Designing out Waste

Exploring applications of industrial waste by Martin Sombathy

Doctoral research:	Age- and environmentally friendly design
Realization:	2022 — ongoing
Researcher:	MID Martin Sombathy
Research supervisor:	Prof. Veronika Kotradyová, PhD.
Text:	Michala Lipková

Manual heat bending of SymaLITE® boards

Research by Martin Sombathy focuses on integrating industrial waste from specific local companies within serial production design. The project aims to impact the environment realistically rather than produce art design solitaires. The project explores the possibility of applying the principles of circular economy in local production, using the tools of product life cycle assessment to compare hypothetical design concepts and the existing product portfolio of local producers.

The first step in applying industrial waste in interior design is a case study of a modular display system used in the first DESIGN × SCIENCE exhibition project at Prague's Designblok '23. The system uses heat-bent spare SymaLITE® boards donated by local automotive suppliers as the main display surface, combined with custom 3D-printed PLA components and standard bolts and nuts inspired by joints used in construction scaffolding. Each part of the exhibition system is replaceable and fully demountable, allowing for future adaptation, reuse, or recycling.

In his recent research progress report, Sombathy outlines the current waste policy situation in Slovakia:

“Several laws and decrees legislatively support the Slovak Republic's waste management. Definitions of waste, its types, and disposal methods are dealt with by Act no. 79/2015 Coll. on waste and amendments to certain laws (White Book, p. 6). According to this law, waste is “a movable thing or a substance that its holder gets rid of, wants to get rid of or is obliged to get rid of in accordance with this law or special regulations” (§2, paragraph 1) and waste management is defined as “a set of activities aimed at preventing and limiting the generation of waste and reducing its danger to the environment and managing waste in accordance with this law” (§3, paragraph 1).” (Sombathy, 2024)

The most recent legal activities in Slovakia consider the obligation to ensure the sorted collection of textiles - a new category of sorted waste collection, which will bring new challenges and responsibilities for municipalities, as well as local manufacturers (Potočár, 2022). Only two companies are currently operating in the Slovak market in terms of recycling textile waste. One is the company SK-TEX, which was successfully approached as one of the partners in Sombathy's research project.

Sombathy considers the dissertation research to be the starting point of a long-term R&D project that combines elements of education with new approaches to designing and manufacturing products.

As Sombathy states in his progress report, the theoretical part and primary research carried out within the dissertation project are divided into two streams with related research questions:

- **Researching the influence of the input material choice on the product's environmental friendliness.**
  RESEARCH QUESTION #1: To what extent can a designer influence the effect of a product on the environment through creative selection and work with materials?
  RESEARCH QUESTION #2: To what extent can the choice of materials used in the product design process reduce its burden on the environment?
- **Surveying the level of knowledge about the environmental impact of products among design students and professionals involved in product development and production.**
  RESEARCH QUESTION #3: How knowledgeable are design students and design professionals about the impact of the products they design on the environment?

Sombathy defined the first steps and conditions of the practice-based research as follows:

