



Prototyping your insights

Developing a prototype of a circular product can provide a range of insights. That's one of the conclusions from the project where Electrolux and Stena Recycling jointly developed a 100 % recycled and reused vacuum cleaner. Among other things, we found that the components from discarded vacuum cleaners still have much of their service life left in them.



Our vision in the project was to create a circular vacuum cleaner. A vacuum cleaner that is recyclable and made from only recycled material and reused components. In other parts of this story, we have shown how the project started, how our experts outlined the project, how recycling and reusing worked, and finally how another company could manufacture the new plastic components. This brings us all the way to the finished prototype series, fully functioning vacuum cleaners, that we introduced at the Circular Initiative forum last fall. Prototypes that have already got international acclaim.

In the Electrolux/Stena Recycling cooperation we specifically had four main viewpoints:

- recycled material
- recyclability
- reuse of components
- in-depth learnings and insights.



COLLABORATION CREATES KNOWLEDGE

There are a number of conditions that contribute to a successful circular collaboration. In this project, our companies benefited from cooperating between manufacturers, recyclers, and component manufacturers — all with know-how concerning different aspects of a product's life. Electrolux has control over the beginning of the product, its development and manufacture. Stena Recycling knows how end-of-life products can be taken care of for recycling and reuse. The company produces high-quality circular raw materials and understands how products can be designed from the start so that they can be recyclable in the future. Through the collaboration with PE Plast, we gained the technical expertise and production environment to manufacture new product parts from 100% recycled post-consumer electronics plastics.

NECESSARY COMMITMENT AND TRANSPARENCY

As we started, we made sure that the company experts all had time and ability to commit to the project. The project was limited to Sweden, where all parties involved have their headquarters. This made it easier to meet, with better access to both experts and production. Despite the ongoing global pandemic, the project developed well. Normally, industrial companies have a lot of confidential information about, for example, product content. We removed these barriers within the collaboration with confidentiality agreements, and the expert group could work openly and efficiently.



DARE TO DELIMIT

In a circular transformation work, it is often necessary to delimit the collaborative projects. This is to make them both easy to overview and to conduct - especially if they are conducted in parallel with a major strategic project. Doing so, the insights in the more agile projects can contribute to how the larger circular transformation is carried out in a company.

In the collaborative project, work was concentrated on a single vacuum cleaner model. The experts chose the Electrolux Classic Silence vacuum cleaner. This is a model still manufactured and yet so old that it also ends up as a discarded product in WEEE waste electronics recycling at Stena Recycling.

Some important aspects, we felt a need to investigate in the project were:

- examination of every single part of the product
- how well different components in discarded products still functioned, determining which could be reused or not
- if the recycled raw material could meet the demanded quality for a consumer product.

RECYCLED MATERIAL AND REUSE

Stena Recycling recycles hundreds of thousands of tons of electronics every year. The large-scale production enables the work of sorting out 100 discarded vacuum cleaners of the right model from the waste flows in just a short time. After that, Electrolux started to evaluate the condition of the plastic components, the motors, the cord winders and more. This way, the lifespan of the components was examined. For example, we found out that the selected 25 motors of discarded vacuum cleaners had an average of more than 80% left of their component life.

Stena Recycling investigated how much of the old vacuum cleaner could be recycled. That knowledge is useful one of the main viewpoints of the project: recyclability. For example, the wheels of the vacuum cleaner are made of two types of plastic, which makes it difficult to recycle the product. Because of this conclusion, only one type of plastic was used for the wheels in the prototype. An insight that can be considered in the development of new products.

Plastics and component for the prototype

At Stena Recycling, there are various recycling processes for sorting and extracting plastics. PP and ABS plastics, the plastics that dominate the plastic content of the current vacuum cleaner, are extracted from the electronics recycling. In addition, some of the plastic components from discarded vacuum cleaners could be reused directly. Putting it simply, both components and recycled plastic from electronics could be used for the prototype. And the recycled plastics, both ABS and PP, was produced at Stena Recycling.

Rigorous demands on material

The material requirements for the raw material are very important for manufacturers, as the quality determines whether the raw materials are suitable for their quality products. The material must meet regulatory requirements for prohibited or regulated substances according to EU legislation. Raw material from recycled waste must meet the requirements of REACH, PoPs and ROHS legislation. The recycled materials must also meet the technical requirements of the molding, as well as the manufacturer's material specifications. Stena Recycling met all these requirements for the all the post-consumer, recycled ABS and PP plastic.

Testing reused components

How well does a motor from a discarded vacuum cleaner function? And can it be used in a new product? In the project a multitude of components were examined. The examination gave us many valuable insights:

- the selected 25 motors had an average >80 % service life left
- all fan motors tested were fully functioning
- 80% of all cord winders functioned very well
- also, some of the plastic components were in such a good condition, that they after cleaning could be reassembled in the prototypes.

COMPONENTS OF RECYCLED MATERIAL

The next step was to find out how well the recycled plastic worked as raw material in the molding of new plastic parts. For this project, the company PE Plast was chosen. A company that makes components for many different companies and has in-depth know-how of plastic and the sustainability focus needed for the project.

In a short time, PE Plast could determine that the recycled ABS and PP plastics could meet the rigorous technical requirements for use in the molding process. This is a delicate issue, as raw material with lesser quality could damage the expensive equipment, in this case unique molding tools.

The raw material quality matched the specification for virgin plastic material for the vacuum cleaner model. This comparison showed that the recycled raw material stayed within the acceptable range in terms of material mechanical properties. Therefore, within a few weeks PE Plast was able to manufacture all plastic parts for the prototype. Four of the parts produced were made of PP plastic and two made of ABS plastic. It was the first for PE Plast, to be able to manufacture components from 100% recycled material, with the quality required in the collaborative project.



FINALE PROTOTYPE TEST

How will one know if the materials and components will work in the end? This is something that is carefully measured by the manufacturer. The one important thing for the project was to ensure that the new prototype is at least as good as the standard-made vacuum cleaner model. So, among other things, Electrolux tested performance, noise level, mechanical impact, and a whole string of additional tests. All the same a new vacuum cleaner from the Electrolux factories would go through before being put on the market

The materials themselves isn't everything either. The product's properties are also affected by a well-thought-out design during when the product planning. This is when the manufacturer can work „smart from start”, ensuring that the product is long-lasting and possible to reuse, repair or recycle.

The materials were also reviewed using the Fit-Feel-Finish assessment model. The review showed that the recycled plastics had a high-quality finish. This is important as the assessment considers how consumers experience seeing, touching, and using the product.

The prototypes were developed in a relatively short time. This was possible through distinct goals and roles, as well as a clearly delimited project, using experts in design, product development and material knowledge who worked closely together.

What's your company's real potential? Feel free to contact us at Stena Recycling concerning your challenges.

