Bound for a rebound

It has been a tumultuous 12 months in the mining EPC and EPCM space, with project and sector-wide exits, plus handfuls of contract awards. Dan Gleeson delves deeper

With the project development, design and engineering space in the middle of a 'quiet period' (Australia iron ore and gold sectors aside), it's hardly surprising contractors and mining companies continue to re-examine the existing execution models mines tend to be built on.

Mining companies with the financial means and intent to develop projects are aware they are on the right side of the deal table and are picking and choosing the elements that best suit them and the development of their future mines.

This has led to some upheaval in the space, which a few high-profile cases underline.

Shortly after a costly dispute around a significant engineering, procurement and construction (EPC) contract in Chile, SNC-Lavalin decided to exit its lump-sum turnkey contracting business and announce it would no longer bid on such projects. The company said the move away from these contracts would "mitigate risks and exposure to further negative impacts".

Meanwhile, in September, ASX- and TSX-listed CleanTeQ confirmed it was terminating an EPC contract with Metallurgical Corporation of China for the Sunrise battery materials project in New South Wales, Australia, following disagreements with the contractor on several key design, procurement, contracting and project execution matters.

This saw the company transition to a conventional engineering, procurement and construction management (EPCM) approach, a "delivery model that provides Clean TeQ with a higher degree of control over key aspects of project execution and management", it said.

While these events are isolated, they could arguably be representative of a shift in project execution philosophies from companies looking to develop projects and a need for contractors to repurpose their offering to suit today's mine development status quo.

The latter trend can be seen by companies such as Fluor and Wood, this year, spinning off or selling individual engineering businesses as they look to refine their focus and improve profitability.

Fluor recently launched Virta, a material handling design-supply company based on the engineering company's existing material handling technical capabilities, project execution experience and global reach (*see Enter Virta High Profile on page…*). Wood, meanwhile, sold its conveyor systems business Terra Nova Technologies to Cementation Americas as part of its asset disposal program.

Transferring risk

Steve Rusk, Vice President of Mining at **Stantec**, said in almost all cases, managing the risks inherent with EPC/EPCM projects remained front of mind for mining companies.

"Project proponents are rethinking what risks are ultimately retained by them regardless of risk sharing or risk transfer strategies. After a period of risk transfer to service providers and constructors, we are seeing a trend where owners are reconsidering risk management tactics."

Rusk said a few clients are coming out during the study phase and stating to service providers and construction contractors that they recognise "they own the consequences of project risk" and would like a project plan that reflects that reality; the CleanTeq Sunrise battery materials case being a relevant example.

Teck's majority owned Quebrada Blanca II (QBII) copper project, in Chile, has been financed with the help of Sumitomo Metal Mining and Sumitomo Corp and is expected to use autonomous haulage technology

"I believe this is a healthy path to a balanced approach and an enhanced ability to have a shared view of project success," he said.

Dave Lawson, President, Mining & Minerals at **Wood**, said the transfer of risks from owners/governments to their supply chains had manifested into project failures in other industries – something to be aware of in mining too.

"The resulting exits of some EPCM companies from mining are a prime example of the consequence of contractors taking risks they are unable to control, driving an ultimate negative consequence to project owners," he said.

WSP's Director of Resources (Australia), Samuel Bennett, also noticed a return to the familiar EPCM model in the last 12 months.

"Overall the suggested shift to more EPC forms of contacts has quietened down. Whilst juniors prefer turnkey contracts, the majors appear faithful to EPCMs," he said, adding that Tier One miners rely on these contractors for the systems and processes they bring to bear on projects.

Bennett noted that the relative size of projects coming onto the market is another reason why EPCM contracts are gaining preference over turnkey agreements.

Reduced contract size was something David Meadows, **Bechtel** Fellow and Manager of Global Process Technology – Mining & Metals, picked up on when ***IM*** spoke with him in Chile,

in October.

"Compared to where we were when the copper price was $3/lb, the whole drive for copper projects is 'incremental improvements'," he said. "It's almost impossible to get the $3-5 billion projects that we saw previously being executed off the ground."

The multi-billion-dollar projects that are moving forward from the feasibility study stage tend to be owned by multiple parties where risks are shared. This may involve jointly financing a project, sharing resources, or integrating existing infrastructure into a mine plan.

There are numerous examples of this including Teck's majority owned Quebrada Blanca II (QBII) copper project, which was financed with the help of Sumitomo Metal Mining and Sumitomo Corp's $1.2 billion package; and Glencore, Newmont Goldcorp, and Yamana Gold's plan at the Alumbrera and Agua Rica assets, in Argentina, which is expected to see Minera Alumbrera's infrastructure and facilities used as part of an integrated plan to develop Agua Rica.

The bulk of projects now coming to the table in South America are estimated to cost $300 million to $1 billion to build, Meadows said, reflecting a much more cautious approach from mine owners chasing guaranteed returns over a short timeframe.

