



**Rigid PU foam recycling
R&D project: first results**

Rigid polyurethane foam products can be found in many industries and are part of our lives. The insulation of refrigerators, the dashboard of cars, or even the thermal insulation of modern buildings: many **industries pour PU products into various applications by millions of tons every year.**

But we must also take care of the end-of-life recycling of these materials. While the recycling of soft polyurethanes and PU derivatives is practically solved, the recycling of rigid PU products is a challenging area. The recycling of closed-cell, rigid polyurethane foams is only functional within certain limits, based on our current knowledge. We carry out our research and development activities in this challenging area, thanks to the R&D grant won in 2022.

Which PU foam materials are the focus of our R&D project?

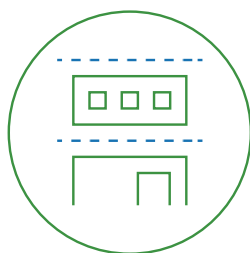
During the project, we specifically focus on the recycling of the following PU foam materials. These materials can be generated as waste and scrap even during production and construction, or at the end of their life cycle, after dismantling and disassembly. In either case, these need to be destroyed or reused.



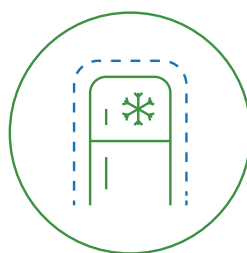
Insulating wall panels and partitions of buildings, typically sandwich panels



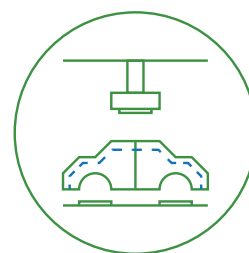
Insulating elements of refrigerating chambers, processing plants



Rigid PU foam insulation of building slabs



Insulation of refrigerators



Rigid PU foam waste from the automotive industry

Our company installed the necessary equipment for PU processing, and **we carried out successful experiments in laboratory conditions.** In April 2023, we reached the first milestone of our project, during which many encouraging results were obtained for the reconstruction of rigid polyurethane foams. Further development of the equipment specialization is currently underway.

Recycling of rigid polyurethane foam waste

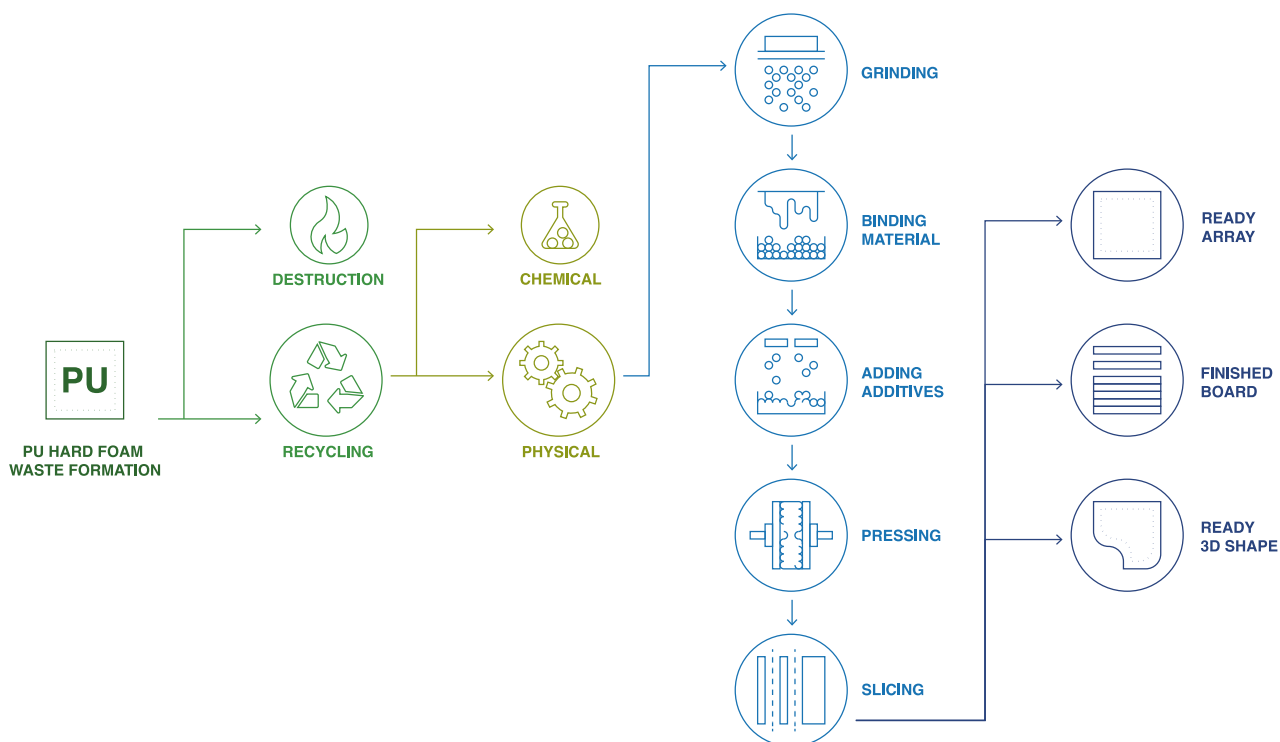
Our goal is to develop a material with new properties, during the production of which the recycled PU hard foam materials can be given new functions. Therefore, during the research & development activities, we focus on the possibility of adding other additives.

