


GLOBAL MINING REVIEW

NOVEMBER/ DECEMBER 2022
VOLUME 5 ISSUE 9



EMERSON™



**EDGE SOLUTIONS
ENHANCE
OEM
OPTIONS**

COVER STORY

Thishen Naidoo, Emerson, Canada, considers why mining operators are relying more heavily on their OEM suppliers to improve uptime and support, and why in response these equipment providers are enlisting edge technologies.

Mining is a long-established industry with many traditional aspects, however this does not mean it enjoys completely stable conditions. In fact, a scarcity of labour, rising OpEx costs, and dynamic market conditions are pushing mining operators to achieve new levels of flexibility and capability.

One way mining operators can do so is to partner more closely with their original equipment manufacturer (OEM) suppliers, urging them to add technologies and capabilities for maximising uptime, delivering superior performance, and enabling new methods of improving responsiveness (Figure 1). Digital transformation, through the application of edge technologies and industrial internet of things (IIoT) solutions, is a fundamental way for OEMs to deliver these capabilities. A better-connected asset is more effective over its lifetime, and the opportunity to employ advanced machine learning and analytics provides new opportunities for optimisation.

Although OEMs are experienced at delivering machinery for specific mining operations, many are still in the early phases of their digital transformation journey to deliver advanced features capable of helping end users coordinate site-wide systems. End users know they can benefit from IIoT and remote connectivity, but they are not always positioned to completely specify which technologies provide the best mix. Indeed, OEMs and end users alike may expect that a custom mixture of hardware, software and networking

products are required, and recognise this can involve significant risk and cost.

All those involved, especially the OEMs supplying equipment to the mining industry, may find that a better method is to select the required automation and connectivity products from a coordinated portfolio, supplied by an industry leader with established experience. Proven, ready-to-develop edge solutions reduce the risk and effort needed to deliver rapid results, enabling open system implementations scalable to any size, while maintaining cybersecurity.

Digging into the details

By nature, many goals of an OEM equipment supplier and a mining end user are in alignment. They both want the equipment to perform reliably and be cost-effective,



Figure 1. OEMs harness the power of IIoT and edge solutions to help mining operators unlock more productivity from their assets. Using proven hardware/software platforms instead of custom developed projects minimises risk and project costs.

as proven by metrics, such as mean time between failure (MTBF), overall equipment effectiveness (OEE), and energy monitoring. However, sometimes the parties involved pursue objectives that may diverge.

For instance, the mining industry equipment arena is dominated by specialised OEMs using a variety of automation platforms, and often offering limited, or even proprietary, connectivity. These OEMs will inherently focus their efforts on new equipment and their core market.

However, as the industry shifts toward higher levels of autonomy, there is an end user push for more functionality, openness, and connectivity. In part, this is to enable optimisation, scalability and integration within mining operations, but obtaining IIoT and remote connectivity is becoming equally important to support data acquisition, analysis, control, and diagnostics.

Also, while some installations will be new from the ground up, there are many cases where legacy systems must be accommodated, or the existing fleet needs to be upgraded. End users need solutions for all these cases.

Extracting answers

Traditional OEM automation systems have largely been based on programmable logic controllers (PLCs) and human-machine interfaces (HMIs). While these are excellent choices for basic automation, there are newer options providing improved interconnectivity and communications.

To progress from standalone equipment towards better integration and IIoT capability, it becomes necessary to incorporate higher-level controllers – along with advanced networking and computing capability – in conjunction with on-premises and/or cloud-based data handling. In order to provide these and other capabilities,

