BMT WBM Machinery Group

Industries
- Ports and bulk handling 2
- Power generation and process industries 2
- Mineral processing 2
- Conveying 3
- Rail, road and shipping 3
- Surface mining 4
- Underground mining 5

Services
- Machine design 6
- Design audits 7
- Analysis 7
- Test and measurement 9
- Asset management services 10
- Project engineering 11
- Accident investigation/failure analysis 11
- Expert witness advice, arbitration 11

Specialist Technologies
- Large rolling element bearings 12
- Gearing 12
- Fluid power hydraulics 12
- In-situ machining 12
- Conveyor dynamic analysis 13
- Conveyor belt monitoring 13
Machinery Group

BMT WBM has built a reputation for solving the more difficult and challenging problems facing machinery designers, manufacturer and operators.

Underpinning this reputation is an innovative, analytical approach, a very comprehensive measurement and analysis capability and a highly qualified, highly experienced team of professionals.

From massive bulk handling equipment to small mass-produced machinery components, WBM provides assistance in the acquisition or design of new machinery.

For operators of existing machinery, BMT WBM offers a range of services aimed at reducing costs, improving operational performance, efficiency and safety and in extending life.

With specialists covering all engineering disciplines from mechanical, electrical, structural, and controls to fluid power hydraulics, BMT WBM provides a totally integrated service to address any machinery requirement.

The company has offices in Brisbane, Newcastle, Sydney, Mackay, Melbourne and Perth in Australia, Denver, USA and Vancouver, Canada, providing a world wide service to customers with machinery problems.

BMT WBM also offers specialist services in water and coastal engineering and environmental science.
For downtime-critical process and power industries, BMT WBM’s broad expertise and thorough technical approach delivers substantial benefits. Clients include:

- Smelters
- Sugar mills
- Paper and pulp mills
- Oil refineries and petrochemical plants
- Power stations
- Chemical plants
- Abattoirs

BMT WBM offers design, auditing, troubleshooting and related services on a range of mineral processing equipment including:

- Ball, SAG and rod mills
- Vibrating screens
- Rotary breakers
- Centrifuges

For companies operating bulk materials export and import facilities, container terminals and mine site or power station stockyards, BMT WBM provides assistance with the selection, operation and maintenance of machinery. The company has developed special expertise in many areas and offers a broad-ranging service covering design, design audits, repair supervision, vibration testing, life extension, safety audits, inspections and re-engineering.

BMT WBM’s experience includes:

- Shiploaders/Unloaders
- Reclaimers
- Stackers
- Stackers/Reclaimers
- Container Cranes
- Rotary Dumpers
- Conveyors

Industries:

Ports and Bulk Handling

Power Generation and Process Industries

Mineral Processing
Conveying

BMT WBM provides a complete engineering service covering all aspects of overland and underground conveyors; from design, testing, problem solving to procurement and total project management. Over the past several years the company has designed a number of major, high capacity systems for clients worldwide.

In line with its general approach to engineering design, BMT WBM has developed a number of sophisticated conveyor analysis tools and also integrates its troubleshooting and testing experience in the design process to provide cost effective, reliable conveyor systems.

Areas of special expertise include the following:

- Design of moveable conveyors and drive heads, based on many years of experience with moveable conveyor systems used in Australian brown coal mines.
- Dynamic analysis – to assess belt and system dynamics during starting and stopping of long or high-inertia conveyors.

Rail, Road and Shipping

For many years, BMT WBM has provided a specialist engineering service to the transport industry.

Shipping

For shipbuilders and operators, the company offers naval architecture, structural, and machinery design services, vibration and structural testing, drive train analysis, as well as trials monitoring and evaluation.

Road vehicles, semi-trailers

BMT WBM provides engineering advice and testing services to operators, manufacturers and licensing authorities. These services include accident investigations, failure analysis, re-design, vibration testing, ride evaluations, braking and performance testing and offtracking studies.

Railways

Clients include manufacturers and operators of locomotives, rolling stock and special purpose machines. The company assists in design, product development, testing, reliability and performance improvement.
Surface Mining

For more than two decades, BMT WBM has specialised in providing consulting advice to operators of surface mining machines, especially to draglines, bucketwheel excavators, mining shovels and trucks.

