# Operational Excellence in Rodding Plant - A Path to Control Sodium in Anode Butts

**Mohammad AlShaibani[1] and Zobida Farzanah[2]**
1. Manager - Process Control, Carbon and Port
2. General Superintendent - Process Control, Carbon and Port
Emirates Global Aluminium, Abu Dhabi, United Arab Emirates
Corresponding author: malshaibani@ega.ae
https://doi.org/10.71659/icsoba2025-el019

**Abstract**

DOWNLOAD FULL PAPER

Carbon anodes are consumed in electrolysis cells during primary aluminium production. Carbon consumption in pre-baked anode cells is typically between 400 and 430 kg C/t Al and is affected by the $CO_2$ reactivity and air reactivity of anodes. The anode reactivities are affected by the properties of raw materials, the quality of the butt returned and the parameters of the manufacturing processes. In Al Taweelah Plant prior to 2019, sodium levels in butts were exceeding the normal levels of 800 ppm that had a significant impact on the entire manufacturing process from producing anodes to the multiple operational challenges in the potlines. This paper covers the successful journey Al Taweelah Carbon & Port rodding department to reduce Na in butts from over 800 ppm to a target of 250 ppm through strategic operational changes. The measures included adjustments to operational protocols, enhancements to the butts stripping process, introducing optical analyser, and clear process definitions. These steps have improved the quality and efficiency of the anode production process, setting a standard for future manufacturing processes.

**Keywords:** Lower sodium in anodes, Anode performance, Butt condition, Sodium impact, Potline process.

## 1. Introduction

Contaminants such as sodium in recycled anode butts can lead to operational challenges in the manufacturing process of prebaked anodes [1]. In 2019, at the Al Taweelah Plant rodding, one operation involved receiving butts from potlines for a multi-stage cleaning process. This process comprised an initial Hot Bath Removal Facility, followed by manual cleaning, and subsequently treatment in a Butt Shot Blasting Machine designed to remove residual fine bath layers from the top surface of the butts. As per operational quality standards, the cleaned butts were required to achieve a sodium (Na) content of 600 ppm or less. However, performance data from 2019 showed that, on average, 360 butts were processed per shift, with only 50 % meeting the specified Na content requirement. The remaining 50 % had elevated sodium levels, averaging 920 ppm, thus failing to comply with the acceptable limit (Figure 1). These findings indicate a substantial performance deficiency within the existing cleaning process and suggest the need for further evaluation of process parameters, equipment effectiveness, and operational controls to enhance cleaning efficiency and improve product quality outcomes.

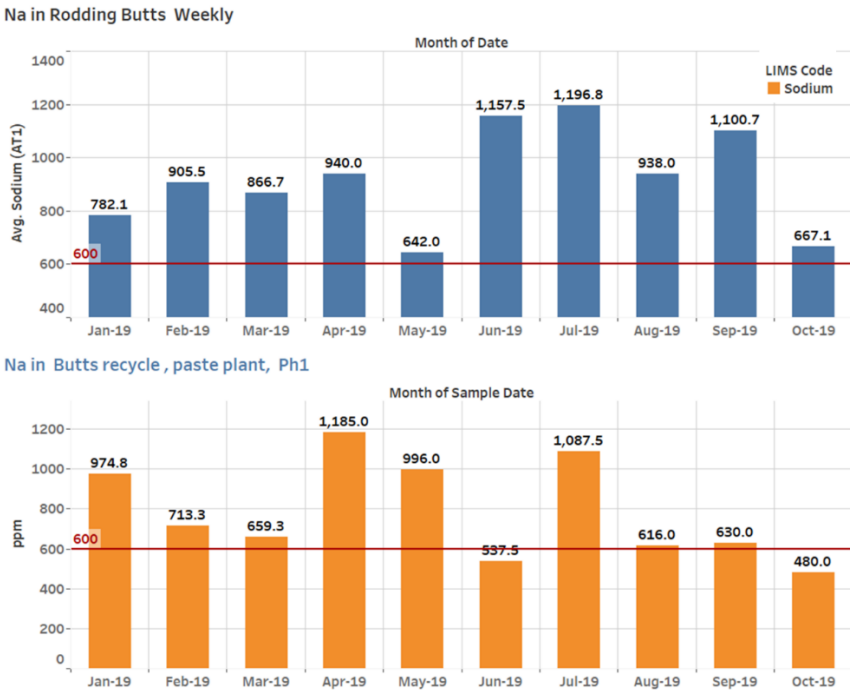


**Figure 1. Sodium levels in recycled butts.**

The images in Figure 2 illustrate the condition of the 50 % of butts that failed to meet quality standards despite undergoing cleaning process. These butts retained excessive bath residues, with sodium (Na) content exceeding the 600 ppm limit which indicate the inconsistencies in the current cleaning process and the need for operational improvements to enhance cleaning efficiency and product quality.

