



The right  
ingredients  
for tailings  
management



**Amanda Adams and Anna Norris, Stantec, USA,** explore how the right mixture of EORs, technologies, and ESG practices can be crucial in developing successful tailings management.

**T**ailings management is top-of-mind for many mine owners and operators. Implementing sustainable environmental, social, and governance (ESG) practices is also a hot topic. There is lots of talk surrounding the shortage of qualified engineer of record (EOR) candidates – and what this means in terms of meeting industry demand – how ESG and EORs are related, and whether it is possible for mining companies to look outside of traditional candidates to meet both needs.

### **The industry is hungry... for change**

Tailings management has come to the forefront of many mining companies' priorities. Demonstrating safe tailings practices is critical in maintaining community and regulatory support,

as well as meeting investor requirements. Many mines will start documenting global industry standard on tailings management (GISTM) compliance for their facilities in 2023. The effort to achieve this high standard requires dedication from teams of people at every mine.

The need for experienced tailings practitioners, both internal to mining companies and serving in supporting roles, such as EORs and external review boards, has revealed a dramatic shortage across the industry. However, it has also created opportunities for exciting and sustainable work to manage tailings and other mine waste diligently and consistently. While the driver to make this change has unfortunately been catastrophic failures, the result has been a renaissance of

information sharing, collaboration, research, and training that the industry will benefit from now, and well into the future. It turns out, the industry was hungry – some might even say starving – for a change, and is now making meaningful, long-term modifications in response to the new requirements.

## Find the right ingredients: People and technology

The first ingredient for successful tailings management is finding the right people for the job. The role of an EOR is no small task, and to conduct all expected tasks and functions, an EOR must have a well-rounded background in distinct aspects of mining and engineering. This is a tall order, therefore the industry must start early in preparing engineers to take on the role of an EOR. Just like a budding chef must begin with cleaning and food preparation, before moving on to sauces and sautés, the process of building an EOR skill set needs to begin early and include education, exposure, and experience. A challenging piece of this is identifying willing individuals and encouraging them to begin their EOR journey.

It can be tough to attract talent to tailings management, but the role of an EOR is a noble goal for any engineer. Given the industry's focus on sustainability and environmental goals, one way to recruit future EORs is by framing tailings management as



Figure 1. EORs require a broad skillset as well as a strong foundation in soil mechanics and geotechnical engineering.



Figure 2. One way to recruit future EORs is by framing tailings management as a key part of social and environmental stewardship.

a key part of social and environmental stewardship. It is indeed a major player in both the social and environmental components of ESG. Perhaps the EOR role requires ‘rebranding’ to attract more candidates and increase diversity in the candidate pool. By expanding the role to encompass engineering and ESG goals, more candidates may be interested in pursuing the path, and find a more relatable, worthy purpose in the pursuit of becoming an EOR.

The second ingredient is access to the proper technology and tools to do the job well. Change does not happen overnight, and the immense scale of the need is still being defined. It is not known how many tailings facilities exist, though new research is being conducted to firm up the number. It is, however, known that the quantity of facilities far outnumbers the seasoned tailings professionals available to do the work. That is why the industry needs to become collectively smarter. Everyone in mining has a role to play by communicating good practices, collaborating on research, and proactively sharing results. Mining professionals need to look at available tools for data collection, analysis, and decision making. Using the best data to make real-time, risk-based decisions will lead to the best outcomes.

Achieving those outcomes can be difficult. It starts by having a solid understanding of the design and operation of all aspects of the facility. This requires a strong foundation in geotechnical engineering and soil mechanics as a start, but it does not end there. An understanding of the site geology, hydrogeology, geochemistry, hydrology, and more is also required. In other words, tailings management takes a team. Yet, having more skilled people is not the only change needed. Better data collection systems, more thoughtful instrumentation plans, and timely review and action are also critical ingredients for success. But, more data is not always better. Tailings operations may encounter the following instrumentation and data challenges:

- n Not enough instrumentation, or incorrect instrumentation to detect issues.
- n Too much data with no way to quickly synthesise it and decide on appropriate actions.
- n Delays between data collection and interpretation, resulting in a constantly out of date understanding of conditions.
- n Insufficient expertise in planning instrumentation (location or type of instruments) or interpreting results.

Regardless of the data collection or instrumentation systems in place, mines still need competent engineering judgement from experienced professionals to pull it all together.

## Mix your ingredients together: A successful EOR adds the ‘G’ to ESG

An EOR is critical to the ‘G’ in ESG. Why? Tailings governance is made up of many elements that provide checks and balances to ongoing operations. These elements include surveillance and monitoring, inspections, internal review processes of operations, ongoing construction, planned designs, detailed third party reviews, as well as independent review boards. Although there are many parties involved in these tasks, the EOR is the key player that connects each element, maintains involvement in critical dam safety decisions, and ensures continuity in the effectiveness of the governance each separate effort tries to impart.

The ICMM defines six key components in a tailings governance framework as follows:

- n Accountability, responsibility, and competency.
- n Planning and resourcing.
- n Risk management.
- n Change management.
- n Emergency preparedness and response.
- n Review and assurance.

Within the mix of client and owner, the EOR is a principal ingredient driving these elements into daily operations and ongoing design. The EOR maintains a critical line of communication with involved parties to prioritise technical decisions regarding dam safety. The EOR plays the role of head chef in the busy kitchen and takes on oversight of each step in the process. In doing this, the EOR can make informed decisions and communicate timely recommendations and concerns to the owner. The owner can then balance economic gains alongside risk management and environmental protection.

### **An appetite for more: Growth in the tailings industry**

Tailings training courses, degree programmes and micro-credentials are emerging, record numbers of tailings related abstracts and papers are being submitted to mining conferences, and entirely tailings focused conferences have been established. For a long time, tailings were a niche part of the mining industry. Tailings-specific career paths with upward mobility within mining companies were rare. Now, that is no



Figure 3. Mine tailings are often stored in large impoundment ponds. The EOR is an important part of the team that monitors the stability of the tailings storage facility.

longer the case. Today, the status of tailings storage facilities are regularly presented at the board level of mining companies, and the industry is seeing the formation of entire teams of engineers and operators specialising in tailings.

It is inspiring to see the growth in tailings management over the last few decades. Advances in tailings and waste storage methods introduce safer and more environmentally friendly opportunities that were not seen 10 years ago. It is an exciting time to be a tailings professional. **GMR**