The project is technically realized by treating the ground rigid polyurethane foam with a binder and additives that enable the molecules of the ground PU foam to react and form chemical bonds with the additives. As a result of the process, we plan to introduce PU foam-based materials to the market in many industries.



We conduct experiments with several types of binders and additives

According to the current state of the project, **research has purposefully moved in the direction of plant-based additives**, and there are promising tests and preliminary results with natural mineral additives. The goal is to improve the properties of recycled, rebonded, rigid PU foam materials and to enable the base material to be re-used for many different industrial applications.



With the current method, the ground PU foam is coated with chemical binders, the adjustment of the different mixes is being tested, which is recorded in mass percentage. Experimental production runs are carried out with different quantitative settings of water and binder dosage, as a result of which the manufactured foam blocks are examined, cut, and their density is measured. In the event of a promising result, we record the production settings and continue experimenting with new parameter settings, in order to ensure that the upcycled PU foam product has the most optimal properties



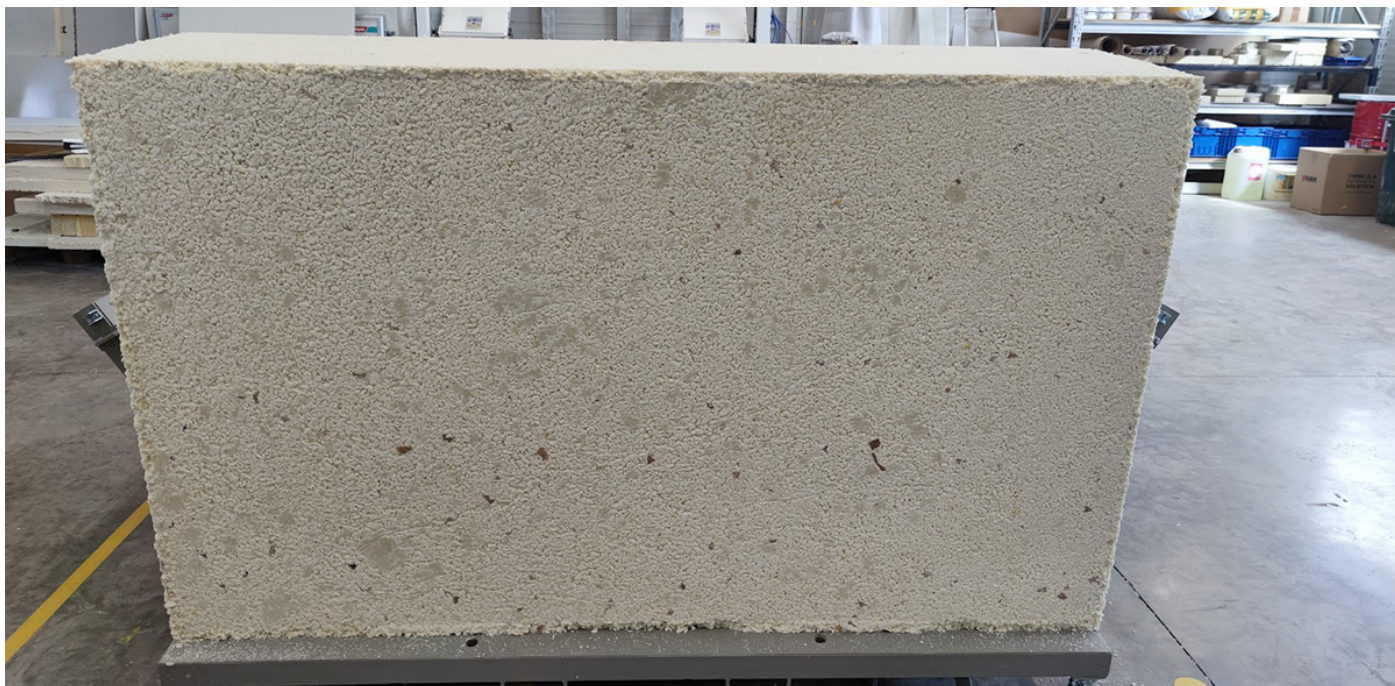
The foam block obtained as a result of trial production is subjected to several tests

Finding the right binder is the biggest challenge of the R&D project

Regarding the binder, further research processes are underway. Our product can be made even more environmentally friendly by replacing the polyol in the binders with a vegetable oil-based one. We would like to investigate the effect of different quantities and qualities of binders derived from petroleum and vegetable oil on the mechanical and thermomechanical properties and thermal conductivity of the foam material, as well as the pressures used during the production of the reconstructed foam.

The innovation of the project is to be found in the fact that we want to recycle rigid PU foam using a production process that is currently not available in the industry.

Not only will the properties of the final products to be developed differ from those produced by the currently used methods, but we also want to add additives to them that, based on currently available information, other developers have not yet experimented with. Various combinations of the additives to be added are conceivable during the development, as well as supplying the materials to be produced with the researched production process with different coatings - that is also a direction of the development activity.



The goal of the R&D project is to obtain materials that can be used in industrial applications

Uncertainty lies in the fact that, as far as we know, a significant percentage of the additives to be used in our experiments have not yet been used in R&D projects aimed at the reuse of rigid PU foams, so there is no knowledge available from which good manufacturing practice, factors of material composition and production methodology, or the desired results could be obtained.

In the course of the project, we are experimenting with novel solutions, additives and binders that have not been used so far. Based on the results of the experiments, we continue to develop our production equipment. During the project, many scientific and technical uncertainties arise, the effort to eliminate which is one of the main goals of our activity.

We welcome external developers, researchers and specialists to join the project.

Read more about our project [on our website!](#)

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