

Application of a Reinforcement Learning AI Solution for Optimisation of Screening Shuttles Control

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ABSTRACT

Iron ore screening plant productivity is strongly affected by the performance of the shuttle operation, with the control system robustness and associated strategies having a direct impact on utilisation and throughput rates. A number of aspects intrinsic to the methods and technologies traditionally applied on the motion control of shuttles are often observed to decrease the efficiency of the ore distribution process across multiple screening modules which ultimately impacts the plant's production. Those include the number of operational scenarios that are unmanaged by conventional discrete control logics which may intermittently lead to undesired events, such as 'high level alarms' and 'low level interlocks' in the screening bins. This outcome usually demands excessive manual intervention by Control Room Operators.

A Reinforcement Learning (RL) Artificial Intelligence (AI) solution was deployed to control the motion operation of the scalping and products screening shuttles in an iron ore handling plant. The RL algorithm was trained in advance to handle multiple operational scenarios and generate optimised outputs. In nominal operation, the shuttles are moved in a modulating and highly predictive fashion over the whole range of safely reachable bins. When the need occurs, the AI control agent deviates from that modulation behaviour, limiting its travel range or moving to other groups or clusters of available bins by employing 'bin jumping' or 'ore break' strategies. The RL platform capabilities include the ability to learn in real time to account for and auto-adapt to new operational patterns and process changes whilst applying improved strategies for shuttle dwelling times, target setting and speed control.

The deployed Reinforcement Learning AI solution has better managed the existing challenges associated with the shuttle operation and control, and resulted in a more efficient ore delivery process, superior operations stability and increased production rates.