

Alteo Gardanne Refinery: 130 Years of Adaptation to Meet the Dual Challenges of Environmental Protection and Added Value

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Abstract

The Gardanne plant was the cradle of the bauxite-to-alumina refining industry through the Bayer process, 130 years ago. Throughout its industrial and entrepreneurial history, the plant has consistently reinvented itself to meet the structural and conjunctural challenges faced.

The company has been able to modernize its plant and increase its alumina production in line with growing demand from the Second World War until the 1970s. Then from this period energy costs became a major issue with the oil crises and more recently, the consequences of the war in Ukraine. The Gardanne operating configuration has been revisited several times to change its energy supply mix and its energy production and to adapt its processes (evaporation and digestion).

With the evolution of regulations and corporate social responsibility (CSR) challenges, taking environmental constraints into account has become an issue of survival. Innovative solutions have been implemented to meet environmental constraints, such as water consumption and wastewater quality, control of dust emissions and atmospheric discharges and particularly on bauxite residue management.

Regarding CO₂ emissions, the site launched a major - and much-acclaimed – reduction plan for its entire process in 2022, proposing innovative solutions to improve energy efficiency and increase the proportion of electrical energy.

Finally, the Gardanne plant has successfully implemented a new business model for higher value-added specialty alumina, and production facilities have been modernized to realise this.

This transformation has been underway for the past two decades and has accelerated since the cessation of bauxite refining in 2021 and the transformation of its Bayer process.

The oldest active alumina plant in the world, Gardanne has 130-years' experience of adaptation.

Keywords: Innovation, CO₂ emissions, Bauxite residue management, Value-added specialty alumina.

1. An Industrial Epic for More Than 130 Years

1.1 The First Years and the First Challenges

In 1893, the first alumina production plant using the Bayer process was set up in Gardanne. The site was chosen for its proximity to the bauxite deposits needed to manufacture alumina, and its coal mines, which provided an essential source of energy for the process. Then came the time of industrialization: artisanal methods were rapidly replaced by more efficient industrial processes.



Figure 1. photograph of operators working at the Gardanne plant during its start-up.

Alternative processes to Bayer's were briefly assessed but proved to be far less efficient and more costly. During the First World War, the plant faced new challenges such as production interruptions and shortages of raw materials. Despite these obstacles, the industry rebounded strongly after the war with technical innovations improving production efficiency, enabling the Gardanne plant to strengthen its market position.

1.2 The Trente Glorieuses, Period of Expansion and Modernization

After the Second World War, the plant underwent a lengthy period of expansion and modernization, as production techniques evolved and innovative technologies enabled continuous operation of the digestion process, increasing yields, and reducing costs. Benefiting from strong economic growth and increased demand for aluminium, notably with the boom in aeronautics and the expansion of the mass automotive and construction markets, the plant continued to increase production through massive investment, becoming a major production center in Europe, modernizing its facilities, and adopting more efficient management practices. In 1949, an alumina research center was set up near the production site to develop innovative technologies and improve operations.

These years were also marked by the upward social mobility of workers, with companies and employees enjoying a close and sometimes conflictual relationship. Working conditions and employee safety improved as industrial risks were prevented. On the other hand, salaries rose rapidly because of productivity gains.

Owned by the Pechiney Group, the site was a typical example of the industrial paternalism of the period, with a swimming pool open to families, housing provided and other advanced social schemes, all in the context of a town hall driven by the French Communist party, again typical of industrial and working-class sites of the period.

4.3.5 Social Adaptation

This transformation also involved a fundamental change in the management of the Gardanne plant: more than one hundred and fifteen job positions have been modified, impacting more than 30 % of the plant personnel (and 50 % of the production team).

With the objective to propose a solution for everyone, the company had to provide extensive training and social support to the operators and workers offered new positions; Alteo also decided to open new roles, with a decision to adapt and internalize the operations undertaken by subcontractors.

This important workflow had to be conducted in parallel with the industrial transformation. Our constant concern was to maintain dialogue with the employees and the unions throughout this transition. This demanding but compulsory approach enabled us to pass through this period without any major clashes, with only one night of complete shutdown of the plant for social reasons at the early beginning of the transformation.

This social project was welcomed by the relevant authorities.

Another challenge continues to occupy not only the managers but the entire company: to make this strategic change percolate, throughout the organization and right down to the workstations: in behaviour – the importance of the value of the product produced, quality over quantity, specialty alumina vs. commodity alumina.

A in-depth work and support for the teams. Another challenge was the management of Bayer operators, technicians, engineers, and managers: closing (adapting) a Bayer was also a human operation for these professionals who currently have four generations at work in Gardanne.

For these unique profiles, some were redeployed for the smaller Bayer loop and in the factory; the vast majority were brought together under a dedicated entity, *Alteo Technologie®*, which provides expertise for the outside and primarily works on the new refinery project in Guinea.

Together more than 250 people have been involved on a global 25 MEUR investment project, following budget commitments, and with zero lost time injury (LTI). All Alteo teams took up this challenge, which turned out to be a great success.

5. Conclusion

The Gardanne plant has constantly gone through challenging times to meet technical, political, economic, social, and environmental requirements. Some of the challenges the company went through could have closed it, as has happened to comparable plants in the world.

Its recent and latest transformation, launched under the impetus of the UMSI Group, is based on a deliberate shift towards specialty alumina. This approach was implemented quickly thanks to the financial contribution of its shareholder, with consideration given to the social impacts, environmental history and current and future carbon footprint of its production and products.

Alteo is convinced that its future can only be imagined by continuing to improve the performance of its products while continuing to reduce their carbon footprint, by collaborating closely with its customers and all its partners, particularly institutional ones.

130 years of existence and 130 years of adaptation; long live, Alteo!