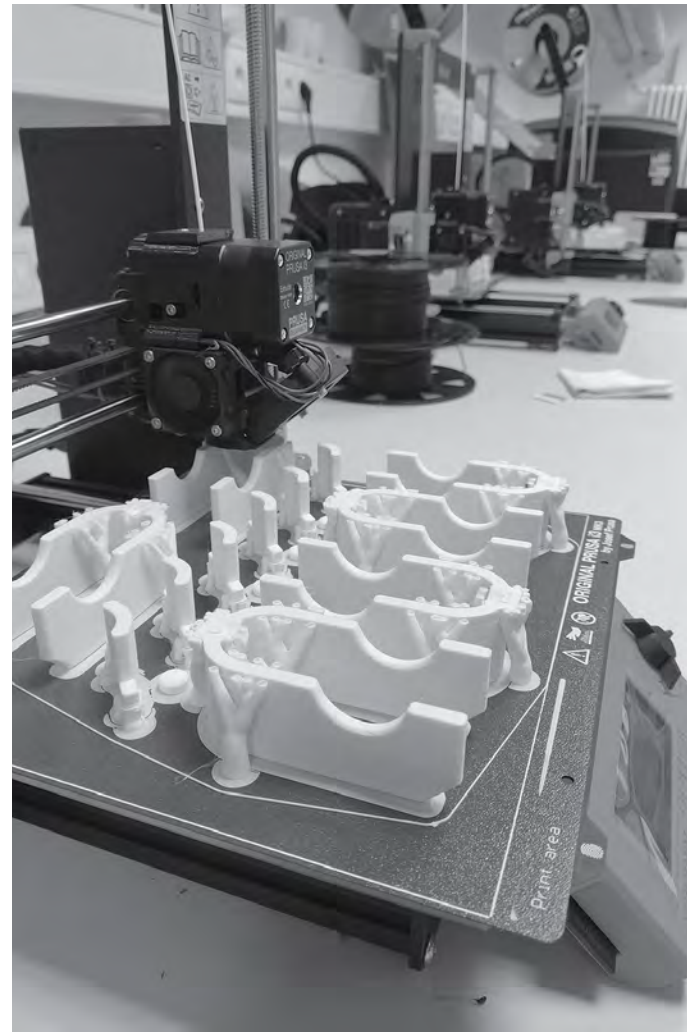
- **Establishing contacts with industrial producers in Slovakia,** looking for companies that generate large quantities of waste when creating their products. Focusing on materials that are no longer suitable for internal processing or recycling but still usable in another production method.
- **Obtaining samples of waste materials,** looking for possibilities of their use in a design case study, focused on testing different material processing possibilities and potential combinations with different materials.
- **Creating the first proposals for a specific use** involves designing a product made from waste material, prototyped in real size, and then subjecting it to a comparative LCA study.

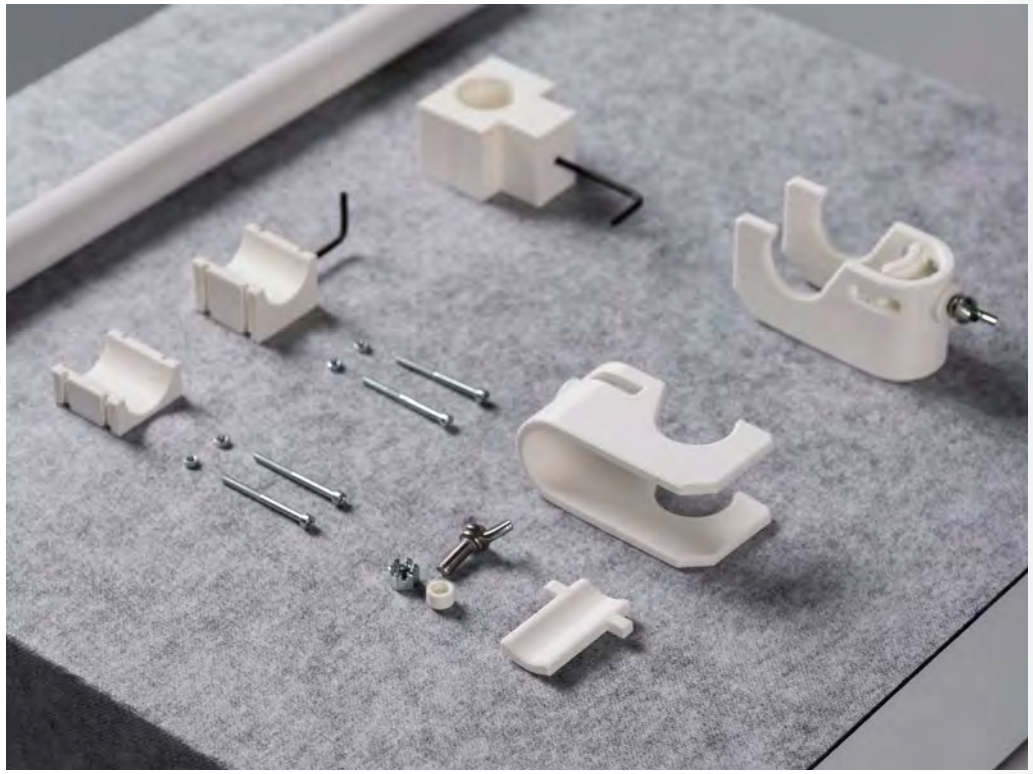
The starting point for designing is the existing material - industrial waste. In this project phase, two companies have already agreed to participate in the research: the previously mentioned company SK-TEX s.r.o. from Senica and Mitsubishi Chemical Advanced Materials Composites s.r.o. from Nitra. SK-TEX s.r.o. is a company systematically focused on processing textile waste and producing isolation materials formed by a mixture of textile fibers, which has been their main activity since 1998. On the other hand, Mitsubishi Chemical Advanced Materials Composites s.r.o. produces a specific material, SymaLITE®, used mainly in the automotive industry.

