Implementation of SY-235 Technology for Upgrading One Potline to 235 kA at INALUM

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Abstract

INALUM and SAMI finished upgrading Potline 2 at the Kuala Tanjung smelter using SY-235 technology. This upgrade increased its operational amperage from 195 to 235 kA in 170 reduction pots. The objective of this enhancement was to improve metal production and current efficiency while maintaining the existing Pot Control System. The upgraded pots can now produce up to 1790 kg, of metal per pot per day and have DC specific energy consumption up to 13 300 kWh/t Al at 235 kA, which is a big step forward in the smelter productivity.

One of the most important technical changes made during this upgrade was switching from a two-end riser busbar system to a four-side riser configuration. This balances the magnetic field distribution and overall energy efficiency. Additionally, a new Pot Tending Machine (PTM) equipped with a cavity cleaner was introduced to improve the anode-changing. Changing the old bar break system to point feed system was another big improvement. This made feeding alumina and AlF_3 more efficient, which make the pots more stable.

The start-up process of the upgraded pots began in mid-April 2023 and was successfully completed by the end of December 2023. The large-scale start-up was systematically carried out to ensure the smooth integration of the new technologies without significant disruptions to ongoing operations. Even though upgrading a fully operational potline was hard, the project team did a good job of dealing with problems like allocating resources, making changes to the infrastructure, and improving the process.

Keywords: Potline amperage upgrade, Sami technology, Point feeder system, Aluminum reduction optimization.

1. Introduction

The Company, officially established on January 6, 1976, maintained its original name, PT Indonesia Asahan Aluminium (INALUM). However, the Company's status underwent several transformations. In 2014, based on Government Regulation No. 26 of 2014, INALUM became a state-owned enterprise (BUMN). Subsequently, in 2017, the government established the Mining Industry Holding, appointing INALUM as the holding company with majority shares in Indonesia's leading mining firms, including PT Aneka Tambang Tbk, PT Bukit Asam Tbk, PT Timah Tbk, and PT Freeport Indonesia. In 2019, this Mining Industry Holding was rebranded as MIND ID (Mining Industry Indonesia) to differentiate between INALUM's operational role and its holding company function. With the issuance of Government Regulations No. 45/2022 and 46/2022, INALUM reverted to its original operational status in 2023.

INALUM operated three potlines for aluminum smelting, each containing 170 pots. Potlines 1 and 3 utilized Sumitomo S170 technology at 195 kA, while Potline 2 underwent upgrading to 235 kA using SAMI's SY-235 technology (Figure 1). Potline 2 was chosen as the oldest potline, with an average pot life around 2300 days. The upgrade project, executed through an EPC partnership with SAMI, modernized Potline 2 by transitioning to the higher amperage technology.

Figure 1. Aerial view of INALUM's reduction plant.

2. Project Timeline

The project contract was signed on April 9, 2021, with an official commencement date of May 5, 2021. The first step was to look over and complete the Detailed Engineering Design (DED), which included nine sections, such as the main facilities (lining, busbar, superstructure, super-dense phase conveying system, anode covering material conveying system, and potroom) and supporting facilities (lining material shop, workshop, and motor control center room). The successful completion of the DED was extremely important to ensure that all components met the required specifications and standards. Once finalized, the project team could proceed with the procurement of materials and the scheduling of construction activities.

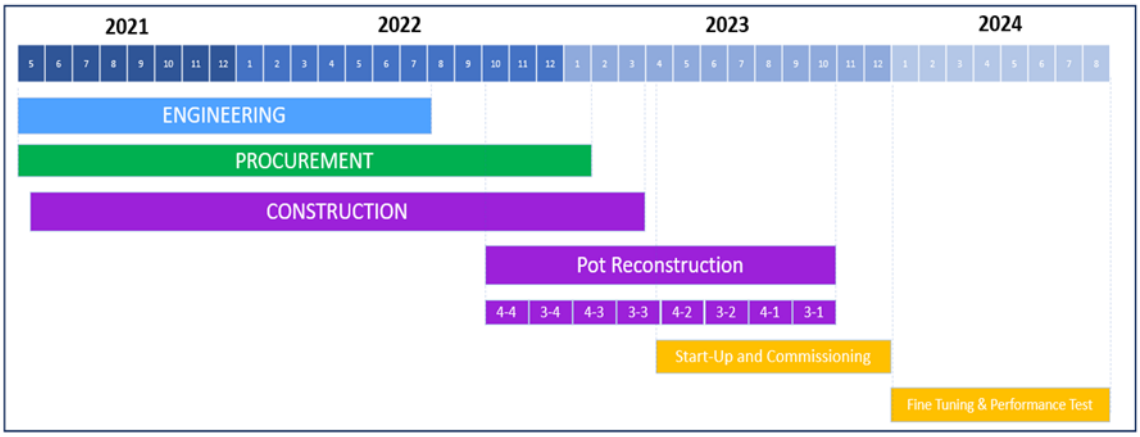

Figure 2. Timeline of project execution

Key phases of the EPC project were as follows (Figure 2):

- Detailed Engineering Design (DED): 5 May 2021–18 July 2022
- Procurement: 5 May 2021–9 January 2023
- Construction: 20 May 2021–6 March 2023

Table 3. Comparison of pot parameter in INALUM.

Parameter	Unit	S170	SY-235
Line Current	kA	195	235.4
DC energy consumption	kWh/t Al	14 426	13 300–13 800
Current efficiency	%	92.2	92.5–94.5
Metal production	kg/pot·day	1447	1749–1790
Anode effect frequency	AE/pot·day	0.52	0.05–0.30
Number of pots in standard bath temperature range (950–970 °C)	%	54.5	81.8
Number of pots in standard bath acidity range (8.5–11.5 %)	%	34.4	50.1

6. Conclusions

The collaboration between INALUM and SAMI has delivered a large-scale upgrade across all 170 pots of Potline 2, setting the stage for enhanced operational stability, lower energy consumption, and increased aluminum output. Comprehensive risk management and proactive project management are critical. Continuous operational monitoring ensures sustainable performance and rapid response to challenges. These lessons help aluminum smelters successfully implement amperage increases and expansions, achieving targeted efficiency, environmental compliance, and operational stability.

7. References

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