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Not just any mine closure specialist, Canada-based O’Kane Consultants Inc. boasts world-leading expertise in mine waste cover system design, final landform design and performance monitoring.

THESE SPECIALISMS OWE themselves largely to work done by company President and Chief Executive Mike O’Kane at the University of Saskatchewan, where he focused on the field monitoring and numerical modelling of how water interacts with mine waste cover systems. Following encouragement from both his university mentor Lee Barbour and his father Terry O’Kane, Mike brought this niche technology to

his father’s consultancy company in 1996. Terry had started up O’Kane Consultants (OKC) in 1993 as a way of continuing to work in the mining industry after he retired.

“My Dad said, ‘you’ve got this niche technology to offer that’s not really in the industry right now and there’s a need for it, so why don’t you write up a business plan, get a line of credit at the bank and we’ll start up a branch office in Saskatoon?’,” says Mike. “So that’s what I did, and the company grew from there.”

For around six years, OKC focused almost entirely on designing cover systems for mine waste storage facilities. This is often the biggest issue of closing a mine, as it can have a high cost and environmental impact and is particularly



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susceptible to public and regulatory scrutiny. OKC became an expert in putting down soils, suitable waste materials or engineered products to manage acidic drainage from legacy and current mine sites.

"Our approach to cover system and landform design is to use geomorphic principles," explains Mike. "Rather than using a simple engineering approach that assumes a landform is static, we understand that there are physical, chemical and biological processes that make a landform dynamic. We help companies to account for such changes in their initial reclamation or closure designs, so that the reclaimed landform looks more natural, is more aesthetically pleasing and has greater longevity."

The complete package

Mine waste cover system design remains OKC's key area of expertise, but the last decade has seen the company broaden its capabilities to include all aspects of mine closure. "We were fortunate enough to be in the right place at the right time; using performance monitoring to build upon our initial niche cover system design technology, when clients began asking us to do the mine sites' geochemical characterisation and hydrological modelling as well," Mike remarks. "Before we knew it, we were helping mine sites with a wide range of mine closure aspects."

OKC now offers materials characterisation, landform design, performance monitoring, fine tailings management, heap leaching,



data management and support services. An on-going project with AngloGold Ashanti in Tanzania, East Africa, has been a particular joy for Mike as it has packaged all of OKC's capabilities into one project.

"The first positive point is that AngloGold have been very good to work with," he says. "We've had substantial support throughout the project, and they had done a really good job with the project so far because one of our Australia-based staff, Dr Peter Scott, had helped them develop the mine's waste management plan many years ago.

"We began by verifying that the site had followed that waste rock management plan, which included some characterisation of waste

rock, development of a cover system design, groundwater and unsaturated flow modelling and – because of the nature of the climate and the materials – we had to do landform design work and show that the landforms would be sustainable. Then we used an approach called Failure Modes and Effects Analysis, or FMEA, to evaluate the design for risk. We feel that risk assessment is an essential component of the design process, and the FMEA process provides an opportunity to communicate and understand the risk of a design, and come to agreements on mitigation strategies."

OKC has been working on the project for about a year now and just completed its landform modelling and groundwater flow



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modelling. It is one of many global projects to call upon OKC's talents. Besides OKC's work in Canada and the US, the company has also done work in Brazil, Peru, Chile and Argentina in South America; Sweden and Northern Ireland in Europe; and Kazakhstan, Papua New Guinea and Indonesia in Asia. OKC has experienced substantial growth in Australia, expanding its one office to two (in Brisbane and Perth) and its few staff to 15 people, and opened a New Zealand office several months ago.

Achieving closure

OKC's approach to closure and the methodology it uses are constantly changing in response to its

research and development, which Mike estimates makes up around 30% of the company's total activity. A large part of this research is monitoring surface hydrology (surface water balance) at more than 75 sites around the world, in every type of climate. Interpreting the collected data enables OKC to improve and update its methodology and designs.

"It's likely my own personality coming through – as an engineer, I always want to find a better and cheaper way of doing something," says Mike. "I'm very fortunate to be working with very bright and innovative people, including principal University researchers. Hence, using applied research to develop new technologies is something we take pride in."



Mike says there is a “tremendous amount” of multi-disciplinary science involved in mine closure. “We have geochemists who help us understand the potential metal leaching rates and oxidation rates, so that we can properly characterise reactive waste materials. We have people who understand how water flows through the cover and waste materials, and how it flows through the groundwater system. Others understand soil-plant-atmosphere boundaries, and how water infiltrates and evapotranspires. A huge part of mine closure is the biological component, such as how to get vegetation established and sustainable. Mine closure requires an understanding of the building blocks that will eventually allow for

the creation of the site’s ecosystem.”

Over the last five years, climate change has become another important consideration for mine closure. It can influence future rainfall patterns, thermal regimes and overall hydrology – especially in the cold, northern Canadian environments in which OKC works often – so must be taken into account during cover system design.

Besides all these scientific factors, there is also the vital element of stakeholder engagement. Mike says a lack of true engagement and consultation with stakeholders is the first of four common ways in which a mine closure plan can fail – the others are characterising the mine waste incorrectly and/or insufficiently; misunderstanding the timeframe required for closure; and

failing to plan for closure at the mine's outset.

Mike believes the nature of stakeholder engagement has changed significantly over time. "It used to be about showing people a plan and asking what they thought, but now companies are practising true consultation, offering shareholders different options and presenting them with the advantages and disadvantages of each," he explains. "I think that interaction with local communities is absolutely key."

Doing things differently

OKC's deep expertise in cover system design puts it at the forefront of the mine closure industry. The company's desire to share that knowledge with others sets it apart.

Mike and his team have been asked to write technical guides on cover system design: the latest, for cover systems in cold regions, was funded by the Canadian Government through Aboriginal Affairs and Northern Development Canada (AANDC). They have also been granted a great number of associated educational workshops.


"People often ask, 'why are you giving away your technology?' to which I reply that technology transfer is essential to advancement," says Mike. "I learn just as much from the people who participate in our workshops as they do."

Another way in which OKC goes beyond what's required is its humanitarian efforts, delivered through the Habitat for Humanity initiative. Habitat for Humanity is an international development charity that aims to break the cycle of poverty by

eliminating poverty housing and homelessness.

Every year, OKC sends 12 of its employees abroad to assist in building a house with Habitat for Humanity for a less fortunate family. The company pays the volunteer fee and airfare, and the time does not count against an employees' vacation. "It is something we all really believe in, as we feel we are incredibly fortunate to be able to work in such a great industry and in so many different places in the world," comments Mike. OKC has also helped raise money for Habitat for Humanity through holding fundraising events.

Although the company has grown significantly this year, Mike is happy for OKC to stay small as long as it remains at the forefront of the industry. "We want to continue to be the leaders in our area of expertise – we take a lot of pride in that," he remarks.

"We don't have grand plans to become a large consulting company; I think that misses the point. For us, it's about making sure we're staying ahead of the game, working with good people and helping our clients develop innovative, cost effective and sustainable mine closure plans."  **IRJ**

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AS SEEN IN THE OCTOBER 2013 ISSUE OF THE INTERNATIONAL RESOURCE JOURNAL

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