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LSAA 2009 Conference
"Technology and Sustainability application in Lightweight Structures"

Sustainable design and environmental impact
of recyclable membrane materials

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Outline

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- ❖1. Issues of the Current World
- ❖2. Principles for Sustainability
- ❖3. Design a Sustainable Future
- ❖4. The eco-Care project
- ❖5. Conclusions

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❖1. Issues of the Current World

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- High energy consumption
- Deforestation
- Habitat destruction
- Soil problems
- Water management problems
- Over-hunting
- Overpopulation

→ Environmental degradation due to mismanagement of natural resources.

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❖Indicatives consequences

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- Mass extinction
- Energy shortage
- Build up of toxic chemicals, pollution
- More potent destructive technologies
- Alienation and social breakdown
- Global climate change

→ the risk of a global rather than a local collapse increase.

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❖Critical points overview

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- Overpopulation
- Overconsumption
- Resources depletion
- Wastes and pollution

→ Degenerative pattern generated by egocentric living style

→ Just use it mentality and money-driving economy

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❖..for the future

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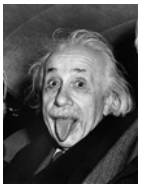
"We cannot solve problems using the same thinking that created them."
- Albert Einstein



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❖..different thinking is required

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Today's Economy vs. Tomorrow's Eco-Economy

- Competitive, hierachy
- Degenerative
- Money-based, market forces
- Favours maximum production
- Carbon, fossil fuel based energy system
- Pollutes the environment by toxic chemicals

→ Unsustainable

- Co-operative, network
- Regenerative
- Respects principles of ecology
- Favours optimum production
- Renewable energies and reduced energy systems
- Revaluate the environment by re-usable materials

→ Sustainable

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❖ 2. Principles for Sustainability

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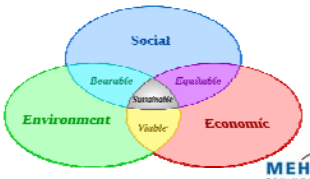
Sustainability, in a broad sense, is the capacity to endure in balance with the enviroment.

Support a Sustainable Development means:
Respecting ecological balance, avoiding depleting natural resources, replacing waste with efficient recycling and protecting the climate

Since the acceptance of the concept of **Sustainable Development** (world conferences of Rio de Janeiro 1992 and others) it is stated that **Sustainable Development** is based on three main pillars, namely **environment** ,**economy** and **society** .

Bereable, **Equitable** and **Viable** crossing aspects deliver finally full **sustainable** solutions.

The guideline argument: "*meet the needs of the present without compromising the ability of future generations to meet their own needs*".



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❖Design a Sustainable future

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Design for Sustainability means in general:

Designing products to improve the quality of life today, without compromising the quality of life of tomorrow.

In order to design sustainable products and services…..

innovation, creativity and new ideas are required by product manufacturers and designers.

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❖Design a Sustainable future

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Design for Sustainability in general aims:

"to take all global and regional socio-economic concerns into account in products and services, meeting the needs of society now and in the future, moving from a product to a service oriented system."

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Examples of different way of designing

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Product oriented design vs. Service oriented design

The nuclear energy industry takes care of energy production costs and amount of energy production.

At today there is no one 100% safer way of produce and store nuclear energy and all related wastage materials.

This is a product orientated think and cannot be considered sustainable.

Alternative fonts of energy like wind, solar and thermo-geodesic are indispensable.

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Products designing, from product to service oriented and sustainable way

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The old incandescence lamp.
Low production cost but high energy consumption.
Can be recycled

Energy saving and long life lamp. High production cost but low energy consumption.
Difficult to be recycled

Energy saving and long life LED lamp. Medium production cost and low energy consumption.
Can be recycled

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Products designing, from product to service oriented and sustainable way

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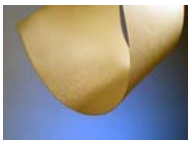
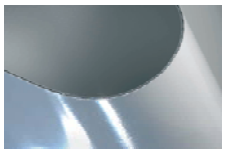
PVC coated PES.
Low production cost, low energy consumption but limitated service life.
Can be recycled



PTFE coated Fiberglass.
High production cost, high energy consumption but longer service life.
Difficult to be recycled



THV coated PES. (Vivax)
Medium production cost, low energy consumption and longer service life.
Can be recycled

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Importance of "Design for Sustainability"

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On a global scale current design and use of products are seen to hinder Sustainability as designers ironically increasing focus on disposables. Therefore:

4 R's regarding design for sustainability:

Repair → Refine → Redesign → Rethink

Repair: Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems and their right to co-exist.