Most of the experimentation to date has been carried out with the SymaLITE® material, partly because the larger volume of its samples was obtained first. The first step in the process of applying industrial waste in interior design is a case study of a modular display system used in the first DESIGN × SCIENCE exhibition project at Prague’s Designblok ‘23 - the intention of the authors (Martin Som-

Top: 3D printing of joining components in STU Scientic Park at FAD STU

Bottom: Laser cutting of SymaLITE® boards
Next page: Details of modular display system DIY Scaffolding





“SymaLITE® is essentially designed as a material for circular production - scraps from the production of the material, as well as scraps from its processors, can be reused in the production of new plates, creating potential for the hypothetical 100% recyclability of the material.”

abathy and František Dorko) was to carry out a design exercise aimed at creating a functional prototype, with the priority of minimizing its impact on the environment.

Mitsubishi describes the material on its website as “low-weight reinforced thermoplastic (LWRT),” i.e., lightweight reinforced thermoplastic (Mitsubishi, 2023). The material is composed of a mixture of plastic and glass fibers that can be made into textiles or solid plates of different thicknesses or with different surface treatments. The properties of SymaLITE® include sound absorption, impact and weather resistance, oleo and hydrophobicity, and the ability to create spatially shaped components using low-pressure molding.

The production line located in Nitra produces SymaLITE® in the form of 3 mm thick plates. The main part of the plate consists of a mixture of 50% glass and 50% polypropylene fibers, on which either non-woven fabric or foil is laminated on the top and bottom sides, according to the specifications of the order from the customer. This iteration of the material was donated to the purpose of the proposed research.

SymaLITE® is essentially designed as a material for circular production - scraps from the production of the material and its processors can be reused in the production of new plates, creating the potential for the hypothetical 100% recyclability of the material. As Sombathy claims in his report, “during production from time to time a situation arises when plates leave the line that do not meet the strict tolerances required by the industry. In such a case, the plates can be ground up and used again, but from an environmental point of view it is definitely more appropriate to find a use for them.” (Sombathy, 2024)

Since SymaLITE® contains 50% glass fibers, from the point of view of the safety of the technologies available at STU's Science Park, laser cutting was the most suitable choice for dividing the material. At the same time, laser cutting technology enables the shape variability of the manufactured parts, and, above all, it is possible to modify the parts during their development quickly. At the same time, the design uses exclusively mechanical joining of material and shaped joints without additional materials.

Sombathy describes their formal inspiration and final design solution for the modular exhibition design system as follows:

“DESIGN x SCIENCE is presenting projects that are building blocks of solutions to com-

plex social problems. We, therefore, decided to display the objects on modular platforms inspired by construction scaffolding. The main structural element of the exhibition system is commonly available wooden (beech) rods with a diameter of 25 mm painted with a white water-soluble glaze. The rods are connected by a clamp custom-made on a 3d printer (FDM technology) from industrially compostable white PLA plastic. Tightening and loosening of the clamp are ensured by the wing screw and nut (M6). Individual projects are displayed on the shelves made from waste SymaLITE® donated by Mitsubishi. None of the design elements were glued. The entire exhibition system can be disassembled into individual material sources, and each part can be easily replaced in case of damage. Easy folding and disassembling of modular elements also save space when transporting the exhibition."

The next planned step in the dissertation is to continue experimentation with the materials obtained in cooperation with local furniture manufacturers. The cooperation's goal should be to find a suitable application for the mentioned materials and to compare the environmental impact of a product made from primary raw materials with a waste-using product.

MID Martin Sombathy
martin.sombathy@stuba.sk
www.martinsombathy.com

After obtaining a Master of Industrial Design at Pratt Institute in New York, Martin has led the design team of NYC's Joya Studio, an internationally acclaimed producer of scented objects. He has experience with graphic, packaging, and product design projects in various roles, from product manufacturing to art and design direction.

Modular display system
DIY Scaffolding

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