FISSAC December 2017 Update

Much has happened in the past six months and the project is now halfway through. We invite you to find out about our latest progress and activities in the following paragraphs. The work carried out at each level is explained below.

Manufacturing processes

The objective at this level is to define **processes** for obtaining cost-effective **secondary raw materials** from different industrial waste streams (from specific industrial sectors) to be used in the **design** and manufacturing of eco-innovative **construction products** that are going to be applied in the FISSAC scenario.

Closed-loop recycling processes to transform waste into secondary raw materials

Innovative technological and non-technological processes to transform waste into valuable secondary raw materials have been developed and validated. We recovered waste from several industries:

- **Steel**: Accelerated carbonation processes technology was employed to upgrade the quality of **Electric Arc Furnace and Ladle Furnace Slag** (by-products of the steel-making industry) for use in concrete manufacturing.
- **Aluminium**: A milling ball process was developed and validated to treat **Aluminium oxide-based materials** (a product from secondary aluminium that can be considered as high alumina secondary raw material). After the crushing step, a classification step was carried out to remove aluminium metal. The use of secondary aluminium will be tested for cement and ceramic production. Additionally, it will be tested in the production of Rubber Wood Plastic composites.
- **Glass**: Different types of **post-consumer flat glass** waste stream from various points in the construction glass supply chain were selected. The different materials went through a variety of different processing techniques depending on their source and anticipated end use. The minimization of plastic contamination and particle size was identified as a critical factor to produce secondary raw materials meeting the requirements for production of eco-cement. Following the collection at an industrial scale, readily available glass sorting technology is used to remove remaining contaminants. Size reduction was achieved by standard milling techniques such as ball milling, vertical shaft impactor (VSI), or cone mills.
- **Natural stone**: The main primary treatment of **marble slurries** (a residue from the cutting and polishing manufacturing processes of natural stone) corresponds to drying processes using different techniques: infrared (IR) heating and microwave treatment.
- **Wood**: Microwave technology was tested as an alternative wood drying technique in order to reduce drying time, increase the drying homogeneity, and ultimately minimize energy consumption for the Rubber Wood Plastic Composites manufacturing process.

In addition to defining the processes, the project aims to contribute to standardisation. To this end, the **Deliverable 2.6 "Report on the contribution to the standardisation system regarding FISSAC technologies"** was submitted in August. It consists in two different parts:

a) An approximation and **analysis** of the relevant technical committees, published standards, and works under development dealing with the secondary raw materials and products related to FISSAC. This first part provides FISSAC members basic information to help decide further steps in the standardisation process of the project results.
b) The **contribution to standardisation**, including strategy to follow, actions envisaged or taken, and proposals to be made to promote and facilitate the inclusion of project results in standards as a way to disseminate project results within market stakeholders and industry concerned. The strategy for communication with corresponding technical committees will be elaborated considering which of them can be the most relevant, to what extent the relationship should be established, and an initial planning of activities.

This deliverable will have proper continuity with deliverable D3.12 "Report on the contribution to the Standardisation System regarding FISSAC *products*". Due to the close relationship between standardisation of raw materials and that of the products studied within FISSAC, both aspects were taken into account when making this first analysis and conclusions will be valid for future phases and deliverables of the project, with regard to standardisation.

This deliverable contains the fields considered of interest related to FISSAC project, which could be useful and relevant for the project activities. Furthermore, it can help to identify standardisation gaps that will need to be addressed.

Product eco-design and certification

We developed a **guideline for the application of Environmental Technology Verification (ETV)** in industrial activities related to the construction sector: recycling processes and production of innovative materials with the use of secondary raw materials (Deliverable 3.9). It constitutes a key point to start involving partners in the ETV aspect of FISSAC. It gives technical instruments useful to implement the EU ETV Pilot Programme and illustrates the procedure that will be applied to the eligible technologies belonging to FISSAC's framework in the next phases of the project. FISSAC partners with technology in the "Materials, Waste, and Resources" area should now be able to cover an active and conscious role during the Eligibility Assessment.

To summarise, the works carried out and the results obtained during this semester have showed that available technologies are effective for production of high quality secondary raw materials for construction products manufacture.

Product validation

Currently, our efforts are focused on the evaluation of new products' formulations that are optimised at lab scale and the work plan for the next phase. Indeed, we aim to **validate** the recycling **processes** and new eco-innovative **products at pre-industrial scale** (in 2018), to set up the basis for the validation **at real scale** (in 2019).

Industrial symbiosis model

FISSAC model for industrial symbiosis

The development of the FISSAC model for Industrial symbiosis (IS) started in June 2016. The FISSAC Model is composed of an IS scenario, a methodology, and a software platform.

Based on previous activities (an analysis of the FISSAC Software Platform Requirement) a **Software Design Document** was prepared. It provides a comprehensive architectural overview for the FISSAC ICT Platform, using a number of different architectural views to depict various aspects of the system. It aims to capture and convey the significant architectural and design decisions that were made for this project. In addition, the document illustrates the purpose and explanation about complete declaration of used cases, scenarios, system architecture, data designs, human interface designs, integration of developed parts, and interaction.

The FISSAC platform will be used and evaluated within the project's IS model system concept. The next steps for methodology and model validation will be to organize in a well-structured way the information and results for their integration within the FISSAC ICT Platform.

Industrial symbiosis replicability and social issues

The Industrial Symbiosis Replicability aspects have been tackled thought the **Living Labs for replicating the FISSAC model**. An overview of the Living Labs in each of the countries (Belgium, Czech Republic, Germany, Hungary, Italy, Sweden, Spain, Turkey, and the UK) will be released on the FISSAC website in January 2018 – for now you can already get a general description of the living labs. A summary of main results is below:

- Sweden: FISSAC is enabling learnings about Living Labs from the Swedish pilot since autumn 2016, organised by Hifab and RISE. The topic chosen by participants is the whole construction process of a building material.
- Belgium: OVAM organised a first living lab gathering in June 2017 on stakeholder analysis for an IS Management Software tool. It has since organised two more workshops focussed on urban mining for the construction and demolition sector.
- Czech Republic: a 1st Workshop named "Eco-innovation in construction sector" was organized by FENIX with ICE and the Business Innovation Centre (BIC) in June 2017 in Prague, aiming to map and survey stakeholders' needs.
- Spain: Símbiosy will organize a Living Lab in Barcelona in January 2018. Símbiosy plans to organize four Living Labs in Barcelona, thanks to ITeC's collaboration the LL experience will continuity until the end of the project.
- UK: British Glass and GTS organised a first event in October 2017 in collaboration with Zero Waste Scotland, to explore how flat glass recycling can be increased.

Further work was carried out on **social engagement and acceptance** with the social advisory board on social issues to focus on the identification of complementarities and tensions between technical and collaborative approaches. The objective is to co-create a guideline to help stakeholders to remove barriers linked to social acceptance

Exploitation and business models for industrial symbiosis

The 2nd FISSAC Exploitation and Business Model Workshop took place on the 4-5 October in Stockholm, during the project's General Assembly. The main topics were Key Exploitable results, Intellectual Property-related issues, risk assessment, and Business Model.