Refine: Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.

Redesign: Understand the limitations of design. No human creation lasts forever and unlimited use does not solve all problems. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.

Rethink: Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate this energy efficiently and safely for responsible use.

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❖ 3. Design a Sustainable future

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Design for Light-weight materials and structures

- Focuses on optimising the type, volume and weight of materials so that less energy is used during production, transport and life cycle.
- Use products and solutions deliberately designed to generate more benefits with less efforts in order to deliver a quality and balanced result.
- Integrate materials offering combined acceptable performances instead of many single-performing materials

For example, in architecture:

- Use tension-balanced support instead of using thick-walled or weight reinforced components
- Reduce the volume in transportation: Consider foldable or stackable designs and final product assembly at the retail location or by the end-user

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Design for Light-weight materials and structures

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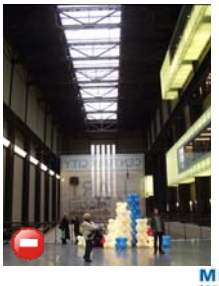
Tensile Architecture compared to classical construction materials involves use of a smaller amount of materials/mass and is mostly prefabricated executed = less execution time



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Design for Light-weight materials and structures

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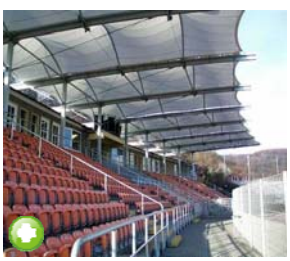
Tensile architecture compared to classical architecture solutions is recreating natural light condition generating positive, safer life ambiences



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Design for less emissions & reduction of energy consumption

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- Application of design that will lead to lower energy consumption in general
- Use products realized with low energy consumption at production and manufacture
- Use of more efficient use of consumables origin materials
- Use materials containing approved and traceable additives and chemicals
- Design to minimize the use of auxiliary materials/systems to reduce emissions during a project's life span., e.g., pneumatic support
- Minimize maintenance or service life necessary additional emission measures

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Design for less emissions & reduction of energy consumption

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Ex.1 Environment high impacting composite materials like PTFE-Glass:

PTFE cannot be processed like other thermoplastics by extrusion or injection moulding due to the high melt viscosity. It can only be formed by compression moulding and sintering at 350° – 400°C, and manufactured at similar higher temperatures.
Due to the inalterable fusion between coating and support materials, PTFE-Glass membranes cannot be easily recycled.

Ex.2 Environment high impacting systems like inflated elements:

Auxiliary pneumatical systems are necessary in case of air supported permanent tensile architecture solutions. This is generating additional emissions during a project's life span.

The energy consumption for the air aggregate for a 90tsd m³ pneumatical roof equates the yearly energy consumption of a middle standing industry. (approx. 25tsd,-€/year)

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Design for Recyclability

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Product design can make a significant contribution to recyclability.

- Use materials which can be easily and optimally recycled nearly to the dismantling place.
- Select materials that are in mutually compatible groups, e.g. for plastics – ABS, PES, PVC, ecc.
- To aid recycling, avoid materials which are difficult to be re-used as compound or be separate itself such as laminates and fiberglass reinforced.
- Choose viable, feasible and economic recycling systems, avoiding high volume packaging and reducing to minimum loadings of wastage materials.
- Avoid use of non documented, non conforming materials
- Avoid polluting elements such as stickers, bounding strips or similar that could interfere with recycling processes.

