A NEW NAME AND A NEW COLOUR. Change is a process which we have been through several times during our 150-year history. We have re-structured, renamed, sold business activities and invested in new ventures. Essentially we are what we have always been and that is a company whose focus remains on its key competence – plant engineering and constructions. We pursue technical leadership in our market sector through continuous research and development rather than taking second place elsewhere. We simply want to build the best machines on the market for your company’s process requirements. That is why we place so much emphasis on the people and the technology that have stood behind our name in the past and will continue to do so in the future. In this brochure we would like to introduce our technologies so that you appreciate: the name is new, the colour of the logo is new – BUT THE ESSENTIALS ENDURE.

Because of this we have every reason to be open for the changes ahead. Stability will remain the core of our business operations.

Some of our machines have changed the market, some have perfected previous models. From Europe to Australia, from Africa to America or Asia they have been installed and perform heavy-duty work worldwide. In order to perform this work and deliver the required results we develop machines which can withstand two types of stress. On one hand there is the force of the materials. Tons of coal and minerals worked for decades to define the highest demands on material and precision. These demands are the measure we use as orientation for our development department.

On the other hand we have the pressure of the global market which never forgives mistakes or standstill. We have been world market leader for many years and that is where we aim to stay. To achieve this goal we must be prepared to change with the business environment. At the same time we must concentrate on our core business, on what we do best – preparation processes for coal and minerals plus the machines to do this.

We design both complete plants and systems to complement or modify existing installations. We work alongside you, our customer, every step of the way from the first consultation to start-up. We deploy precisely those members of staff who are specialists in the relevant technology – in every screw and every detail. For some it results from the urge to perfect technology, for others from the pure passion for the elemental force of the machines. Whatever drives us – it results in better machines.
Iron ore processing with BATAc Jigs
BATAÇ Jig for coal/principle

BATAÇ Jig for coal/typical flowsheet

BATAÇ Jig for iron ore/typical flowsheet
Jigs represent one of the earliest types of process equipment employed in mineral separation. The adaptation to process coal established BAUM-type jigs as a popular and efficient method of coal cleaning over the last century. Increased demand for more cost-efficient methods of beneficiation led to a review of the jigging process 40 years ago, when large-size washery concepts as well as the use of new technology of manufacturing and control resulted in the new designs of jigs. The newly developed underbed-pulsated BATAc®Jig has a significant improved performance compared to the BAUM Jig. Multiple air chambers directly under the screen bed permit uniform distribution of air pulsations, giving greater capacity and more accurate separation than standard BAUM Jigs. Additionally the BATAc®Jig is equipped with a new concept of air valves, automatically controlled, permitting infinite variation in jigging pulsations. The compactness of the BATAc®Jig is unique on a unit ton-per-hour basis compared to other equipment, and the design allows widths up to 8 m [equivalent of up to 1,000 t/h raw coal feed at maximum feed size of 150 mm]. In countries where consumption of magnetite associated with the old-fashioned heavy medium system of coal cleaning is considered a waste of iron ore resources, the BATAc®Jig is regarded as the primary choice in the selection of cleaning equipment for coal washeries.

Meanwhile the BATAc®Jig technology has been introduced to the iron ore industry successfully, upgrading intergrown iron ores – lump ores as well as sinter fines – that require high separation densities to obtain marketable concentrate grades, and a growing number of globally spreaded projects consider the BATAc®Jig to be the optimum sorting equipment for upgrade of low-grade iron ores.

Anyhow, the BATAc®Jig is not limited to applications in coal and iron ore but can be used in all kinds of minerals where separation by gravity is possible. There are good operational scale examples for the jigging in tin ore, oil shale, in sand and gravel, and additionally it has been proved by lab tests that the BATAc®Jig is even able to preconcentrate e.g. gold ores, diamonds, copper ores, respectively to separate light and heavy fractions in the recycling industry very efficiently.
JONES ready for shipping

Grooved plates of JONES
The JONES generates very high gradients of the magnetic field by the flux converging grooved plates resulting in the high magnetic forces at low current consumption.

