Triggering a PLC change using a cloud-based machine learning model

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**TRIGGERING A PLC CHANGE USING A CLOUD-BASED MACHINE LEARNING MODEL**

​Dense medium cyclones (DMCs) are a class of process separation equipment used in coal preparation, iron ore, the pre-concentration of diamonds and in metalliferous and industrial minerals. Under unstable process conditions a symptom called “surging” occurs disrupting the efficient separation in the DMC causing production losses. This can account for millions of dollars of lost revenue per annum per site. There are different reasons that cause this “surging” condition, and it is difficult to detect with limited direct sensory feedback from the DMC. Commonly, if surging is suspected it needs to be visually confirmed in the field and a decision needs to be made on what process control set points need to be changed to rectify this behaviour. These changes typically need to be made manually by an operator in the control room.

​Although in most cases there is no direct indication from the DMC, symptoms of the surging are evident in downstream equipment trends with distinct patterns across multiple tags. By applying a cloud-based multivariate Machine Learning (ML) model on these trends, it is possible to automatically detect this condition. Furthermore, the output from this model can be used to trigger a response at the control system layer, without the model residing there, like with Advanced Process Control (APC) or Model Predictive Control (MPC).

​This method provides a means to validate ML model performance and quantify the actual production value before deploying the model at the site PLC level. The successful hybrid integration of cloud-based machine learning with edge-based control systems offers new possibilities for older equipment, avoiding costly hardware upgrades while still achieving a similar outcome. The knowledge gained from undertaking hybrid PLC testing could prove pivotal in the decision to upgrade a plant control system, reducing risk for the plant owner and operator.