
Process Improvements at Hulamin

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Hulamin, situated in Pietermaritzburg, South Africa, is an independent producer of semi-finished and fabricated aluminium products. Their rolled products division manufactures a wide range of sheet, plate and foil alloys and is focused on high specification, tight tolerance products which it supplies to customers both within Southern Africa as well as throughout the world. Remaining ahead of its competition has required investment in its people, judicious choices in capital investment and appropriate use of external technical expertise.

A year ago, Hulamin contacted Innoval to carry out an audit of their six-high cold mill last upgraded in 2004. What was needed was an independent assessment of the general capability of the mill, especially an objective view on its performance relative to other mills producing similar products.

The Hulamin process engineering team already monitored many of the key metrics relating to performance, up-time, recovery and productivity. What a visit from an outside expert provided was a check on the data integrity and the methodology employed. It identified some modifications to the measures employed to conform to current best practices and it provided a way of benchmarking the mill performance against world-class standards. The suggestions have subsequently been incorporated in the plant operating practices and provide a baseline against which to judge the ongoing improvements. The discussions around why the data should be analysed in particular ways also provided the newer engineers with insights into how to pick up trends and difficulties early, utilising the large volumes of data now regularly collected off modern mills. This has proved to be a more effective way to enhance individual skills than the abstract study of analysis techniques and has been a spin-off benefit of the mill audit. Figure 1 shows the improvement in mill efficiency following the visit.

During the visit there was a detailed audit of the rolling operations as well as an examination of the control software where analysis revealed it was clear the control could be improved. This is essential if the achievements within the plant were to be maintained against improving external competition. Part of the auditing procedure included mentoring of key personnel, helping them to understand what the control programs could be expected to achieve (examining the process from measurement to actuator movements) and how to assess whether this was being realised. Figure 2 shows the results from one coil where the flatness performance was examined region by region across the strip width. This analysis helped focus in on where the real challenges lay and provided the means to prioritise tasks on the basis of their contribution to improved performance and quality. In addition to ensuring the process engineers understood both the potential of the software and the limits in its implementation, the explanations were also used to help communicate to the operators some of the differences they observed while rolling. The operator in the pulpit (Figure 3) supplements the information from the measurement systems with his observations of the strip and the mill behaviour. Providing them with a better



understanding of what should happen allows them to judge when and how to intervene to counter any unusual events. The enhancement of operator knowledge is a deliberate component in improving plant quality and productivity.

The outcome of the detailed audit identified some key issues in the control software that required to be addressed: these were beyond the simple re-tuning of some of the control parameters. The recommendations from the audit were divided into two parts: those that would help to improve mill performance immediately and those which should be considered longer term improvements. The latter related to improved strategies for the use of intermediate-roll versus work-roll bending and more effective usage of the hot edge sprays. Innoval and the Hulamin team worked closely together to prioritise the recommendations. The realisation of these improvements allows the full capabilities of the mill to be exploited and fulfils the objective of achieving cold mill performance against its engineering capability and matching the requirements of world-class quality and performance.

The visit proved a good opportunity for Innoval to improve the skills and knowledge of Hulamin's engineers and operators, ensuring they were capable of implementing the recommendations themselves, and facilitated the transfer of the analysis techniques to other operations in the plant. In this way improvements in mill productivity and product quality are being realised more widely.

The cold mill audit has been followed up with support activities relating to the foil rolling expansion. While the upgrade and commissioning of new foil mills can be reliably left to the suppliers, the process requirements for the wider range of products to be run through the newly available mills need to be determined by the plant personnel themselves. The suppliers provide advice based on their experiences, but this needs to be complemented by historical local knowledge and where possible by leveraging external expertise. Hulamin therefore requested Innoval to provide two components towards the new facility: a study on the lubrication requirements for the mills and a training course in foil rolling and defect analysis for the lead operators. Innoval was chosen because of the company's comprehensive range of skills and extensive industry experience and because of its independence to provide objective advice.

The training course was specifically arranged to maximise the interactions between the Innoval expert giving the course and the operational staff. This was achieved by combining teaching sessions with detailed workshops directed at finding solutions for defects found on the existing foil products. While Hulamin already uses highly structured approaches to identify problems and set in place corrective actions that prevent their re-occurrence, the contributions from Innoval ensured that different perspectives were brought to bear both on problem solving approaches and provided wider knowledge of the problems. This approach provides an inclusive learning environment that can be maintained between the visits from Innoval and ensures continuing improvement driven from Hulamin's own people. The combination of mentoring, objective external observation and analysis is showing rapid benefits as the new equipment ramps up to full productivity.

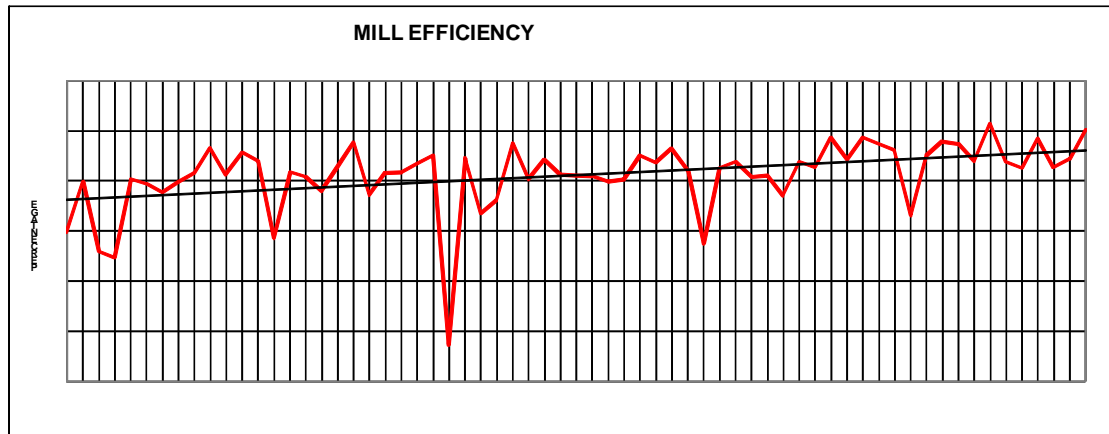


Figure 1. Improvements in mill efficiency

Note: The dips in the data correspond to unscheduled downtime on the mill



Figure 2. Maximum flatness errors for regions over the strip width for one final pass coil

The colours are blue - edge; red - quarter pocket; green – centre
Upper box is the non-drive side; the lower box is the drive side



Figure 3. Hulamin's S6 mill pulpit