Cradle to Cradle Design

Prof. Dr. Michael Braungart

Eco-Conception Conference

September 11th 2012 - Brussels
The Trash Vortex of the north Pacific is an area the size of Central Europe.
Environmental Disasters

1940: Minamata Disease
1956: Love Canal
1976: Bhopal
1978: 1989 Exxon Valdez
1980: Melamine
1984: Fukashima, Japan
1986: Chernobyl
1990: Three Mile Island
1999: 1999 Turkey
2000: Basel
2008: Kolontár
2010: Deepwater Horizon
2011: Itai Itai Disease

EPEA
Resource Scarcity
Precious Slag from Waste Incineration

- Incineration slag contains 13,000 tons of copper (average Germany)
- It is worth $100 million per year (Price rate 2010)
Gallium
Keyelement for photoelectrical Cells, LED´s, Computers, etc.

Indium
PV-Cells, Computer, Flatscreens, Laptops, Mobiles etc.
Price/kg:
2003: $60,
2006: >$1.000
Producing Humus

• In the European regions it takes 100 to 300 years to build a 1 cm layer of Humus.
• 25 cm of Humus is needed to have soil which is fertile enough to be used for food production.
• Every year we lose 4000 – 6000 times more humus than we build up.
Copenhagen Climate Plan
The short version
Copenhagen Carbon Neutral by 2025
zero emissions?
sustainable: Companies destroy less rainforest for Palm oil Plantations.

22.11.2011 – Blick am Abend, Zürich
Minimize the ecological footprint

How do you get more out of the same resources?

DON’T BUY THIS JACKET

COMMON THREADS INITIATIVE
Together we can reduce our environmental footprint.

TAKE THE PLEDGE

Accenture helps leading companies increase performance without increasing costs. By optimising supply chains to enhance productivity. By using predictive analytics that drive growth through insights. By applying outsourcing not only as a way to save money but also as a way to make it.

Talk to us and find out all the ways our capabilities can help you make the most of yours.

• Consulting • Technology • Outsourcing
“The greenest house is that, that is never built “

— Whit Faulconer, GreenBlue
Beyond Sustainability

The 3rd Annual
GLOBAL CSR
SUMMIT & AWARDS 2011
PHILIPPINES
"BEYOND SUSTAINABILITY"
11-12 August 2011
Marriott Hotel Cebu City, Philippines
www.globalcsr2011.tpgi.org
IS YOUR OFFICE KILLING YOU?

The dangers of sick buildings

By Michelle Conlin

PAGE 114
Indoor Air Quality for our children
Off-Gassing of wallpaper
bad design: chromatogram used for a child’s toy
Effects of poor indoor air quality

- Over 40% of all children have allergies. It used to be just 2-3%.
- One in three people suffers from allergies in the Western Hemisphere

Solution:
- design materials and products for indoor use.

Quelle: National Institute of Allergy and Infectious Diseases
Asbestos-free brake pads

A Solution?

Sulphides are more carcinogen than asbestos
Production:
600 chemicals used of which 500 should never enter biological cycles.

Tyre wear particles:
The particles are very small so they do not sediment anymore.
<table>
<thead>
<tr>
<th>LID:</th>
<th>CUP:</th>
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<tbody>
<tr>
<td>Aluminum</td>
<td>Plastics</td>
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<tr>
<td>Printing inks</td>
<td>Additives</td>
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<td>Top Coat</td>
<td>Pigments</td>
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<td>Primar</td>
<td>Filler</td>
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<td>Sealing wax</td>
<td>Label</td>
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<tr>
<td>Binder</td>
<td>Printing inks</td>
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<td>Pigments</td>
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<tr>
<td>Photoinitiators</td>
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<tr>
<td>Additives</td>
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</tbody>
</table>

More than 600 different chemicals used for one noodle cup!
Pigment Green 7; CAS 1328-53-6

- Highly Halogenated
- Contains Copper
Sweetening our water?
• OHCs → non-naturally occurring compounds (flame retardants, pesticides)

• Highly volatile → enter atmosphere and persist until condensed and concentrated in cold Arctic and Antarctic environments

• Enter food-chain at low trophic level and biomagnified through subsequent trophic levels

• High accumulation in top trophic level organisms (i.e. polar bears and whales)

• Accumulate in fatty tissues and are trans-generational, from mother to offspring


