

Exploration and Mining Equipment

7/2011



Equipment for the Exploration and Mining Industry



BAUER Maschinen GmbH is the leading company in developing and manufacturing of specialized foundation equipment. Based on their world wide experience over many years, Bauer Maschinen is also actively involved in the field of Exploration and Mining.



Rotary drilling rig BG 36 drills holes with a diameter of 2,5 m to a depth of 60 m in Kimberlite pipes (Australia)

We offer equipment and systems in the following fields:

- Onshore exploration
- Offshore exploration
- Bulk Sampling
- Groundwater control
- Cut-off systems
- Mine development

In addition to developing and manufacturing suitable equipment, we are designing new solutions together with our clients for special challenges.

Exploration

Mineral exploration is the process of finding ore (commercially viable concentrations of minerals) to mine.

(Definition Wikipedia)

Exploration activity is conducted in brownfield areas (an area where there is current or past mining of a particular resource) as well as in greenfield areas (an area where there are no current mining operations or known mineral resources).

Methods for exploration can be divided into:

- Drilling core samples that intersect a mineral deposit
- Bulk Sampling
- Sea floor exploration

Exploration

Drilling core samples

Our daughter company **PRAKLA Bohrtechnik** provides drilling rigs for drilling diameters of up to 1000 mm. RB rigs are mainly used for sampling and coring to a depth of 500 m and more. To accurately investigate rock sequences – for which the recovery of drill cores is necessary – rotary wireline core drilling with a double tube core barrel is applied. The most common borehole diameter is 146 mm with a core diameter of 101 mm. To perform core drilling with these dimensions rotary power swivels are needed that can achieve speeds of up to 240 rpm.



RB 40 kimberlite RC sampling and coring in Angola



Exploration Bulk sampling

“Bulk sampling” is a commonly used industry term to describe the practice of the removal of relatively large quantities of a mineral bearing substance for the purpose of testing mineral content. Bulk sampling locations are selected at random with the necessity of using mobile but powerful equipment which is capable of fast and easy self-travelling between sampling locations and extracting up to several hundred tons of ore at one sampling position. Equipment, which originates from the foundation business, are excellent tools for this purpose.

Typical examples of equipment which is normally used for constructing bored piles or diaphragm walls are:

- Rotary drilling rigs with kellybar system. (intermittent dry or slurry supported process)
- Rotary drilling rigs with RCD attachment (continuous reverse circulation drilling)
- Hydraulically operated and wire-rope suspended grabs (intermittent dry or slurry supported process)

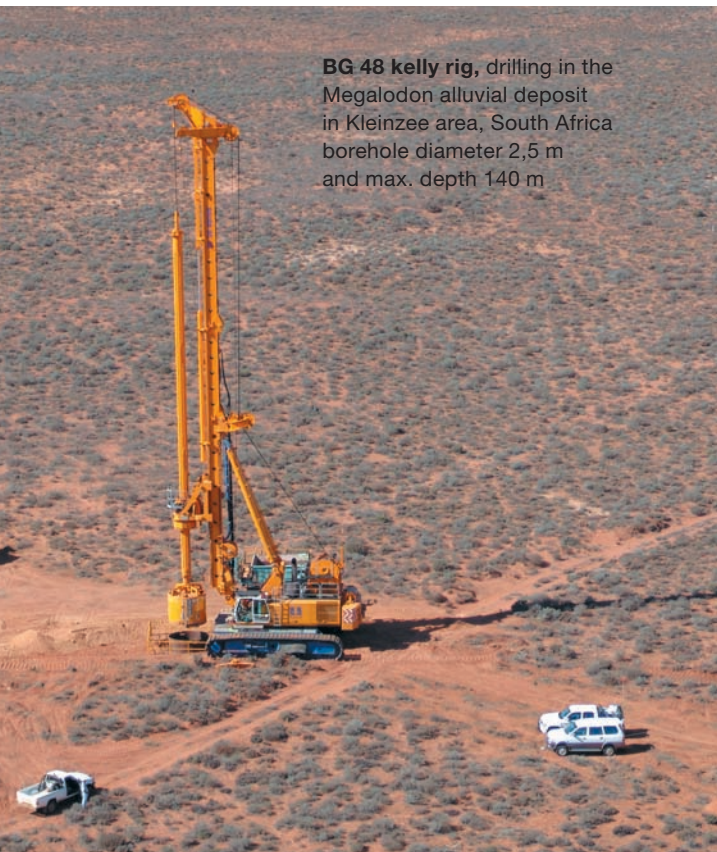
Rotary drilling rigs Bauer BG system and hydraulic grabs Bauer DHG

