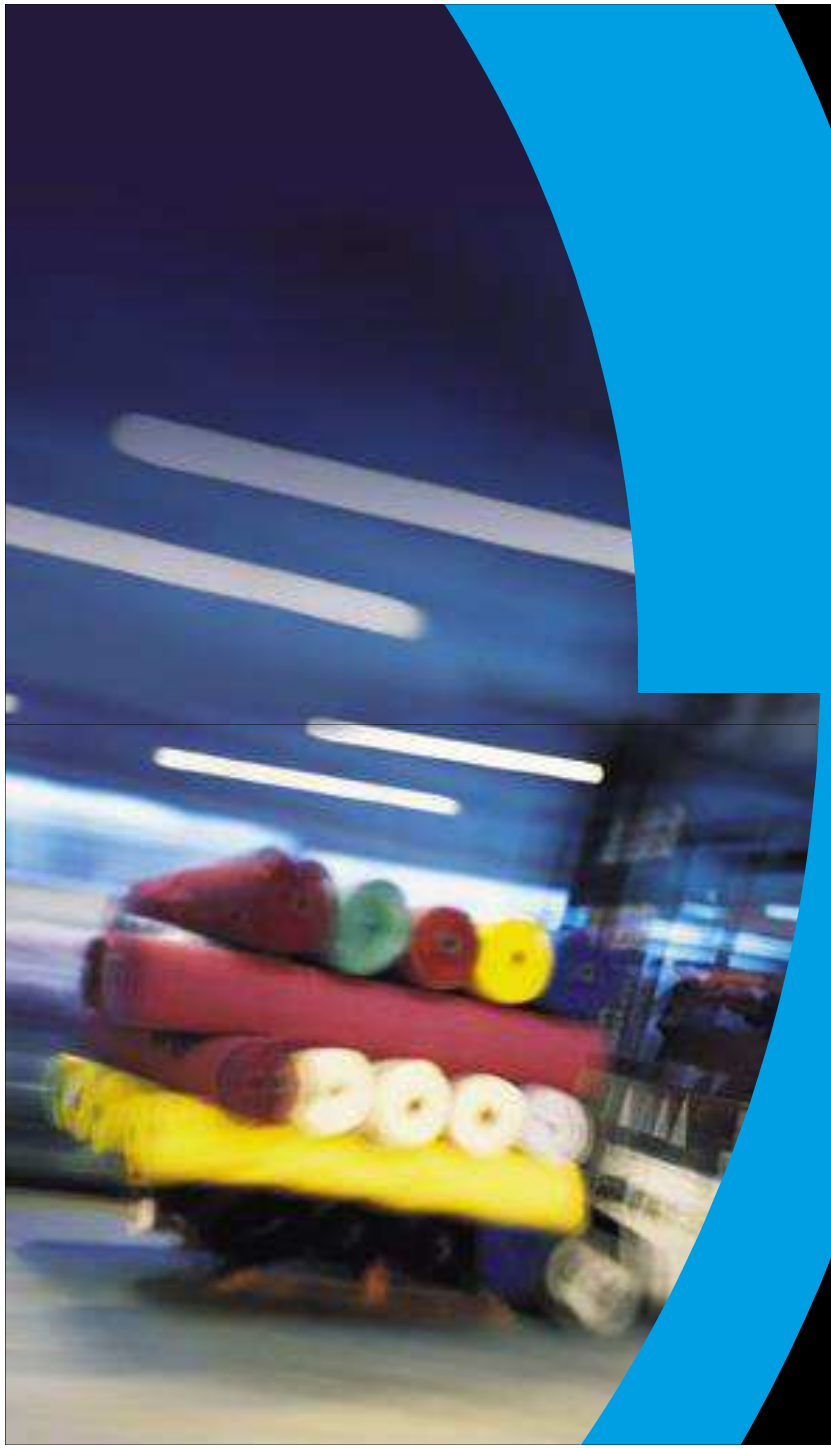


INSQIN

Taking PU Waterborne: How to address the sustainability challenges of a key material in our industry

Bayer MaterialScience

is now….

