

Production of P0303 Grade Sows at Mahan Aluminium

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Abstract

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Globally, customers consistently demand high purity grade metal and Mahan Aluminium, a unit of Hindalco Industries Limited, part of Aditya Birla Group (ABG), took up this challenge as an opportunity for new product development by initiating production of P0303 premium grade metal ingots/sows. Mahan is consistently producing high purity grade metal beyond the regular grades and established itself as a preferred choice of world's leading customers of primary aluminium. Mahan Aluminium metal is also categorized as equivalent to "Good Western Metal" by some of our customers. For production of high purity metal, the chemical composition is a major quality attribute that controls product quality and adds extra value to aluminium produced. Mahan products have reformed the views of global customers for Indian aluminium by continuous quality improvements in all products. Our new initiative "Make in India" for manufacturing of aerospace and defense products encouraged us to foray into this premium segment. With continuous product quality upgrades, we have an opportunity to enter this segment and be a partner in nation building.

The methodology adopted for achieving this goal consists of understanding customer requirements, analysis of factors affecting hot metal purity, brainstorming, and raw material selection and blending to produce high purity metal. Further new process improvements, such as introduction of magnetic separator, usage of fresh tapped bath with alumina were carried out to obtain desired purity in metal for P0303. Dedicated pots to produce P0303 grade metal, shuttle planning, process improvements, monitoring and feedback enabled us to consistently produce P0303. This new product has enhanced our product portfolio and meets our client's expectations while showing the world that Mahan has the capability to produce high premium grade metal on a consistent basis.

Production of Premium Grade Aluminium P0303 is an extraordinary feat achieved by Mahan Aluminium in metal purity and customer centricity.

Keywords: Mahan Aluminium, Aluminium purity, Premium grade P0303 aluminium, Hot metal purity.

1. Introduction

Mahan Aluminium is an integrated aluminium smelting complex which uses globally proven smelter technology AP36 from Pechiney, France, while its integrated carbon plant uses technology from Solios, and the captive power plant uses Bharat Heavy Electricals Ltd (BHEL) technology for each of its 6 x 150 MW units. Both, smelter and captive power plant commenced operation in April 2013 and reached full capacity in August 2015. The plant was commissioned in a record time of 27 months, a benchmark time for Greenfield project execution in India. Mahan Aluminium is an ISO 9001, 14001, 45001 and 50001 certified company and its primary products are London Metal Exchange (LME) registered. Within a short time, Mahan has established itself as the preferred choice of the world's leading customers of primary aluminium. Over 60 per cent

of total production is exported to various countries such as USA, Japan, Korea, Mexico, Israel and others.

Customers consistently demand high purity metal and Mahan Aluminium, a unit of Hindalco Industries Limited, took this challenge to produce high purity metal beyond the regular grades and established itself as a quality conscious unit. Delivering high quality grade metal has been the primary goal of Mahan Aluminium smelter, which has a direct impact on the customers and at large the face value of the organization. The production of Grade P0404 metal has been reported [1]. Production of Premium Grade P0303 is a bigger challenge. The P0303 metal grade comprises elemental impurities such as silica < 0.03 % and iron < 0.03 %. The source of Si and Fe in metal is primarily from raw materials like alumina, anode, anode cover mix, AlF₃, etc.

Mahan metal is categorized as equivalent to “Good Western Metal” by some of our major customers. For production of high purity metal to meet customer’s demand, the chemical composition is the major attribute that controls the product quality and adds extra value to the aluminium production. Raw materials, cell process and regular operational works play important role in the production of high metal grade. To achieve this high metal grade production, a cross-functional team was formed, and they worked in coordination with various departments. Mahan products have reformed the views of global customers for Indian Aluminium by continuous quality improvements in all products. Our new initiative “Make in India” for manufacturing of aerospace and defense products encouraged us to foray into this premium segment. These segments are currently dominated by western and Middle East smelters. With continuous product quality upgrades, we have an opportunity to enter this segment and be a partner-in-nation building.

Figure 1 shows that, while Mahan was continuously producing high purity metal, it kept on adding new grade products in its portfolio.