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Investing in recycling-able products

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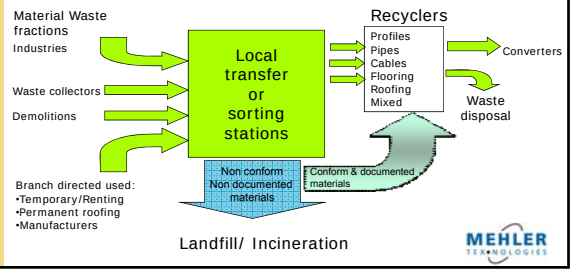
The huge potential impact of PVC products can be shown easily: With only 0.5 % of the cost of PVC-products one can compensate the entire Greenhouse Gas effect (100%!) caused by them.

Investing this small amount of money into environmental improvements allows the creation of products which are still very competitive whilst achieving a much lower environmental impact than their alternatives.



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In general

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Tensile architecture compared to classical architecture solutions shows lower environment impact: Economic, ecological and therefore socially compatible




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❖4. The Eco-Care project

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Our commitment to environmental responsibility and sustainability

The MEHLER eco-care Project

Sustainability begin with selected row materials The European REACH directive

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REACH stands for **R**egistration, **E**valuation and **A**uthorisation of **Ch**emicals. This new EU directive centralises and simplifies chemicals legislation across Europe and has been in force since 1st June 2007.

The objective of REACH is to improve knowledge of the dangers and risks that can emanate from chemicals. The companies affected by REACH are producers, importers and users of chemical substances.
The intent is transfers to the companies greater responsibility for dealing safely with their products.

We confirm that **our goods are conform to the REACH guidelines**.


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Reliable and effective partners

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We believe that the preservation of the environment is much more than "waste management" as may be the case of the sole recycling tasks.
Mehler Texnologies, as one of the large coating company in the world, producing more then 50Mil.m² fabric/years and is participating actively to sustainable activities as partner of Vinyl 2010.
This commitment covers the entire lifecycle of PVC and PVC products and represents for Mehler Texnologies a set of guidelines for acting in a sustainable manner.

VINYL 2010
PARTNER FOR SUSTAINABILITY

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The Vinyl 2010 associates main commitment

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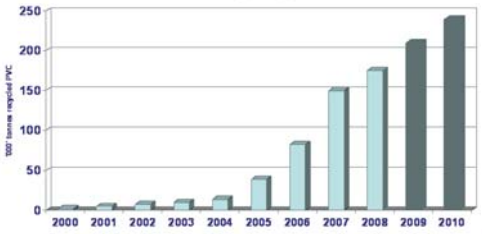
- Recycling **200.000 tons** of post consumer PVC waste by 2010 (in addition to established recycling volumes at 2000 and excluding regulated waste streams)
- Replacement lead stabilisers 100 % by 2015
- Stop using cadmium stabilisers in 2001 (REACH regulations)

Evolution of recycling Volumes



Source: Vinyl 2010 Report yearly report 08

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Overview of recycling systems results in EU

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PROJECT	Type of PVC post consumer waste	Tonnage recycled in 2007	Tonnage recycled in 2008
EPCoat (and, only for 2008, Recovinyl)	Coated fabrics	2,609*	11,323*
EPFLOOR	Flooring	2,054*	2,524*
EPPA (incl. Recovinyl)	Window profile waste & profile related waste	56,046	79,877
ESWA - ROOFCOLLECT and Recovinyl	Flexible PVC	20,454*	19,333* tonnes which consist of:
ESWA - ROOFCOLLECT	Roofing and waterproofing membranes		954
Recovinyl	Flexible PVC applications		18,379
TEPPFA (incl. Recovinyl)	Pipes & fittings	21,236	22,555
ERPA via Recovinyl (incl. CIPRA)	Rigid PVC film	2,135	4,352
Recovinyl (incl. Vinyloop Ferrara)	Cables	44,929	54,986
TOTAL		149,463	194,950

Source: Vinyl 2010 Report yearly report 09

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The EPCOAT Recycling system

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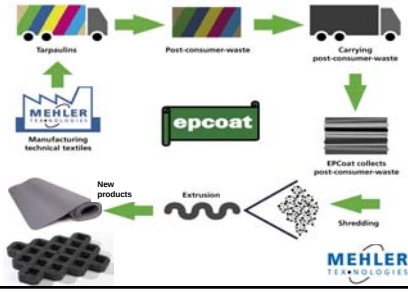
The collecting and recycling system EPCOAT (European Coated Fabrics) is an initiative of the IVK-member-manufacturers of coated textiles in Europe. Via the EPCoat collection system post-consumer waste is gathered together, mechanically processed and made by thermo-physical means into new products.