They are excellent tools for the exploration industry. The capacity of forming holes with diameters up to 3 m and depth to 100 m even in very hard ground conditions makes it ideal for bulk sampling. The holes can either be cased or for greater depths stabilized by drilling mud.



GB 50 base carrier with a hydraulically operated grab, drilling pocket beaches along the Atlantic Ocean in Namibia





BG 48 kelly rig, drilling in the Megalodon alluvial deposit in Kleinzee area, South Africa borehole diameter 2,5 m and max. depth 140 m



Bulk sampling of mine dumps is an ideal application for the **BG 36 kelly drilling rig** 2,5 m diameter sample holes in Kimberly, South Africa

Reverse circulation drilling rigs



Rotary drilling rig **BG 36 RC** for the sampling of deep Kimberlites in Saskatoon, Canada with diameter of 1200 mm to a depth of 360 m. Installation of long top casing with oscillator to 40 m and kelly bar drilling to 100 m. Thereafter drilling system is changed over to RC drilling. The unit is derived from the standard Bauer BG series.



Reverse circulation drilling with **Bauer BBA 100** in an open pit mine, Germany

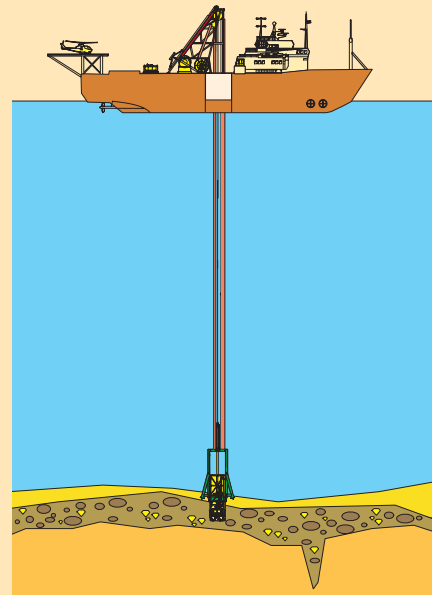
Exploration

Sea floor exploration



Sea floor bulk sampling for diamonds with trench cutter technology

Over 4000 samples were extracted from the seabed to a depth of 5 m and 200 m below sea waterlevel off the coast of Namibia by a sampling tool designed for BHPB.



MeBo – Sea floor core drilling

MeBo is a sea floor core drilling rig, working in water depth up to 2000 m (tests are running for 4000 m). It is deployed on the sea bed and it is remotely controlled from the vessel via umbilical (survey by video cameras and sensors). The drill rig is powered by four hydraulic pumps that are driven with electric motors. The MeBo stores drilling rods, casing tubes, and rotary barrels on two rotating magazines. With a storing capacity of 17 barrels, 16 rods and 15 casing tubes, the MeBo has the capability to drill up to 50 m into the sea floor, to recover cores with 74 – 84 mm diameter. The preferred sampling methods are push coring (soft sediments) and rotary drilling (wireline coring) for rock. MeBo was developed by the Marum Center for Marine Environmental Sciences (University of Bremen). Most of the mechanical and hydraulic parts of the drill rig are developed, manufactured, and assembled by Prakla Bohrtechnik.

Mine Development

Bauer Maschinen offers machinery for working steps which are associated with mine development, such as

- Blast hole drills
- Drill rigs for additional exploration
- Trechn cutter technology for mining
- Costumized solutions
- Machinery for the control of ground water.



