No illusions

By Ian Ewing
Antofagasta Minerals has created a staged approach to developing its Centinela district, which contains three operating mines and four undeveloped deposits.

For those planning capital projects, it is important to exercise fiscal restraint, yet be prepared to splurge on a chance to create value. To plot the best course, a company must have the vision to recognize its strengths and liabilities – a task which history has proven difficult. Today, there are ways of evaluating exactly what can move a business forward and what threatens to break the bank – but be ready to take a good hard look in the mirror.
Rainy River Resources COO Mike Mutchler contends that the key to survival is managing capital costs and capital estimates, and that all starts with good scoping and project definition. “It’s making sure that we get the right fit for our application,” he says. In particular, Mutchler criticizes other projects that he feels have overbuilt. “We’re making a conscious effort not to build a Cadillac plant,” he points out. “We’re building a fit-for-purpose plant. We don’t want to invest more capital than we need in our plant; we want to invest the right amount of capital.”

Kevin Bullock, president and CEO of Volta Resources, has a similar opinion. Volta currently has nine projects at varying stages of development in Burkina Faso and Ghana, and its flagship Kiaka project is moving towards the completion of a feasibility study. “You get to a point where people are saying, ‘How big could this be?’ and everybody’s excited,” Bullock says, “and then all of a sudden, when the market turns, it’s too big and costs too much to build.” Instead, he says, companies need to stay within themselves and not get caught up in their own hype. For Rainy River, currently in the late stages of feasibility, that meant actually decreasing the size of its gold plant in northern Ontario. Originally conceived as a 30,000-tonne-per-day mill, the company scaled it back to around 20,000 tonnes per day, bringing the capital costs down to a level that was forecast to have a higher probability of success.

Gerald Whittle, managing director of the mine optimization firm Whittle Consulting, agrees with their approach. “We like to give engineers credit for building the best plant,” he says, “but what’s the best plant? The one that maximizes recovery? That minimizes cost? That has the lowest capital?”

“I like the words, ‘fit-for-purpose,’ because that opens a discussion. What is it we really need here? It doesn’t have to be fancy or shiny or long-life or whatever. What’s the best outcome?”

The best defence is a strong offence

Determining what is needed is never simple. Although aggressive cost-cutting is a surefire way into an investor’s heart, the consequences can be devastating and often do not address the real issue. “It makes me shudder,” says Whittle, “when I hear this mindless chatter about reducing costs. What people really want when they’re in trouble is to improve their cash flow. “You can reduce mining costs tomorrow,” he adds, “by parking half the trucks. But that would be an absolute disaster, because the revenue they would have produced would have more than offset their costs.” This approach also presents some serious questions about an operation, he explains. “If you can do the same work at a lower cost, why weren’t you doing that before?”

Whittle’s firm instead advocates the importance of aligning business units towards a common purpose. In many companies, each organizational silo has its own objectives and its own key performance indicators. Geologists try to maximize reserves, mining engineers try to minimize costs or maximize plant utilization, plant managers try to maximize recovery or metal production, and marketing managers try to maximize the sale price of the commodity.

“‘It’s chaos,’” Whittle exclaims. The problem, he says, is not just that those objectives conflict; it is that not one of them is right for a well-structured mining company. “The ultimate objective of the company is to create economic value through better cash flows,” he says. That means maximizing net present value (NPV). Once the money is in the operator’s bank account, they can do whatever they want with it: invest in new projects or expansions, return cash to shareholders, or sit on it in case of downturns, as Volta tries to do.

The best results of enterprise optimization attempts are obtained in new plants that can be optimized in every aspect to maximize NPV. Rainy River engaged Whittle to create a stockpiling plan that will allow the company to go after higher-grade material more quickly, before going back to process the stockpiled material later in the life of the mine. Volta’s highly banded Kiaka gold deposit in Burkina Faso will also benefit from phasing and stockpiling, according to Bullock.

Another option is staged development, which can involve building a small mill and running a high-grade policy for several years, then building a second mill once the head grade starts to fall off. “That second one can be self-financed,”
Whittle says, “because you’ve made cash the first few years. And if the market goes bad, you don’t have to build it.” At the very least, he adds, you are deferring a big chunk of your capital expenditures.

Antofagasta Minerals is using a staged approach to minimize upfront capital costs at its Centinela copper district in Chile. The area contains three operating mines – Esperanza, El Tesoro and Mirador – and another four deposits. The company is currently in the project definition stage for all of the Centinela district, considering geology, resources, engineering and environmental studies. “It is a very large project but it will be in three phases, one after the other,” explains project manager Francisco Walther. “We can check if we are moving in the right direction and control all aspects of the project.”

Walther says the first phase will include optimization and life of mine extension of the El Tesoro and Esperanza operations, and is targeted for completion in 2016. Phase 2, in 2018, will see a new concentrator plant and, beyond 2020, the final phase will involve a second new concentrator. Antofagasta is also working to sequence mine planning within the district to maximize value and to minimize risk and capital exposure.