Image Sources: awi.de; wikipedia.org
Effect of OHC on Wildlife

- Endocrine disruptors

**Polar Bears**
- Decrease in both ovary and genital size in polar bears
- Resulting in adverse effects on mating and reproduction in species with low reproduction rates
- Renal lesions
- Low bone density

**Whales**
- Disruptive effects on thyroids of beluga and white whales

Image Sources: destination360.com; animalkingdom.files.wordpress.com
Antimony leaches out of the bottle into the juice.
The citric acid in the juice speeds up the process.
SACHTLEBEN: Heavy-metal free PET catalysts
Consequences of low-quality structural steel

Earthquake in Turkey on 17th August 1999

Destruction in Izmit - homes that were built without earthquake-proof standards
„No goal is more crucial to healing the global environment, than stabilizing human population“

Al Gore
Not welcome on the planet?

Are we too many?

...are they too many?
Cradle to Cradle

Product Quality

Time

100%

0%

ECO-EFFECTIVENESS
Cradle to Cradle® DESIGN PROCESS

INVENTORY → ASSESSMENT → OPTIMISATION

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Clients & suppliers regard themselves as partners, aiming for the highest qualities.
Cradle to Cradle®: doing the right things!

Doing things right

Doing the right things!
effective vs. efficient
Cradle to Cradle® Design Paradigm

- Waste equals food
  (Nutrients are Nutrients!)
- Use current solar income
- Celebrate Diversity
Biological Nutrient
Offset-Printing innovated by gugler* and EPEA
Trigema Biodegradable T-shirt

Production

Growth

Compost

Disposal

Distribution & usage
Climatex® - beneficial fabrics for challenging applications:

Flame retardant, suitable for aviation needs.

Completely biodegradable, beneficial ingredients.

Improving Indoor Air Quality.

High comfort and beautiful designs.
Cradle to Cradle® Coatings

AkzoNobel
Tomorrow's Answers Today

Interpon
powder coatings
EVERY COLOR IS GREEN
Cradle to Cradle® glass printing inks

Also suitable for certain plastics

Developed in cooperation with:
Marabu GmbH & Co. KG
71730 Tamm
Solution: Algae Biopolymer

Bioplastics breakdown in salt water
Paper industry: Van Houtum Cradle to Cradle® toilet paper
Cradle to Cradle certified cosmetic products

- Biological cycle

Packaging

- Technical cycle
Technical Nutrient
MIRRA® Chair by Herman Miller

- Production
- Purchase & Use
- Take-Back
- Repolymerization
- Disassembly
Cradle to Cradle® - Office

Stoll Giroflex
G 656 Office Chairs
SILVER
Technical Cycle

Koninklijke Ahrend NV
A250 Desk Chairs
SILVER
Technical Cycle

Orangebox Ltd.
ARA Task Chair
SILVER
Technical Cycle
Herman Miller

Designed for disassembly
2008 - 2009
Start C2C
- C2C training
- Inventory and definition of materials

2010 - 2011
C2C certification

2012
>40% C2C in portfolio
- Optimising existing portfolio with C2C

2015
>60% C2C in portfolio
- New products designed to C2C-principles

2020
Humanising Spaces
Safe, healthy & productive working environments

Innovation
- Green electricity
- Heat-pumps

Innovation
- Elimination hazardous components
- Ahrend Next Life (Revitalise, Reuse & Recycle)
- Suppliers change to C2C
Powder coating, Textiles (Gabriel)
C2C Company Award

Innovation
- Database on C2C materials

Energy
- Reduction of >65% (1990)

Innovation
- High quality recycling (upcycling) methodology

Energy
- Renewable energy sources
- Reduction of >75% (1990)

Closed loops
- Materials with high quality
- Take-back system

Energy
- Aim to be positive

Continuous improvements

Step-by-step approach
Ahrend receives Cradle to Cradle® Company Charter Award in Berlin
Off-Gassing: PHILIPS Econova TV
REVALPHA:
– thermally releasable adhesive tape (90°C / 130°C / 150°C)
– Cleanly removable

http://www.nitto.com/product/datasheet/e_parts/010/
Design for Sustainability

- C2C
- Eco-efficiency
- Environmental cost accounting
- Partnerships in total chain management
- Product Stewardship / LCA
- Integrated management systems
- Management system focus
- Pollution prevention
- Compliance - proactive
- Compliance - reactive
- Waste/ costs/ non-compliance

- Unprepared ➔ Aware / reactive ➔ Proactive ➔ Mainstreaming ➔ Mature / highly integrative

Global view ➔ Outward view ➔ Inward focus

Jan Verlaan March 2008
Green Chemistry: Cradle-to-Cradle System Gains Momentum

Some chemical companies say it is more profitable and environmentally beneficial to design and produce chemicals that may be readily recovered as raw materials once a product’s useful life has ended. Such a system, dubbed cradle-to-cradle (C2C) manufacturing, is gaining traction even beyond industry as some retailers and government officials advocate C2C as the basis for the next industrial revolution.
Cradle-to-cradle at DSM

ENJOY THE CHALLENGE!

