REuse and REcycling of CDW materials and structures in energy efficient pREfabricated elements for building REfurbishment and construction

TODAY´s WASTE, TOMORROW MATERIAL!
Circular Economy in Construction
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Scope

RE⁴ project aims to develop a **prefabricated energy-efficient building concept** that can be easily assembled and disassembled for future reuse, **containing up to 65% in weight of recycled materials from CDW**. The reusable structures will range from **15-20% for existing buildings** to **80-90% for the RE⁴ prefabricated building concept**. The intermediate but self-standing industrial results of RE⁴ are the following: Innovative and effective solutions in terms of **CDW sorting technology**; **Pre-fab building components** made of recycled materials; Development of a **BIM-compatible tool** with the aim of supporting owners and construction/demolition companies by providing an estimation of the types and quantities of CDW that will be generated during construction/demolition phase. The approach and technology developed will be scaled-up through the set-up of pilot-scale manufacturing lines for the innovative sorting of CDW and the production of structural, non-structural and lightweight prefabricated element integrating CDW. Moreover, representative prototypes of the final components will be designed, produced, tested and applied on real-scale structures for demonstration purposes.

Specific S&T objectives

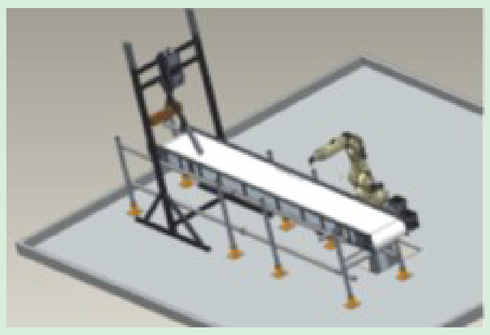
Maximization of recycled CDW amount and value by advanced sorting technologies

Development of advanced sorting technologies based on attrition, density separation and automated robotics' equipped with advanced sensors and artificial intelligence software. The state-of-the-art recycling rate will be increased from 80% to 90-95% (HQ mineral fractions, lightweight fractions).

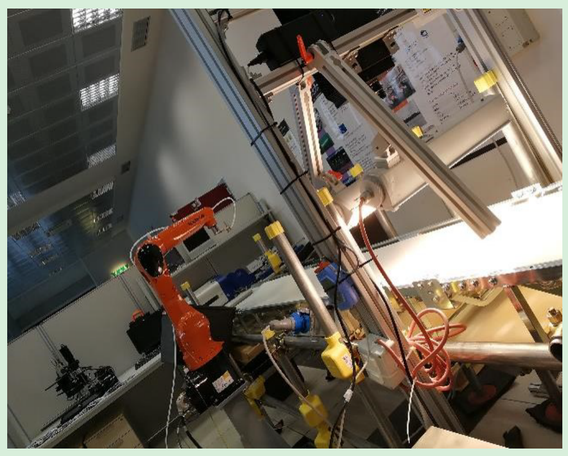
Actions taken

Identification and pilot scale testing of **3 new CDW separation methods** (attrition cell scrubbing, CFCU separation and spiral separation). Tests showed significant improvement in the quality of sand (the highest value product).

Definition of the detailed architecture of the robotic sorting system. **4 different sensor technologies** (hyperspectral - NIR, SWIR and MWIR - cameras and RGB cameras) were tested and the most suitable methods to detect the different materials (normal and lightweight) were identified. Other components (robotic arm, conveyor belt, etc.) of the sorting system were also identified and installed.



Actions taken



Robotic sorting system in Stam facility in Genoa, Italy

STAM and CDE members operating robotic sorting system at Sheehan's, Oxford

Actions taken

Laboratory built counter flow classification unit (CFCU) in CDE facility

CFCU during commissioning phase at a recycling plant in Glasgow, Scotland

Actions taken

Lab based attrition cell

Set of 4 attrition cells incorporated into a C&D plant in New York, USA

Partners

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723583.

www.re4.eu