

MINING GOES PAPERLESS

The mining industry is cutting time and costs with software that removes the seemingly endless series of drawings from the electrical design and management process. Chris Sheedy looks at the technologies, the efficiencies they are bringing, and how the effects will be felt across the engineering world.



During a presentation to analysts in early 2013, Mark Cutifani, CEO of Anglo American, famously didn't hold back when discussing the need for innovation. "The mining industry is decades behind other parts of the economy on productivity, and the industry, not government, must raise its game," Cutifani said. "In the mining industry, we're some 20 to 30 years behind other more progressive sectors in terms of productivity and business practices."

Innovation occurs as a result of challenge and difficulty, of desperation and need. None of these describe the mining industry of the past decade. But as the boom ends, demand slows and share prices fall, the innovative businesses will thrive.

One revolution in how work is done has recently taken place on the site of Fortescue Metal Group's North Star magnetite project. It centres around the development, design, implementation and management of electrical segments of the project, and makes current processes look positively medieval.

"In the past, when I was working on a \$2 billion expansion project, we would have had six or seven electrical engineers as well as 10 electrical draughtsmen," says Adam Ritchie, Electrical Delivery Manager on the North Star project.

"The amount of electrical drawings that you pump out on a job that big can easily reach 10,000, which far exceeds any other discipline."

From switch room arrangements to schematics to cable schedules and termination drawings, CAD drawings end up on pieces of paper. Once changes are made those printouts are out of date.

It was like going from a Formula One racecar to a horse and cart.

"The most frustrating thing about the design process is that if something does change, we're not talking about one change to one document. It would need to be replicated on many drawings," Ritchie says. "When you're trying to get these drawings issued for construction, you have a bunch of well-paid people whose job is to manually check each drawing is correct. It is very long-winded and expensive and there are a lot of errors involved."

But the result is not perfect accuracy. Dermot Kennedy, owner of Perth-based engineering

Fortescue Metal Group's North Star magnetite project near Port Hedland will process up to 30 million t of ore a year over a 45-year period.

software business I&E Systems, worked on a construction project in Brunei in which a single and simple change to the name of a specific panel would have ended up costing over \$600,000 in the drawing and checking process.

Drawings Are Dead

Since the late 1990s, Kennedy had been working on a software offering for the mining and construction industry, using new technologies to make the process of electrical design more fluid, natural and accurate.

His team called the software 'DAD' because 'D' follows 'C', so 'DAD' follows 'CAD'. One of his staff members also pointed out that the anagram could stand for 'Drawings Are Dead'.

There is a lot of wastage in the industry because people are too scared to try something different.

It made the North Star Stage One process almost paperless and, according to the people who managed the process, takes away at least 50% of effort, and therefore expense. For instance, typically 20% of construction hours for a major electrical project are attributed to testing to ensure equipment has been installed correctly.

"On North Star that would have equated to about 20,000 hours," Ritchie says. "But by using DAD we executed that part of the job, with higher accuracy than we have ever seen before, in 10,000 hours."

Constant checking

Eugene Leong, Lead Electrical Engineer on the North Star project, moved on to another project that was using traditional

CAD drawing methods after finishing work on Stage One. It was like going from a Formula One racecar to a horse and cart, he says.

"When you made a change at North Star, that change flowed through everything," Leong says. "There was no constant checking. Going back to the old system was very frustrating. That job took me four weeks, but if it was originally done in DAD then I could probably have done it in 25% of the time."

So how does DAD work? It begins with the design of the electrical system in the Systems Information Model, which contains pre-set components and connectors being used on the particular job.

Once the design moves to the field, technicians carry a laptop, tablet or smartphone offering direct access to DAD with all its design and installation data including a link to the plant 3D model, rather than folders filled with 2D line-drawings, and any changes made within the design portal are immediately reflected in the cloud-connected systems of the technicians. When it comes time for the final systems check, technicians simply tick check boxes, which are immediately uploaded into the main system allowing managers to have a real-time view of progress.

"You only need about 15 minutes of training in order to be able to navigate yourself through the system," Ritchie says. "Most people got themselves through those first 15 minutes. But we also had some people who spent hours trying not to use it."

That was one of the past roadblocks to uptake of the DAD software, people's natural resistance to change.

"The problem of take-up was confounded by the perceptual shift from a paper-based industry that communicates between design and construction by handing over a large pile of paper," Kennedy says. ●



THE ACADEMIC ANGLE

Professor Peter Love, the John Curtin Distinguished Professor from Curtin University, has been researching the effectiveness and efficiencies of projects using DAD.

What sorts of efficiencies are you identifying?

We took drawings from a past project and found over 1000 errors. We remodelled it using object-orientated management, which the DAD system is built around, and found that you get a 94% improvement.

How are such efficiencies made possible?

DAD enables collaboration and the sharing of information. It enables visualisation using 3D models. In CAD, if there's a mistake that needs to be rectified you could have that object appearing on 100 different drawings which must be certified and reissued, which costs a fortune. In the DAD world, you make the change and it automatically changes everything else.

Why is this only appearing now?

In the resources sector, everything was quite cushy for a long time and you had contractors being paid very well to issue documents. They were being paid by the hour, so there was no incentive for them to change.