A world without waste. Closing the loops. 100%. Cradle-to-cradle is a powerful concept that is mobilizing a rapidly growing number of people. From all walks of life. Uniting people, creating new market opportunities. With this concept, Michael Braungart and William McDonough have presented a very appealing vision and challenge. Appealing, because it means we can create added value by doing business in innovative ways that benefit society and our children. A combination that is most inspiring and motivating. It fits perfectly with DSM's core business and sustainability drive. With our ambition to meet the needs of the global community. We want to be an ideal partner for customers embarking on cradle-to-cradle. It's a wonderful challenge.

Chemistry is an enabler of innovation. DSM is in the business of developing processes and materials that are at the very basis of many products that help enhance the quality of life. For more than a century we have built our expertise – and our success – on science. Understanding substances, using and manipulating their properties to develop and produce materials and ingredients that meet customers' often complex demands. Cradle-to-cradle is a new way to find solutions for existing and emerging market needs.

Perfect fit

Over the last decade, our strategy has been to focus on the combination of Materials Sciences and Life Sciences as our core competences to come up with innovative business opportunities for our customers. Practical, value adding solutions in a rapidly changing world. Re-inventing the way we make things is a logical step forward for DSM. Especially at the interface between these
Auping and Van Gansewinkel – Mattress Take Back System

Quelle: http://www.recyclingportal.eu/artikel/26930.shtml
Van Gansewinkel Office Paper is the result of collaboration between Van Gansewinkel, Océ and the German paper producer Steinbeis.

First C2C certified office paper by Van Gansewinkel
„For us Cradle to Cradle® is not an invention but a discovery of what our work really is about! It is so inspirational for our company.“

Ruud Sondag - CEO van Gansewinkel Groep

van Gansewinkel Groep – Nutrient Management Company
It’s a task we’re proud to undertake, for the betterment of our products, our brand, the people and our planet.

<table>
<thead>
<tr>
<th>Milestones</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2012</th>
<th>2015</th>
<th>2020</th>
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<tbody>
<tr>
<td>Started to define all ingredients for carpet tiles</td>
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<td>Started certification of one product</td>
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<td>Started to create take back program for European market</td>
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<td>Developed a carpet recycling concept</td>
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<td>Introduced C2C in every department at Desso</td>
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<tr>
<td>Started certification of artificial grass</td>
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<td>Established take back program in the Benelux</td>
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<td>Started optimization for all product segments</td>
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<td>Implement C2C supply chain management</td>
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<td>Continued optimizing carpet tiles</td>
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<td>Continued training of employees</td>
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<tr>
<td>Started C2C Research Center at Desso</td>
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<tr>
<td>Use 33% renewable energy</td>
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<tr>
<td>Establish take back program in UK</td>
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<tr>
<td>Start optimization for all product segments</td>
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<td>Installation of green roofs in Waalwijk, NL</td>
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<td>Use 40% post consumer material for production of carpet tiles</td>
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<td>Certification of artificial grass</td>
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<td>Start program to increase biodiversity</td>
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<td>Get silver certification for carpet tiles</td>
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<td>Achieve gold certification for selected products</td>
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<tr>
<td>Establish first recycling facility in Europe</td>
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<td>Production has a positive effect on environment</td>
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<tr>
<td>Use of 100% positively defined, renewable energy</td>
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<tr>
<td>Use 80% self generated energy at Desso</td>
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Actively contribute to the Cradle to Cradle Community in The Netherlands and Worldwide.

Development of innovative products for a healthy environment and material reutilization.
PUMA’s Says “No” to PVC

PUMA was the first sporting goods company to ban PVC from its entire product range.

