

Boosting circularity in the process industry: Focus on industrial symbiosis between the aluminium & cement sectors

ONLINE WORKSHOP

26 SEPTEMBER 2022



ReActiv 2nd Cross-Fertilisation Workshop

On Monday 26 September 2022, European Aluminium organised the online Cross-Fertilisation Workshop “[Boosting circularity in the process industry: Focus on industrial symbiosis between the aluminium and cement sectors](#)” in the frame of [EU ReActiv project](#) with the support of [Processes4Planet](#).

The main objective of the clustering event was focused on the development of new clinker and/or cement types using alternative/waste-derived material resources, incl. Bauxite Residue (BR), with a reduced carbon footprint and/or enhanced symbiosis within or across value chains. This cement-centric workshop aspired to reinforce European & international cooperation for highlighting the benefits of BR utilisation in the cement industry as well as to put BR on the innovation radar screen of the cement industry.

Thirteen (13) experts provided their contribution through valuable presentations covering topics to boost industrial symbiosis between aluminium and cement sectors, and in the closing panel discussion four (4) experts representing the aluminium and cement sector shared their views on the future of the BR and other by-waste materials’ use in the cement industry as well as the opportunities and the challenges within or across the industrial value chains (Figure 1).

<p>09:00 WELCOME by Paul Voss, European Aluminium & Philippe Benard, Holcim</p>	<p>14:40 – 15:00 COFFEE BREAK</p>
<p>09:10 – 10:30 SESSION 1 SETTING THE FRAMEWORK TOWARDS A MORE CIRCULAR PROCESSING ROUTE Chair: Christian Leroy, European Aluminium</p> <p>KEYNOTE SPEECH → Promoting innovation through Industrial Symbiosis: the enabling role of Processes4Planet, Ángels Ordoña, A.SPIRE</p> <p>A carbon neutrality roadmap for the European cement industry under the Green Deal, Rob van der Meer, CEMBUREAU</p> <p>Bauxite Residue: Supporting the need for circularity in the cement industry, Lavinya Kugaswaran, International Aluminium Institute</p>	<p>15:00 – 16:20 SESSION 4 KEY ENABLERS FOR DEPLOYMENT OF INNOVATION TOWARDS A CIRCULAR PROCESS INDUSTRY Chair: Bernard Mathieu, HOP3</p> <p>Towards a harmonised policy framework for Bauxite Residue valorisation: barriers and opportunities, Konstantinos Kollias, European Aluminium</p> <p>Novel business models for utilisation of wastes/by-products applying Industrial Symbiosis concepts (CORALUS), Ignacio Martin, CIRCE</p> <p>Developing the next generation of standards for by-product based-cements, Xavier Guillot, Chairman of CEN TC 51/Holcim</p>
<p>10:30 – 10:50 COFFEE BREAK</p>	<p>16:20 – 16:40 COFFEE BREAK</p>
<p>10:50 – 12:15 SESSION 2 OVERVIEW OF ALTERNATIVE RAW MATERIALS / SCM FOR LOW-CARBON CEMENT PRODUCTION Chair: Nikos Nikolakakos, CEMBUREAU</p> <p>The role of SCMs and alternative raw materials in decarbonisation and resource savings in the cement sector, Jörg Rickert, VDZ</p> <p>High-value industrial by-products for novel low-clinker cement (EnDurCrete), Arnoud Müller, Heidelberg Cement</p> <p>Using Bauxite Residue in the cement industry: A systematic review of challenges and opportunities, Diego Rosani, RosCon consultant</p>	<p>16:40 – 17:30 PANEL DISCUSSION UNLOCKING THE OPPORTUNITIES FOR ALTERNATIVE RAW MATERIALS/SCM & BR IN CEMENT APPLICATIONS Chairs: George Karkampas, European Aluminium & Eric Waezenbergh, Geocycle Europe</p> <p>Oscar Nieto Sanz, European Commission, DG GROW (Construction unit)</p> <p>Claude Loréa, Global Cement and Concrete Association</p> <p>Philippe Benard, Holcim</p> <p>Efthymios Balomenos, MYTIILINEOS</p>
<p>12:15 – 13:15 LUNCH BREAK</p>	<p>17:30 – 17:45 CLOSURE by Philippe Benard, Holcim & Paul Voss, European Aluminium</p> <p>DEBRIEF AND MAIN CONCLUSIONS BY THE CHAIRS</p>
<p>13:15 – 14:40 SESSION 3 SESSION 3 / POTENTIAL FOR BAUXITE RESIDUE IN CEMENT APPLICATIONS Chair: Ken Evans, International Aluminium Institute</p> <p>Overview on the EU ReActiv and RemorAL projects, Efthymios Balomenos, MYTIILINEOS</p> <p>Bauxite Residue modifications for use as Supplementary Cementitious Materials (SCM) (ReActiv), Philippe Benard, Holcim</p> <p>Valorising bauxite residue in the Indian cement industry: current status and future needs, Ishwar Sahu, UltraTech Cement Limited (Aditya Birla Group)</p>	

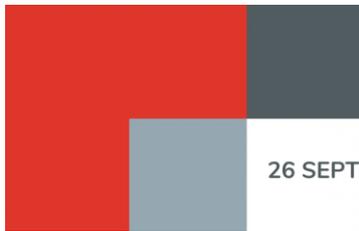
Figure 1. Programme of the ReActiv 2nd Cross-Fertilisation Workshop (26 September 2022).