Mine Development Mining



Blast hole rigs

The BAUER Maschinen Group offers blast hole drill rigs in various sizes from two of their daughter companies.

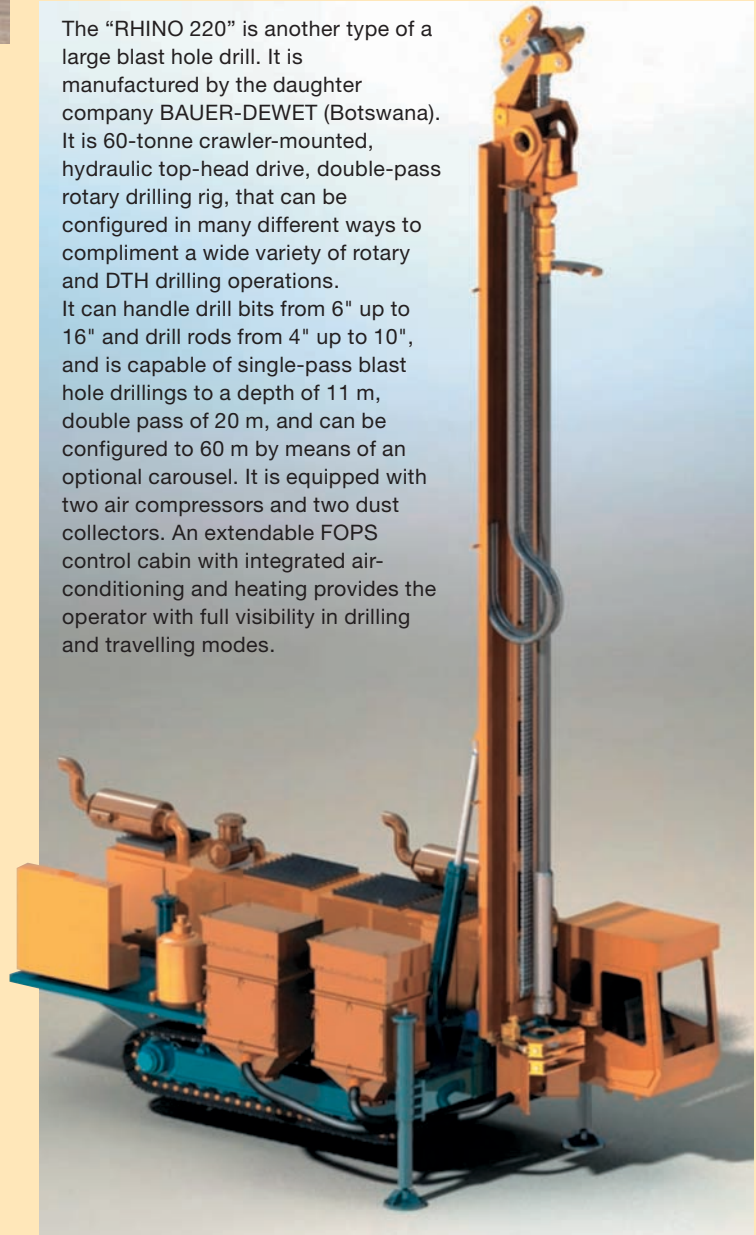
The machines of HAUSHERR (Germany) can be used in blast hole and exploratory drilling in all scopes of open cast mining. They are not only suitable for rotary drilling but also for DTH drilling. A slew ring with 90° pivoting angle allows the machine to travel parallel and with enough safety clearance to the quarry wall. Each rig has an on-board compressor, a rod magazine and a FOPS cabin.

The rigs are powered by CATERPILLAR-diesel engines with sufficient power reserves. Optionally an electric drive is possible. If required the rig can be mounted on a wheeled chassis instead of a crawler base.

The service free hydraulic rod handling magazine operates without sensors' technology. Depending on the machine type usable lengths of the rods vary from 4 to 8 meters, with different rod diameters and magazine set-up.

