

Cradle-to-Cradle principles change how products are designed

Industry from the very beginning has treated natural resources as essentially infinite, and the world's capacity to accommodate waste with the same regard. As the economy becomes global, we now understand this is not true – so the way we make products also should change. EPEA Switzerland has developed 'Reference Model Cradle-to-Cradle Design Innovations'. Their reference model works for every product in every industry. It can be used to create products in way which aim to close the loop on the cradle-to-grave economy – whether that's by using safe chemicals and materials, or designing products so their resources can be used across multiple lifecycles without loss of quality.



The end of the last decade was a defining moment for the sustainability movement.

We, the world's consumers, are more aware than ever of our impact on the environment, and there is increasing pressure on companies and governments to act in the interests of biodiversity and sustainability.

OUR CRADLE-TO-GRAVE ECONOMY

The problem is that, for as long as industry has operated, almost all production is conducted on a 'cradle-to-grave' process: remove resources from the ground, convert them into products, and expect that products will at the end of their life be entirely discarded – ending up in landfill, recycled or incinerated. Regulations about recycling are leading to some improvement in the way waste is managed, but products are still generally designed for their useful lifetime, not for their ability to biodegrade or to be reformed into new products. This is especially true for plastics, which are polluting for the same reason they are useful: they are resistant to degradation. For example, flexible packaging solutions are saving resources compared to other packaging, but their use of varying multi-layered materials make it impossible to recycle within a circular economy.

Consumers and the environment are crying out for better alternatives to the linear take-make-use-dispose economy, and the only valid response is for companies to seriously begin considering what happens to their products after they are used. Ideally,

once a product is discarded, all of its component materials should biodegrade or be reused to create new products.

A framework for realising this ambition is the cradle-to-cradle approach. Conceived in the 1990s by German chemist Dr Michael Braungart and American architect William McDonough, a properly functioning cradle-to-cradle design process eliminates waste by creating products with materials that are safe, and can be used again in new products. Converting from cradle-to-grave to cradle-to-cradle is a difficult but necessary paradigm shift to reach a more circular economy, requiring manufacturers to think in cycles rather than in a linear way. We have been educated and trained to think linear. All our systems are based on linear design. Just everything. Now we have to learn to think in cycles.

THE REFERENCE MODEL

EPEA Switzerland supports companies in implementing cradle-to-cradle design concepts and was founded in 2009, the founder has over 28 years of experience in cradle-to-cradle product design. EPEA Switzerland is one of 13 firms worldwide which are accredited assessment bodies for the Cradle-to-Cradle Certified™ product certification standard.

EPEA Switzerland has created the Cradle-to-Cradle Innovation Reference Model, to make it easier for industry to create products which can meet cradle-to-cradle principles. The reference model has 18 steps, many of which are self-evident, such as defining the purpose of the product. However, some

steps are less obvious because they are novelties of the EPEA Switzerland approach to cradle-to-cradle innovation.

An early stage in the reference model is identifying the type of 'metabolism'. For a material to be used cyclically, it must at some point be metabolised. Some products lend themselves to being metabolised in biological systems – for example, cosmetics and detergents, and products made from natural fibres. All of these can decompose, creating nutrients that can be used to grow plants to make new products. However, some products are not metabolised by nature – things like televisions, cars, and products made from synthetic fibres – these products are instead made from 'technical nutrients'. If these products are carefully designed, these technical nutrients can be separated and reused to make new products. This can work especially well in cases where manufacturers collect used products so that they can reuse the materials.

The Material Health Assessment approach is, by the Cradle-to-Cradle Certified™ certification standard, the classification of materials as being A, B, C or X materials. ABC-X classification is an efficient method of ensuring that all materials meet the cradle-to-cradle principles of safety and reusability >100 ppm. These scientific assessments are subcontracted to accredited Material Health Assessors of the C2CPII. By legislation industry is required to disclose toxic ingredients in products >1000 ppm in the Material Safety Data Sheet (MSDS).

EPEA Switzerland has another valuable involvement in the product development procedure: it acts in the role as a 'knowledge and innovation trustee'. In the complex networks of material production, some companies may be wary of sharing information about how their manufacturing processes work, including the materials chemicals, colours and suppliers they use. This can make it difficult to assess materials for their cradle-to-cradle credentials. EPEA Switzerland can mediate between companies, obtaining relevant information, making an assessment and then passing on the assessment outcome, without revealing trade secrets.