For this clustering event, 173 experts from the European Commission, the academia as well as SMEs, and Large Enterprises registered. On 26 Sept, up to 106 on-line participants had the opportunity to be informed about the technological, non-technological enablers for the successful deployment of relevant innovations, but also to interact with the speakers in order to promote cross-fertilisation and foster new synergies.

Main outcomes

1. Alternative raw materials can pave the way towards low-carbon footprint cement

The production of clinker generates about 850 kg CO₂/t of clinker. Especially the decarbonisation of limestone corresponds to approximately 60% of the cement industry’s emissions. The use of waste and by-products of other industrial processes directly introduced into the kiln, and/or Supplementary Cementitious Materials (SCMs) for partial clinker replacement could significantly reduce the carbon footprint of the cement industry. For instance, increasing the average level of clinker substitution in cement to reach 40% using alternative raw materials like BR could avoid up to 400 million tonnes of CO₂ emissions annually.



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2. As current SCMs will become scarcer, Bauxite Residue could re-lay the foundation for low-carbon cement

BR contains high content of $\text{CaO}/\text{SiO}_2/\text{Al}_2\text{O}_3$, which cumulative amounts to 30-40% wt., as well as Fe_2O_3 , TiO_2 and Na_2O . Its most widespread use is as a source of iron and alumina in the clinker production process. However, the processed bauxite residue can be valorised as a SCM (in terms of performance and durability). In this context, the EU ReActiv project aspires to demonstrate technologies to transform BR into an alternative SCM, i.e. a re-active material for low CO_2 cement production, which can be used in much larger quantities, substituting 30% to 50 % of clinker in cement. Such practice could result in the production of BR based-cement products with less than 520 kg CO_2 per ton of cement.

3. A harmonised regulatory framework facilitating the BR valorisation is urgently required

Especially for the bauxite residue, the current EU and national regulatory framework should be harmonised and re-aligned to pro-actively facilitate its valorisation under the overall concept of circular economy action plan. Permitting and (cross-borders) transportation processes need to become much faster and less complex. Developing harmonised EU criteria to consider processed BR as non-waste or as by-product should act as key enabler in this respect.

4. Construction Products Regulation (CPR) as a tool for the integration of environmentally friendly cements in the market

Currently CPR defines the rules to place building products on the EU market where the product performances are declared via CE marking. However, up to now, no environmental data are included in the CE marking. Hence, to further promote sustainability, EU authorities in collaboration with stakeholders are currently debating about the methodology to include environmental data in the CPR, especially Global Warming Potential (GWP) indicator.

5. New actions should be initiated to evolve the standards for by-product based-cements

It is necessary to extend market solutions with promising new SCM/by-products by focusing on the availability, the proper performance as well as the overall environmental and sanitary assessment. In this frame, we should boost the way forward to develop a new generation of standards for by-products based-cements with emphasis on reinforcing cooperation/partnership with all types of stakeholders (scientific international organisations, institutes, industry, professional associations, NGO, CEN TC), liaising with other CEN Technical Committees (TC 104, TC 229, TC 351, TC 350, TC 442, TC 125, TC 396), conducting pre-normative research, preparing technical dossier to be assessed by CEN/TC 51.

6. The awareness and social acceptance of the end-users in respect of the valorisation of BR should be increased

The sensitivity for low-carbon constructions is rapidly rising and will further increase in the future which will also increase the end users/stakeholders' acceptance for waste/by-products based-cements. Especially for the commercialisation of bauxite residue based-cements, a challenge which may become a barrier could be the reddish colour. It is noted that hindering bauxite residue disposal or gradually reclaiming the legacy BR disposal sites will foster European and international cooperation in the field of Raw Materials and provide tangible evidence that circular economy and sustainable industrial operations are feasible in our time by focusing on the improvement of social engagement.

7. Public-private-partnerships for fostering synergies between academia, industry & society for social acceptance

The successful valorisation of bauxite residue and other wastes/by-products resulting from industrial processes, as shown during the cross-fertilisation workshop through variable case studies, can be used to demonstrate the benefits for the process industry. However, promoting partnerships and synergies between public and private sectors could influence positively the overall effort for establishing a circular economy. In this frame, public-private partnerships (such as A.SPIRE) could play a key role in order to bridge between academia, industry and society as a whole, ensuring the development, deployment and acceptance of relevant innovation and best practices and finally to achieve to a sustainable resource efficient process industry.