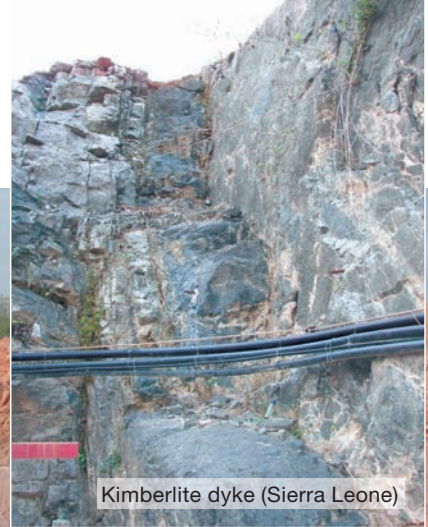
The "RHINO 220" is another type of a large blast hole drill. It is manufactured by the daughter company BAUER-DEWET (Botswana). It is 60-tonne crawler-mounted, hydraulic top-head drive, double-pass rotary drilling rig, that can be configured in many different ways to compliment a wide variety of rotary and DTH drilling operations.

It can handle drill bits from 6" up to 16" and drill rods from 4" up to 10", and is capable of single-pass blast hole drillings to a depth of 11 m, double pass of 20 m, and can be configured to 60 m by means of an optional carousel. It is equipped with two air compressors and two dust collectors. An extendable FOPS control cabin with integrated air-conditioning and heating provides the operator with full visibility in drilling and travelling modes.



Mining with trench cutter technology

The well-proven trench cutter technology of Bauer – which is normally used for constructing underground walls – can also be used for special mining activities. A good example is the introduction of the system in a diamond mine in Sierra Leone. There are areas where Kimberlite is present in narrow but long and deep veins within granitic base rock. With the trench cutter technology it is possible to excavate the Kimberlite dykes without the need of large scale rock excavation.



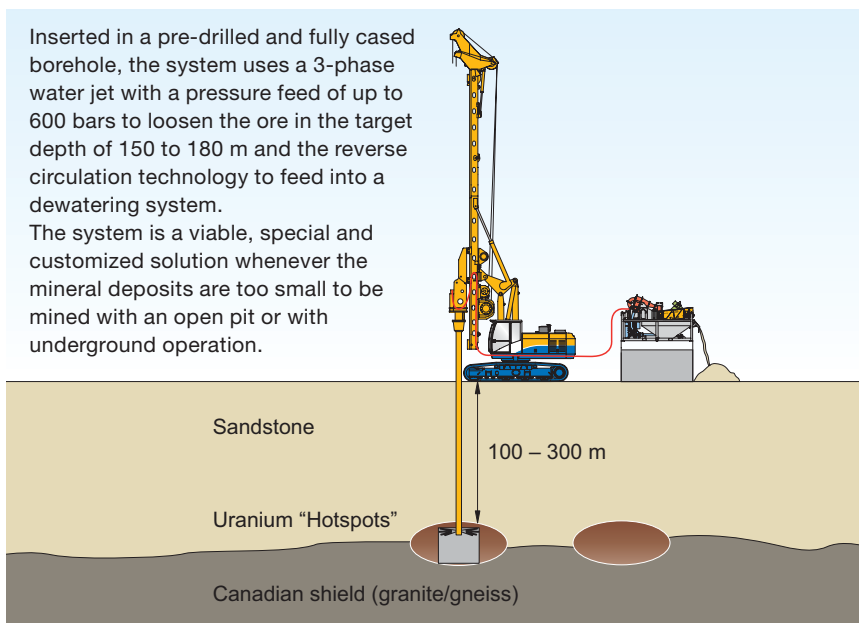
Kimberlite dyke (Sierra Leone)

Special systems for mining

For its Mclean Lake project, AREVA Resources Canada Ltd. addressed BAUER Maschinen GmbH for the development of an alternative mining method for small, pocket-shaped, high-grade uranium deposits, embedded in sandstone. BAUER Maschinen GmbH designed and manufactured a system to mine the uranium ore: the High Pressure Reverse Circulation (HPRC) system in close cooperation with AREVA Resources Canada Ltd. and BAUER Resources.