Cradle to Cradle® Projects Reference Model

1. Defining purpose of the product
2. Determining the **metabolism: biological or technical**
3. Definition **closing the loop scenarios**
4. Definition **areas of innovation (chances/risks)**
5. Development of **product criterias and product purposes**
6. Setting priorities of **the criterias**
7. ABC-X categorisation of **the ingredients**
8. Development of **the positive list**
9. Phase out plan X (**red**) substances
10. Implementation **product design**
11. Implementation **processes production and supply chain**
12. Strategy implementation of **closing the loop scenario**
13. Development **marketing statement** (certification yes/no)
14. Influences **consumer behaviours**
15. Financial **investments**
16. Influences **business models**
17. **Marketing focus**
18. After sales services **after the product launch**

Source: EPEA Switzerland

© 2011 EPEA Switzerland GmbH


Converting from cradle-to-grave to cradle-to-cradle is a difficult but necessary paradigm shift to reach circular economy, requiring manufacturers to think in cycles rather than in a linear way.



EPEA Switzerland's Cradle-to-Cradle Innovation Reference Model enables industry to create products which can adopt the cradle to cradle principles more easily, resulting in a possible Cradle-to-Cradle Certified™ Product Certification.

We have been educated and trained to think linear. All our systems are based on linear design.

Added to this, EPEA Switzerland are an accredited assessment body for the Cradle-to-Cradle Certified™ certification standard for products of organisations and businesses, owned by the Cradle-to-Cradle Products Innovation Institute (C2CPII), giving consumers the credibility and knowledge that companies really are acting sustainably.

INDUSTRIAL ROLE MODELS: FLEXIBLE PACKAGING

So what would it take for a company to take these principles seriously in its product development?

Since 2011, EPEA Switzerland has been working with German company Werner & Mertz GmbH, on an ambitious task to implement the cradle-to-cradle approach into their product and packaging for their cleaning detergents.

In 2014, Werner & Mertz began pitching the idea of a fully recyclable flexible plastic stand-up pouch to packaging suppliers. At that time, many companies dismissed the aspiration as unachievable – but not packaging and paper company Mondi. These two companies together with the Duale





Pouch packaging: cradle-to-cradle certified and completely recyclable.

This will add another small piece of the puzzle on how to make the right things right for 'Future viable products designed for a modern society and environment'.

System Deutschland "green dot" a recycling specialist, Joachim Christiani, co-managing director of cyclos-HTP and EPEA Switzerland, collaborated to perform a product design of the laundry packaging according to the cradle-to-cradle reference model. According to Albin Kälin, CEO of EPEA Switzerland, unlike many companies who attempt to implement the cradle-to-cradle approach, the Werner & Mertz – Mondi collaboration was one of the few collaborations to truly 'get it' when it comes to executing a cradle-to-cradle design process.

GETTING THE RIGHT THING RIGHT

Implementing the process properly required these companies to consult with a multitude of sources of expertise for each stage of product development, in order to align every aspect of the pouch's design with the way it would be processed as waste. The consortium

initiated the processing by identifying and assessing potential materials to be used in the new packaging. The search needed to be comprehensive, even down to the resins and inks. This is not an easy task, as chemicals used in current plastic production are a critical issue. Over five thousand different substances are used in the production of plastics; some of them need to be reviewed as critical. This does not include the breakdown products created when plastics are exposed to sunlight, water, or heat, and begin to degrade.

A crucial element of the project was finding materials which are not only technically recyclable, but will also actually be recycled and safe in regard to material health. Packaging constructed from multiple layers of different types of plastic are tricky to process, and may end up contaminating the waste stream, resulting in materials of a lower grade.

EPEA Switzerland's Albin Kälin explains: "It is not making a cycle from the linear line, because the dustbin still exists, it just has to be designed out, with no compromise. This means all products need a redesign 'rethinking the way we make things'."

As Albin Kälin explains: "This will add another small piece of the puzzle on how to make the right things right for 'future viable products designed for a modern society and environment'."

The end result is a pouch which can be cradle-to-cradle certified and is completely recyclable. Almost all of the packaging is undyed low-density polyethylene, LDPE. This includes the body of the pouch, the spout and the cap – all transparent plastic. The only colours are found on two panels, also made from LDPE, which attach to the front and back of the pouch without using any glues. These panels are used to advertise the product, as well as contain any additional product information required for customers. Most importantly, the pouch's panels are easy for the recycling machines to unstick, making for easy sorting that doesn't degrade the quality of the recycled plastic – creating plastics of equivalent quality to the plastic entering the recycling stream is an essential step in creating a circular economy. What's more, it only uses about 30 percent of the material needed to make a rigid plastic bottle of the same volume.