WILLIAM MCDONOUGH: BUILDINGS LIKE TREES, CITIES LIKE FORESTS
Buildings like trees – cities like forests
Eco-effective architecture

- More Impact
- MORE
  - Habitat
  - Biological Diversity
  - Clean Water
  - Fresh Air
  - Beauty
  - FUN!
Bionorica: Building like a tree
Tarkett Linoleum range is awarded the Cradle to Cradle Silver Certificate

Quelle: http://c2c.mbdc.com/c2c/itemDetails.php?item=611
Quelle: http://www.ais-online.de/6/category/01/88/00/category_6.html
Green facades → air filter and habitat

Venlo City Hall
Park 20|20 in Hofddrop, Netherlands

www.park2020.com

Park 20|20 is being jointly developed by Delta Development Groep, VolkerWessels, Reggeborgh Groep
Inspiriert von Cradle to Cradle®

- Masterplan Klavertje 4, C2C® area Venlo (NL)
- Redevelopment Port Area based on C2C, Belgium
- Delft Design Bridge, up cycle material use (NL)
- Ferry terminals, Dubai Creek

Masterplan Eko Atlantic City
Lagos, Nigeria
Floriade and Greenport Venlo

Eröffnung am 4. April 2012

http://www.floriade.de/fotos/sneakpreview-luchtfotos-floriade-park
ortfolio&ctrl=image&view=large&c=-1&i=-1&ii=35
Oia Instituto Ambiental
Latin America

- Soil recovery
- Nutrient recycling
- Energy from Biomass
- Economic profitability
- Social justice

www.oiain.org.br
Phosphorus: back to the source

Can ThermPhos help to close the phosphorus cycle?
*(and take away the Dutch manure mountain?)*

State Secretary **Mr. Joop Atsma** (Ministry of Infrastructure and the Environment):

‘Ik ben er trots op dat Nederland als eerste land ter wereld de fosfaatkringloop gaat sluiten.’

“I am proud to be able to say that the Netherlands are the first country in the world to close phosphate cycles”

4th of Oktober 2011
Solar cells

Up to 40% efficiency

Silicon

Cadmium telluride
• Wind turbines do not have to be ugly (eg. vertical wind turbines)
• Direct harvesting from the sun (eg. algae, solar panels, semiconductive cement, semiconductive windows)
• Biogas production through biodigestion
• Tidal power
• Blue Energy (sweet/saltwater differential)
• Geothermal energy
The Belgian EU Presidency wants to promote the concept of 'sustainable materials management'...which covers the whole life-cycle of products in a so called Cradle to Cradle® - approach“
10 partners from 6 countries in Europe (NL, BE, UK, F, LU, GER)

Budget: 8,997,899 €
The time is now for us to go beyond simply being "less bad" and to lead the world in the invention and innovation of "more good" with Cradle to Cradle products and a prosperous Cradle to Cradle economy.

Together, we will inspire and transform the world.

Arnold Schwarzenegger
January 2010
Proclamation

WHEREAS, the City and County of San Francisco traditionally honors significant and remarkable contributions, and the dedicated work of William McDonough and Dr. Michael Braungart through their revolutionary book, Cradle to Cradle represents San Francisco values at their best; and

WHEREAS, today, William McDonough and Dr. Michael Braungart, the coauthors of Cradle to Cradle, are speaking alongside one another in California for the first time in years; and

WHEREAS, “Cradle to Cradle” has been identified as a concept and design with the potential to unlock the next Industrial Revolution; William McDonough and Dr. Michael Braungart have shown that humanity does not need to choose between a strong economy and a clean environment; and

WHEREAS, William McDonough and Dr. Michael Braungart have gifted the Cradle to Cradle product certification protocol to the San Francisco-based Cradle to Cradle Products Innovation Institute, which is dedicated to a world where all products are good for both people and the environment, because they are designed and manufactured using only healthy materials and processes; and

WHEREAS, Cradle to Cradle product certification helps ensure that companies strive to eliminate all waste, pay fair wages, steward clean water and use only safe ingredients and renewable energy; and

WHEREAS, Cradle to Cradle Product Certification has already been applied to nearly 400 products, resulting in carbon reductions of over 13 million metric tons and toxic reductions of at least one million pounds to date; now

THEREFORE BE IT RESOLVED, that I, Edwin M. Lee, Mayor of the City and County of San Francisco, do hereby proclaim June 9, 2011 as...

Cradle to Cradle Day

In San Francisco!

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the City and County of San Francisco to be affixed.

Edwin M. Lee
Mayor
Taiwan...
Example of a Cradle to Cradle® Platform