These strategies can even help companies obtain financing, since investors look at cash flow profiles to see how quickly they will get returns. And though most effective when new deposits are about to come on stream, enterprise optimization can help many current operators too. “As long as you’ve got five or 10 years left on the life of the mine,” Whittle says, “then this analysis is still going to be valuable.” Variables such as phase design, mine schedule, cut-off grades, stockpiling, throughput, and product specifications can all be tinkered with to maximize NPV and front-load a mine’s returns – giving an operator more cash-in-hand almost immediately upon implementation.

For a smaller company struggling to access capital in equity markets, it might be the difference between going broke or surviving until market conditions improve. “You can add, typically, a million dollars a week to your cash flows,” says Whittle.

**Quality planning and strong teams required**

The most important aspect of cost management, however, remains vigorous early planning and detailed prefeasibility and feasibility studies. Independent Project Analysis, Inc. (IPA), leaders at researching and benchmarking capital projects, preach the importance of good project definition. Their research indicates that better early planning drives everything, from more competitive and predictable costs to better operability and fewer safety incidents. “The measurement of project definition is correlated with every outcome you could want,” says Phyllis Kulkarni, the plant-based systems manager at IPA. They have a database of nearly 15,000 projects worldwide, in every commodity, to back up their assertion.

“The most powerful use of our approach is in defining the project and in doing an option analysis,” agrees Whittle. Without that, he says, “project managers will be meticulously executing the wrong strategy.”

Unfortunately, in boom times of the last decade, there was a tendency to rush through prefeasibility and feasibility. “There was such great pressure to develop a new project very quickly, because the commodity prices were so high, that they started to take shortcuts,” says Claudio Martinez, managing director of Enthalpy Consulting. “And because of that poor definition, when they were in the middle of the project, they found they didn’t do all the proper engineering, follow the proper processes, and now they have to spend more money.”

Antofagasta learned that lesson the hard way. After rushing through feasibility on several projects between 2007 and 2011, the company discovered during the execution of their Esperanza project that they had significant problems in the quality of their engineering, delaying completion of the final stages. “The ramping-up process has taken two years, instead of half a year,” reveals Walther. “It’s costing us time and money.”

As a result, the company has spent the last two years developing a standardized internal procedure for quality control, based on Enthalpy’s process, called the Asset Delivery System. A key component is the Functional Quality Assurance Review.
Endless possibilities

Stochastic mine planning deals with the inherent uncertainty (stochasticity) of mine planning, design, production forecasting and valuation of individual mining projects and operations. It can also be applied to mining complexes with multiple processing streams and products. The approach integrates two core technical elements: stochastic simulation and, in turn, stochastic optimization. These provide a new mathematical framework that supports the direct integration of uncertainty in the mathematical optimization processes of life-of-mine planning and, more recently, mine supply chains.

Stochastic, or Monte Carlo, simulation methods for generating scenarios of forecasted commodity prices, market volatility and other variables are based on probabilistic concepts and provide any number of possible predictions over a specified time period. Different types of stochastic simulation methods also exist to evaluate mineral resources. Based on existing drilling data, these methods interpolate the grade, metal, material types and other properties of interest over the 3D space of an ore body. Like market uncertainty quantification, groups of simulated scenarios of an ore body describe...
the spatial uncertainty of pertinent attributes like grade, rock hardness and others. These spatial simulations require vast computing power because ore bodies are described by hundreds of thousands to millions of 3D mining blocks. As a result, their industry application only became common in the last decade. The availability of stochastic modelling allows the development and implementation of stochastic optimization approaches.

Stochastic optimization refers to various mathematical optimization approaches used to maximize net present value of life-of-mine planning. Unlike conventional approaches, stochastic optimizers simultaneously use groups of simulated scenarios of an ore body, costs and, more recently, simulated commodity prices as inputs, thus accounting for uncertainty when generating life-of-mine plans, designs and production schedules. This is shown to lead to substantially higher net present value, greater chances for meeting production forecasts, more metal production and larger pit limits.

**Stronger markets, weaker memories**

For now, companies will have to use every tool at their disposal to survive. But they may not have to scrimp and save for much longer. Ernst & Young’s global mining and metals leader, Mike Elliott, expects to see a gradual upturn by the second half of 2013.

“We see some signs that suggest we may have already bottomed out,” Elliott says, “maybe in the fourth quarter of last year. In the second half of this year the availability of capital will free up a bit. It’s not going to bounce back up or anything, but we should see gradual improvement over the year.”

Having survived tighter conditions, many companies with better corporate memories will be well-placed for a recovering market. The management team at Volta considers itself among that group. “I think we’re reminded of the lessons we’ve learned in the past, more than anything,” says Bullock.

Others may face longer-term problems because of their cost-cutting measures. But the big question for the wider industry will be whether we have really learned the hard lessons about planning, project definition, and cost management from this downturn.

“I would love to say yes,” sighs Enthalpy’s Martinez. “But I don’t think so.”