

## Busbar Integrity in Potline Tunnels in EGA Jebel Ali Smelter

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### Abstract



Emirates Global Aluminium (EGA) Jebel Ali operates seven potlines with six different pot technologies. Each potline consists of sections of pots and busbar linkages, connecting these sections. The linkages consist of passageways between pot sections, end of potline crossovers, emergency crossovers and connections from end pots to the rectifiers. All these linkages are installed in tunnels, from simple to complex, below passageways or roads. All are equipped with powerful industrial cooling fans in different configurations. The tunnels and the fans were designed with traditional engineering practices at the time of potline construction without the aid of computational fluid dynamics (CFD) which was not yet available. Over time EGA Jebel Ali increased amperage in all potlines considerably and this increased the thermal load in the tunnels.

The largest amperage increase from 250 kA to 480 kA was in Potline 5 Eagle Section where five demonstration cells of four different technologies have been built since 1998: CD26, DX, DX+ and DX+ Ultra. The busbar linkages to Eagle Section are in a system of complex tunnels. With the increased thermal load in the tunnels, the existing cooling became inadequate and in March 2021 the supply circuit of the Eagle pots was cut off by local busbar melting and the pots had to be shut down. Since then, the tunnels and busbars have been rebuilt, and tunnel cooling was optimized with CFD simulations, for safe operation of DX+ Ultra Eagle pots at 500 kA.

Following the Eagle incident, Jebel Ali Busbar Integrity Project was launched with the aim of providing safe operation of busbars in the tunnels of all the potlines at planned amperage increase. The project consisted of systematic openings of the busbar tunnels at strategic locations, documentation of any damage, monitoring of busbar and air temperatures, fan evaluation and CFD simulation of all tunnels, accompanied by special measurements for CFD model validation. The cooling system configurations were optimised with CFD simulations of the tunnels.

This paper describes practical investigations of the busbar tunnels in EGA Jebel Ali, as well as examples of corrective actions for busbar integrity and safe future operation of potlines.

**Keywords:** Potline busbar linkages, Cooling of busbar tunnels, Industrial cooling fans, CFD simulation of busbar tunnels, Continuous monitoring of busbar temperatures.

### 1. Introduction

EGA is the largest industrial company in the UAE outside oil and gas. EGA operates aluminium smelters at Jebel Ali in Dubai and at Al Taweelah in Abu Dhabi, with a combined production of 2.501 Mt of cast metal in 2021, using EGA's own cell technologies. The smelter in Jebel Ali has seven potlines operating six cell technologies: CD20, D20, D20+, D18+, DX and DX+ Ultra, which produced 1.056 Mt of cast metal in 2021. The smelter in Al Taweelah has three potlines operating three technologies: DX in potlines 1 and 2, DX+ in Potline 3 and DX+ Ultra in the recent extension of Potline 3. The journey from a modest beginning in 1979 to a mega smelter happened with potline expansions and amperage increase [1].

In Jebel Ali smelter (Figure 1), each potline consists of sections of pots and busbar linkages, connecting these sections. The linkages consist of passageways between pot sections, end-of-potline crossovers, emergency crossovers and connections from end pots to the rectifiers. All these linkages are installed in tunnels, from simple to complex, below the potline passageways or roads. The most complex system of linkages is in Potline 9 at the rectifier end, shown in Figure 2. Another complex system is Eagle Section of Potline 5 (Figure 3), where five demonstration cells are installed, and are fed by the current from Potline 5 and the booster circuit. All tunnels are equipped with powerful industrial cooling fans in different configurations; altogether there are 131 fans in Jebel Ali smelter. The tunnels and the fans were designed with traditional engineering practices at the time of potline construction without the aid of Computational Fluid Dynamics (CFD) which was not yet available.



Figure 1. EGA Jebel Ali smelter.

- Smelter Maintenance team.
- Technology Development.
- Reduction Operations.
- Technical team.
- Capital Projects and Engineering.
- Human Capital.

## 8. References

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