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Roofcollect® overview of recycled quantities in EU

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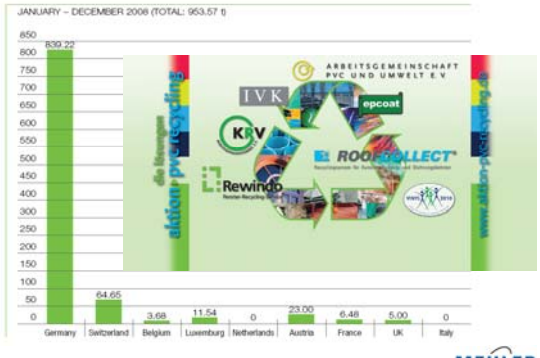
EUROPE
RECYCLING END-OF-LIFE ROOFING AND WATERPROOFING MEMBRANES IN TONNES



Source: Vinyl 2010 Report yearly report 09

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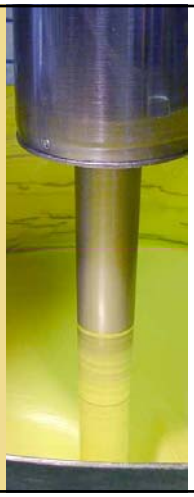

In-house recycling

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Waste created during paste production and residual paste from coating operations is processed and made into products again

→ **eco-tarpaulin**

The leftover paste is also used to coat textile remnants

→ **different applications**

Each production site recycles exclusively the residual materials generated there. Transport costs and unnecessary gas emissions are thus avoided.

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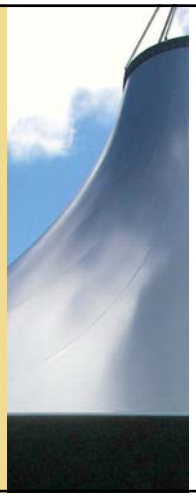

Investing in a secure future

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Mehler Texnologies has invested millions of Euros into the purification of waste gases

→ **reducing CO_2**

Circulation flows to utilise thermal energy created during the production process

→ **less gas and electricity**

All components due to the European **REACH** directive

→ **free of DOP, monomers and other components not permitted in Europe**

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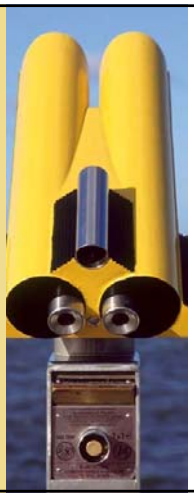

Far-sighted actions open up new horizons

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Investing in improved equipment at production facilities

→ **energy efficient manufacturing**
→ **avoiding production waste**

Keeping a very close eye on the environment and resources

→ **recycled materials for packaging**

Establishing local storage facilities

→ **no long-distance transportation**
→ **less exhaust fumes and pollution**

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❖5. Conclusions

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- Our main industry responsibility is to be good parents to our next generations. It will need support from all of us to grow and prosper.
- By designing and use products we should evaluates the environmental + ecological impact during <u>all</u> the stages of a product's life cycle
- It becomes obvious that the greatest influence on the life cycle energy usage *is at the design and at the end life stage of a product*

To continue to be an alternative, the tensile industry needs principles that:

- is grounded in sustainable development
- can incorporate hard targets and timetables
  - can provide traceable and recyclable materials
- can provide a sustainable and coherent long term solution
- include the potential for a truly global approach

Remeber....

"We cannot solve problems using the same thinking way that created them."
Albert Einstein

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Mehler Texnologies around the world

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THANKS FOR YOUR ATTENTION

TÜV CERT · ISO 9001:2000 IQC · 15 YEARS WARRANTY · MEHLER eco-care · MEHLER TEXNOLOGIES