This headline capital expenditure drop could also be reflective of mining companies' decisions to carve bigger projects into packages that can be funded through existing cash flow or equity deals.

Rusk said this tactic comes with the upside that mines can manage a range of risks in a "controlled and progressive fashion".

"The disadvantages of this approach primarily revolve around disintegration of project streams, and can become complicated during reintegration," Rusk said. "If not managed carefully this approach can be costly and time consuming, so the ability to control certain risks comes with a tradeoff."

Stakeholder pressures

While miners are still in 'risk off' mode when it comes to developing new mines, they are facing a number of external and internal pressures that means they have to consider some new, risky elements in project design and implementation.

Wood's Lawson said some of the big contracts to have been awarded earlier this year have seen an "increase in the integration of industry-leading automation and digitalisation technologies", as well as a focus on sustainable mining to help deliver a "safer and more productive mine with reduced energy consumption and environmental impact".

Lawson said at the same time as the industry is increasingly leveraging new technology and sustainable mining solutions, shareholders are demanding "better returns", which is driving innovations to improve productivity and achieve higher margins.

WorleyParsons' contract at Rio Tinto's Koodaideri iron ore project will see the contractor produce a digital asset of the mine as well as help build the 43 Mt/y iron ore project

This has seen most of the large mining companies make "significant" investments in technology to deliver next generation mines, Lawson said, "and they're looking for partners that can provide EPCM services, which help them connect the mining value chain".

A case in point is Rio Tinto's EPCM award for the Koodaideri Phase 1 iron ore project, in Western Australia, a development expected to see the miner consolidate its recent technology advances in automation and digitalisation.

The project award, which went to **WorleyParsons**, would see the engineering company use "data centric engineering processes" to produce a digital asset of the mine for Rio Tinto as well as help build the 43 Mt/y iron ore project.

Stantec's Rusk said it was now commonplace for automation and innovative technologies to be integrated into project plans from the very beginning.

Documenting details about new tools, technologies, and assets in project design plans had many advantages, he said: "For example, when project design tools (like 3D design tools) interface to integrated 'business' systems, mines have a database of information that works directly with their enterprise software systems."

This database of information can enhance or speed up the transition from project development to operational readiness, according to Rusk.

While WSP's Bennett was cautious of making sweeping project generalisations, he did acknowledge that the digitisation trend being embraced by the construction industry would inevitably make its way into the resources space – "especially from the perspective of facilitating the transition from capex spend to operations and asset management".

In the Nordic region, especially, **ÅF Pöyry**'s Head of Mining and Metals, Process Industries Division, Janne Tikka, said digitalisation would remain one of the key drivers in the mining sector.

"Companies now have the understanding of digital strategy importance to create the strong foundations for future requirements," Tikka said, adding that mines and plants designed today will be operated through the 2030s where autonomous equipment is the "rule, rather than the exception".

On automation, specifically, Lawson said: "Driven by safety and productivity, we expect to see the shift to automation continue until manually-operated vehicles become a thing of the past."

The Western Australia iron ore miners have undoubtedly led the autonomous haulage transition, but there are now examples in oil sands (Canada), coal (Australia) and copper that point to much wider spread adoption.

For instance, the QBII copper development in Chile, which Bechtel was awarded the EPCM contract for in January, is expected to use autonomous haulage with a fleet of Caterpillar 794ACs.

Bennett said smaller mining houses with existing mines were looking at this technology through the lens of 'remote' operations where people were removed from the mining face, rather than the automation of mobile plant. He did, however, concede newer projects and underground mines were considering automation from the off.

Wood's Lawson said the company is seeing a shift to remote control rooms in mining operations, with one specific example being the work it is carrying out for Antofagasta in Chile.

Wood is in the process of designing a Remote

Pure Gold Mining's Madsen underground gold mine development, in Red Lake, Ontario, is looking to leverage both battery-electric and tethered machinery from the off

Centre that will allow integrated operations management at the miner's Centinela operation, which produced 248,000 t of copper in 2018.

This work involves the preparation of studies for a technologically advanced integrated operations centre, including cloud data storage and information management for its operations, easily accessible from anywhere in the world, according to Lawson.

And, of course, battery-electric and mine electrification solutions are coming into focus both above and below ground, with mines being designed to best leverage the new technology coming onto the market.

Pure Gold Mining's Madsen underground gold mine development, in Red Lake, Ontario, is one such project to leverage both battery and tethered machinery from the off. **Dumas Mine Contracting** recently secured the underground mine design engineering contract on this 80,000 oz/y project.

Sustainable returns

Lawson mentioned earlier the sustainable mining focus starting to be felt across not only the operational space but also the project design and engineering sectors.

This is seeing contractors incorporate natural gas, renewables or some other 'alternative' energy supply into the design and construction mix.

