Management

- Safety management
- Mining intensity
- Mine optimization
- Mine design
- Mine production scheduling
- Mine equipment selection
- Contract mining strategy
- Contract mining documentation
- Mine rehabilitation planning
- Registered Manager .WA, QLD, SA.

Corporate Services

- Study management
- Risk assessment & workshops
- Reserve estimation
- Competent person reports
- Qualified person reports
- Technical due diligence
- Independent technical expert Reports
- Operation reviews
- Project development strategies
- Accident investigations

Koniambo, Nickel Mine – New Caledonia

About KBPL

Kent Bannister

After graduating in 1974 and mining for two years in Kalgoorlie and Mt Isa, Kent has over 39 years of experience in base metals, gold, uranium, manganese, mineral sands, nickel and iron ore. During this time, Kent has held positions as Mining Engineer, Senior Mining Engineer, Assistant Superintendent, Principal Engineer, Mine Manager, Registered Manager, General Manager, Consultant, Managing Consultant, Technical Advisor and Company Director. Kent has provided consulting services for over 25 years and has undertaken or led more than 100 mineral project studies. The consulting teams that Kent has managed have been responsible for completing more than 500 studies for Australian and international companies.

KBPL was formed in 2013 to provide independent advisory services.

KBPL

KENT BANNISTER PTY LTD
Phone 0418747912
Kent.bannister@kbpl.com.au
http://www.kbpl.com.au/

Lebedinsky, Magnetite Mine- Russia

Commodities

- Base metals
- Gold
- Uranium
- Mineral sands
- Manganese
- Phosphate
- Nickel
- Hematite iron ore
- Magnetite iron ore
- Industrial minerals
- Bauxite

KENT BANNISTER PTY LTD

Open Cut Waste Cost Reduction

Mine operating costs can be reduced by critical analysis of:

- Waste volumes
  - Geotechnical parameters
  - Slope dewatering
  - Ground support
  - Blasting practices
- Waste mining schedule
  - Cut back strategy
  - Mining equipment selection
  - Minimum mining width
  - Vertical advance rate
  - Cutback separation
  - Mining intensity

Darlot Gold Mine – Western Australia

Waste Reduction

Geotechnical assumptions

Open cut wall geometries are typically selected after a data collection program and stability analysis. Slope designs are based on dewatered slopes. Ground water level reduction must therefore keep pace with open cut vertical advance rates to maintain the design factor of safety. Storm water management is equally important to ensure walls remain dewatered. Even a small slope failure in a critical area can have large impact on the mining operation. Therefore ensuring slopes are effectively dewatered is critical to minimize long term operating costs.

Ground support

The use of Cable Bolts and Dowels can provide a cost effective solution for deep hard rock pits. The cost of mining waste escalates with depth and the hardness of fresh rock. Most open cut slope geometries are designed around the frequency and orientation of Joint Sets without ground support technology. By using cable bolts and dowels to support benches and haul roads, the overall slope angles can be steepened and the geotechnical risk to production mitigated.

Blasting Practices

Good blast design and procedures will prevent damage to batters, safety catch berms and haul road crests. Poor blasting will result in additional waste mining and sterilization of ore.

Mary Kathleen Uranium

A good example of how costs can be reduced through the use of ground support was the Mary Kathleen Uranium Open cut. Problematic joint sets that resulted in wedge failures on bench crests were a major safety and production risk. By changing the approach to trim blasting and implementing a crest and mid batter cable doweling program the risk of wedge failures was illuminated. The significantly improved crest lines enabled the open cut design to be modified to 24m high batters. The resultant steeper overall slope angle enabled mining costs to be reduced and the published Ore Reserves to be recovered.

Mary Kathleen Uranium Mine - Queensland

KBPL

KENT BANNISTER PTY LTD
Phone 0418747912
Kent.bannister@kbpl.com.au
http://www.kbpl.com.au/

Waste Schedule

Project NPV can be improved by a deferred waste mining schedule. As waste mining is usually the single biggest cost center for a project, postponing the mining of waste can have a significant impact on the project operating costs and finances.

Open cut optimization software packages can identify the most profitable pit for a given commodity price and operating cost regime. A series of nested pits can be generated that can be then be used to select a cut back sequence to defer the mining of waste. Assumptions are made during the optimization and cut back selection process. As projects evolve the assumptions may in time be inappropriate rendering the waste mining sequence less than optimal. By reviewing these assumptions significant value can be added to the project through an improved waste mining sequence.

Mining equipment selection

Mining cost estimates are made at the beginning of an optimization and scheduling study. This means an early view is needed on the type and scale of the mining equipment as a basis for cost estimates. Apart from the obvious cost savings of utilizing largest scale equipment, the type of equipment should be considered including continuous mining, crushing and conveying and automation. As projects mature new technology becomes available that can reduce costs.

Minimum mining width

Cutback strategies require an assumption to be made regarding the narrowest practical mining width. This choice is usually made early in the scheduling process and takes into account the safe operation of the mining equipment selected. The ore characteristics, geotechnical properties, pit design and bench access all need to be considered. The selected mining equipment operating in the cut back will have a productivity which in association with the number of operating units creates, operating procedures near openings and assumed acceptable mining intensity.

Vertical advance rate

The vertical advance rate determines how quickly the waste benches can be completed and therefore the time required to exposed ore at depth. There are some empirical rates used in the Western Australian Minerals Industry that are based on what has been achieved in some operations. These may not be applicable for the open cut waste and ore geometries, grade control procedures or the selected mining equipment finally chosen for the mine.

Cutback separation

The vertical separation between cut back phases is another assumption made during waste scheduling. The separation is a practical consideration based on the mining intensity and vertical rates of advance and safe operating procedures. Small separation reduce benefits while large separation add risks.

Mining intensity

Mining Intensity can be described as the amount of mining activity in a given area of the open cut. Increasing mining intensity is an important concept for reducing costs. Mining Intensity studies should include:

- Equipment safe operating area
- Infrastructure, - power, dewatering,
- Haul roads
- Temporary ramps
- Bench access roads
- Blast hole drilling
- Blast hole sampling
- Laboratory turnaround time
- Blast design and grade blocking
- Blast area clearance
- Blast frequency
- Blasting time constraints
- Grade control drilling
- Grade control sampling
- Pit edge safety buffer zones
- Final batter scaling
- Equipment type & size

Many mines utilize “rules of thumb” to limit schedules to what are considered practical vertical rate of advance or minimum mining width. As all deposits and open cut designs and equipment combinations are unique a critical review of these assumptions can yield large savings in costs and improvement to the projects NPV.

KBPL

KENT BANNISTER PTY LTD
Phone 0418747912
Kent.bannister@kbpl.com.au
http://www.kbpl.com.au/