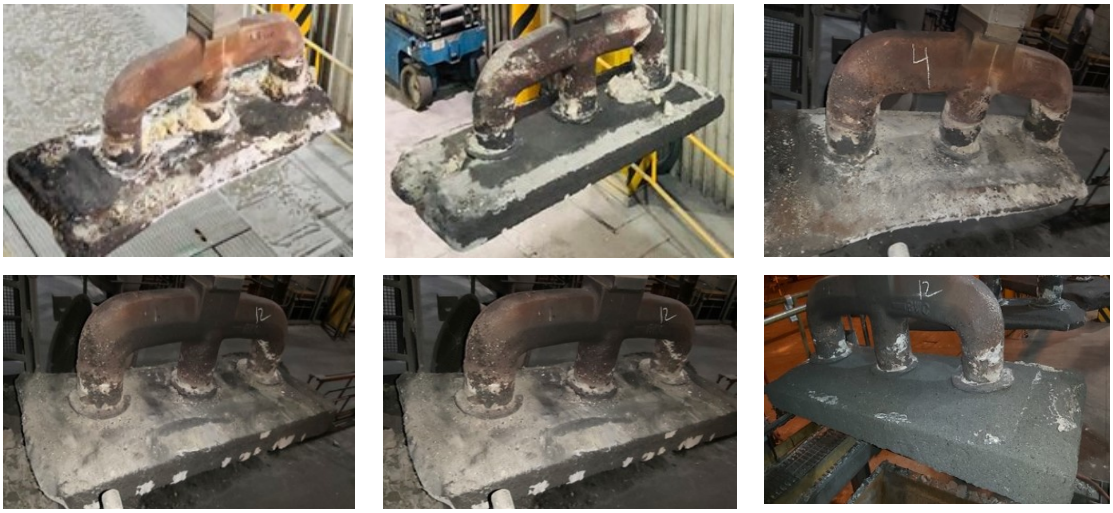

**Figure 2. Images of butts with bath presence after cleaning.**

## 2. Innovation Strategy

A cross-disciplinary team, comprising personnel from Operations, Process, Maintenance, and the Potline department, was assembled to investigate and identify the contributing factors to elevated sodium content and inadequate butt cleaning performance. As part of this root cause analysis, a Fishbone (Ishikawa) diagram was developed to systematically classify the potential causes, as shown in Figure 3.

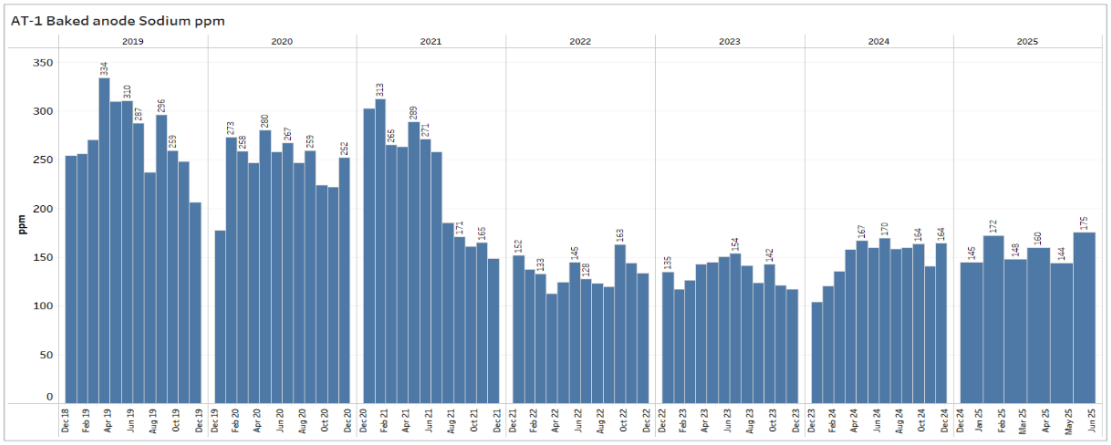


**Figure 16. Reduction in Na levels in Baked Anodes**

## 7. Conclusions

The butt cleaning performance enhancement project at Al Taweelah Rodding Plant-1 surpassed its original target of 80 % improvement. Through a combination of process changes, equipment upgrades, and heightened operator awareness, the initiative achieved an 85 % reduction in residual sodium content lowering it from 920 ppm to 300 ppm and reduced manual butt cleaning efforts by 85 %, boosting automated cleaning efficiency to 90 %.

This success reflects a data-driven, collaborative effort between the operation, process and maintenance teams, resulting in measurable, sustainable gains in both quality and productivity. The project exceeded expectations and set new benchmarks for operational performance.

To sustain these improvements, updated operating standards and continuous shop floor awareness have been embedded into daily practices. Since 2019, close monitoring has ensured sodium levels in the butts remain consistently below 600 ppm, supporting ongoing optimisation of the anode butt cleaning process.

## 8. References

1. W. Schmidt-Hatting, A.A. Kooijman and R. Perruchoud, Investigation of the quality of recycled anode butts, *Essential Readings in Light Metals* 2016, 251–266. https://doi.org/10.1007/978-3-319-48200-2_33.
2. S.S. Sijabat, F. Ashad, A. Buandra and E. Mugiono**,** Anode quality improvement at Inalum smelter, *Light Metals* 2017. 1213–1219. https://doi.org/10.1007/978-3-319-51541-0_145