

Potlines Extension Project in EGA Al Taweelah Smelter

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Abstract



DX technology is operating in Potlines 1 and 2 in EGA Al Taweelah smelter, and DX+ technology in Potline 3. The three potlines were expanded by 66 pots in a brown field expansion project, named P100. 52 DX pots were added in Potlines 1 and 2 and 14 DX+ Ultra pots in Potline 3. This project increased the production capacity in Al Taweelah smelter by approximately 80 thousand tonnes per year. This paper will describe the brown field execution and coordination including equipment upgrade. It will also include pot start-up and early operation, including the cut-out pots in the existing potlines, operational KPIs for each technology and the challenges during the project. It will cover critical decisions made to minimize the production losses and impact on the process during construction.

Keywords: EGA Al Taweelah brownfield potline expansion, DX technology, DX+ technology, DX + Ultra technology, Early operation pot performance KPIs.

1. Introduction

EGA is the largest industrial company in the UAE outside oil and gas and the world's biggest 'premium aluminium' producer. EGA is an integrated global aluminium producer, with operations from mine to metal. EGA operates aluminium smelters at Jebel Ali in Dubai and at Al Taweelah in Abu Dhabi, an alumina refinery in Abu Dhabi and a bauxite mine and associated export facilities in the Republic of Guinea. The two aluminium smelters had a combined production capacity of some 2.5 million tonnes of cast metal in 2021. The smelter in Jebel Ali has seven potlines operating six EGA-developed cell technologies: D18+, CD20, D20, D20+, DX and DX+ Ultra.

The smelter in Al Taweelah was built in two phases, Phase 1 included Potlines 1 and 2 (PL 1 and PL 2) and the second phase (Phase 2) was Potline 3 (PL 3). The three potlines totalled 1200 reduction cells prior to the extension. The potlines are operating with three technologies: DX in Potlines 1 and 2, DX+ in Potline 3 and DX+ Ultra in the most recent extension of Potline 3 [1]. The extension project involved the extension of all three potlines, with a total of 26 pots added to potline 1 and 2 respectively and 14 pots added in Potline 3. It added an estimated total metal production capacity of approximately 80 000 tons of hot metal per year. Table 1 gives the potlines data before and after the extension.

Table 1. Potlines data.

Description	Unit	Potlines 1 and 2	Potline 3
Before potline extension			
Number of potlines		2	1
Total number of pots		756	444
Number of pots per potline		378	444
Potline current	kA	42.2	465
Potlines extension - FEED study			
Additional pots per potline		26	14
Total number of additional pots		52	14
Number of pots per potline		404	458
Total number of pots		808	458
Potline current	kA	425	465

2. Brownfield Start-up Plan

2.1 Brown Field Complexities

The brown field start up carries with it a lot of complexities and bottlenecks. Assessment of the potline extension impact on the reduction main areas and/or equipment such as potline substation, gas treatment center, pot feed system, and potroom equipment was performed. It was established that facilities would be suitable for the increased capacity, considering the optimised modifications. The work has to take place keeping the current conditions of the potline operation. One of the main challenges of the potline extension is that it requires relocating the existing busbar crossover between two potrooms to the end of the extension while keeping the busbars energised for the existing potlines. This could represent an electrical hazard with operating amperages 420-465 kA. This requires engineering of the electrical insulation requirements for work in space-limited areas on different pot-to-earth potentials.

Contingency plans were set to accommodate a variety of emergency scenarios for pots in operations that can occur during the project execution. All existing buried services and new required services were identified considering the system capacities and any required upgrades. The Potline 3 extension involved tie-in of the new DX+ Ultra technology with the existing DX+ technology. That required a major upgrade in some of the critical equipment which challenged operations due to the equipment availability during the upgrading. In addition, complex safety and coordination requirements had to be followed to get safe access and execute the daily tasks with minimal disturbance to running operations.

2.2 Planning and Decision Making

The team (Hatch and EGA Capital Projects and Operations) considered the above requirements while preparing a suitable execution plan. The first decisions were made on the 66 extension pots layouts in both existing phases of operations, Phase 1 and Phase 2. The requirements in Phase 1 were more or less straightforward where 13 pots were distributed equally on every east side of the 4 potrooms for a total of 52 pots (Figures 1 and 2). The remaining 14 pots for Phase 2 were designated to one potroom only and that decision was taken based on many aspects (Figures 3 and 4):

- Optimising the civil work requirements by building 1 potroom extension instead of 2
- Reducing the access and operational disturbance to 1 potroom
- Optimising equipment upgrade and utilisation
- Optimising workforce by focusing to 1 potroom

6. Conclusions

EGA successfully added 52 DX pots in Al Taweelah Potlines 1 and 2 and 14 DX+ Ultra pots in Potline 3. This increased production capacity by approximately 80 000 tonnes per year. DX technology is currently operating at 435 kA and DX+ Ultra at 465 kA. The performance of the potline extensions is excellent with 94.1 % current efficiency and 13.5 kWh/kg Al specific energy consumption in Potlines 1 and 2, and 94.9 % current efficiency and 13.0 kWh/kg Al specific energy consumption in Potline 3.

7. References

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