

Vibroforming and Cooling Sections Revamping of Green Anode Plant Line 2 at EGA Jebel Ali

Christophe Bouché¹ and Vincent Philippaux²

1. Carbon technical Director

2. Head of Mechanical Department

Fives Solios, Givors, France

Corresponding author: Christophe.Bouche@fivesgroup.com

Abstract



In 2014, as part of an amperage creeping project, EGA Jebel Ali Operation (DUBAL) decided to increase anode size up to 1600 mm, and therefore, to upgrade Line 2 anode forming, cooling and handling systems within DUBAL's Green Carbon area. It was also the opportunity to improve the green anode quality and Line 2 availability. Fives Solios was awarded the contract to supply its latest generation of Xelios vibrocompactor and pan cooling conveyor. Firstly, this paper details the challenges related to such revamping project: constrained footprint, interfaces with existing equipment's and extremely short plant shutdown duration to minimize anode production losses. Secondly, the safety, process, mechanical and environmental performances achieved by the upgraded installation are presented and discussed.

Keywords: Green anode plant; Xelios; forming; cooling; anode.

1 Introduction

Amperage creeping projects are key milestones to improve productivity of aluminum smelters. They are also opportunities to upgrade vibro-compactors to the state-of-the-art in terms of anode quality and equipment availability.

In 2014, as part of an amperage creeping project, EGA Jebel Ali Operation (DUBAL) decided to increase anode size up to 1600 mm, and therefore, to upgrade Line 2 anode forming, cooling and handling systems within DUBAL's Green Carbon area:

- This was a real challenge in terms of constrained footprint, interfaces with existing equipment's and extremely short plant shutdown duration to minimize anode production losses.
- Fives was awarded the contract to supply its most advanced eco-designed vibro-compactor called "Xelios 2.0" and pan cooling conveyor.
- Finally, the safety, process, mechanical and environmental performances achieved by the upgraded installation are presented and discussed.

2 The Contract

Green anode plant line 2 at DUBAL has a nominal throughput of 36 tph. Design is based on conventional process associated with kneader and cooler. After the latest revamping in 2005, forming and cooling sections' layout is composed of a single former and a cooling tunnel able to handle up to 30 anodes per hour. For the revamping DUBAL decided to increase anode size up to 1600 mm and to have no taper, no bottom chamfer and no slot at green stage.

The work environment was a brownfield in a plant under production: This was a real challenge in terms of constrained footprint, interfaces with existing pieces of equipment and extremely short plant shutdown duration to minimize anode production losses.

Despite the fact that size of anode was increasing, allocated space to implement the new pieces of equipment remain exactly the same, meaning very constrained in the area of the vibro-compactor. Original design of the paste plant was not based on this type of equipment to form and cool the anodes:

- Height is very limited for a vibro-compactor,
- Footprint for the cooling tunnel is a simple corridor of 60m x 5m confined between buildings.

On time schedule side, Notification to Proceed (NTP) was placed in December 2014. Anode plant Line 2 shutdown was forecast for only 6 weeks and estimated date for the first good anode was December 2015, so just one year after the NTP.

On top of that, DUBAL for the past 10 years established routine procedures and best practices which lead to what can be considered as a benchmark in terms of plant availability and reliability [1], so this revamping was also a real challenge in term of process and performance requirements:

- DUBAL needs for anodes and so for throughput are very high: Design criteria were defined to achieve up to one anode every 118 seconds, to have a total reject rate below 2,5% and to reach availability above 90%.
- Due to specific upstream layout, there was some existing segregation of paste on the paste feeder. The target was therefore to attenuate the effect of segregation as much as possible.
- Anode density target was set to 0.02 kg/dm³ above existing mean values and height of the anodes has to be with a +/- 5mm tolerance instead of +/-10mm usually.
- Moreover, the available flow and inlet temperature of cooling water were set. Nevertheless, efficiency of anode spraying had to be optimized to reach a skin temperature of 65°C downstream of the cooling tunnel.
- The constraints were similar for the Pitch Fume Treatment System (PFTS): Fan was existing, and spare capacity was very limited. However, quality of ambient air in the vibro-compactor had to be improved.

3 The Project

The scope of this brownfield project included:

- Engineering and Fabrication of new pieces of equipment and all modified parts
- Pre-assembly of modules, erection and commissioning
- Structural, civil works, electrical, mechanical, automation and process
- Training

Battery limits were the exit of paste cooler upstream and the roller conveyor for stacking crane downstream.

3.1. “Augmented 3D simulation”

A main characteristic of a brownfield project is that you should compose with existing plant. Redmarks and site survey were not ensuring enough reliability in our case. So during a shift shutdown, a complete 3D scanning of existing equipment and its environment has been done (Figure 1). With post-treatment it locates existing pipes, structures, cable trays with an accuracy of 3 mm. This image of the existing environment has been inserted in our 3D models.

DUBAL Line 2	Typical production before shutdown 4 months in 2015	Achieved production after shutdown 4 months in 2016
Anode weight (kg)	1276	1294
Anode Height (mm)	650,2	650,0
σ height (mm)	2,1	1,4
Anode density (kg/dm ³)	1,633	1,654
σ density (kg/dm ³)	0,006	0,005
Availability of Vibro + cooling section (%)	94,4	98,8
Availability of line 2 (%)	90,0	93,5

On side of product performances, other benefits have been also achieved as reduced noise level in the vibro-compactor area and improvement on fume captures. It allows to keep the area open and so to ease the access.

6 Conclusion

For Fives, this contract was the opportunity to confirm its turnkey know-how for brownfield projects. Its most advanced eco-designed vibro-compactor “Xelios 2.0” and pan cooling conveyor demonstrated also state-of-the-art performances.

This project is also a success thanks to DUBAL. Running a plant with an uptime above 93% is demanding and required skilled people. Their teams are highly professional and were able to handle immediately this new installation.

7 References

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