITY:	800 L				
FUEL CONSUMPTION:	BETWEEN 40 AND 90 L/H DEPENDS ON SOIL/SPEED/DEPTH				

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SEPARATE ENGINE FOR WORKING UNIT:	No
COOLING SYSTEM :	155 L
OIL CAPACITY:	60 L
HYDRAULIC OIL CAPACITY:	70 L + 235 L FOR THE TRANSMISSION
AIR CONDITIONING:	YES
<b>OPERATOR COMFORT:</b>	
<p>THE MINE GUZZLER HAS A FRAGMENT-PROTECTED CABIN LOCATED AT THE REAR OF THE VEHICLE. THE CABIN IS MOUNTED ON VIBRATION AND SHOCK ABSORBERS TO MINIMISE ACCELERATING STRESS EFFECTS ON THE CREW WHEN MINES ARE DETONATED. THE DRIVER'S SEAT CAN BE ROTATED, MAKING IT EASIER TO DRIVE THE VEHICLE BACKWARDS IN TRANSPORT MODE. THE LARGE WINDOWS, MADE OF ARMoured GLASS, ALLOW FREE SIGHT AROUND THE VEHICLE.</p> <p>THE CABIN IS DESIGNED WITH A HIGH LEVEL OF COMFORT AND EASY ACCESS TO ALL CONTROLS. FOR THE COMFORT OF THE CREW, THE SEATS CAN BE ADJUSTED FORWARDS/BACKWARDS, IN HEIGHT AND FOR WEIGHT, AS WELL AS FOR BACK SUPPORT AND ARM SUPPORT WIDTH. EACH SEAT IS ALSO FITTED WITH A FOUR-POINT SAFETY BELT. A FAN WITH FILTERS SUPPLIES THE CABIN WITH FRESH AIR. THE CABIN IS ALSO EQUIPPED WITH AN AIR CONDITIONING UNIT WITH HEATING AND COOLING CAPACITY.</p>	
ARMOUR:	13 AND 16 MM WELDOX 700 STEEL
REMOTE CONTROLLED:	YES INCL CAMERA CONTROL AND MONITOR
+ GREATEST DISTANCE:	2 KM IN LINE OF SIGHT

### Past performance

The overall performance of the Mine Guzzler is clearly stated in the ITEP and CROMAC test reports included with this document. The testing of the system and the results of the tests are proof of its capability.

Total area cleared during tests and evaluations is 1,500,000 sqm

### Price schedules

The total prices for the Mine Guzzler as per enclosed spec<sup>4</sup> are:

Demining Machine <sup>5</sup> :	2,500,000 EUR
Rotator:	469,800 EUR
Spare Parts 1 500 h per Machine:	248,250 EUR

1,500 h is estimated to be equal to the need for one year operation.

<sup>4</sup> See the attached Product Brochure.

<sup>5</sup> Rotator not included



### Customary practices

#### Warranty - Guarantee undertaking and guarantee time period

Rybro International Ltd guarantees that the supplied product shall fulfill the agreed requirements.

Rybro International Ltd shall, with reference to the preceding sentence, without special compensation, rectify defects in design, material, manufacture and/or assembly that can be shown to have occurred within 6 months from the day of delivery.

#### Guarantee against defects

Rybro International Ltd's responsibility does not include defects caused through careless use or handling, lack of maintenance or faulty maintenance, inappropriate storage, incorrect assembly by the customer, changes made without written permission from Rybro International Ltd, incorrectly made repairs by the customer or any person or persons employed by the customer, normal wear and tear or damage caused by mine detonations.

### Requirements of any laws and regulations

Export License may be required.

The design is protected by several patents controlled and owned by Rybro International Ltd registered in US, Sweden and UK.

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