The unique design of the JONES results in high throughput rates in a compact machine, enabling small buildings and guarantees low operating as well as maintenance cost at the highest efficiency.

It separates feeble magnetic minerals from non-magnetic minerals by a wet process, even at very fine sizes (<1 mm).

Within the process it either produces a magnetic concentrate when the magnetic mineral is the required product, e.g. haematite, pyrrhotite, siderite, ilmenite, ores of chromium, manganese, tungsten, zinc, tantalum/nioibium, nickel, molybdenum and other feeble magnetic minerals.

Or, non-magnetic mineral, can be upgraded by removal of impurities, e.g. glass sand, apatite, clay, talc, kaolin, feldspar, coal, fluorspar, nepheline, barite, graphite, bauxite, cassiterite etc.

Or it serves as a preconcentration for additional treatment by a different process, e.g. scavenging from subgrade deposits or tailings, minerals like uranium, gold, platinum, chromium, manganese, iron, slags, residues etc. Such impurities include biotite and muscovite, iron-stained particles, garnet, iron silicates, hornblende, tourmaline etc.

Generally the required feed is a thoroughly mixed slurry with particles 100% < 1 mm, but it can be chosen differently in special applications.
The application range of the permanent drum type magnetic separators with open gradient magnetic systems (OGMS) and larger diameters has been extended to a field strength range in excess of 0.7 tesla and a wide working range outside the drum, thus allowing a dry and wet magnetic separation of coarse and fine minerals of medium susceptibility at high throughput rates.

These PERMOS-type magnetic separators are characterized by a special orientation of the magnetized heavy-duty magnet blocks made of NdFeB. Conventional electromagnetic separators with a grooved shell-type drum can also be used for the magnetic separation of coarse particulate weak magnetic industrial minerals, even in a wet state.
PNEUFLot cell copper ore in Chile

PNEUFLot Pilot Unit. MBE Coal & Minerals Technology GmbH has compact pilot plant units that could be delivered worldwide in 20-feet container with plug and run system for conducting test work either in greenfield or in existing plants. This pilot unit has proven to have a 1:1 scale-up factor after comparison studies with industrial scale PNEUFLot.
The pneumatic flotation cell operates on the principles of mixing the air and pulp in a continuous stream and ensuring that the correct bubble sizes are fed into the pulp as it enters the cell. This maximises the number of particle and bubble collisions. The aerator is installed in the vertical central pipe. The flotation pulp is first directed to a single aerating unit arranged in the central pipe above the flotation cell. Following aeration, the pulp flows through the central pipe to the distributor located at the bottom of the cell where it is vertically deflected upward.

PNEUFLOT is applicable for every flotation process, where conventional flotation cells are considered, such as:

- sulfide non-ferrous metal ores, such as copper ores, lead/zinc ores, nickel ores
- oxide ores, such as iron ore, copper oxide ores, tin ore
- industrial minerals, such as phosphates, magnesite, fluorspar, quartz, limestone
- salt minerals, such as potassium salts, rock salts, kieserite
- coal
- paper and plastic waste recycling
- disposal of fly ash and gypsum from flue gas desulphurisation

Benefits of PNEUFLOT cells are for the process:

- better recovery and more yield because of optimal particle and bubble contact
- higher selectivity with optimal control of air
- no re-sliming because of less shear force

Economical advantages:

- less wear thanks to absence of agitator and the modern materials, e.g. hard ceramics
- low energy, since only a pump is required
- no compressed air required on account of the new self-aspirating aerator technology
- small footprint because the particle and bubble contact has occurred before the pulp is injected to the separation vessel, furthermore this is also causing less reagent consumption and less number of cells
- identical cell design for all applications because of the wide range of the bubble sizes that can be produced by the PNEUFLOT (0 – 1000 μm accumulated at 300 μm)

Operational advantages:

- flexible flotation circuit balance with help of automatic recirculation of down comers
- optimal froth control with adjustable “goose neck” and “froth crowder”
- simple control through online monitoring of the process parameters, such as air volume, pressure and tank level
- robust and non-sensitive to feed alteration
BATAK Jig for coal washing
incl. desliming and dewatering screens
PRODUCTION OF STEAM COAL WITH ROMJIG IN INDIA. The movable screen jig ROMJIG can be used to advantage for the preparation of steam coal which in the past was fired as raw coal. The ROMJIG process saves specific transport costs to the power plant. The power plant is supplied with a raw material of increased constant calorific value. Moreover, wear in the boiler house is reduced.