Eventually, companies in every industry will have to consider how they can create products that are sustainable in order to secure our future on this planet. Companies with this vision would do well to emulate the best practise laid out by Werner & Mertz and Mondi, who have demonstrated how, when taken seriously, the cradle-to-cradle design approach is effective at creating products which are good for people and for the planet.

⁰ Cradle-to-Cradle® is a trademark of MBDC McDonough Braungart Design Chemistry.

¹ Cradle-to-Cradle Certified™ is a certification mark exclusively licensed by the Cradle-to-Cradle Products Innovation Institute (C2CPII).



Behind the Research

Albin Kälin

E: kaelin@epeaswitzerland.com **T:** +41 76 4422668 **W:** www.epeaswitzerland.com

<https://www.linkedin.com/company/epeaswitzerland> <https://business.facebook.com/epeaswitzerland/>

<https://twitter.com/epeaswitzerland> <https://www.instagram.com/epeaswitzerland/>

https://www.youtube.com/channel/UCGkxk3OI0mQK4_1dqZ4dfyA

Research Objectives

EPEA Switzerland, accredited assessment body for the Cradle-to-Cradle Certified™ certification, acting globally with a worldwide management network, independent, neutral, knowledge, and innovation trustee with Swiss Precision. Ownership 100% Albin Kälin GmbH.

EPEA Switzerland GmbH supports companies in different areas of activities in the development and implementation of Cradle-to-Cradle® design concepts.

Personal Response

What can companies learn from the way Mondi and Werner & Mertz carried out their cradle-to-cradle design process?

“Sustainable development is not a ‘plug-and-play’ exercise. Everyone must depart from the status quo and accept that risk is a necessary condition for serious technological advancement. If you want to develop something new, you have to be willing to put in hard work, to take the hurdles of ‘restrictive thinking.’”

Immo Sander, head of packaging development for Werner & Mertz

“We worked our way through an innovation funnel – testing different materials until we arrived at a designed-for-recycling concept that convinced everyone at each point of the value chain.”

Jens Kösters, manager technical services for Mondi Consumer Flexibles

“What made this project exceptional was how all relevant parties were involved from the beginning – the brand owner, the packaging producer, the waste material collector and sorter, the recycler and the C2CC accredited assessor – all were consulted at every step of the product development process.”

Joachim Christiani, co-managing director of cyclo-HTP

“One key approach is to close the circle so that packaging can be turned back into high-performance packaging again. The C2C approach is a vital step toward saving resources and reducing unnecessary waste.”

Dr Markus Helftewes, managing director of Germany-based Der Grüne Punkt

“This project is a lighthouse for all industries for how new products can be created.”

Albin Kälin, CEO of EPEA Switzerland



References

- Kalin, A. (2016). Flexible packaging industry. *Packing Films*, 7(3), 46 – 47.
- Introducing the frog prince of packaging? (2018) *Packaging Europe*. Volume 13.6, 4-9.
- Packaging Europe (2018). ‘Reverse-Engineering’ the Recycling Process. [online] Available at: <https://packagingeurope.com/reverse-engineering-the-recycling-process-mondi>
- Grace, R. (2019). *Plastics Engineering*. New Mono-Material Flexible Pouch Follows Cradle-to-Cradle Principles. January 2019, 14-18. Available at: www.plasticsengineering.org

Detail

Albin Kälin
EPEA Switzerland GmbH
Seestrasse 119
CH-8806 Bäch, Switzerland

Bio

In 2001, Albin Kälin was awarded with the UBS Key Trophy as “Rhine Valley Entrepreneur of the Year”. Between 1981 to 2004 he was Managing Director of Rohner Textil AG in Switzerland. Under his leadership, the company won 19 international design awards. Albin Kälin stimulated the development of the product line Climatex® and thus the first Cradle-to-Cradle® products worldwide in 1993. He was CEO of EPEA Internationale Umweltforschung GmbH in Hamburg between 2005 to 2009, and additional CEO of EPEA Netherland in 2007-2009. Albin Kälin founded EPEA Switzerland GmbH, accredited assessor for the Cradle-to-Cradle Certified™ certification standard in 2009 where he is CEO.

Collaborators

- William McDonough and Michael Braungart (Founders of Cradle-to-Cradle)
- Reinhard Schneider, Werner & Mertz GmbH
- Immo Sander, Werner & Mertz GmbH
- Matthias Perrick, Mondi Group
- Jens Kösters, manager technical services for Mondi Consumer Flexibles
- Joachim Christiani, cyclo-HTP
- Markus van Halteren, DSD, der grüne Punkt
- Dr Michael Heyde, DSD, der grüne Punkt
- Albin Kälin, EPEA Switzerland