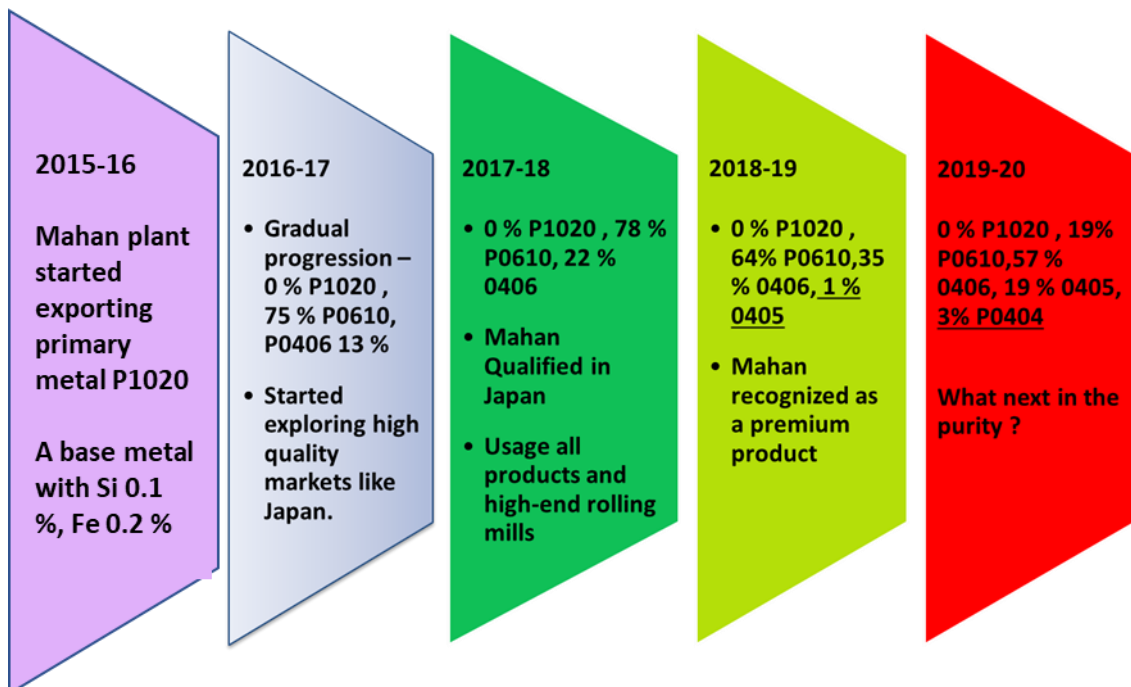


Figure 1. Evolution of metal purity at Mahan Aluminium.

Demands from customers were coming through marketing on capability to produce P0303. Since this metal grade is used in aerospace and defense equipment, this gave us an opportunity to enter

6. Financial Benefits

The financial benefits of continuing P0303 metal production are shown in Table 3.

Table 3. Financial benefits.

P0303 Production (t)	Premium Obtained (USD)	Actual Gain (USD)
8697	\$ 180 per tonne of metal	USD 1 564 560
Cost Incurred	\$2560	

7. Non-Financial Benefits

- Patent application submitted by Corporate Legal Team for the method of P0303 production. (In-tangible asset).
- Acquired new customers and delighted existing customers.
- Product portfolio enhancement.
- Deeper penetration of Hindalco brand in exports market.
- Mahan has entered in the league of premium metal producers in the world.
- Developed first time in India as an import substitute.
- Supporting “Make in India” initiative by enabling aerospace and defense manufacturing (Supplied 10 t to Indian Space Research Organisation (ISRO)).

8. Conclusion

This paper shows that high purity aluminium can be produced consistently by optimizing the raw materials, stringent process control, using innovative approach and seamless coordination among all sections of the aluminium smelter. As marketing demand is increasing for high purity aluminium, it will give extra advantage with extra premium.

9. Acknowledgements

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10. References

1. Pratap Sahu et al., Production of premium grade P0404 metal at Mahan Aluminium, *Proceedings of 38th International ICSOBA Conference*, Virtual Conference, 2020, Paper AL06, *Travaux* 49, 609-618.
2. Kai Grjotheim, C. Krohn, M. Malinovsky, K. Matiasovsky, Jomar Thonstad, *Aluminium electrolysis: Fundamentals of the Hall-Héroult process*, Aluminium Verlag 1982.
3. Ali Jassim, Edouard Mofor, Jamil Wazir Eddin, Shane Pollé, and Daniel Whitfield, Effect of changes in anode top cover composition on anode butt quality, *Light Metals* 2018, 1243-1251.
4. Gaston Riverin, Jean-François Bilodeau, Claude Dupuis, A novel crucible treatment for impurity removal, *Light Metals* 2006, 759-763.

5. Stewart Hamilton and Ray Cook, Impact on smelter operation of operating high purity reduction cells, *Light Metals* 2013, 27-32.
6. Franz Vogt, Robert Tonti, Maia Hunt, Les Edwards, A preview of anode coke quality in 2007, *Light Metals* 2004, 489-493