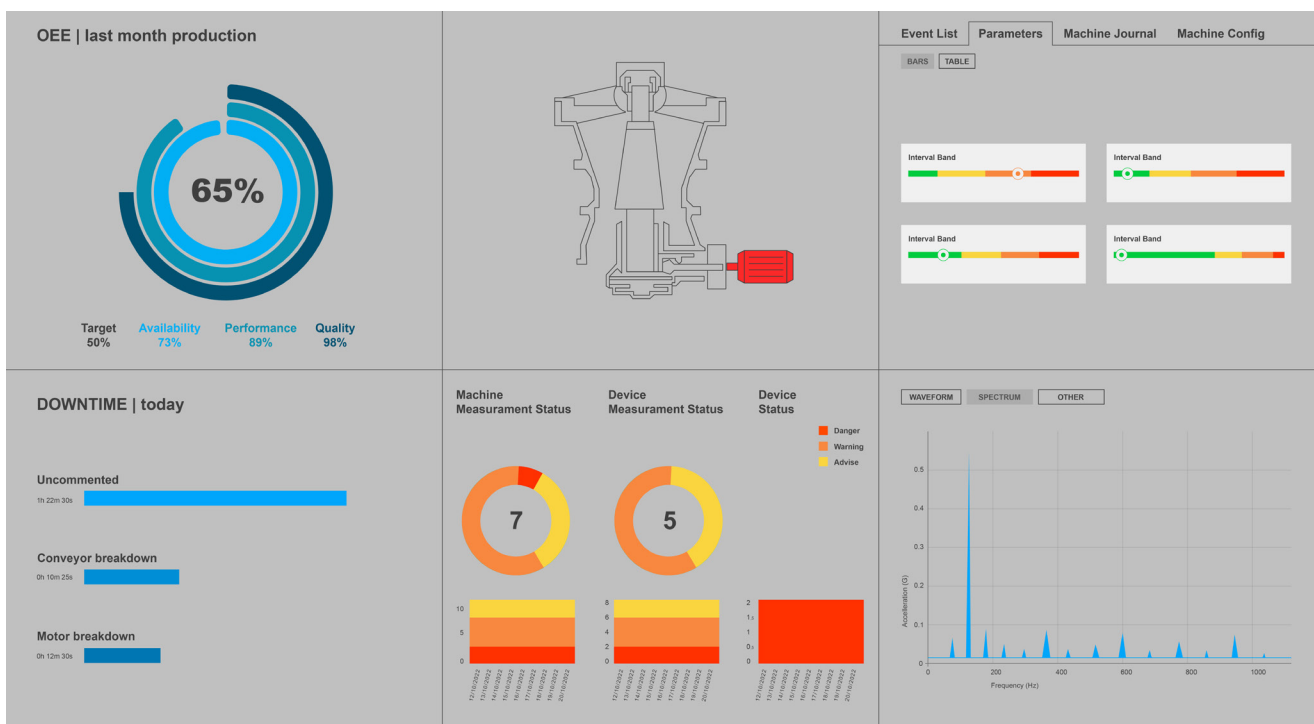


Figure 2. Emerson PACSystems edge solutions are ready-to-develop combinations of hardware and software, built on open standards and pre-tested for a variety of roles, so users can focus on developing applications instead of creating an edge platform.

designers can build their automation systems using some, or all, of the following components:

- Programmable automation controllers (PACs).
- Edge controllers.
- Supervisory control and data acquisition (SCADA) systems, hosted on standard PCs or industrial PCs (IPCs).
- Operational technology (OT) industrial communication protocols like PROFINET and OPC UA.
- Information technology (IT) capable protocols, such as MQTT.
- Edge-enabled software.

In the face of overwhelming choice, there may be a tendency for designers to mix and match a variety of products from different vendors to create the desired solution. Sometimes there is even a sense that choosing products in this way can be the most economical approach.

However, a realistic review must include the many hours of research, development, and testing to deploy such a solution. This assessment involves not only the up-front costs, but also the ongoing costs of maintaining a bespoke IIoT platform, which includes future firmware updates and retesting. And it must consider newly introduced issues, such as cybersecurity.

Evaluating cybersecurity

Digital transformation presents many benefits and opportunities for mining operators, but edge and IIoT connectivity also introduce new concerns around cybersecurity, which must be addressed head-on. Ernst & Young's Global Information Security Survey, published in mid-2021, indicates that 71% of mining respondents had seen an increase in disruptive attacks during the preceding 12 months, and about 55% of mining executives are worried about their ability to manage a cyber threat.¹

Ensuring that an edge and IIoT solution meets all functional and performance needs, is supportable and offers comprehensive cybersecurity, is a tall order. A custom solution created from individual products involves many different tools and programming environments for PLC/PAC, HMI/SCADA, edge computing, IIoT, and more. It is impractical for OEMs and end users to train their staff on so many products, and it can be difficult to guarantee operational results – and cybersecurity aligned with industry standards – using this type of approach.

A rock-solid foundation

To address these, and other concerns, OEMs and end users should build their edge and IIoT solutions upon comprehensive and coordinated product families of hardware, software, and networking products. Truly pre-tested options are limited, but available. What should implementers look for?