.

covestro

- Leading manufacturer of high-tech polymer materials with focus on innovating for products used in daily life

- High performance polyurethanes for coating of fabric
- Expertise in application
- Integrative approach to industry to maximize their innovative potential in functionality and sustainability

PU plays an important role in many different ways in the apparel industry

In outdoorwear materials…

400 million

outdoor jackets

…in garment printing and finishing

300 million

pairs of jeans

2 billion

t-shirts

In synthetics, PU is the most important kind of polymer with softness and durability

In fashion and sportswear

7 billion

pairs of fashion shoes

2 billion

bags

1 billion

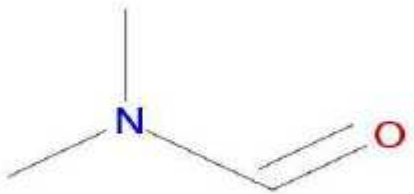
fashion garments

1 billion

pairs of sports shoes

99% of all PU synthetics factories use DMF as the process solvent

DMF is a Substance of Very High Concern



N, N – dimethylformamide, or DMFA

- Organic solvent used in wet processing “coagulation” of PU
- For manufacture of PU synthetic materials and for outdoor fabrics
- DMF classified as SVHC due to its classification as CMR – Toxic to Reproduction (Repr. 1B)

DMF is a substance of high concern due to risk assessment and in many countries national chemical legislations – recognized as problematic

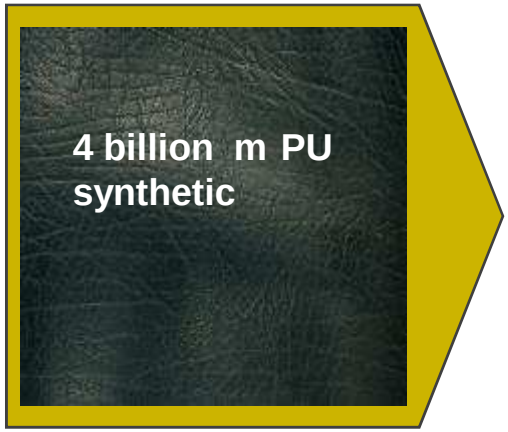
DMF is in the focus of Greenpeace and now coming into national press

“Red Card” report of May 2014

“Dirty Discounters” report of October 2014

“Poison in Boot” *Die Zeit, October 2014*

But the real problem is to be found in the use of DMF *per se*



4.4 billion litres DMF creating exposure & airborne pollution risk

12.3 billion litres DMF-contaminated wastewater creating water pollution risk

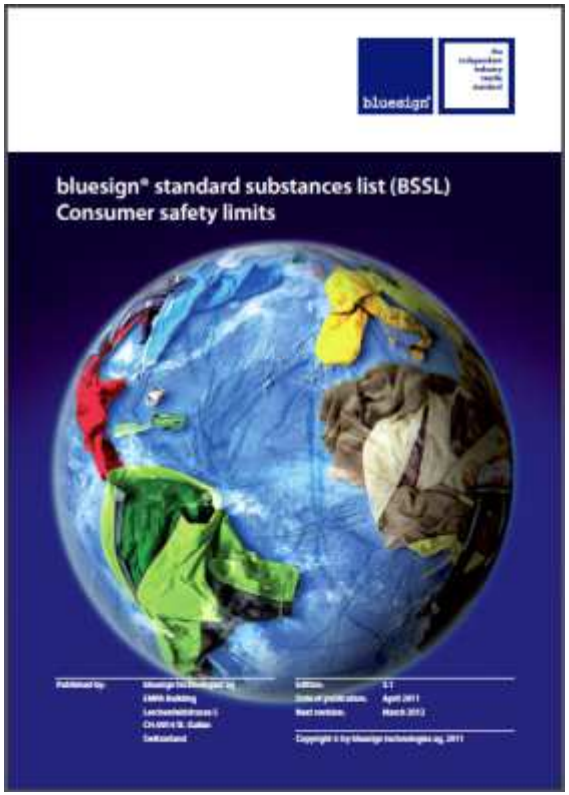
30 thousand tonnes solid waste

The objective should be to secure safe production processes and workin conditions along the value chain

Coalitions and systems that consider the holistic view will be the real driver of change

Manufacturing Restricted Substances List (MRSL) of ZDHC

Research List (June 2014) includes DMF



bluesign® standard substances list

Waterborne PU Chemistry

How Industry can Build the New Generation of Sustainable PU

Chemical industry is investing in R&D to create products to meet industry requirements

