The International Aluminium Institute's Bauxite and Alumina Committee: A Blueprint for Industry Collaboration

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Abstract

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The Bauxite and Alumina Committee (BAC) is one of the five industry committees established by the International Aluminium Institute (IAI) to foster collaboration among member companies on shared challenges. Their mission is to drive projects that are aligned with the IAI board's strategic priorities and to be an industry reference group on the key issues and challenges. The BAC is a group of approximately 20 participants from member companies who are experienced technical specialists in the field of Bauxite, the Bayer process and Bauxite Residue (BR), and have a broad view of the industry. Over the past decade, the BAC's focus areas have been bauxite mining and BR management and reuse, safe transport of bauxite and BR by sea, remediation strategies for closed BR storage areas, proposals for safer storage of BR, and reuse in cement. Several reference documents and scientific publications were produced by the IAI as an output from these collaborative projects, which were completed in universities, research institutes and member companies' facilities. In many instances, the BAC has been the catalyst to these projects and ensured alignment with key industry priorities. The most recent and significant project is ReActiv, which is funded by the European Commission and aims at the development of processing routes to make Supplementary Cementitious Materials (SCM) from BR. This flagship project was a direct spin-off of BAC initiatives and exemplifies the alignment, integration and collaboration between an end-user (Holcim), the alumina industry, academia and research institutes. This article will highlight key BAC activities from the past decade and discuss the main factors that contributed to the success of industry collaboration.

Keywords: Bauxite, Processed bauxite (bauxite residue), Cement, Mining, Rehabilitation.

1. Introduction to the Bauxite and Alumina Committee (BAC)

The International Aluminium Institute (IAI) was established in 1972 as the International Primary Aluminium Institute, with the purpose of representing the global primary aluminium industry. The IAI has 25 signatory member companies, representing about half of global primary aluminium production with a broad geographical spread.

Initially, the principal function of the IAI was collecting and publishing production statistics. Over time, as the industry's complexity increased and stakeholder expectations evolved, the IAI expanded its role to encompass leadership in sustainability reporting, coordination of internal industry initiatives and the development of sector-specific standards and tools. Given that bauxite residue (BR) accounts for more than 90 % of the solid waste generated during the production of primary aluminium, the IAI established the Bauxite and Alumina Task Group (BATG) in 2004

to address associated challenges. In 2005, the BATG was reconstituted as the Bauxite and Alumina Committee (BAC).

The BAC is one of several IAI advisory committees, alongside Climate Change, Communication and Promotion, Environment and Nature, and Health Committees. It aims to support continuous improvement in BR management, specifically to mitigate the safety risks associated with storage in impoundments and to reduce the volumes through improved processing and the development of reuse strategies. As circular economy principles gain broader acceptance, the development of BR reuse applications have become an area of significant focus. The BAC convenes twice per year to review strategy and projects, while focussed working groups meet more regularly to review specific projects and themes.

The focus of BAC activities is often more technical than the other IAI committees, which is reflected in the makeup of its member participants. Member companies will typically appoint senior technical experts to represent them on the BAC and to take part in the various projects. The bi-annual BAC meetings typically host around 20 participants from over 10 companies and industry associations, creating a diverse group. A dozen countries are typically represented, and most participants do not have English as their first language. The BAC and the members of its working groups have more than 800 years of combined experience in our industry. The diversity is also reflected in the range of academic backgrounds and industry experiences: from chemists and chemical engineers to soil scientists, geologists and extractive metallurgists; having worked in R&D and technology development, refinery operation, university laboratories or mine site rehabilitation.

2. Impactful Achievements

Each year, a suite of projects aligned with the IAI strategic priorities are proposed by BAC members for review and selection by the IAI Board for funding. These projects have resulted in the delivery of significant and impactful achievements, which has been underpinned by the participation of industry experts and external consultants. A summary of these achievements is covered in this section.

2.1 Best Practice Storage and Management of Bauxite Residue

The 2010 alumina refinery tailings dam failure in Ajka, Hungary, prompted the BAC to enhance its review of safe BR storage and management practices, increasing focus on utilisation and remediation. Immediately after the incident, the BAC established a task force to provide advice and support to the Hungarian authorities. The IAI recognised the significance of the incident and published a voluntary code for the industry with five objectives: assured integrity of current residue storage facilities; the provision of industry-based support; best practice management; the end of BR solids disposal to marine and aquatic environment; and improved technology.

In subsequent years, a review of best management practices was performed, covering the storage and management, remediation of storage areas, and uses [1]. The review was later expanded to include more detailed data on BR storage practices, risk assessments, characteristics, work being undertaken for reuse opportunities and case studies. In 2015, the “Bauxite Residue Management: Best Practice” document was published in Chinese, Bahasa and English [2], and has since been updated and published in 2022 as “Sustainable Bauxite Residue Management Guidance” [3]. It remains a comprehensive guidance document for the industry and its stakeholders. It can be downloaded from the IAI website.

The increased focus on BR management, storage, remediation and reuse led to new IAI-funded initiatives in the fields of *in situ* remediation, leachate control using constructive wetlands,

The alumina industry has demonstrated that progress can be achieved through collaboration on common issues and challenges. This collaborative spirit is essential for the industry's future prosperity, as it enables the sharing of knowledge, resources and expertise to tackle complex problems to drive sustainable development. The BAC's success in fostering industry-wide cooperation highlights the importance of continued collaboration to address the evolving needs of the alumina sector and ensure its long-term growth and sustainability.

Through collaboration the BAC has initiated and supported several achievements, including:

- Publication of "Sustainable Bauxite Mining Guidelines" which focusses on the aluminium industry's drive to ensure that bauxite mining is sustainable and minimises social and environmental impacts during operation and post-closure.
- Publication of "Bauxite Residue management: Best Practice" which followed the Ajka dam failure in Hungary, after which the BAC developed a voluntary code for industry practices to ensure safe storage and management of bauxite residue.
- Ongoing reviews on the utilisation of BR, especially in cement, which resulted in several publications including a "Roadmap to maximise the opportunities for bauxite residue in cementitious materials." This was a key document that increased interest in the topic resulting in the EU funded ReActiv project aimed at producing new SCMs.
- Remediation strategies for BR disposal areas: various initiatives have been launched to investigate effective remediation methods for closed storage sites, including bioremediation techniques and the use of constructed wetlands. Other projects discussed include refinery decarbonation, an assessment of the mineral carbonation of BR, the pelletisation of BR for safe transport by sea and more in-depth characterisation of BR including leaching and standardisation of analyses.

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