Accelerating the progress of internal process improvement teams – a case study

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Many of the smaller aluminium rolling companies have in past years been able to offset the advantages of being associated with the larger multi-national companies (with their access to shared resources and cumulative experience) by exploiting the ability to supply to niche markets, to supply small lot sizes, and to provide a more tailored end-product. These companies have often had to be more resourceful and have been able to expand without having either to partner with a major global supplier or to rely on third party technical support. They generally have been able to modernise equipment and to implement internal quality improvement programs which have allowed them to expand penetration into domestic and especially the more valuable export markets. The ongoing improvements and the enhancement in the skills of their workforce have allowed such companies to develop into comparatively significant exporting companies with a secure domestic base and a high reputation in the market place.

The threat of further competition and the growing number of these types of companies prompted some of the more forward-looking companies to re-examine their approaches to deciding the priorities for implementing improvements. One penalty of being a small independent supplier is a degree of isolation from the changes there may have been within the industry and what global customers expect to be delivered. Baseline assessment of what is possible using the equipment and procedures a plant has in place is much more difficult without some access to comparative information.

Innoval has worked with one such company recently, a manufacturer of strip & foil products. The company had moved into flat rolled products in the 1960’s and then began the production of foil products over the next few decades. Aware of their competition, they relied on their technical and marketing staff to keep them up to date with the manufacturing improvements. Expertise from mill suppliers ensured their manufacturing equipment was kept up to date through new investments and through upgrades (Figure 1). A couple of years ago, they approached Innoval Technology, an independent supplier of product and process expertise to the aluminium industry, to carry out an audit within its foil plant and provide an objective assessment of their foil rolling operations and performance. Such exercises are useful as they provide a different perspective on what can sometimes be an isolated introspective view of the technology and manufacturing methods within a plant.

The company was led well, with a corporate philosophy that included the deliberate enhancement and rationalisation of the production routes, a focus on quality and the development of people’s knowledge. Because of this the audit itself could be carried out very efficiently, utilising the databases already in place and quickly identifying areas where further improvements could be made. A process flow diagram was the starting point as this identified the key steps including the source of the foilstock.
The process flow is conventional for a plant of this size. The source for the stock material comprises both internal and external suppliers. Some ingot is bought directly from third parties, scalped and hot rolled down to the transfer gauges for cold rolling. Some of the stock is generated through continuous casters on-site and a small proportion of the incoming material is purchased in the form of hot rolled coils.

A cold mill is used both to produce strip products and to carry out the passes required to bring the material down to the gauges commonly used to transfer to a foil roughing mill. Associated with the cold mill are a series of annealing furnaces to ensure the material properties will be correct for the final product as well as slitter and levelling lines. Furnaces are also available for partial annealing to meet the customer specifications.

A significant proportion of the output is destined for foil products. The cover a wide range of applications and hence final thicknesses, of which the most demanding from a process and quality perspective are the thinner foil products. The routing may take the product through the three foil mills (roughing, intermediate and finishing). In this plant a doubling machine is used to prepare coils for the final pass. After separation and quality inspection, the foil coils are annealed and prepared for dispatch.

Once the flow diagram is prepared, it is used as a template on which volumes, recovery & productivity values can be added to provide a map of some of the key manufacturing metrics.

Using Innoval’s experience to consider the entire process, rather than just the final machine centre, the overall quality and productivity was assessed. This highlighted the need to quantify better some of the metrics relating to the incoming material to ensure it met the quality needs of an ambitious and improving operation. The foilstock specifications were reviewed and revised. After working with the various foilstock suppliers, one was discontinued as it was unable to meet consistently the profile targets and cleanliness requirements demanded of the product in its final form.

The audit looked very closely at the productivity figures through the foil operations. This identified opportunities to optimise productivity both through increased mill speeds and through reduced handling & down time. The improvements in mill speed had to be done in such a way that the product quality – flatness, surface finish and winding conformance – was not reduced. Determining what could be achieved in practice was a joint activity combining the plant’s experiences with their mills and the accumulated knowledge from Innoval Technology. Decisions were arrived at collectively, trialled and then put into standard practice. The success in implementing this is shown in Figure 2.

Though the performance figures shown look impressive, this was only part of the story as the audit looked at the overall plant performance and not just at a couple of machine centres. Improvements to the roughing mill handling were initiated by an analysis of dead time at that machine centre and then successfully implemented. Attention was also paid to the loading of the machine centres and to the optimisation of transfer gauges between the mills. An extensive improvement program was carried out by the process engineers, which has contributed to the overall plant performance figures. This allowed the plant to steadily improve its foil products and the plant output. Even during the recent challenging economic period the plant has been selected preferentially to supply a higher volume to a more demanding customer base (see Figure 3).
The growth is now threatening to outstrip the capacity of the machine centres, and several models have been put together by both companies to consider possible business & investment scenarios for the next few years. The models indicate where it is most advantageous to invest in the plant. They include as inputs the business sales projections, the profit margins of the different product groups and the practical as well as engineered capabilities of the existing equipment. An example of the individual product productivities in tonne/mill-hour is given as Figure 4. This needs to be multiplied by the added value of the product and weighted by the strategic importance of an individual product within the product portfolio.

This use of an external consultancy provides a good case study of how outsourcing resources to compliment an existing team provided not only a reality check on how the market place is moving in general, but also allowed several important new ideas to be identified and pursued. Within the narrower focus of production demand the broader perspective and objective analysis does occasionally get lost. The use of knowledgeable external team members helps generate renewed enthusiasm, enforces the most productive concepts and ensures that the resources are put into those areas that are jointly defined as high priority and where investments can be most usefully made. As can be seen in this study, such effort is reflected in the company’s business growth.
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Figure 1 Overview of the finishing foil mill and coil storage area

Figure 2 Implementation of improvements tackling mill speeds (fluctuations reflect changes to product mix across the two finishing mills)
Percent growth in foil volumes following investment in new & upgraded equipment

Figure 3 Growth in foil products supplied to the market (domestic plus export)

Productivities of the current major products

Figure 4 Productivity data