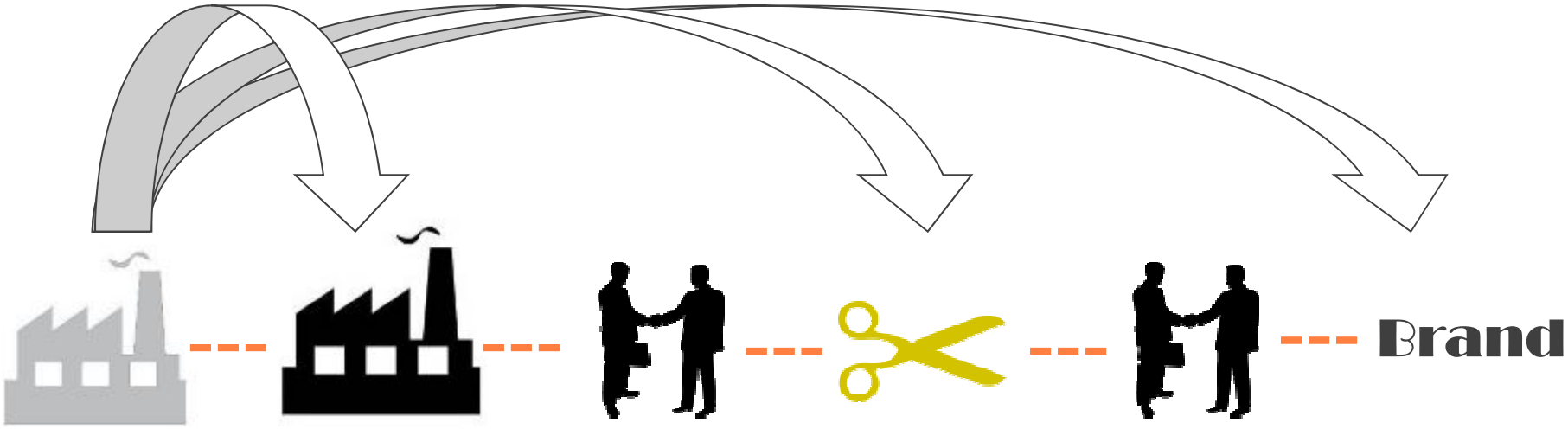
Covestro Developments with INSQIN Inspiration in every square inch

WB PU for sports footwear material with high peeling strength >3.5 kg/cm

WB PU for garment material that retains soft handle at all temperatures

WB PU for bag material that is embossable

New way of collaboration to develop & scale new materials faster



Chemicals | Coated Fabric Manufacturer | Trader | Cut and Sew | Trader | Brand Owner

- **Enabling disruptive innovation and speed**

INSQIN® Partner Manufacturer Program to break down supply chain barriers and foster best practice collaboration

- Helping brand owners find reputable manufacturers of sustainable materials
- INSQIN Partner facilities and production audited by third party testing house

Bayer and Bureau Veritas Consumer Products Services

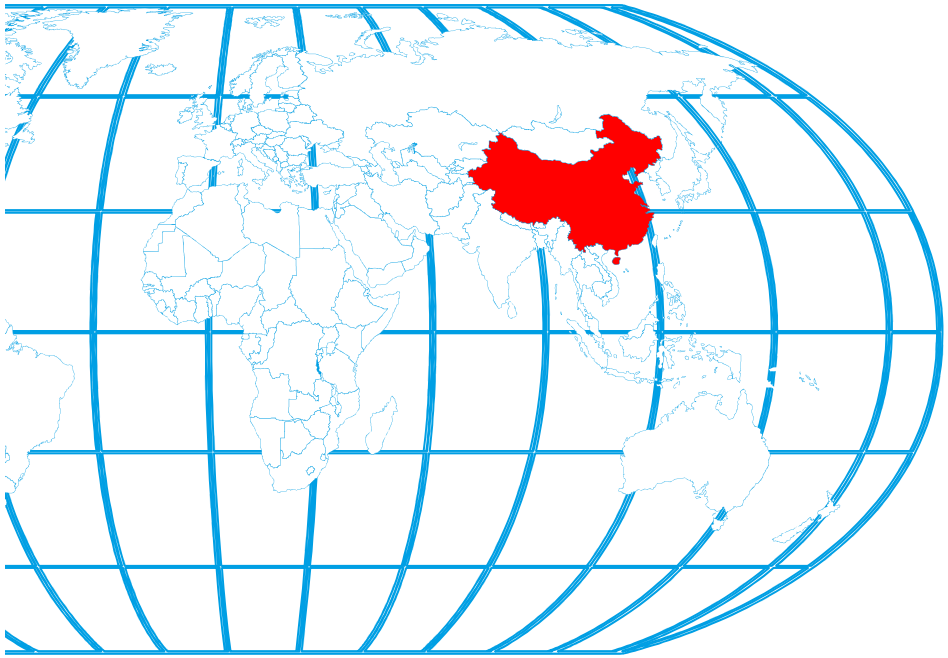
INSQIN Partner Manufacturer produces material “Made with INSQIN”