For example, the raw coal of 45% ash extracted by opencast mining in Bina/India is crushed to ~400 mm size in the central crushing system and screened at 30 mm. The coarse fraction [30–400 mm] is directed to three parallel-operated ROMJIG units to be separated into a heavy and a light fraction. The light fraction (~1.9 kg/dm³) containing 31% ash and the raw coal of 41% ash content are delivered as a mixed product of 34% ash to the power plant.
 PRIMARY REJECTS SEPARATION. The first ROMJIG, i.e. a movable screen jig, was successfully tested in 1985 under harsh operating conditions during continuous operation in the German hard coal mine Emil Mayrisch to separate rejects from raw coal 30 – 400 mm. The ROMJIG with a jig width of 2.0 m separates the rejects even at heavily fluctuating raw coal feed rates and heavily fluctuating rejects portions in the feed. The reject yield is allowed to be even more than 90%. The maximum feed rate is 400 t/h. The ROMJIG operates in a closed water circuit without requiring additional clarification of the water. Only the water discharged with the products has to be replenished. Consequently, the specific water demand is no more than 0.03 m³/t. The specific energy demand amounts to less than 0.2 kWh/t. The ROMJIG offers several advantages for the following preparation process: optimal utilisation of the downstream-arranged process stages (i.e. as to capacity and efficiency) less comminution of the fines; reduced ash content; reduced wear of machinery and equipment; reduced specific energy demand – because the coarse fraction has been separated before the conventional washing process starts.

WITH MOVABLE SCREEN FOR DESHALING OF COARSE RAW COAL. The ROMJIG is a single-cut machine developed for primary separation of rejects from the coarse raw coal of 30–400 mm size.

Jigging proceeds in a water bath. Loosening of the feed required for separation is achieved by lifting and dropping of a hydraulically moved rocker arm. The rocker arm movements and the slope pressure result in material transport. The rejects are discharged by a roll that has the effect of a retaining edge. The hydraulic pressure applied during the upward movement of the rocker arm reflects the reject layer thickness that has accumulated on the rocker arm. That value is used as a controlled variable for the discharge roll velocity. The separated coal is transported over a chute.

The rejects separated in the ROMJIG can be stored in the mined-out cavities, which alleviates numerous impacts on the environment, like roads being soiled when taking the rejects to the landfill, reduced demand of steadily scarcer landfill capacities.
1. Bucket wheel for sinks
2. Perforated plates
3. Nozzles
4. Separating compartment
5. Sinks discharge chute
6. Floats discharge device
7. Drive
8. Support
9. Guide rollers
10. Drive for discharge device
11. Pneumatically fitted sealing buffer
12. Feed to be washed
13. Dense medium
14. Sinks
15. Floats
TESKA Separators are used for processing coal and ores. Dense media separation is performed in a suspension of finely ground solids and water. In a slurry of that type particles of high specific gravity settle at the bottom, while particles of lower specific gravity, such as coal, float.

The TESKA Separator is a slowly rotating bucket wheel which has been joined to the separating compartment by seals. The bucket wheel for sinks has been partitioned into compartments by means of perforated plates which enable removal of the sinks. The floats run towards a discharge paddle wheel.

