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## BOZENA 4 Mine Clearing Flail System

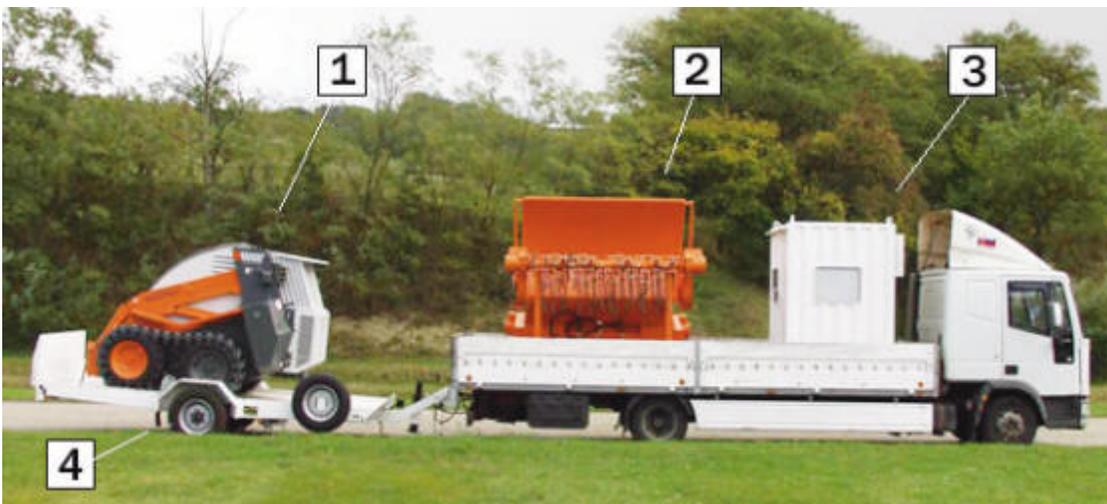
**The new BOZENA 4 Mine Clearing Flail System is one-of-a-kind in many aspects, from the tracking of AP and AT mines to the lightweight and small design that enables BOZENA 4 to be easily transportable.**

by Marián Zimmermann, Dipl. Eng., *Project Administrator*,  
WAY Industry



### Introduction

The latest model from the well-known Slovakian Mine Clearing Machine series is BOZENA 4, which its producer, WAY Industry, introduced to the international community in May 2002. The BOZENA 4 Mine Clearing Flail System (BOZENA 4) is a mechanical tracking mine-clearing machine controlled by a transmitter as far away as 2,000 m. BOZENA 4 was designed for clearing AP mines that are both pressure and tripwire fused, and for clearing AT mines containing no more than nine kg of trinitrotoluene (TNT) charge. The system is able to clear mines between buildings, along paths, on plantations, around permanent obstacles and where the ground cannot support heavy weights. A truck pulling a trailer carrying the BOZENA 4 transports it between work areas. An air-conditioned and armoured cabin sits on the truck bed for an operator to maneuver the BOZENA 4 within visibility; a protected remote camera system can be provided as well. BOZENA 4 is protected with an armoured metal covering and by a shield directly behind the flail at the front of the vehicle, giving protection against damage from detonations. The amount of clearing BOZENA 4 can perform daily depends on the ground and terrain conditions. The average hourly cleared area is about 1,700 sq m.



The BOZENA 4 consists of:

1. Prime mover B4-L1203 RC
2. Flail (two pcs) - working tool
3. Operator's monitoring cabin (air-conditioned)
4. Trailer for transport between operational sites

### Basic technical characteristics of BOZENA 4

Model	DEUTZ BF 4L913
Type	Four-stroke, turbocharged diesel with direct fuel injection, air cooled
Volume of cylinders	4,086,00 cm <sup>3</sup> (four in-line cylinders)
Rated power output at 2,500 rpm	78 kW/106 HP
Max. fuel consumption	223 g/kWh (8.2 l/Mh)

#### Hydraulics

Three independent hydraulic circuits	Bosch-Rexroth
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#### Flail - Working tool

Width of flail	2,000 mm
Soil depth penetration by flail	Up to 250 mm
Operating rpm of flail	350–400 per min

#### Working speed (sq m per hour)

Light soil condition	1,800 sq m per hour
Medium soil condition	1,100 sq m per hour
Heavy soil condition	520 sq m per hour

#### Weight

Remote control prime mover B4-L1203 (with recovery winch and tire tracks, but without flail)	4,740 kg
Flail	1,060 kg
Total weight of BOZENA 4	5,800 kg

#### Remote control

Maximum transmitter range	2,000 m
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- Transmitter CSB T3 is the portable module equipped with setting and controlling elements.

Minimum operational time with fully charged accumulator (ACU 100 percent charged)	6 hours
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Band of radio modem action	430–470 MHz
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- Receiver CSB R3 is the firmly built-in module that receives commands from the transmitter.

## BOZENA 4 Training Course

### Participants

Due to the mechanical element of operating the BOZENA 4, we request that technicians with a good technical background and experience in the field of heavy construction machines (loaders, tractors, bulldozers, etc.) be chosen. Knowledge about hydraulic systems, diesel engines, electronics, etc., is also important.

The required personnel are as follows:ws:

- Two trained operators per BOZENA 4
- One substitute for every three BOZENA 4s
- Two trained mechanics per service team
- One service team for every two to four BOZENA 4s
- One substitute for each two service teams

The General Training course schedule consists of the following two parts:

- 1st part (theory): This part covers the theory behind the machine, the design, the regular maintenance required and the troubleshooting system. It is held at the manufacturing site in Slovakia for five working days.
- 2nd part (practise): This part covers practical training with the machine and a parallel theory training refresher course. It is held for five working days in the country where the BOZENA 4s will be deployed once the shipment to site is completed.