▶ Providing supply chain transparency

Players along the value chain must take the input stream approach pioneered by bluesign

Covestro is a bluesign system partner since 2014

Manufacturing industry only now starts to invest in capacity – but can move fast



- 90% of production ex China
- ca. 500 producers, 1500 lines
- Zhejiang, Fujian, Jiangsu & Guangdong main provinces
- Installed capacity 6 billion m, production 4 billion m
- Waterborne capacity currently 10-20 mio m
- More investments happening in 2015

Investment will be much faster with increasing interest

2 additional drivers to change – from the supply side

1 Chinese Government

- Environmental protection law amended in beginning of 2015.
- Measures to improve pollution and worker safety
- Stricter rules and standards, far stronger penalties for non-compliance.
- Some city governments have already announced their own programs.

2 Energy

- Energy costs expected to increase as poor quality coal is phased out and replaced by gas.

future prospects

Next generation of polymeres

Enabling tomorrow's needs and wants
Polyurethanes based on renewable resources

- **Sustainability** is a megatrend and consumers are gaining awareness on the impact of their purchase decisions on the environment.
- There is an increasing interest on buying **green** and many labels have appeared in the market in order to help consumers to take responsible decisions.
- Governmental programs are running or being developed in different regions.

Enabling tomorrow’s needs and wants

Polyurethanes based on renewable resources

Brand owners → **Consumer**

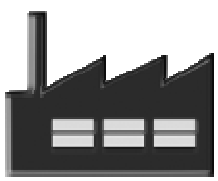
- Textile brands are aware of their corporate responsibility to fulfill this market need and are **looking for more sustainable materials** in order to decrease their impact on the planet.

Sustainable Apparel Coalition

RØADMAP TO ZERO DISCHARGE OF HAZARDOUS CHEMICALS

Enabling tomorrow's needs and wants

Polyurethanes based on renewable resources



Coated fabric manufacturers → **Brand owners** → **Consumer**

- Manufacturers are already improving sustainability by **switching from solventborne systems to waterborne PU** to meet brand owner requirements and to comply with tightening laws and regulations.

Manufacturing Restricted Substances List (MRSL) of ZDHC

bluesign® standard substances List (BSSL)

Oeko-Tex

Enabling tomorrow's needs and wants

Polyurethanes based on renewable resources

Raw material supplier → **Coated fabric manufacturers** → **Brand owners** → **Consumer**

- What if you could combine the essence of a natural product with the benefits of a synthetic high performance material?

