

Helping BHP into the brave new world of digital twins

DECIPHERING the moves of BHP can be a difficult business. The world's largest miner rarely shares insights about strategy, so is to be made of last month's announcement from Dassault Systemes of a long-term strategic partnership with BHP?



Kailash Sriram (left) and Vinay Sriram.

Asset Management > Simulation-optimisation

Dassault is not a familiar name in the resource sector. The Paris-based tech giant was a pioneer in computer aided design and is best known today for 3D design software that is almost ubiquitous with Europe's manufacturers.

Comments

These days the company is leading a shift to so-called "digital twins" - a digital replica of physical assets and processes.

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Management consultants tell us digital twins are at the heart of a fourth industrial revolution, which is yet more jargon that needs explaining.

The first revolution goes way back to water wheels and steam power, the second was mass manufacturing and the third was the arrival of the internet, personal computing and smart phones.

The fourth industrial revolutions is an era where digital technology becomes inextricable with physical assets and processes.

To understand what that might really look like in terms of the mining industry, it is helpful to look deeper into another recent announcement by Dassault about a memorandum of understanding with IPACS - formerly International Projects and Consulting Services.

The agreement is a major coup for the Adelaide-based firm, which is the only Australian company with products that will interface with Dassault's global platform.

The business was founded in the 1990s in the backyard garage of engineer Kailash Sriram. He still runs the firm, now located in a technology park in a northern suburb of Adelaide, along his engineer son, Vinay Sriram.

IPACS made its name in the defence sector, working with the likes of Tenix - owned by BAE Systems - to build sophisticated sensors to monitor the physical performance of ANZAC frigates.

Defence also gave IPACS its introduction to Dassault, with both firms selected for the South Australian government's "Virtual Shipyard" program.

IPACS has already done impressive work in the mining industry and has contracts with a number of the country's leading miners.

It is pioneering work in the field of equipment analytics, which Vinay Sriram said was based on the reality that most faults reported by maintenance engineers started with imbalances and misalignments of a machine's bearings.

"We have developed technology that provides early warnings for mechanical and electrical faults," he said.

"We collect time series data from vibration sensors, convert it to spectra and use mathematical modelling of the machine to identify faults.

"The keys to equipment analytics are a military-standard, shock and vibration-proof data acquisition system along with advanced machine modelling and customised alarms and alerts.

"We model each and every component of the drivetrain. We work with original equipment manufacturers of those components to get their input data into our machine model.

"So we have a very accurate measure of how the machine should be behaving at various operational conditions."

Case studies make the story even clearer.

In 2015, IPACS was given the opportunity by OZ Minerals and Thiess to trial real-time monitoring of planetary gearboxes in Caterpillar 793D dump trucks.

Each truck has two of these gearboxes, and Caterpillar mandates a rebuild every 20,000 hours at a cost of \$180,000 each.

The objective of the trial was to extend the period between rebuilds, based on the actual condition of the gearbox rather than the schedule.

A customised solution of multiple vibration sensors was designed, built, installed and connected to a 3G modem, allowing real-time monitoring from a control room 650km away in Adelaide over a six-month period.

One of the best results from the Prominent Hill trial was early identification of a gearbox about to fail because of a broken gear tooth.

The truck was taken out of service early and rebuilt at 30% less than the cost of a total rebuild.

Another case study from South Australia involved a 500t per hour mobile crusher, operated by Lucas Total Contract Solutions at Arrium's Iron Baron mine near Whyalla.

IPACS designed sensors that could cope with the constant vibration of the crusher and still monitor the intricate components of the crusher's mechanical screen.

The trial picked up the early signs of a bearing fault on a crusher gearwheel, avoiding an unplanned shutdown.

IPACS is a pioneer in this kind of remote asset monitoring, which makes it easy to understand its appeal to Dassault as it pushes into the world of digital twins and cyber-physical systems. IPACS provides the know-how to capture meaningful data from the physical world to support living, digital copies of machines through their life cycle.

The first goal of the partnership Dassault-IPACS partnership will be to design and build a number of demonstrators, specific to the industries being targeted.

Vinay said the mining industry demonstrator would most likely be a truck gearbox.

"Instead of adding sensors to an existing design as we did at Prominent Hill, we will be designed and building a gearbox that incorporates sensors from the very first design stage," he said.

"The demonstrators will be the first machines based on the philosophy of the fourth industrial revolution and we are keen to show how much potential that will unlock."

While the benefits of this kind of high-tech asset monitoring are obvious to a global miner such as BHP, it is really just the beginning of what the fourth industrial evolution promises for the resource sector.

Digital twins can be built not only for single machines, but any number of complex processes that link them together.

Dassault identified early how this could lead to a future of customised manufacturing with robots.

Its new partnership with BHP shows it also sees big potential to unlock value in the process-intensive mining industry.

Vinay has an exciting vision for the Australia as a global leader in sophisticated mining processes and machinery, and exporting its technology and know-how to the rest of the world.

"I believe Australia can be to mining technology what Germany is to manufacturing," he said.

"Germany still exports more to China than it imports. That shows their manufacturing superiority.

"In order for Australia to maintain its superiority in mining, not only do we need high-quality resources, we must also keep getting better at delivering the product to the market, and that's what we can achieve with this fourth industrial revolution."



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