Précontraint Composite
Sustainability
Life Cycle Analysis
Recycling

Presented by Francoise Fournier - Ferrari S.A

Why Recycle ?

- 1% of Ferrari turn over for 7 years
- 10 years of research and development
- Short term profitability is zero

Why Recycle ?

To enter the age of
Industrial ecology !!!

Industrial ecology ???

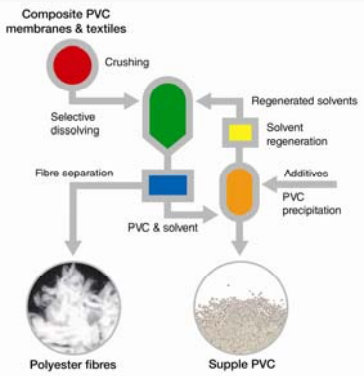
- Limited availability of raw materials
- Vinyl 2010 : In 2000, Voluntary Commitment of the general PVC industry to recycle 2 200,000 T of waste by 2010
- REACH : Registration, Evaluation, Authorization of Chemicals
- To ban harmful products .
- Increasing public awareness & demand for environmentally responsible product
- Corporate responsibility to find and implement real solutions….

Texyloop Development

1) Pilot Laboratory : 2002
2) Technological Pilot : 2003-2004
3) Fully Industrialised :
   PVC : 2005 - 2006
   Fibres + PVC : 2007

Treatment process

Selective dissolution then precipitation of PVC in a closed loop process.



Collection and Sorting

At an average of 500 gsm Ferrari have recycled approximately 4,360,000 square meters of composite material.

General industrial setup

Preparation plant (at La Tour du Pin)

- sorting
- checking
- metal part removal
- crushing
- sampling
- compacting

Industrial setup

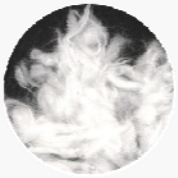
Treatment plant

- dissolving
- separation
- precipitation
- checking and packaging

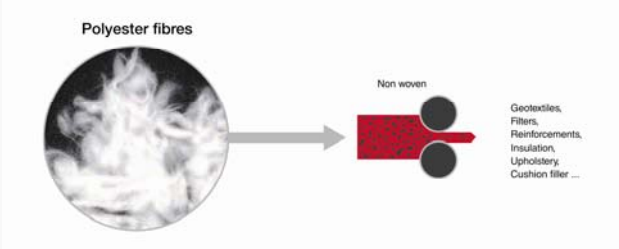
The materials produced by the Texyloop® process are:

polyester fibre and soft PVC

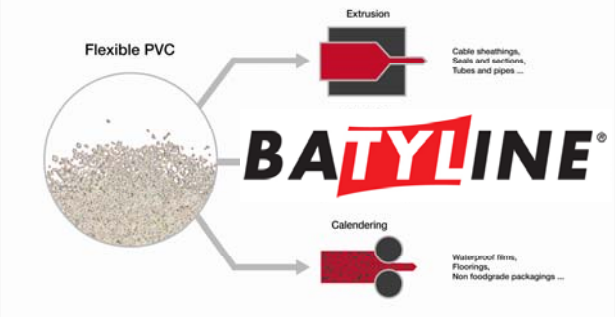
of comparable quality to the original raw materials and fully reusable in industrial processes



Applications for Recycled Polyester Fibre



Applications for Recycled PVC



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Life Cycle Assessment

LIFE CYCLE ASSESSMENT is the measurement of the environmental impacts of a product through its full life cycle, from cradle to grave.

ISO 14040-44

evea EVALUATION & ACCOMPAGNEMENT

TEXYLOOP

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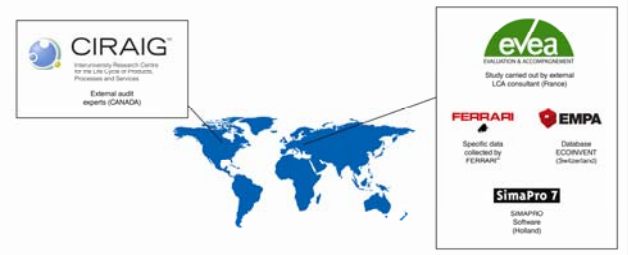
Ferrari network for LCA analysis



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LIFE CYCLE ASSESSMENT

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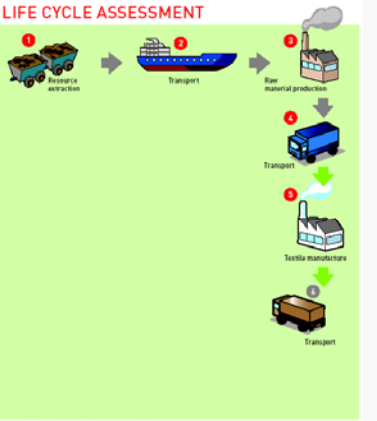
LIFE CYCLE ASSESSMENT



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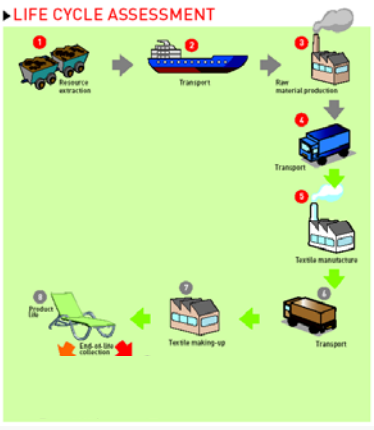
LIFE CYCLE ASSESSMENT