WSP's Bennett said: "There has been a conscious shift to consider options in the use of renewables and/or clean technology by miners, not only in the generation of their power but also in the power plants of their mobile plant."

Stantec's Rusk said this energy source switch over the last 12 months was tied to the pressures miners are facing from numerous stakeholders.

"Different energy sources are being looked at early in the project with the goal of improving sustainability and improving stakeholder relations over the life of the mine," he said.

These sustainability moves in the project design and execution stages extend beyond just energy inputs, with Bechtel's Meadows saying tailings management and water recovery are major customer focus areas. This comes on the back of several high-profile tailings dam accidents across the globe and more awareness of dwindling water resources in locations such as South America and Australia.

Bechtel has recently been leveraging knowledge from its in-house water and pipelines business line to provide a differentiated offering to its clients when it comes to water recovery and tailings operations, according to Meadows.

This could see the company soon trial two new technologies at mine sites in the Americas that may, separately, improve water recovery, and enhance the geotechnical considerations associated with depositing materials onto existing tailings dams, he said.

Against this backdrop, many miners are looking to move to dry stack tailings options, with several OEMs launching new, bigger and 'smarter' filter presses to enable them to do exactly this.

Rio Tinto recently started the commissioning of industry-leading filter press technology at its Vaudreuil alumina refinery in Quebec, Canada, to move the refinery to dry stacking of bauxite residue, while Twin Metals Minnesota, a company owned by Antofagasta, said it would use dry stacked tailings at its Twin Metals underground copper, nickel, platinum, palladium, gold and silver asset in Minnesota, USA.

And, when it comes to water recovery, miners in Latin America are often looking to desalination plants to guarantee this vital resource.

Codelco, for example, recently awarded the project for the development, construction and operation of a desalination plant and its complementary infrastructure to supply water to the Chuquicamata, Radomiro Tomic and Ministro Hales divisions. This project, which will see a

While project owners and EPC/EPCM providers are integral to the success of future mines, there are companies in the middle that ensure developments are kept on course in terms of time and money.

Turner & Townsend is carrying out such a role on behalf of Danakali at the Colluli potash project, in Eritrea.

IM put some questions to Bruce Clarke, Director of Turner & Townsend in charge of the consultant's team at the project, which is expected to produce some 472,000 t/y of premium sulphate of potash in its first stage.

IM: How will you complement the owner's team at Colluli?

BC: Turner & Townsend have provided support in terms of the EPCM tender process and evaluation and EPCM contract formulation. Turner & Townsend will also be providing a team to support the client as part of the owner's team for the project. Initially the team will assist in the first two phases of the project where we will evaluate the capital estimate for the project while the EPCM evaluates that capital estimate as part of EPCM services for the project.

IM: What project functions will you be carrying out?

BC: Initial estimating assistance with project controls and quantity surveying services provided for all phases of the project.

IM: What type of contract is this based on?

BC: The two contracts – On-Shore and Off-Shore EPCM contracts – are based on the FIDIC Client/Consultant Model Services Agreement 2017, with a number of controls in terms of incentives and damages for cost, time and performance guarantees.

consortium led by Marubeni Corporation build a plant with an initial design capacity of 840 l/s through a BOOT contract, will enable the company to gradually increase the use of seawater with respect to the use of mountain water in all its operations located in Calama, Chile.

While these developments – on top of the move away from diesel power underground – will reduce the amount of greenhouse gas and carbon dioxide emissions that can be attributed to mine operations, miners are also looking to their EPCM contractors to reduce their overall carbon footprint.

This includes the consideration of modular, smart – in terms of logistics – and low environmental impact solutions, according to Bennett.

One could look at the modular solvent extraction plants Outotec has been delivering to greenfield mines recently, or Woodgrove Technologies' Staged Flotation Reactor flotation cells that both reduce power and air consumption, and require a much smaller footprint for installation than conventional cells.

It's also worth considering the use of pre-cast concrete in this sustainability drive; the ability to carry out the casting process in another location or offsite improves project execution and reduces the footprint of the site.

Burgeoning demand

From the list of potential developments that EPCM providers could be bidding on in the next 12 months, it is fair to say the project pipeline looks robust.

In addition to a number of major iron ore and lithium awards expected to be made in Western Australia, there were award prospects for expansion and underground projects in New South Wales and South Australia, in addition to a new underground coal mine in Queensland, WSP's Bennett said.

Pöyry's Tikka said, more generally: "ÅF Pöyry expects some of the record high number of projects currently in design phase in both North and South America to proceed to execution stage."

All of this bodes particularly well for a sector that is still out of favour thanks to the lack of mine development funding options and memories of project blowouts of the past.

"With the sustained low investment in mining, a subsequent boom seems inevitable," Larsen says.

"We are hoping customers learn the lessons from the past and work to set the right levers into contracts to incentivise success and fair reward."