Draglines

BMT WBM is a world leader in providing independent advice to dragline operators to assist with mechanical, structural or electrical problems. The company offers a range of specialist services including:

• Repair/replace advice and re-engineering for dragline tubs, revolving frames and booms.
• Modification of drive control – to extend operational life or allow increased payloads.
• Suspended load test – to accurately quantify bucket loading under operating conditions.
• Roller load test – after roller load tests on more than 160 draglines worldwide, WBM can accurately assess the condition of dragline slew bearings, predict their likely life, identify the source of problems and advise on means to extend bearing life.
• Spall detection – on roller circle rails to track progressive damage.
• In-situ rail grinding – to quickly correct a range of slew bearing problems.

Trucks

BMT WBM provides a range of services to operators and manufacturers of large haul trucks, having been involved in the design, testing and analysis of truck bodies, drive trains and suspension units.

Bucketwheel Excavators

BMT WBM is a recognised authority on Bucketwheel excavators: their application, selection, design, maintenance and operation. In particular, the company is uniquely positioned to advise on the use of BWE’s in lignite mines and in similarly difficult digging conditions.

• Maintenance practices
• Repair and refurbishment, including stability issues
• Design
• Condition assessment and inspection
• Automation and control of the digging operation
• Safety device checking
• Production, performance and structural testing

Mining Shovels

Mining shovel problems, whether related to machinery, structure, slew bearings, hydraulics, electrics or controls are all areas where BMT WBM has expertise and experience.

Through analysis, testing or design, BMT WBM can assist with specifications, troubleshooting, repair, re-engineering or maintenance.
Underground Mining

In parallel with the development of new underground mining systems and technology during the past decade, BMT WBM has acquired a wealth of experience in providing engineering support to underground mining companies.

For both coal and metalliferous mines, WBM assists operating companies in purchasing new equipment or improving the productivity and safety of existing systems.

Longwall Roof Supports
- Specification and design audits for new supports.
- Diagnostic measurements on operating walls.
- Full scale prototype strength and fatigue testing.
- Inspection and management plans for roof support cracking problems.
- Quality management of fabrication and rebuilds.
- Repair planning and supervision.
- Optimisation of hydraulics and control systems to increase longwall productivity.

Longwall Shearers
- Specification and design audits for new shearers.
- Measurements of cutting loads and operating stresses to resolve machinery and structural problems.
- Haulage drive trouble-shooting and design reviews increase longwall productivity.

Armoured Face Conveyors
- Measurement and analysis to solve recurrent problems with AFC drives, drive sprockets, flight bars, chains and line pans.
- Dynamic modeling of start/stop behaviour to predict tensions and slack chain generation.
- Optimisation of tail gate tensioning systems to increase chain life and reduce chain jamming problems.

Continuous Miners, Crushers and Loaders
- Failure analysis, problem solving, re-engineering.
- Diagnostic measurements of stress, loads.

Underground Conveyors
- Dynamic analysis and design for systems with booster drives, CSTs, loop takeups.
- Troubleshooting and re-engineering.
- Optimisation of control systems

Tunnel Borers
- Cutter head bearing assessment.
- Structural problems.
**Services**

**Machine Design**

**New Machines**

BMT WBM offers a total design capability for all types of machinery, ranging from complete bulk handling systems and machines to small mass produced components.

The company specializes in designing complex, special purpose, high-tech machines to suit a customer’s specific requirements.

Whatever the application, BMT WBM has the expertise to integrate all of the required skills to develop a cost-effective machine for the task.

BMT WBM can manage the entire process or assist with particular aspects, from concept development, through detail design, manufacture, installation to final commissioning.

**Upgrade existing Machines**

BMT WBM also specialises in the re-design and re-engineering of existing machines to eliminate recurrent failures, improve performance, increase capacity or reduce risks.

**A complete Integrated Service**

BMT WBM has in-house capabilities in all design related disciplines including:

- Electrical
- Electronic
- Mechanical
- Structural
- Control systems, PLCs
- Fluid power hydraulics
Design Audits

A world leader in auditing the design of large and complex machinery, BMT WBM has completed audits on more than 40 major machines for clients in many countries throughout Africa, Asia, North and South America as well as Australia.