One initial consideration for industrial use is to choose products with a proven reliability record when installed in the most challenging locations. Evaluating the hardiness and suitability of hardware can be straightforward, but the path is less clear for software. Consumer or



Figure 3. Clear OEE and energy visualisation, supplied using Emerson Movicon with Pro.Lean and Pro.Energy modules, helps users develop improved operating strategies and more sophisticated analytics.

commercial-grade software is simply not sufficient for always-on mining applications.

From a hardware standpoint, PLCs/PACs will continue to be necessary, but in many cases newer options – such as edge controllers – can be a preferred way to apply deterministic control, closely combined with general-purpose computing. For equipment control, designers should choose product families, enabling them to port and deploy proven control logic seamlessly among all these control platforms, using a consistent toolset to minimise training.

Edge and IIoT software must run on and interact with edge controllers, IPCs, or site/cloud computing resources as needed. They must fluidly work with all popular OT and IT communication protocols, including OPC UA, PROFIBUS, MQTT, and many more. Developers may need these platforms to host their own custom code, but in many cases, they would prefer to rely on standard software module for common needs, such as OEE analytics and energy/utility monitoring. These developers also need a way to incorporate commercial software apps, and a consistent development environment.

For the most flexibility, edge software should itself be built on modern standards like Microsoft .NET and .NET core, ensuring it can be deployed seamlessly to any type of end point – whether an edge controller, a panel PC, or a full IPC – running Windows or Linux. Similarly, edge platforms need to support secure access from any type of end user mobile device, such as a laptop, smartphone, or tablet.

Another benefit provided with some automation platforms is the convenience of ready-to-develop hardware/software configurations (Figure 2). These are available for the most common edge roles, such as: visualisation, edge computing, edge control, supervisory, and analytical. Interoperability testing has already been performed for these configurations, and software and licensing are pre-installed, so developers can focus their efforts on rapidly creating the application at hand, instead of qualifying the platform.

Ready-to-develop configurations are also a dependable way to scale up configurations to span production lines and fleets of equipment. Home-grown implementations can become exponentially complex as they are expanded, and

may be hampered by communication driver limitations, a need for more third-party products, custom scripting/code, and complications involved with patching and updating these items. A ready-to-develop platform accommodates all these issues.

Beyond functionality and ease-of-use, one other advantage of single-vendor hardware/software platform combinations is they can offer built-in cybersecurity at all levels, demonstrated by the supplier to meet cybersecurity standards, such as IEC 62443-3-3. This provides a more trustworthy path for users to address cybersecurity, as opposed to attempting to self-verify a configuration.

Edge enables better OEM support for mining

Navigating the digital transformation journey and incorporation of IIoT technologies can be daunting. Mining operations consist of an assortment of OEM equipment types and vintages, typically distributed over great distances. End users must deal with new challenges with respect to labour scarcity, escalating costs and unstable markets, in addition to the usual needs for improving uptime and production. Addressing these issues on a machine-by-machine basis is unwieldy.

Thankfully, an established edge platform reduces the development timeframe, letting OEMs focus on addressing solutions for known problems. Some of the key challenges for mining are centred around overall equipment effectiveness (OEE) and energy efficiency (Figure 3).

At the machine automation level, it is possible to collect a huge amount of data at a high frequency to measure various parameters, via sensors and instrumentation, that translates into availability, operational performance, and

quality metrics. Data can be translated into a visualisation of OEE for the machine. Providing this clear view can then lead to the development of more sophisticated condition monitoring analytics to predict downtime by consolidating vibration, temperature and other key parameters, in order to detect operational anomalies. In a similar way, energy consumption can be visualised and analysed to improve energy efficiency across machines or a process circuit.

Conclusion

OEMs and mining operators alike benefit from the careful application of reliable edge automation and IIoT connectivity technologies, in order to overcome the complications of efficiently and safely extracting and processing materials. Tailored solutions for mining equipment automation and integration are best built upon a comprehensive edge platform, consisting of a coordinated portfolio of industrial-specific hardware and software offered by a provider with deep domain experience. **GMR**

References

1. MITCHELL, P., 'Does cyber risk only become a priority once you've been attacked?', *EY*, (8 March 2022), www.ey.com/en_gl/mining-metals/does-cyber-risk-only-become-a-priority-once-you-ve-been-attacked

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