Inserted in a pre-drilled and fully cased borehole, the system uses a 3-phase water jet with a pressure feed of up to 600 bars to loosen the ore in the target depth of 150 to 180 m and the reverse circulation technology to feed into a dewatering system.

The system is a viable, special and customized solution whenever the mineral deposits are too small to be mined with an open pit or with underground operation.



Customized solutions

Many problems in mining can be solved when finding new and economic solutions. Based on the world wide experience over many years in designing and constructing of specialized foundation equipment, it is the strategy of Bauer Maschinen to design new customized solutions and machinery for solving problems in a new way. Such an approach will always be made in close cooperation with the customer with incorporating their ideas and wishes.

Mine Development

Water control in open mining



Cut-off wall

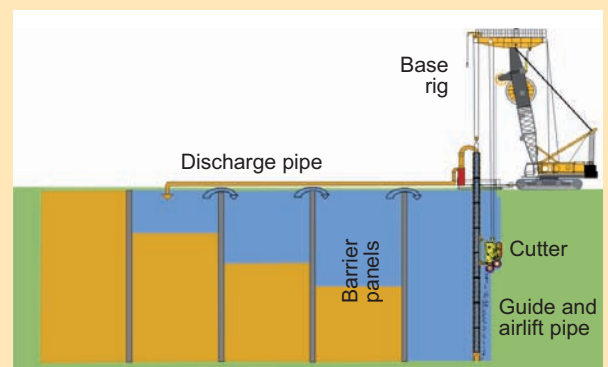
Cut-off wall systems are ideally suited as water barriers around excavation pits, mining pits or similar. A variety of cut-off systems is available for almost each type of soil and site condition, for temporary or for permanent use. Cut-off walls are constructed with techniques of the specialist foundation industry like trench cutters, slurry wall grabs or soil-mixing techniques. Wall material ranges from plastic concrete, standard concrete to in-situ mixed soil-cement material.

A huge cut-off wall on the **DIAMIK Diamond Mine in Canada** serves as an impressive example for a complicated cut-off wall. The kimberlite pipes were sealed off with dikes and cut-off walls installed with BAUER equipment and technical support. More than 40.000 m² had to be sealed in water depths up to 25 m under extremely harsh conditions.



Continuous cut-off wall

For sealing off big lignite open pits in Germany, the energy company Vattenfall created a system of a continuous cut-off wall. The soil is excavated with a special cutter – designed and supplied by Bauer Maschinen. The excavated soil, mixed with clay slurry is pumped into the continuous trench behind the cutter. After sedimentation, an impervious clay crust is formed on both sides of the trench.



Slurry Handling / Mixing and Recovery Plants

For many operations slurry is required for stabilizing holes or as transport medium for cuttings.

Slurry mixers are essential components when constructing boreholes, wells or cut-off walls. MAT mixers are capable of mixing bentonite slurries, cement slurries or bentonite-cement slurries. They can be provided as fully automatic and electronically controlled units, or as manually operated batch mixers, especially suitable in remote areas.



Automatic slurry mixing system SCC 40 in Kleinzee, South Africa



PRAKLA RB 40

Well drilling

A standard method for groundwater control is the installation of wells. Wells are constructed outside of cut-off walls to relieve water pressure on the cut-off wall and they are installed in the open pit to lower the groundwater table for ensuring dry operation. Our daughter company PRAKLA Bohrtechnik as well as BAUER-DEWET provide drilling rigs for drilling diameters of up to 1.000 mm.

Desanding and separation units are required when working with reverse circulation methods (well drilling, wall construction with BC cutters) to separate soil cuttings out of the slurry backflow.

A variety of systems is available depending on the particle size of the cuttings and the volume stream to be cleaned. Bauer BE desanders can treat volume streams from 50 – 1000 m³/h.



Slurry desanding plant BE 500 (capacity 500 m³/h) at DIAVIK, Canada



„Buffalo 90“
BAUER-DEWET



Desanding plant and kimberlite recovery system BEK 375

PRAKLA
Bohrtechnik

MAT
Mischanlagentechnik GmbH

**HAUS
HERR**
SYSTEM

BAUER
DEWET



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