

Dadco and Aluminiumoxid Stade A Perspective - Past, Present and Future

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Abstract

Aluminium Oxid Stade GmbH (AOS) started in 1973 as a Joint Venture between Reynolds and VAW (50%/50%) and has operated ever since. The original plant design allowed for 3 production units of 600,000 tonnes alumina per year each. However, through changes in European energy economics which curtailed expansion plans for local smelters, only one unit was actually built. AOS was originally designed for Weipa bauxite from Australia, but these days operates primarily on bauxite produced by the Compagnie des Bauxites de Guinée (CBG). Dadco became a joint venture partner in AOS in 2001 when Alcoa divested assets as a part of its overall acquisition of Reynolds Metals Company. Hydro acquired VAW in 2002, and sold its 50% share in AOS to Dadco in 2004, together with the Hydro share in the Compagnie des Bauxites de Guinée. Final products are sold to a quite diversified customer base and are used for many different applications. Through a number of strategic investments authorized by Dadco, AOS has modernized its operations and managed to increase the production capacity to approximately 1.1 Mtpa today. The increase in production and continuous cost reduction initiatives form a part of Dadco's strategy to remain competitive now and in the future.

Keywords: Aluminium Oxid Stade, Dadco, Compagnie des Bauxites de Guinée, cost reduction initiatives.

1. Introduction

Dadco is a privately owned investment, manufacturing and trading group with ties to the aluminium industry stretching back over 50 years. Dadco is part of a larger group of companies; the founding company was established in 1915. In April 2001 Dadco acquired 50 per cent shareholding in the Aluminium Oxid Stade GmbH (AOS) refinery in Germany, after the Alcoa / Reynolds merger in 2000. In June 2004, Dadco purchased the remaining 50 per cent share from Norsk Hydro (who had acquired VAW two years previously).

Dadco is also a shareholder of Halco (Mining) Inc., a partnership with Rio Tinto Inc. and Alcoa World Alumina and Chemicals and which owns 51% of Compagnie des Bauxites de Guinée (CBG) in Guinea, with 49% being owned by the Government of the Republic of Guinea. CBG has exclusive rights to bauxite reserves and resources in North-western Guinea until the end of 2038. In addition to mining in Sangaredi, CBG operates a plant at the port in Kamsar for drying and shipping bauxite to alumina refineries worldwide. The mine near Sangaredi and the plant at Kamsar are linked by a 135 km long railroad, owned by the Guinean government, but maintained and operated by CBG under a long term concession agreement. CBG is presently expanding its capacity and replacing its 44 year old installations. Capacity will be increased from 15 to 18.5 million metric tonnes per annum (Mtpa) in a first phase and then to 23.5 Mtpa in a second phase. This will guarantee long term full supply of high quality bauxite to AOS at competitive pricing.

Dadco's production facility, the AOS refinery located in Lower Saxony, 40km West of Hamburg, Germany, was built in the Stade-Bützfleth industrial zone between 1970 and 1973.

Production commenced at the end of 1973. AOS has a current production of 1.1 Mt of alumina (aluminium oxide Al_2O_3) per annum. Bauxite is refined into two main product groups:

- i) Smelter grade alumina (SGA) - delivered to aluminium smelters for processing into aluminium metal and
- ii) Alumina Chemicals – these are in various forms:
 - a) damp aluminium trihydrate,
 - b) dry aluminium trihydrate and
 - c) chemical grade calcined alumina.

All alumina chemicals products are marketed and distributed by Dadco and are used as feedstocks for further processing into a range of chemicals such as zeolites, flame retardants and water treatment products.

AOS is the only remaining operating alumina refinery in Germany and is situated on the Elbe river in Lower Saxony. The plant is very well placed logistically, not only for receiving bauxite in Panamax vessels directly from the Kamsar loading port, but also for shipping final products by sea, inland waterways, rail or trucks - whichever provides the best solution for Dadco's customers.

AOS was designed using VAW-developed tube digestion technology which has in later decades formed the technological basis for several recent and significant greenfield alumina refineries, e.g. Rio Tinto's Yarwun refinery, the Ma'aden's refinery at Ras Al Khair in Saudi Arabia and Emirates Global Aluminium (EGA)'s Al Taweelaw refinery in Abu Dhabi. This technology is characterized by its low energy consumption. After 44 years in operation AOS still ranks with the best world refineries with regards to energy consumption per tonne of alumina produced. Needless to say, this also has a positive impact on environmental emissions, notably CO_2 .

AOS added to and improved the performance and attractiveness of tube digestion technology with the development of (Enhanced) Wet Oxidation technology for very effectively controlling the organic content in the liquor stream, with attendant advantages in liquor productivity, alumina quality and in operational factors such as low foam generation.

Furthermore, technology has been developed for the effective and safe cleaning of tube digesters. AOS has taken this to another level in recent years, increasing digester reliability, and reducing scale-induced flow reduction and downtime.

Since Dadco became the sole owner of AOS in 2004, many improvements have been made in different fields, such as maintenance, plant infrastructure, production, logistics, etc. To give just some examples:

- Major overhaul of the bauxite vessel unloading installation
- Implementation of a centralized Honeywell DCS system
- Substation and electrical infrastructure renewals
- Increased hydrate storage capacity
- Upgrade of hydrate filters
- Installation of a cogeneration plant
- Digester equipment modifications which pushed production up from 860 ktpa to approximately 1.1 Mtpa, and a number of other strategic investments.

Thanks to the abovementioned developments AOS is today a very well maintained and reliable alumina refinery, ready for a steady and reliable supply of alumina and alumina chemicals for many years to come. There is constant focus and action on cost reduction in every possible field at AOS in order to remain competitive. AOS is fully certified for the following norms: ISO

9001, ISO 14001, ISO 50001 and OHSAS 18001. AOS has a long term permit for the storage of red mud, which – like any alumina refinery - is a key element for AOS' future.