Both training courses can be conducted in the country of the BOZENA 4s' deployment, if preferred. Three manufacturers' instructors conduct training, one of which will be an interpreter.

BOZENA 4 was tested several times on AP & AT mines by various organizations

Croatian Mine Action Centre (CROMAC), October 2002:

- AP blast mines: PMA 1 (five pcs), PMA 2 (five pcs), PMA 3 (five pcs)—at different depths
- AP bounding fragmentation mines: PMR-2A (two pcs), PROM-1 (two pcs)
- AT mine: TMM-1 (one pc—5.6 kg of TNT)

Ethiopian Mine Action Office, May 06, 2003:

- AP blast mines: PMD-6 (two pcs), PMN (two pcs)
- AT mine: PRB-M3 (one pc—6.0 kg TNT/RDX/Aluminum powder - 70/15/15)

Poland Army, December 05, 2002:

- AT mine: TM-62P (one pc—7.0 kg of TNT)

Military Technical & Testing Institute (Záhorie, Slovakia), October 2002, May 2003:

- AP fragmentation & bounding mine: PP Mi-Sr II (13 pcs)
- AT mines: PT Mi-Ba III (eight pcs—9.0 kg of TNT), PT Mi-K (two pcs—4.9 kg TNT)

BOZENA 4 was also positively evaluated by mine-clearing specialists from various non-governmental organizations (NGOs), UN Mine Action Centres (MACs) and UN Peacekeeping Forces operating in the territory of former Yugoslavian countries (Croatia, Bosnia, Kosovo), northern Iraq, Lebanon, Albania and Eritrea.

When comparing BOZENA 4 with other demining machines, the following advantages stand out:

- The price of equipment and spare parts is low due to the simple design.
- Servicing is not difficult and not expensive due to the simple design.
- Servicing can be carried out immediately if the manufacturer's mechanic is on the operational site, or if not, within three days in Europe.
- The remote control aspect of BOZENA 4 provides maximum safety because the operator is at a safe distance from possible explosions. The operator is seated in an armoured, air-conditioned cabin located on the truck bed at a minimum distance of 20 m from the minefield, creating low operator stress and virtually no danger.
- The extremely small dimensions of BOZENA 4 (width: 2,716 mm, length: 6,052 mm, height: 2,145 mm) make it highly maneuverable in confined spaces and under difficult conditions.
- Being small and light (5.8 tons), the BOZENA 4 will not get stuck while operating in muddy and marshy terrain as easily as other demining vehicles that often exceed 20 tons.
- Using the quick-mounting steel tire tracks may enhance its operating capability over wet and muddy terrain.
- The producer can provide professional training courses for customer personnel. Only trained personnel are allowed to operate the machine and perform daily maintenance and minor repairs.

WAY Industry supports the following mechanical flail demining teams with BOZENA 4 machines:

- Albania: In 2002, Slovakian personnel cleared the area around the Albanian-Kosovo border under the UN Development Program/Albanian Mine Action Executive (UNDP/AMAE) project with the help of one BOZENA 4. The extremely harsh conditions and steep mountains proved BOZENA 4's durability.
- Bosnia and Herzegovina: In 1997, one BOZENA 4 flail team with Slovakian personnel won a contract for mechanical demining services in Bosnia and Herzegovina under management of the UNMAC in Sarajevo. The BOZENA 4 flail team cleared approximately 155,000 sq m of densely vegetated minefields in three months through awful weather conditions.
- Croatia: From 1996 to 1998, two BOZENA 4 flail teams worked with a Slovak UN Transitional Administration for Eastern Slavonia (UNTAES) engineering military unit.

During this period, the two BOZENA 4s cleared 96 AT mines and more than 1,000 AP mines without significant technical damage. Due to this great performance, 12 more BOZENA 4s were sent to speed up the process of mine clearance at this moment. The Slovakian president, Mr. Rudolf Schuster, donated one unit of the latest model, the BOZENA 4, to the International Trust Fund in Slovenia during the ninth meeting of the 16 Centro European presidents in Slovenia on May 31, 2002. This BOZENA 4 will be used in Croatia under the management of the CROMAC.

- Kosovo: During 2000 and 2001, four BOZENA 4s cleared an area in Kosovo. Two BOZENA 4s worked with the Slovak Armed Forces and Kosovo Forces (KFOR), and the remaining worked on UN mine action projects.
- Northern Iraq: In 2001, the UN Office of Project Services (UNOPS), as a part of the "Oil for Food" programme, contracted nine BOZENA 4 flail teams with all elements of demining support. All nine BOZENA 4s will help in the reconstruction of Iraq, mostly in the north.
- Eritrea: In 2001, the UN Mission in Ethiopia and Eritrea (UNMEE) Slovak Engineer Units used nine BOZENA 4s that cleared 2,937,000 sq m of minefields and continue to perform a great job.
- Lebanon: In May 2002, four BOZENA 4s were deployed in southern Lebanon to perform demining activities under the Operation Emirates Solidarity project funded by the United Arab Emirates (UAE) government.
- Sri Lanka: One BOZENA 4 will prove its capabilities with UNDP support to mine action in the tropical conditions of Sri Lanka.

*\*All photos courtesy of the author.*

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