

Technology and innovation at Emirates Global Aluminium (EGA)

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Abstract



Dubai Aluminium (DUBAL), an operating subsidiary of Emirates Global Aluminium (EGA), has been involved in technology development for more than 25 years. This has entailed upgrading the erstwhile P69 Kaiser cells to D18 and subsequently to D18+, and developing the DX, DX+ and DX+ Ultra family. The resulting EGA cell technologies were fully designed, modelled, tested and optimised in the UAE. EGA has invested millions of dollars in developing in-house capabilities in cell modelling, design and engineering – a unique achievement for a young country. The focus of technology development has been on improving productivity, reducing energy usage, improving environment performance and reducing capital cost. Innovation has been a hallmark of the culture at EGA, with several awards won internationally by its employees through participation in an employee suggestion scheme and improvement programmes. EGA employees have presented many high quality technical papers in various industry forums. With the successful sale of its reduction technologies, a robust Intellectual Property base has been established, including several international patent applications. Equal importance is placed by EGA on respecting the Intellectual Property of others. With success already enjoyed in its DX family of technologies, EGA has now embarked on the development of next generation reduction cells, named DZ, which aim to operate at more than 600 kA.

Keywords: EGA; DUBAL reduction cell technologies; DX technology; DX+ technology; DX+ Ultra technology.

1. A brief introduction to EGA

From inception in 1979, DUBAL has been committed to continuous innovation in the aluminium smelting process while achieving maximum operating efficiencies. This has been clearly reflected over the last 35 years or so through continual in-house development and industrial-scale installation of enhanced proprietary cell technologies that deliver higher production, improved current efficiencies and environmental benefits.

This commitment continued after the formation of EGA in 2014 wherein DUBAL and Emirates Aluminium (EMAL) became fully owned subsidiaries of EGA. The combined production capacity of EGA's smelters of more than 2.4 million tonnes per year places EGA among the five largest primary aluminium producers in the world.

EGA is also active in developing upstream businesses:

Bauxite mining and alumina refining:

- Al Taweelah Alumina refinery with a planned capacity of 2.0 million tonnes per year in Phase I, scheduled to be commissioned at the end of 2017.
- Guinea Alumina Company, 100 % ownership since November 2013 (ratified by the Government of Guinea in June 2014) - An 8 to 12 million tonnes per year bauxite mine.
- Cameroon Alumina Limited (45 %)

Petroleum coke calcination:

- Jiangsu Suyadi Tancai Company Limited in Zhenjiang, China (49 %),
- Sinoway Carbon Energy Holdings in Shandong, China (20 %),

2. Our ambition and strategies

Our ambition is to be a reliable provider of smelter technologies. This will be realised through the following strategies:

- Continue developing energy efficient, environmentally responsible, low CAPEX and high performance reduction cells.
- Establish EGA as best-in-class operator of carbon facilities that will compliment EGA reduction technologies.
- Explore opportunities for modernising old smelters in the world and develop cost-effective solutions through in-house modelling and process capabilities.
- Ensure that EGA know-how and technologies are protected through developing a portfolio of Intellectual Properties (IP)/Copyrights and active monitoring of development in the industry.

3. Upgrade of former P69 Kaiser cells to D18 and subsequently to D18+

3.1. D18 Technology

The original 360 P69 cells at DUBAL were modified in-house to D18 with a new cathode design, longer anodes and improved alumina feeding system (Pseudo Point Feed). This allowed increased production through higher amperage of >200 kA from the original 150 kA and better current efficiency.

3.2. Development of D18+ Technology

During 2013, the in-house Technology Development team conceived and designed an improved D18 cell (called D18+) that could replace the existing 520 D18 cells with more energy-efficient cells. D18+ cells have the same potpot distance with new magnetically compensated aluminium busbars and anode risers. The pots are longer to accommodate two additional anodes and two cathode blocks. This was achieved by modifying the existing potshell and installing a modern alumina point feeding system [1].

Following a seven-cell pilot project (Figure 1) that demonstrated EGA's expertise in retrofitting older potlines, the D18 cells are currently being replaced with D18+ Technology.

The newer technology offers a reduction in net specific energy consumption to below 13 kWh/kg Al, delivering current efficiency greater than 95 per cent and an increase in production capacity to 2.0 tonnes Al/pot-day. The first 32 new D18+ Technology cells are scheduled for start-up in October 2015.

4. DX, DX+ and DX+ Ultra Technology family

4.1. DX Technology

In 2004, DUBAL independently designed and engineered the DX reduction cell entirely in-house. From 2005 to 2010, DX Technology progressed successfully from initial prototyping through to large scale industrialization. Five DX prototype cells were installed in a dedicated development potroom at DUBAL and started up at 325 kA between September and December 2005.