Figure 1. Aerial view of AOS.

2. DADCO

Dadco has the responsibility to supply the required bauxite to AOS and to assure the marketing and sales of AOS' production:

2.1. Bauxite Supply

Although originally designed to operate on Weipa bauxite, AOS has successfully processed a vast range of bauxites from different continents. For over two decades now, AOS has mainly processed CBG Standard Metal Grade bauxite (SMG). This high quality bauxite - both in Total Al₂O₃ and reactive silica content - contributes to competitive production cost. In addition, CBG has proven to be very reliable source of bauxite supply ever since it came into production in 1973. There have been no major interruptions where bauxite supply has caused production cut backs at AOS, which is of course of great importance to Dadco and to its customers.

CBG is presently expanding its production capacity in two phases from 15 Mtpa to 18.5 Mtpa for Phase 1 and 23.5 Mtpa for Phase 2. Once the expansion is fully completed, Dadco will become totally independent of third party bauxite supply, which further contributes to Dadco's competitiveness.

CBG is not only expanding its production equipment at the mine, it is also replacing equipment that has come to the end of its economic life at its crushing and drying plant in Kamsar. The expansion project includes replacement of the old crushing plant by a new primary and secondary crushing station. The primary crusher requires the construction of a large pit (45 m diameter, 21 m depth) in soft ground, an engineering challenge in itself. The primary crushing and secondary crushing stations are presently under construction and are supplied by Takraf-Tenova.



Figure 2. Crusher pit excavation.

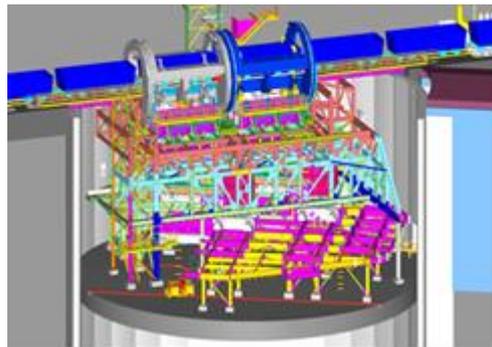


Figure 3. Primary crushing station.

Another important package for the expansion project is the extension of the existing mineral quay by another 360 m. The extended quay will allow the simultaneous berthing of two Panamax vessels.

The advantage resulting from this extension is that once a vessel is loaded, the shiploader can immediately move to the next vessel - tidal waiting time is eliminated, thus increasing the vessel loading capacity at the quay.



Figure 4. Mineral quay deck construction.



Figure 5. Mineral quay extension.

The first phase of the project is well on its way. Financing was secured through policy lenders (United Loan Guarantees of Germany (UFG), International Finance Corporation (IFC), Overseas Private Investment Corporation (OPIC)) and commercial banks. Financing of the second phase is presently being formulated.

It is important to mention that CBG is operating and maintaining the railway between Sangaredi and Kamsar under a long term concession agreement with the Government of Guinea. As there will be additional users on the railway as of 2018, a multi-user agreement has been signed between CBG, the Government of Guinea and the additional users. A project is in preparation to assure that extra rail capacity is created for an undisturbed flow of bauxite transport for all users.

Guinea is an exciting place to be with all the bauxite projects that are under development and in holding nearly a third of the world bauxite resources it is likely to be a supplier of bauxite for many years to come.

2.2. Marketing and Sales

Smelter capacity has been reducing in Europe, a trend that has been going on for several years following the enormous growth of aluminium smelting capacity in China. As a result the market for smelter grade alumina has shrunk in Western Europe. However some aluminium metal producers, mainly in Northern Europe, remain solidly in place.

From a sales and marketing point of view this requires a different approach compared with that of a major SGA producer. Selling AOS' production entirely as smelter grade alumina would only require a few off takers, whereas selling a large part of the production as alumina chemicals increases the number of customers considerably, e.g. Dadco serves over 200 customers not only in Western Europe but also on several other continents. Dadco has a dedicated sale team that maintains long term relations with all its customers and since our products are used for a vast range of applications, integral knowledge of customers' products and requirements are of great importance.

With AOS being located on the banks of the Elbe river, AOS is logistically well placed. Logistic solutions can be tailored to best suit customers' requirements - by sea, inland waterways, rail cars and trucks in bulk, big bags, and so on. Dadco also uses several warehouses, inside and outside of Europe at locations from where multiple customers can be served at a short notice in quantities as small as a truck load.



Figure 6. Wet hydrate bulk storage.



Figure 7. Packaged wet hydrate. storage

The high brightness index of AOS' products is an important quality aspect for many of Dadco's chemical grade customers, whereas smelter grade alumina with its low Na₂O and CaO content reduces the consumption of AlF₃ and spar in the smelting process. There are no issues with Zinc and/or Beryllium that can be found in other sources of alumina.

3. Summary

Important steps of strategic importance have been taken to prepare AOS and Dadco for the future:

- AOS has been modernized and its capacity has been increased, which makes it a well maintained, reliable and efficient facility.
- Cost reduction programs at Dadco and AOS have been and will continue to be an ongoing process.
- Alumina products – smelter-grade and chemical – have been and continue to be of advantageous high quality products for customers.
- Bauxite supply will soon be completely vertically integrated without dependence of third party bauxite suppliers and is guaranteed for the long term. The access to high quality CBG bauxite is a pre-requisite to maintain production cost at a competitive level together with many further cost reduction initiatives that are ongoing.
- Maintaining a good balance between smelter and chemical grade products and focus on customer requirements are of utmost importance.

With all this in place, Dadco and AOS are ready for the future.