Compared with conventional designs, the TESKA Separator is characterised by the following highlights:
- The sliding pneumatically fitted sealing mounted between rotary bucket wheel and stationary inlet and outlet section of the separating compartment prevents the escape of slurry into tires and drive elements. This arrangement does not alter the bath width which almost corresponds to the inside diameter of the bucket wheel.
- The TESKA Separator is easily accessible. Nothing obstructs an unhindered view over separating compartment and discharge of floats.
- The chute for sinks can be positioned at the right or left, i.e. either concurrent with or opposite to the direction of feeding.
- Adjustable nozzles arranged over the bucket wheel circumference induce a downward flow of dense medium and thus prevent an undesired density concentration towards the bottommost portion of the slurry. At the same time, this feature avoids the formation of layers of suspended matter. The operating principle outlined above guarantees high precision of separation, even for near-gravity material.
- The discharge of dense medium just described is intensified by the admission of working medium from above. A continuous flow is maintained via nozzles mounted over the complete bath width at the separator inlet.
- One of the outstanding features of TESKA Separators is optimal bath utilisation relative to the separator’s volume.
- TESKA Separators are protected against wear by ceramic tiles fitted to components that are subject to specific wear, such as inlet, separating compartment, bucket wheel for sinks etc.
Coal washing plant with BATAC Jigs and heavy media cyclones
The CALIBRATOR is a high-performance cone crusher of the most modern design for crushing medium-hard to extremely hard rock: ore, slag, refractory materials and abrasives like zircon corundum. Its outstanding reliability, long-life cycle, high economy in operation and low maintenance make the CALIBRATOR an ideal machine for size-reduction processes.

Special features can be described as follows:
- Flat cone for higher cubic fraction in product
- Spiderless head mantle support which means a large unobstructed feed opening
- Non-wearing and maintenance-free telescopic labyrinth seal with optional sealing air unit
- Central hydraulic gap adjustment
- Large-dimensioned white babbitt
- Compact installations on one base frame for crusher and drive unit
- Central hydraulic head relief overload system
- Hydrodynamic starting with safety clutch
- Crushing tools can be easily exchanged without backing material

For a versatile crushing conception five basic sizes can be applied: CALIBRATOR 710 H III, CALIBRATOR 950 H III, CALIBRATOR 1300 H III, CALIBRATOR 1600 H III, CALIBRATOR 2000 H III. The machine size is given by the cone diameter in mm. Installed driving powers from 75 – 500 kW can achieve up to 800 m³/h.

For an optimal adjustment to your requirements different crushing tools can be used in a standard CALIBRATOR. This means optimal adaption to the specific application by a quick and easy changeover. The closed side setting occurs by the central hydraulic head adjustment which along with the hydropneumatic spring system permits an adjustment of smallest gap settings.

Our standard equipment includes an easily operated electronic control system CALITRONIC II. The automatic gap control keeps the close side setting constant even under tough conditions. A stable product quality can be guaranteed. Furthermore the CALITRONIC II can be integrated in any superior control system.
Prior to the grinding process of most minerals, the raw material has to be crushed to the appropriate size to be fed to the vibrating or rotary mills. Each application requires a specific way of crushing, sometimes in one step only, but frequently in secondary or even tertiary crushing modules.

We can offer all common crusher types from own sources, by that we are able to guarantee the performance of the whole comminution process of a mine or processing plant, i.e.:

- **Jaw Crushers**, single and double toggle
- **Cone Crushers** (as described more detailed in this brochure)
- **Roll Crushers**, with single or double rolls, with smooth, beaded or spiked roll types
- **Impact Crushers**
- **Hammer Mills**
- **Rotary Breakers** (for raw coal)

Some of these crushers are also available in laboratory size, too.

**CRUSHING EQUIPMENT**

**TUBE MILLS**

Beside our world leading vibrating mills PALLA used for ultra-fine grinding, we supply tube mills for efficient grinding of all kinds of minerals, in diameters from 1,0 – 6,4 m diameter, respectively lengths from 1,0 – 12,0 m, either as ball or rod mills, either as single machine, or as a complete tailor-made system including classifying by cyclones/screens and including the auxiliaries for the respective circuits. Depending on the specific applications the wear liners can be provided in steel, rubber or ceramics.

For layout purposes we are able to execute comprehensive grindability tests in our R&D centre in Cologne with the clients’ specific raw material.
The PALLA Vibrating Mill can be used in a wide range of applications for process engineering duties. Due to its easy operation, versatility and operation efficiency the PALLA Vibrating Mill gains in importance in many different branches of industry.