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LIFE CYCLE ASSESSMENT

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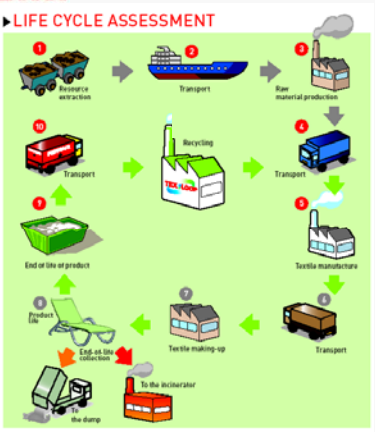

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Life Cycle Assessment

Impact category	Unit	Landfill Disposal	Incineration	Texyloop ex Australia (Boat)	Texyloop ex France by Truck 500 km
Energy Consumption	MJ-Eq	54,795257	54,803092	29,961823	28,845274
Consumption of Resources	kg Sb eq	0,01969347	0,01970745	0,01042963	0,00996065
Global Warming Gases	kg CO2 eq	2,3837158	2,5889976	1,1514945	1,0801669
Ozone depleting CFC's	kg CFC-11 eq	2,37E-07	2,37E-07	1,61E-07	1,53E-07
Human Toxins	kg 1,4-DB eq	1,5965585	1,6244988	0,442853	0,39101172
Toxicity fresh water	kg 1,4-DB eq	1,3245972	1,2367931	0,06331648	0,06141713
Toxicity Land	kg 1,4-DB eq	0,00992803	0,00958778	0,0069615	0,00677965
Photochemical oxidation	kg C2H4	0,00056176	0,00051784	0,00028252	0,0002255
Acidification	kg SO2 eq	0,00666674	0,00673857	0,00595891	0,00416474
Phosphates	kg PO4 eq	0,00262842	0,00192842	0,00058945	0,00044517
Water Consumption	litres	169,86185	170,40887	4,2429986	3,5763136
Bulk waste	kg	0,69806699	0,35037485	0,13086838	0,13131371
Hazardous waste	kg	0,00107809	0,00107863	-1,26E-05	-1,31E-05

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PVC RECYCLING

An Australian Case Study

Ian Knox- Innova International

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Case Study :- Texyloop Analysis
Canberra Olympic Pool

- Engineer : Universal Fabric Structures
- Fabric : Approx 3000 sqm Type II Non Ferrari membrane

After 20+ years the original structure had reached the end of it's working life. The ACT Government called a tender for a new structure that was won by UFS.

This resulted from their offer to recycle the structure and the subsequent replacement Ferrari membrane after it's working life.

> Dismantled, packed and shipped Sept. 2008 (Two days on-site)

> New Structure completed in December 2008

- The original membrane was returned to Europe for recycling with TEXYLOOP TECHNOLOGY using a container that could be re-exported from Ferrari.
- An LCA Analysis was performed by EVEA in France to ascertain the environmental outcome

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The Canberra Olympic Pool

Approximately 3000 sqm
Type II Tedlar coated fabric

Exterior view prior to deflation

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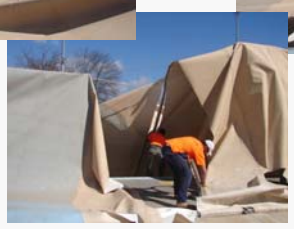
The Canberra Olympic Pool

Deflated structure



"Under the knife"

Removal of metal components

Folded sections being stacked

Folded sections being loaded into container

Site cleared and ready for refurbishment

EVEA analysis results

Impact category	Unit	Landfill Disposal	Texyloop
Energy Consumption	MJ-eq	54,795257	28,845274
Consumption of Resources	kg Sb eq	0,01969347	0,00996065
Global Warming Gases	kg CO2 eq	2,3837158	1,0801669
Ozone depleting CFC's	kg CFC eq	2,37E-07	1,53E-07
Human Toxins	kg -DB eq	1,5965585	0,39101172
Toxicity fresh water	kg -DB eq	1,3245972	0,06141713

Extract of EVEA analysis for the Australian case study

Recycling guidelines

- The Texyloop process has strict guidelines to avoid contamination at the recycling plant.
- Limited to PVC composites originating in or complying with European standards.
- Other composites that could contaminate the process can be tested if doubt exists
- Heavy soiling of textiles needs to be removed for quarantine and contaminant reasons
- Metal components and other foreign matter is not acceptable.

Benefits for Australian Industry

•Made available to participants in the lightweight structure industry as a resource for fabricators and installation specialists using PVC composite fabrics.

•The aim is to provide specifiers, architects and designers with a environmentally responsible alternative to conventional materials and construction methodologies.

•The Australian tensile industry has many structures approaching 20 plus years since installation.

•The ability to recycle membranes will provide our industry with a greater capacity to retain this replacement work.

What does it cost to recycle ?

- Early calculations indicate a cost of A$1.25 to A$1.45 per kilogram
- Based on delivery to Victorian collection depot
- Material only with heavy grime cleaned off
- Additional charges would apply to remove components / dirt etc.