



Roussos Dimitrakopoulos, director of the COSMO Stochastic Mine Planning Laboratory at McGill University in the US, talks to Denis Kalyapin ahead of his appearance at the Optimizing Mining Operations Conference – Americas event in Toronto in October

INTERVIEW

Better together

Q A key theme for this year's OMOC event is promoting collaboration in the mining sector. Where do you think mining companies can benefit most from collaboration?

Mining companies can benefit most by collaborating on research and development (R&D) that generates new solutions to old and emerging problems, including those that address: an increase in metal production from the same volumes of materials mined; greater reliability of production plans; and lower operating costs.

If we compare the state of oil giants such as Exxon Mobil that have a substantially larger top-line revenue, almost 80% higher than the top ten mining companies combined, with the current state of R&D in the mining sector, it is clear that collaboration is necessary if successful paradigm shifts to generate major technological change are to take place.

In other words, no single mining company can achieve the degree of technological sophistication that a company such as Exxon Mobil can

achieve in comparable fields. The mining sector, however, can achieve technological sophistication through collaboration and pooling resources.

Q Why are we not currently seeing more collaboration between mining companies? Do you think that such collaborations will increase in the future?

In my experience, individual mining companies and particularly the larger ones are highly competitive and occasionally 'over-competitive'. While we all appreciate the reasons for this, I think that most of us agree that nothing is black and white, and there are areas, such as R&D, where collaboration could benefit everyone.

New concepts, methods and approaches that are developed and are then available in the public domain do not hamper competition, rather they level the 'playing field' and enhance the adoption of new and sustainable approaches by wider testing and further adoption.

Additionally, moving to suitable digitisation and information flow as

well as further adaptation, specification and implementation by different operations and companies requires substantial technical in-house expertise.

This is a large investment and involves training of mining personnel, comprehensive change-management programmes and more, and leads to varying performance.

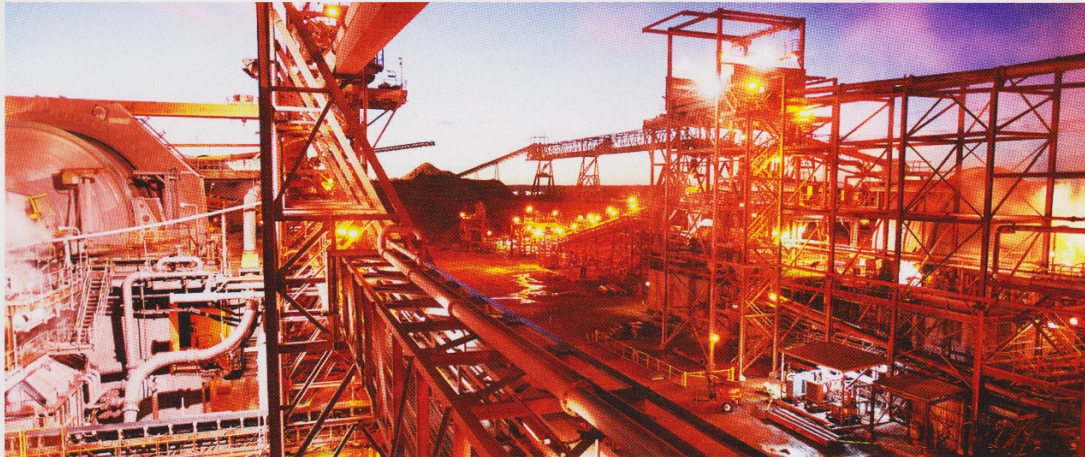
In addition, collaborative R&D outputs are typically further advanced and adapted to company/mine specifics. We know that new approaches and paradigm shifts will be utilised in substantially different ways by different mining companies and will also perform differently. These differences will continue to foster competitiveness and differentiate companies.

I think we are slowly starting to see more interest to collaborate in R&D between mining companies worldwide, particularly now in a distinctly low metal-market cycle. I believe we will see more and more, at least in addressing issues such as increasing productivity and revenue at a lower cost, and of course technical risk management. ▶

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Collaboration can help bring the enlightenment of new technology to mines





Digitisation, optimisation and automation are changing the way mining operations work

► **Q** How can COSMO help mining companies to move down the cost curve?

COSMO was established in 2006 by six major mining companies as a collaborative R&D initiative based at a university, joined by a seventh company in 2015. It [the organisation] will continue its research in close collaboration with its seven members for at least the next five years.

Our new technologies developed to date operate in the sphere of digitisation, and utilise more information while providing for the advanced management of technical risks. Their application results in more reliable production plans, operational efficiencies and risk identification, all contributing to moving the cost curve downwards in a substantial way, minimising investments for shareholders, and reducing capital costs.

We all agree that the effective identification and management of technical risk inherent to reserves, operational mining aspects and commodity markets, improves project value, as well as the robustness of asset portfolios.

Q How do COSMO's techniques compare to more traditional optimisation methods?

There are two major differences in the methods and technologies developed to date, compared with existing methods.

First, unlike the traditional optimisation methods, our approach is based on the concept of a mining complex that is seen as an inte-

grated business starting from the extraction of materials from a group of mines, the processing and treatment of these materials through different processing facilities and transportation, all leading to sellable products delivered to various customers and/or the spot market.

This concept led to the development of a new approach and related method that capitalises on the synergies between the parts of a mining complex to simultaneously optimise:

- When and which materials to extract from the mines;
- How to blend and/or stockpile these materials;
- How to utilise the available processing streams;
- How to transport the various products;
- How to manage capital investments; and
- How to sequence rehabilitation.

All of these are embedded in a single mathematical formulation, unlike any other existing approach. Traditional techniques optimise individual parts of a mining complex independently and are globally sub-optimal, while recent efforts to improve through ad-hoc interactions between some parts of a mining complex are far from simultaneous optimisation.

Our new framework starts with a mining complex that integrates and deals directly with the underlying uncertainties (stochasticity) to manage the risk related to the materials produced from the mines and is the critical facet of this integrated business, its performance and products. Existing technologies do not

explicitly account for or manage risk, leading to sub-optimal performance.

The management of technical risk within the framework of simultaneous optimisation of mining complexes under uncertainty aims to manage risk intelligently and to maximise shareholder value, and while addressing pertinent aspects of sustainability.

Based on stochastic optimisation, our new methods developed and tested (examples to be presented at the OMOOC conference) show that, when compared with traditional approaches, reliability is improved in the operation's ability to meet production forecasts.

Larger amounts of metal are also produced from the same mineral resource, and substantially higher economic value is created than with existing approaches due to the ability of new smart technologies to directly manage risk.

Our next five-year research programme includes the further development of the stochastic simultaneous optimisation framework to include the joint integration of supply (geological) and demand (commodity prices) uncertainties.

It will also enhance the management of capital expenditures; conduct research aiming to integrate the simultaneous stochastic optimisation of short-, medium- and long-term timescales and their respective extraction sequences; and develop ways to integrate real-time information to update deposit attributes and production schedules.

Existing technologies do not and cannot address these any of the above issues. ▼

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Denis Kalyapin is conference director for the OMOOC series of events. The theme for the fourth Optimizing Mine Operations Conference (Toronto, October 25-27) is promoting collaboration in the mining sector. See: <http://www.miningoptimization.com/>