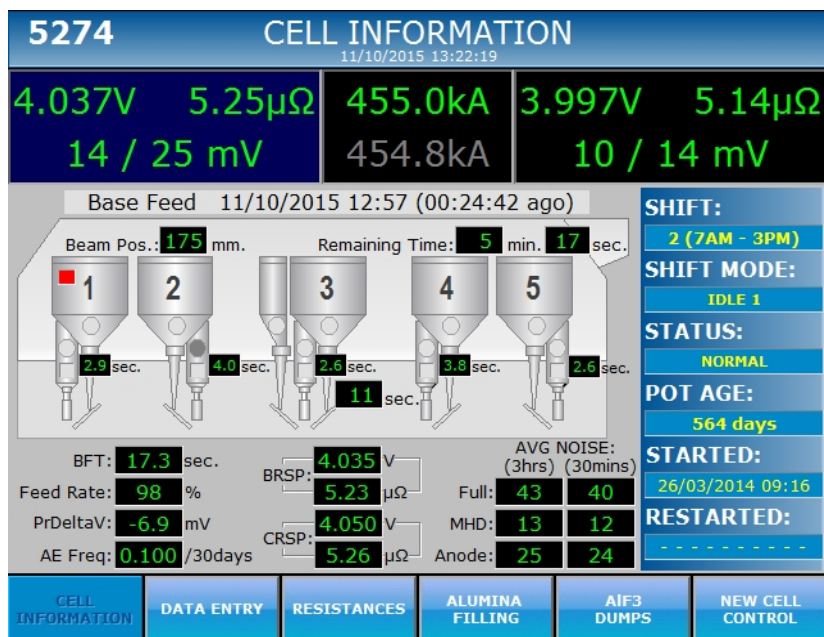


Figure 6. HMI of the PLC Pot Control System in DUBAL DX+ Ultra cell.

6. Suggestion Scheme – Continuous improvement through innovation

The EGA Suggestion Scheme was introduced at DUBAL in May 1981 with the intention of involving non-supervisory employees across the organisation. Today, this highly successful programme is widely recognised regionally and internationally. It has become an integral part of the company's continual improvement process. By involving employees in the decision-making process in areas that affect their jobs, EGA aspires to give employees more control over how they perform their day to day jobs, which leads to greater motivation and commitment and to significant improvements in areas like Productivity, Environment, Health & Safety, Quality, Process, and many other areas.

EGA and its employees have won several awards locally and internationally over the last several years. Just to illustrate:

- Metal Bulletin Global Awards for Aluminium Excellence (2013)
- Gulf Aluminium Council Awards for Environment, Health and Safety (2012)
- Mohammed bin Rashid Al Maktoum Business Awards (2008)
- KAIZEN Awards (2011, 2012, 2013 and 2014)
- Deutsches Institut für Betriebswirtschaft– Best International Idea (2012, 2013)
- Ideas.Arabia awards (2008-2015)
- Ideas.America awards (2006-2008, 2010-2015)
- Ideas UK awards (1997, 1999, 2001, 2005-2012)
- DuPont Safety Awards (2011)
- Institute of Occupational Safety and Health award in Construction category (2011)
- Royal Society for Prevention of Accidents - for Occupational Health and Safety (2013,-2014)
- Vittorio de Nora prize for Environmental Improvements in Metallurgical Industries (2014)
- American Society for Quality (“ASQ”) International Team Excellence Awards – Gold Award (2014)

6. Technical papers in various industry forums

During the last 15 years, EGA has been sharing its know-how and innovation with the industry and has published approximately 100 technical papers at various industrial forums such as ARABAL, Australasian Aluminium Smelting Technology Conferences, ICSOBA, International Conference on Aluminium (INCAL), TMS, and so on.

7. Intellectual property

EGA gives high priority to IP and respects rights embedded in patents. EGA has a robust mechanism to monitor patent applications to ensure non-infringement of third party IPs. It also has an active programme for developing a patent portfolio supporting its technology licensing.

8. What next? – DZ cell technology

Moving forward, EGA is already working on a new cell technology concept that relies on building a high amperage technology (above 600 kA) with even lower energy consumption (<12 kWh/kg Al), which will compete extremely well against other technologies.

9. Conclusion

EGA is committed to continue developing energy-efficient, environmentally responsible, low CAPEX and high performance reduction cells for its own facilities and future licensing. In addition, the business aims to establish EGA as best-in-class operator of carbon facilities that will compliment EGA reduction technologies. This will be achieved by maintaining best-in-class research and development facilities supported by highly skilled and experienced development team as well as innovation contributed by employees across all levels of the organisation.

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