



CASE STUDY

PILOT PRODUCTION OF PREFABRICATED BLOCKS FROM RECYCLED AGGREGATES (NIGRAD D.O.O., MARIBOR)

DO'S

(Objectives of waste processing with the production of new materials)

- definition of the method of waste processing and production of new materials,
- provision of the necessary equipment,
- providing a suitable location with the necessary infrastructure,
- establishment of waste recovery through the production of new materials (machinery, the definition of work organization and responsibilities, training of workers),
- control and monitoring of processing and production processes,
- handover of products for verification and / or certification,
- monitoring and controlling the quality of production to ensure the technical suitability of processed products.

DONT'S

- the unprofessional placing of CDW mixture without the needed vibration,
- incorrect binder dosing (cement and superplasticizers).

CONTEXT

Nigrad d.o.o. has been an important partner of the Municipality of Maribor, acting especially intensely in the field of the use of secondary raw materials and in bringing new, innovative technologies and processes to the construction sector in the city. Through the implementation of different circular economy projects and involvement in different circular networks and programs, Nigrad is already well known in the sphere of circular urban construction. Nigrad is participating in the Horizon 2020 project CINDERELA. As part of the pilot demonstrations of the project, the pilot production plants in Maribor (Slovenia), Madrid (Spain), and Skopje (North Macedonia) are being established. With the pilot production plants, the project aims to demonstrate the technical, technological, and administrative possibilities of processing and using various non-hazardous construction waste as well as some other waste types to produce more sustainable construction products. Following the pilot production, the secondary raw material (SRM) based products will play an important role in construction demonstration where project partners plan to revitalize degraded areas and build small facilities with accompanying access roads. However, as the waste is not suitable for direct use in construction projects, it must be re-processed.

CINDERELA PILOT PRODUCTION PLANT IN MARIBOR

With the means of processing waste by crushing, sieving, and mixing as part of the pilot production, new construction materials will be obtained and used in three different demos, which will be carried out in the area in Dogoše, Maribor, Slovenia as part of the CINDERELA project. The pilot production plant is producing the following four groups of SRM-based products:

1. recycled aggregates,
2. geotechnical composites,
3. green concrete,
4. recycled soil.

A comprehensive system of recovery and monitoring of mass flows is envisaged for the processing of waste before treatment. Nigrad is monitoring the entire flow through the processes of takeover, input control, pre-treatment, all processing procedures, control and certification of output products, the definition of use, fitting, and evaluation of the results of the materials.



CHALLENGES

- The challenges Nigrad has encountered and successfully overcome relate mainly to incomplete and in some areas still deficient legislation in the field of recovery and reuse of construction and certain types of other non-hazardous waste as new secondary raw materials.
- Another challenge was the unwillingness of local communities to innovate in this area due to past bad practices and experiences. Nigrad addressed these challenges through good and open communication with citizens and the local community.
- An additional challenge is that it is difficult to ensure the standard quality of prepared secondary raw materials due to the use of different types of waste.
- In the recovery of waste (in the case of construction waste), the problem is also the generally negative public belief that products prepared from waste cannot be equivalent to products made from natural materials. Nigrad addressed this challenge with their different examples of demos in different projects and other good practices of their work.

Nigrad produced the first green blocks for separation units made of recycled aggregates in Dogošë on 13 November 2020. These will be later used for the construction of a demo small facility and the construction of concrete separation walls at the demo site to separate aggregates. The recipes to produce green concrete were prepared by the Slovenian National Building and Civil Engineering Institute (ZAG) - the CINDERELA coordinator, based on previous laboratory tests of delivered samples of various secondary raw materials. The green concrete was produced with the mobile concrete batching plant of the Danish manufacturer FIBO and installed in the prepared formwork elements for blocks of the Dutch supplier Betonblock.

SOLUTIONS ADDRESSED WITH THE PILOT PRODUCTION

The production of prefabricated blocks from recycled aggregates and part of other non-hazardous construction waste offers solutions on several levels:

- Blocks as a final product resulting from recycling of waste processed into secondary raw materials is a typical example of circular economy in construction, as it provides a sustainable sink of processed waste and at the same time reduces the consumption of natural resources.
- The blocks will be used to make separation walls to separate different composite mixtures. The advantage of these is that they can be used modularly, and the separation walls can be moved and adjusted according to the amounts of materials that needs to be stored at a given time. This is a big advantage for anyone who stores huge amounts of different materials, both in public and private sector.

These blocks can also be used for the construction of retaining walls, the construction of terraced surfaces and fences to prevent access of vehicles to areas intended for pedestrians, markets. Such composite blocks made from secondary raw materials are used in Europe for various purposes as elements to reduce the negative effects of high tides, as bases for urban equipment, etc.

FUTURE PLANS WITHIN THE URGE PROJECT

Nigrad is planning to prepare a Small Scale Activity (SSA) during the URGE project, showing the use of SRM in the construction sector. The idea is to produce micro-urban fixtures out of recycled aggregates (such as the aforementioned prefabricated blocks) that can be used as part of fences, for benches, for bike-stops, etc.