For over 160 different materials, from soft to very hard, the vibrating mill has been successfully established for dry and wet grinding, homogenising and activating. A high filling degree of the grinding cylinders and a low air throughput appear to be beneficial for materials like metals, coal, coke and other organic materials which tend to increase the risk of dust explosion.

The processing of materials of different structure and chemical composition requires a wide and versatile milling conception which can be described in the following features:
- dry or wet grinding
- different options for grinding cylinder connection
- continuous or discontinuous grinding
- indirect cooling or heating
- dusttight, use of inert and protective gas, grinding compartment with over-pressure and negative pressure special designs
- grinding at cryogenic temperatures (PALLA VM-KT or PALLA UT)
- grinding media various (rods, balls, cylpebs of different materials)
- filling degree of grinding cylinders
- rotation frequency
- acceleration

This milling conception can be realised in our laboratory scale PALLA VM line or in industrial scale in the following basic sizes: PALLA 20U, PALLA 35U, PALLA 50U, PALLA 65U. The machine size reflects the diameter in cm of the grinding cylinders. The indication derives from the greek “pallein” which means “to swing” and “U” which expresses “unbalanced weights”.

The feed size of a vibrating mill ranges from 0–15 mm (max. 0–30 mm) whereas the product size can be less than 10 μm at continuous operation, in special applications even down to 3 μm.

With installed drive capacities of up to 200 kW for wet grinding processes, the PALLA is one of the most powerful and versatile vibrating mills available on the market.

Throughputs up to 20 t/h depend not only on the machine size but also on various other parameters like frequency, amplitude of vibration, arrangement of grinding cylinders and grinding media.
The USK Vibrating Screen is a circular motion machine, typically installed on a slope, which provides a reliable safe method of grading coal and ore. Suitable for the dry and wet grading of coarse and medium grain sizes from 150 – 0,5 mm, the USL Screens are suitable for preclassification of run of mine material.

The USL Vibrating Screen is a linear motion machine which provides a reliable safe method of grading coal and ore. Suitable for the dry and wet grading of coarse and medium grain sizes from 150 – 0,5 mm for depulping and rinsing of heavy media systems and for dewatering of all kinds of bulky materials. Both screen types USL and USK are available in either single- or double-deck configurations, these screens can be supplied with varying drive systems and in sizes specified to match any screening application.

**Single-deck screen:** 1,2 – 4,2 m wide and 2,2 – 7,0 m long  
**Double-deck screen:** 1,2 – 4,2 m wide and 2,2 – 7,0 m long

**Typical information required:**
- type of material for screening
- bulk weight of material [t/m³]
- feed quantity [m³/h]
- screen analysis of the feed
- dimensions of the largest grain size [mm]
- required cut point [mm]
- moisture content of the material [% H₂O]
- portion of sticky components [%]
- grain shape characteristics
- project drawing or construction plan
- quantity flow sheet or existing dressing plant
- details of screening machines, if any, used for the same job
For all applications where controllable uniform discharge of bulk materials out of any kind of bins for loading, proportioning, mixing and feeding is required. The design of our vibrating feeders is based on the experience of decades in the design of vibrating machines. The conveying system of well-braced steel design is supported on compression springs serving as vibration insulation. All parts coming into contact with the conveying material are bolted replaceable to the conveying trough. Two unbalanced motors serve as vibration exciter. Feed rates up to 2,000 t/h, max feed size 1.000 mm edge length.

In coal preparation dewatering is of constantly growing importance. As a result of modern mining methods, imposed safety measures, e.g. dust control by spraying with water, specifically, however, by wet mechanical preparation methods, the volumes of solids/liquids mixtures to be dewatered have increased. This coincides with the growing market requirements relating to the moisture content in the washed coal.

