

Strategies for Alumina Refinery Optimisation

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Abstract

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Alumina refineries must continually improve to remain competitive. However, sustaining any improvement presents a challenge due to the complexity of the refining process. Cost reduction programs are often reactive involving personnel reductions and maintenance and capital deferrals. Frequently such cuts are ultimately unsustainable and degrade asset performance over the longer term. To achieve a sustainable improvement in cost curve position requires a combination of process optimisation, innovative enhancement, operational excellence and effective asset management, underpinned by robust systems and effective leadership. This entails an ongoing ability to maintain robust and efficient operation, nullify threats and identify and capture improvements even while the refinery assets are ageing over time and being further ‘squeezed’ for performance. This paper explores these improvement strategies and provides guidance on opportunity identification, the work processes and systems that drive the ongoing performance of the refinery and optimising improvement programs for maximum value.

Keywords: Cost Reduction, Improvement, Optimisation, Operational Excellence.

1. Introduction – the Improvement Conundrum

The Aluminium price, like many commodities, is cyclical in nature due to the delay between investment decisions and additional capacity. This results in oscillations between oversupply and excessive demand. Behind these cycles, however, there is a relentless reduction in real aluminium price over the long term, as shown in Figure 1. This is to be expected in a highly competitive commodity environment. Over time, improvements in technology and operational practices drive efficiencies that lower production costs. This trend places pressure on all operators to continuously improve in order to maintain profitability and the long term viability of their asset.

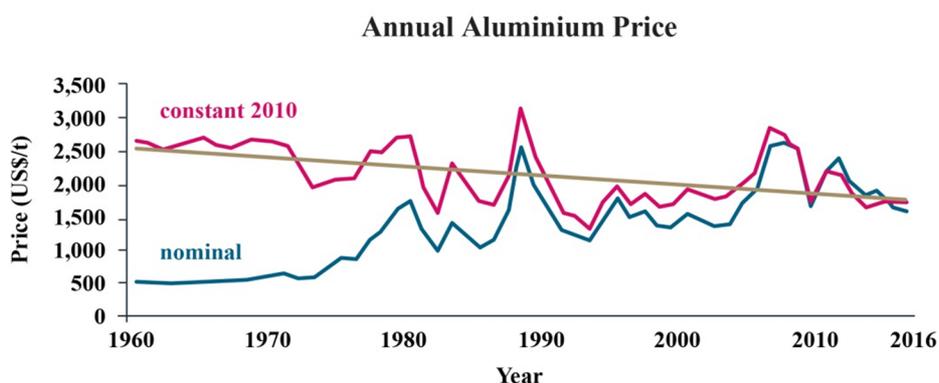


Figure 1. Declining Real Aluminium Price [1].

Whilst continuous improvement is desired, the complexity of the refining process and its associated plant and equipment presents a challenge to sustain any cost reduction. Additionally,

improvement gains must be achieved whilst the refinery asset ages over time and often with declining bauxite feedstock quality.

The continuous improvement mantra is thus ‘get more out of what you’ve got’. But are improvement and optimisation really a case of ‘running the machine harder’, of ‘sweating the asset’? The definition of efficiency suggests otherwise: increasing efficiency requires less work and produces more with less effort. There are several industry studies that conclude the highest performing assets undertake least work, the lowest performing assets undertake the most work [2], [3]. Perhaps then improvement is more closely related to working smarter, not harder?

1.1. What Does Sustainable Improvement Look Like?

Optimisation strategies should deliver improvements in business performance that are sustained over the long run. But what does sustainable improvement look like? Sustainable improvement involves an ongoing ability to identify and capture a range of improvements, to manage and mitigate risks, to maintain or improve plant availability and reliability. It involves a proactive approach and a broad perspective.

Contrast sustainable improvement with the narrower perspective of reactive cost reduction. Such cost reduction programs target those savings that can be most rapidly implemented, typically personnel, maintenance reductions and capital deferrals. Often ‘the cart is put before the horse’ - we do away with people and spending before streamlining the processes and systems that allow us to do so. With sustainable improvement cost reductions are the outcome, not the action of a focus on efficient operation. The inherent philosophy is that efficiency improvements must be realised before cost saving. Otherwise cost reduction may have the opposite effect, removing resource and funds from an inefficient process and therefore risking degradation in asset performance over the longer term.

Sustainable improvement is closely aligned to operational excellence. In fact it can be considered as an outcome of an operationally excellent organisation. Such organisations exhibit a systemic and ever-evolving effective approach to their operations. Process efficiency and effectiveness is supported by the organisation’s values, leadership and culture, as well as its systems and structures which are optimised across functional boundaries. They do the right things, in the right way, to continuously improve business performance.

The output of a sustainable improvement program should simply be to improve the value of the business. Initiatives either capitalise on an opportunity (maximising value) or mitigate risks (minimising loss of value). Initiatives should be defined in terms of the value they create using measures of Net Present Value (NPV) or Return on Investment (ROI), and if they do not add value, simply not progressed.

2. Understand your Performance

Ideally, refinery operators look to implement those improvements which provide the greatest financial value to the business within existing resource constraints. Of course, refinery operators know their own plants best, but that doesn’t always translate into a full understanding of where the value opportunities lie. There can be a variety of reasons for this. Often, personnel may consider themselves ‘too busy’ firefighting daily emergencies to assess opportunities or threats and carry out root cause analyses, or simply the data required for assessment may be lacking.

Understanding your performance is a key, recommended component of any improvement program. It’s fundamental to understanding the value opportunities. In particular, benchmarking

- Consistency: detail each potential initiative to a similar level of definition including the costs and benefits, risks, preliminary resource & schedule details.
- Establish a “value-based” approach: assess each initiative on a standardised NPV basis.
- Quantify risks: quantify non-technical risks and non-financial drivers (e.g. safety) in monetary (\$) terms in accordance with agreed value criteria.
- Sensitivity analysis: evaluate the robustness of individual initiatives and the entire portfolio value over an agreed range for each value criterion and across a defined life cycle. Does the optimum portfolio change over these ranges?
- Determine project inter-relationships: will implementing one project alter the benefits of another or negate the need for the other etc.?

Following prioritisation, the selected initiatives need to be delivered effectively. Implementation should be managed to ensure initiatives are sequenced effectively.

Finally, an effective improvement program should verify that the initiatives delivered are meeting the business expectations and being sustained. This feedback loop allows for continual improvement of the overall process.

The whole cycle of benchmarking through to opportunity identification, ranking and selection should be repeated on a regular basis.

6. Conclusion

To achieve sustainable improvement in cost curve position requires a combination of process optimisation, innovative enhancement, operational excellence and effective asset management, underpinned by robust systems and effective leadership. From this solid operating base, return on appropriately prioritised improvement initiatives can be assured.

A structured methodology towards refinery optimisation is summarised below.

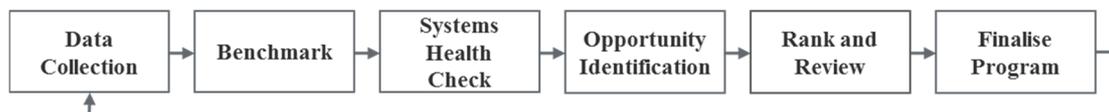


Figure 8. Improvement Program Development Process.

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