The company specializes in fast track audits, run in parallel with the original design of a machine, where the opportunity exists to find and correct design deficiencies and errors. This audit process can deliver:

- Improved safety
- Extended life of structure and machinery
- Verification of conformance with specification
- Identification of operational risks

Specifications

BMT WBM advises clients on the essential requirements for planning and implementing the audit, to ensure the process delivers achievable benefits, without undue impact on cost or benefits or program. In particular, the company specialises in writing concise technical specifications to define the standard against which the machine is to be audited and the procedural rules for conducting the audit.

Analysis

At BMT WBM, analysis is a key element in the overall approach to solving machine problems. It is an integral part of the design, troubleshooting, failure analysis, performance enhancement and life extension services which BMT WBM provides.

BMT WBM specialises in mathematical modeling and simulation of all types of engineering problems. It uses leading edge software and computing hardware to provide rapid answers to complex problems involving stress analysis, fluid flows, heat transfer, structural and drive dynamics and control systems.

In addition, the company has always maintained a large group of highly qualified, very experienced analysts, with a practical, customer problem focus.

BMT WBM has special expertise and experience in a number of key areas including:

**Stress Analysis and Finite Element Modelling**

The company uses a range of FEA software packages (principally IDEAS, NISA, LUSAS) to analyse complex machine structures and components for stress, deflection, buckling, fatigue and related assessments.

**Structural Dynamics**

Vibration problems involving large machine structures are routinely addressed using FEA software.
Analysis

Heat Transfer, Temperature
BMT WBM specialises in analysing complex thermal problems, involving conduction, free and forced convection, using FEA or CFD and has used these approaches for many industrial problems.

Fluid Flow
We use powerful CFD software to assess fluid flow problems, with turbulent or laminar flow, either compressible or incompressible, as an aid to calculating flow rates, pressure drops, drag coefficients.

Drive Train Dynamics
BMT WBM uses a range of proprietary and in-house software to analyse torsional and associated dynamics of machine drive trains, including prime movers and multi-branched geared systems.
Another cornerstone of BMT WBM’s approach in assisting clients with machinery problems is the use of diagnostic measurements under actual operational conditions.

### Machinery Problem Diagnostics

BMT WBM has a very comprehensive range of sophisticated instrumentation and recording equipment for measuring critical parameters such as loads, stresses and hydraulic pressures.

Measurements of this kind often provide the key to diagnosing the cause of machinery problems or failures and they provide the best possible basis for re-engineering to fix a problem.

### Performance, Safety and Design Verification Testing

An independent testing service for customers wishing to verify the performance, safety or design of both new and existing machines.

### Vibration Monitoring

Advice, interpretation, hardware or software supply, or total program management. For the more complex and difficult vibration problems, BMT WBM provides powerful multi channel measurement and analysis to identify the source of problems and their solutions.

### Long Term On-line Monitoring, Data Logging

For problems which only occur intermittently, and for capturing long term trends, BMT WBM provides on-line monitoring instrumentation, coupled to data loggers programmed for the specific requirements of each problem.

### Remote Interrogation

For critical items of equipment, a low cost communication link to a site or to one of BMT WBM’s offices allows rapid, effective interrogation and very cost effective management of a condition monitoring program.

### Testing of Rotating Machines

BMT WBM specialises in measurement of torque, stress and vibration on rotating machines, using radio telemetry links to transmit the measurement data to a recording station.

### Special Purpose Test Instrumentation

The company maintains an electronic design and build capability. Where the constraints imposed by a particular machine require a novel approach, BMT WBM provides purpose-built transducers and instrumentation.
Asset Management

To assist owners and operators of equipment to better manage and maintain capital assets over their operational lifetime, the company offers a comprehensive range of services including:

**Maintenance Support**

For its experience with the operation, repair and maintenance of large machine and machinery systems, BMT WBM can assist operating companies in making maintenance more effective and in reducing total life-cycle costs. At any level, from provision of advice to total implementation or management, BMT WBM can support operating companies in a number of areas including:

- Whole of life maintenance plans
- Repair-replace decisions for major equipment
- Strategic spares inventories
- Documentation
- Maintenance systems
- Vibration monitoring

**Risk Assessment, Reduction and Management**

Based on a long involvement in machinery failures and accidents, BMT WBM is uniquely positioned to provide machinery operators with advice on assessment, management and reduction of risk.

Delivery of this service can involve measurements on an operating machine analysis to assess design adequacy, machinery inspection and condition monitoring; all key areas of BMT WBM’s expertise.

