

How will advanced analytics and artificial intelligence drive development in industrial machine control?

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These smart technologies are extending traditional machine control architectures with more enhanced data processing, learning and decision-making capacity. They hold the potential of increased availability, efficiency and reliability through predictive and prescriptive maintenance, as well as improving productivity with the ability to make autonomous decisions.

Piotr Siwek, Head of Product Marketing EMEA, Factory Automation, Mitsubishi Electric Europe B.V. looks at how embedding these smart technologies in controllers can deliver a new paradigm of machine operation.

It wasn't so long ago that the potential of technologies such as model-predictive control, PID control, field-oriented control and fuzzy logic was merely hypothetical. Today, they are so deeply embedded within controller architectures that we no longer even think about them.

Within that context, consider the development possibilities of advanced analytics (AA) and artificial intelligence (AI) technologies for machine control. They can be a driver for increased machine availability for example by delivering more effective predictive maintenance.

This brings us into the realm of Big Data analysis where AA and AI technologies enable different machine states to be recorded and analysed in real time. Recognising the current machine status, detecting potential faults on the horizon, and then immediately offering recommendations for actions to be taken. The machine operator or maintenance provider can respond, or the system even autonomously initiates remedial actions.

By linking that same AI technology into the wider enterprise, into the logistics chain for example, the control system could even mitigate for delays in the delivery of replacement components. For instance, it could slow the machine down slightly to increase longevity rather than stopping the production line altogether.

Going further, AI can begin to make autonomous decisions to optimise productivity. Consider, for example, how a machine is typically built to work

within defined margins of capability – perhaps to allow for different loads or speeds or safety ranges. AI technology using deep learning algorithms within the controller could enable machines to be driven right up to and even beyond today's margins, significantly boosting productivity without compromising reliability or safety.

We are already seeing how applying AI principles to individual machine processes can be an enabler for operational improvements. For example, Mitsubishi Electric has developed diagnostic technology based on its AI Technology called Maisart. Embedded into products such as Mitsubishi Electric's MELIPC edge computing solution, this uses machine learning to analyse collected data to generate a model of the machine's operational states. This model can detect abnormalities in the machine's operation in real time, enabling it to provide early warning of impending problems so that maintenance personnel can take prompt action.

Another example of the use of AI is the smart predictive maintenance function of MELFA robots. The Smart Plus function can be applied to Mitsubishi Electric's MELFA robots to precisely analyze primary drive components according to actual operating conditions and warns of failing or deteriorating parts at an early stage. Therefore, reducing downtime and allowing an efficient maintenance schedule to be planned. Further, during the design phase of the applications, the technology offers simulation capabilities to predict the robot's lifetime and estimate annual maintenance costs, giving engineers the opportunity to modify the robot's operation to extend the lifecycle.

These two examples already could drive significant improvements in availability of the machine and reduce maintenance costs, yet they merely hint at the potential of AA and AI.

Image Captions:



Image 1: Piotr Siwek, Head of Product Marketing EMEA, Factory Automation, Mitsubishi Electric Europe B.V.

[Source: Mitsubishi Electric Europe B.V.]



Image 2: The edge computing solution, called MELIPC from Mitsubishi Electric uses machine learning to analyse collected data to generate a model of the machine's operational states.

[Image Source: Mitsubishi Electric Europe B.V.]



Image 3: Machine control systems can significantly boost productivity without compromising reliability or safety with the use of AI technology.
[Image Source: Mitsubishi Electric Europe B.V]

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