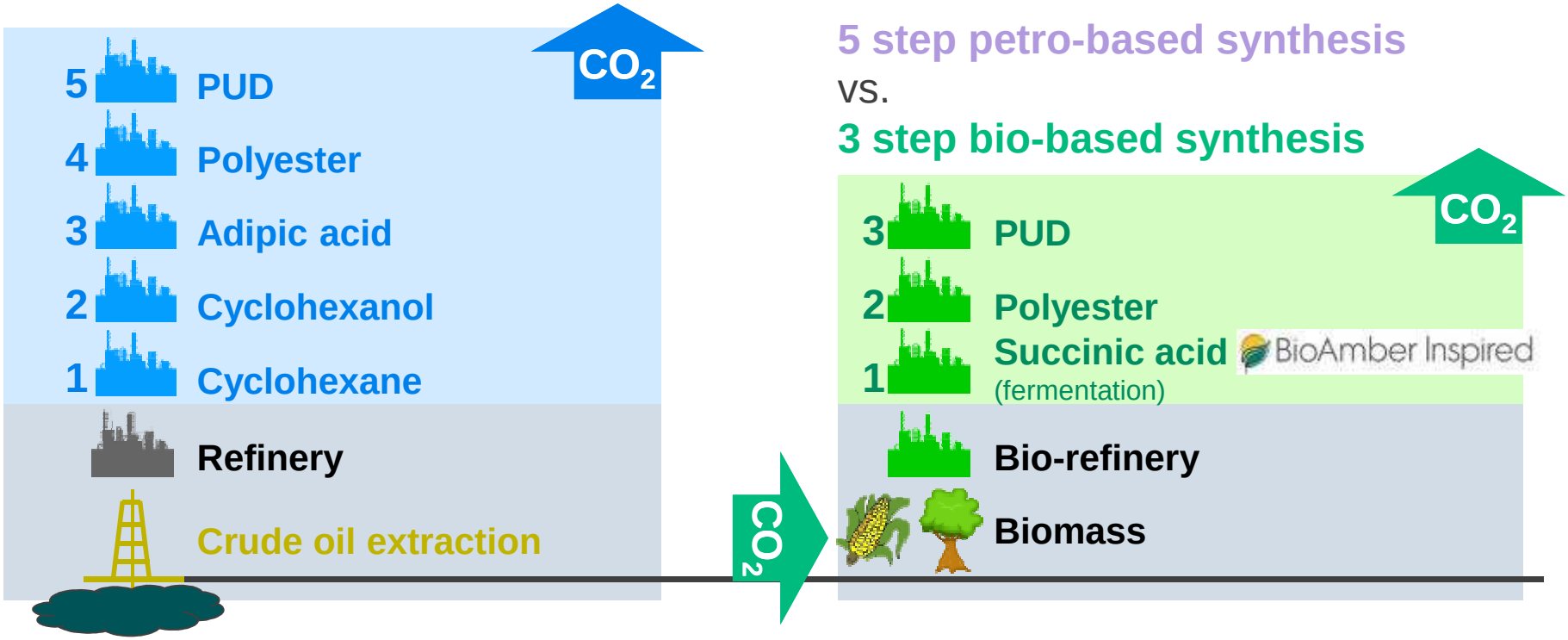
High performance enabled by nature

- **IMPRANIL® eco**, a series of bio-based polyurethane dispersions (new products from INSQIN® technology) with **up to 65% renewable content** and maintaining the **high performance**. These products bring the benefits of waterborne PU into the next sustainability level, contributing to a further reduction in CO_2 emissions.

Impranil® eco

Significantly improved carbon footprint

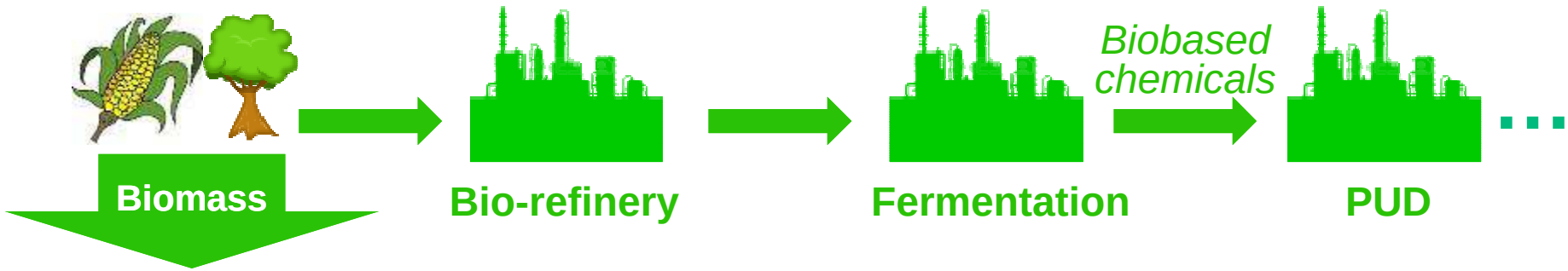
- **Bio-based** and significantly **improved carbon footprint** cradle-to-gate in comparison to standard products
(internal assessment done, external certification in process)
- **Example substitution adipic acid by bio-succinic acid**
(similar advantage for other selected bio-based raw materials)



Impranil® eco

What is the source?

Impranil® eco range is not in direct competition with the food chain



TODAY: 1st generation biomass

- State of the art processing
- Bio-based diols and diacids come currently from **field corn** starch (**non-edible variety**, used for feed and industrial applications)

FUTURE: 2nd generation biomass

- From cellulosic & waste biomass
- Diol and diacid suppliers already developing this technology
- Process will take a few more years to be delivered in sufficient commercial volumes
- This process is starting to be available in significant plant sizes for bioethanol

Recommendations for the industry to achieve phase-out

1. Chemical industry must stay the course with product innovation.
2. Brand owners make your aspirations public!
3. Don’t focus on RSL limits – it might be the opposite of sustainable.
4. Embrace multi-stakeholder developments and treat them as developments
5. Start small with commercialization – <u>but start!</u>

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Thank you for your attention

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