**Condition Monitoring**

An effective condition monitoring program is a primary tool for managing both risk reduction and maintenance.

BMT WBM can assist at all levels of planning, implementing or interpreting condition monitoring programs or, where appropriate provide a total service, running and managing the entire program.

**Machinery Inspections**

BMT WBM has an extensive background worldwide in carrying out independent machine inspections: structural, mechanical and electrical. These inspections are usually undertaken to assess safety or operational risk, or as part of an overall risk management strategy.

**Life Extension**

In many cases, the operational life of a machine can be extended by some minor modifications to the structure of mechanical equipment. As a result, the life extension option often provides a cost effective alternative to replacing an existing machine. At BMT WBM, the process usually involves measurement or analysis to identify potential failure areas, prediction or component life, and development of appropriate structural or mechanical upgrade strategies consistent with the client’s objectives and constraints.
Project Engineering Services

BMT WBM has a large, experienced and capable group which specialises in providing services in support of engineering projects.

Project Management
From project inception, through concept development, feasibility studies, financial projection, design, procurement, contract administration, construction, commissioning to completion, BMT WBM provides total project management of assistance with any specific aspect.

Procurement and Expediting
In the purchasing of technically complex equipment, BMT WBM assists customers in obtaining a better outcome in terms of cost and delivery, while meeting required quality standards.

Quality Assurance, Inspection
With a long history of equipment failure investigations and in subsequent re-engineering, BMT WBM is uniquely positioned to assist customers acquiring new or replacement machine components of better or guaranteed quality.

BMT WBM writes detailed technical specifications, inspection and test plans and provides independent inspections to achieve the required product quality.

Commissioning
Specialists in structural, mechanical, electrical, controls or fluid power hydraulics are available to manage or assist with the commissioning of complex machines or machine systems.

Accident Investigation, Failure Analysis
The company had been involved in many accident investigations, especially with large bulk handling machines. These investigations often involve detailed analysis (structural modeling, fracture mechanics, accident dynamics) or measurements on similar operational machines.

BMT WBM can draw on a broad range of engineering or metallurgical skills which may be required to identify the cause of the accident or failure.

Expert Witness Advice, Arbitration
A large number of BMT WBM’s staff have experience as expert witnesses on legal matters covering a very broad range of technical issues, but mainly related with accidents and machinery failures. In some instances, the company has also provided experts to act as arbitrators/mediators in complex technical disputes.
Specialist Technologies

Large Rolling Element Bearings
BMT WBM provides a unique service in the testing, assessment, troubleshooting and re-design of large rolling element bearings. Based on more than 25 years experience, both with open roller and ball races and with precision, hardened bearings, BMT WBM assists machinery owners by:
- Predicting the probable life of the bearing
- Designing, specifying upgraded bolt-hole compatible bearings to obtain increased life
- Providing advice on bearing change-out procedures and on support techniques for increased life

Gearing
- Design of gear trains, gearboxes
- Failure analysis
- Geared drive train measurements
- Rating of gearing for capacity or life to international standards
- Torsional dynamics analysis of geared systems

Fluid Power Hydraulics
From testing and problem solving to design of complex systems, BMT WBM provides a comprehensive service in all areas of fluid power hydraulics:
- Design of electro-hydraulic servo controlled system, hydrostatic transmissions, as well as conventional industrial systems
- In-situ dynamic measurements of flow and pressure to diagnose and correct system malfunctions
- Complete hydraulic and control system dynamic analysis as an aid to solving system problems

In-situ Machining
BMT WBM has designed and developed computer controlled in-situ grinding machines for localized correction of dragline roller circles and rotary breaker tyres.
Conveyor Dynamic Analysis
BMT WBM has developed the most comprehensive and sophisticated analysis software for calculating the dynamics of conveyors during starting and stopping. This program simulates any configuration of control systems using tension, speed or power feedback. Calibrated against measured behaviour, it is an accurate, reliable tool for design.

Weighing of Large Machines
BMT WBM specialises in the weighing of large machines to determine weight and centre of gravity. Using load cells and/or pressure transducers. BMT WBM has expertise in weighing draglines, bucketwheel excavators, stacker / Reclaimers and Shiploaders.
BMT WBM has a proven record in addressing today’s engineering and environmental issues. We aim to continue to enhance our services, capabilities and areas of application to meet the community’s future development and environmental protection needs.