In respect of the feed rate of solids the most effective centrifuge type is the Vibrating Screen Centrifuge, which we supply in a horizontal design for dewatering of clean coal and middlings. The solids feed sizes range from 0.1 – 25 mm, and the capacities from 50 – 300 t/h, corresponding to screen basket diameters between 1.100 and 1.400 mm. The horizontal design permits easy accessibility to the screen basket and all the drive parts including the vibration motor with its unbalanced weights.
SCOPES OF SERVICES

FROM THE FIRST STEP UP TO THE COMMISSIONING. To realise your projects you can receive the entire scope of services from one source, i.e. from us:

- **Project consulting** by globally experienced mining, process, mechanical engineers and mineralogists.
- **Test work** in our own R&D centre and laboratories.
- **Feasibility studies** in joint effort of clients’ personnel familiar with the projects targets and our competent employees, even up to project financing.
- **Plant design** with basic and detail engineering including project management.
- **Supply** of equipment, systems and plants.
- **Training of end users’ personnel** for management functions same as for operators and maintenance employees, in our offices, in our R&D centre, in our reference plants all over the world, and finally on end users’ site.
- **Installation/supervision of installation** of our equipment and systems by our own globally experienced service specialists.
- **Commissioning** of equipment, systems and plants.
- **After-Sales services** including not only supply of parts and respective services but also consultancy in respect of operation and maintenance of our equipment.

EXTENDED SCOPE OF SUPPLY BY MCNALLY BHARAT ENGINEERING COMPANY LTD. By becoming a member of the MBE family of companies since October 2009, we extended the above scope of services to fields around our processing competence, i.e.:

- **Stockyard equipment** with stackers and reclaimers.
- **Bulk material loading equipment** with continuous barge and shiploaders, automatic train loading stations respectively train unloaders.
- **Belt conveying systems** for processing plants and open-cast mining.
Frequently our customers require consultancy with respect to quality of their mineral resources, the optimum process to make best use of it, selection and dimensioning of appropriate equipment. Due to extremely wide varieties within the mineral deposits and requirement to the final products to be achieved by the minerals processing, most of the tasks given to us have to be accompanied by laboratory – and/or pilot – scale test work. Therefore we operate our own R&D centre in Cologne, with a staff of experienced R&D engineers supported by those process engineers who are in direct contact with the respective clients to safeguard that the test work is done under realistic conditions.

We are able to simulate complete separation processes with our own almost all kinds of crushers and mills, using wet or dry classification on screens, in cyclones or in windshifters, and finally separating the minerals by gravity, magnetic properties or using specific chemical surface attributes for flotation.

Most of the laboratory analysis necessary to judge the test work can be done in our own laboratories, securing short execution times between arrival of specific samples and finalising of the test reports.

Some of the pilot scale equipment is even used for tests on site of the client, with the advantage of proving the efficiency of our equipment in bypass installations, e.g. The containerised pilot cell PNEUFLOT.

Additionally we use our R&D centre for training for our clients’ personnel, either in general mineral process training-courses or specifically in operating and maintaining our equipment.
Utilising our considerable logistical, engineering and site service expertise, MBE Coal & Minerals Technology GmbH aim to provide an unparalleled level of ongoing service. These services will maximise the operators’ return on their investment throughout the lifetime of the equipment. We believe that strong partnerships can only evolve with personal contact. From the outset we have assigned an Account Manager who will learn about your business and understand its unique demands. Utilising that knowledge and by focussing on what is important to each individual customer, we can develop an operational plan that will ensure we deliver on our promises – on time and within budget.

The four key services we offer to maintain and improve the operation of your equipment:
- competitively priced OEM spare parts with lead times to meet the customers’ operating requirements
- we carry out planned service visits at mutually agreed intervals with optional emergency call-out services and operator training
- upgrade packages for your equipment to improve performance, based on our most recent product developments
- equipment refurbishment

Continue to utilise our people and expertise to maximise the efficiency of your operations. “We will not let you down.”

**EXPERTISES**
- Expert process and product designers
- Supply chain efficiency
- Skilled service engineers
- World-class R&D facilities
- Large reference base
- Global coverage

**SERVICES**
- Parts with OEM guarantees
- Service contracts
- Product refurbishment
- Training of staff
- Consignment stocking of spares
- System upgrades

**CUSTOMER BENEFITS**
- Lower costs of OEM parts
- Better product recovery rates
- Lower electricity and water consumption
- Higher availability of equipment
- Lower maintenance costs
- Less investment in stocking levels
MBE COAL & MINERALS TECHNOLOGY GMBH
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