

## REACTIV PROJECT: INDUSTRIAL RESIDUE ACTIVATION FOR SUSTAINABLE CEMENT PRODUCTION

Bauxite Residue (BR) is the main residual material left after the production of aluminium hydroxide from bauxite in the Bayer process produced at a rate of nearly 7 million tonnes per annum in the EU, out of which less than 200 thousand tons of BR per year are reused in industrial processes. Most of the Bauxite Residue is currently landfilled due to the lack of a large-scale, sustainable reuse options. In Europe, the BR production represents about 7 million tonnes per year while the clinker production is about 125 million tonnes per year currently.

ReActiv aims to provide a new, sustainable and large-scale re-use option for BR, targeting the cement sector. In fact, according to the UNEP's 2017 report on Eco-efficient cement, one of the main areas that can deliver substantial reductions in global CO<sub>2</sub> emissions related to cement and concrete is the increased use of low-CO<sub>2</sub> Supplementary Cementious Materials (SCM) as partial replacements for Portland cement clinker (PCC).

Two of the main targets of the project, funded by the European Commission's Horizon 2020 Programme (Grant Agreement n° 958208), are to produce a cost effective SCM and new, non-PCC based, clinkers from BR. The cement industry could potentially consume the total production of the modified bauxite residue in Europe. This approach is also in line with the Bauxite Residue Roadmap launched by the International Aluminium Institute (IAI), to maximise the use of bauxite residue in cement and concrete products.

In the ReActiv project, modifications will be made to both the alumina production and the cement production side of the chain, in order to link them through the new ReActiv technologies. The latter will modify the properties of the Industrial Residue, transforming into a reactive material (with pozzolanic or hydraulic activity) suitable for new, low CO<sub>2</sub> footprint, cement products. In this manner ReActiv proposes a win-win scenario for both industrial sectors, reducing wastes and CO<sub>2</sub> emissions respectively.

The ReActiv project will screen various raw materials (BR available to the project and other accessible mineral and industrial wastes) with different processing technologies in order to produce 'active' material which will be tested for production of new cement products. Performance criteria will be not limited to technical standards but will also include financial and environmental KPIs, in order to ensure that scale up technologies are viable and sustainable. Indicatively:

- Technical KPI: Clinker replacement factor >30%, Activity index >80%
- Financial KPI: The cost to produce the new cement versus the strength achieved, €/MPa under constant workability
- Environmental KPI: CO<sub>2</sub> kg/t of new cement (<520 kg CO<sub>2</sub>/t cement)

The technologies that will be addressed within the project include de-alkalisation; development of new SCM through calcination of BR with clay or other minerals; Iron Rich SCM through BR vitrification; Iron Free SCM through BR carbothermic smelting; BR CAC cement; CSAF- clinker; New blended cement products utilising the Re-Active SCM.

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