



BIOSWITCH

BIO-BASED TOYS FOR PRE-SCHOOL CHILDREN

THE GOOD PRACTICE CASE STUDY DANTOY

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Abstract

The Danish producer of toys and games, dantoy, has a clear target of constantly raising the sustainability levels of its products. As part of that journey dantoy has launched a new series of bio-based plastic toys for pre-school children made of sugar cane grown under environmentally friendly conditions and transported in a sustainable way. Not only the biobased product itself but also the packaging it comes in is based on renewable sources. The market uptake of the "I'm Green"-line has exceeded dantoy's expectations and therefore the company plans to increase its share of bio-based products. The biggest challenge right now is to secure enough amounts of bio-based plastic granulates for this expansion. The dantoy case is demonstrating a successful shift from use of fossil resources to renewable and bio-based resources.



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Company background

Dantoy is a Danish company with approximately 50 employees specialized in production of games and toys for indoor and outdoor use. The company has more than 50 years' experience in designing and manufacturing quality products for use in private homes, nurseries and educational institutions. All products of dantoy can be easily cleaned with a disinfectant solution, washed by hand with water and soap or put in a dishwashing machine. The toys can also be used with food as all roleplay products are approved for contact with food and microwave safe.¹



Unlike many other companies in the toy industry dantoy maintains its production in Europe instead of outsourcing to other continents. Its products are sold in more than 50 countries around the world and 75-80% of its revenues relates to export sales.²

A front-runner in sustainable toys

For dantoy it is very important to deliver high quality and long-lasting toys, which are produced with minimized negative impact on environment and climate. Dantoy is certified according to the environmental standard ISO 14001 and more than 90% of its products qualifies for the Nordic Swan eco-label. Dantoy works systematically to implement the United Nations sustainability development goals in the company.

Dantoy aims to reduce its impact on climate. Different initiatives have been implemented so that today the production process in the factory is CO₂-neutral. However, the feedstock used for production of plastic toys is contributing to CO₂-emissions since it is mainly based on fossil resources.

¹<https://dantoy.dk/en/>

²<https://plast.dk/2018/03/dantoy-investerer-i-udvikling-af-produkter-i-bio-plast/>

The dantoy bioplastic line

In 2016 dantoy initiated development of a new series of toys for pre-school children made of bio-based plastic. This decision was a natural next step in the journey towards even higher standards when it comes to sustainable products from dantoy.

Two years later, in spring 2018, the first bio-based products were ready for the shops and the sale began. Key elements of toys in dantoy's "I'm green"-line are:

- Minimum 90% biobased material (sugar cane)
- The sugar cane is cultivated in controlled, pesticide-free plantations in Brazil
- Same product durability
- 100% recyclable (single-material)
- Recycled cardboard with almost no plastic is used for packaging
- The bio-based plastic line qualifies for the Nordic Swan eco-label

The products in the "I'm green"-line are characterised by a lower climate impact than traditionally used plastic based on fossil resources. For each kg manufactured bio-based plastic, 3.09 kg of CO₂ are removed from the atmosphere.³

"Green Bean" is another product line recently introduced by dantoy. All products from the Green Bean series are made from dantoy's own surplus waste materials. This recycling process creates shades of colour in the toys and no two pieces are the same.

³https://dantoy.dk/wp-content/uploads/2019/01/BIONewspaper_EN-1.pdf



Figure 1. Examples of products from dantoy's "I'm green" -line.

Bio-based packaging based on recycled resources

During the development of the "I'm green"-line dantoy also looked at the packaging used for the new products. To improve sustainability in all aspects of its "I'm green"-line dantoy decided to use 100% recycled carton and no plastic netting or plastic film.



Figure 2. Packaging used for the "I'm green" -line based on 100% recycled carton.

Experiences from the "I'm green"-line

The products in the new "I'm green"-line have been received very well by the customers and the sales have exceeded the expectations dantoy had before launching the bio-line.

The "I'm green"-line has also been acknowledged by the international toy industry. In 2020 dantoy received a silver medal in the sustainability category of the Play for Change Awards, which is organised by The Toys Industries of Europe.⁴

⁴<https://playforchangeawards.eu/winners/>



BioToys

dantoy a/s

BioToys is a line of toys for pre-school children made of bioplastic (at least 90% sugarcane). Their bioplastic is not only as durable as traditional plastic, but it can also be recycled at the end of its life

cycle. Furthermore, the toy sets come in boxes made of recycled cardboard with almost no plastic is used for packaging.

The jury welcomed not just the switchover to more sustainable raw materials but also the way this had been executed: they have worked with Nordic Swan for a full life cycle assessment so its impact on the environment throughout its whole life cycle has been studied. They have made sure that the sugarcane used comes from a sustainable source and has been transported in the most sustainable way. Also, the packaging reflects the philosophy behind this product with no plastic netting, no plastic film and 100% recycled carton. We were happy to see such an inspirational initiative from what is a relatively small company that manufactures locally.



Figure 3. Justification for the silver price to dantoy in the Play for Change Awards 2020.

Challenges shifting to bio-based

One of the challenges of shifting to bio-based plastic granulates is that the price is substantially higher than the traditionally used plastic granulates.

What is more critical, however, is uncertainty about the supply of bio-based plastic granulates. For dantoy it is essential to have a stable supply of its raw materials in right amounts and satisfactory quality. As one of the first movers dantoy has faced challenges getting access to enough amounts because the bio-based plastic production capacity is too low to satisfy the increasing demand. A possible consequence of this bottleneck situation is that dantoy can be forced to postpone the expansion of biobased products in its portfolio.

Ideally, the "I'm green"-line was 100% bio-based and dantoy is very close to this target. However, it is a challenge to find bio-based components to be used for the right colours and this explains why a small percentage of the material in the toys are based on fossil resources.



Figure 4. The dantoy bio life cycle.

Lessons learned and take-home messages

The plastic used for the “I’m green”-line is polyethylene (PE). It was crucial for dantoy to identify bio-based plastic granulates with the same functional properties and chemical composition⁵ as the plastic granulates used for dantoy’s other products. That would allow the bio-based plastic granulates to be used in the existing production line in the factory. If new machines should have been bought to establish a new biobased production line parallel to the existing fossil resource-based production line it would have been too costly to launch the new series of bio-based toys.



Next steps

Dantoy would like to increase the share of its products made of bio-based plastic over the coming years. How fast this transition can be, depends on how the supply of bio-based plastic granulates will develop. According to the CEO of dantoy it is not unrealistic that by 2030 all dantoy products are based on bio-plastic.

Even though dantoy is happy with the plastic granulates made out of sugar cane it might be interesting to find a feedstock which can be produced more locally. That could for instance be wheat straw processed in a biorefinery to produce sugars for plastic.

Quotations

Marck Matthiasen, CEO of dantoy:

“We cannot compromise quality. It is crucial that the bio-based products will have at least the same strength and durability as fossil-based plastic products. Otherwise, we undermine the dantoy-brand.”

⁵Bio-based drop-in chemicals are bio-based versions of existing petrochemicals which have established markets. They are chemically identical to existing fossil-based chemicals. The term drop-in is usually used in relation to commodity chemicals and polymers with large production volumes.