genan
Knowledge-based Recycling Concepts

Your used tyres are a valuable resource that should not be dumped or burned

Besøg af Transportudvalget i Mindelheim, 22. september 2010

Program

- **15.00** **Velkomst, Genan generelt og Genans historie med asfalt (MH)**
- **15.10** **Modificering af asfalt i Tyskland (Prof. Damm)**
- **15.30** **Rundvisning på fabrikken**
- **16.15** **Pause, forfriskning**
- **16.25** **Støjreducerende gummiasfalt (Carsten Rickers)**
- **16.45** **Diskussion og spørgsmål**
- **17.00** **Life Cycle Assessment, besparelse i drivhusgasser og miljø (LR) samt diskussion**
- **17.30** **Afgang til München**

- **Indlægsholdere:**
- **Professor, dr. Ing., Klaus-Werner Damm, en af Tysklands førende eksperter i asfaltteknologi og medlem af flere udvalg under FGSV, der står for udarbejdelsen af det tyske Regelwerk**
- **Carsten Rickers, Amt für Strassen und Verkehrstechnik, Stadt Köln**
- **Michael Hvam, Global Sales Director, Genan Gruppen GmbH**
- **Lars Raahauge, Director of Business Development, Genan Business & Development A/S**

“True recycling requires processing at a level where the output substitutes virgin materials.

Consequently this leads to avoided production and a profound saving of resources.”

Verdens største recycler af brugte dæk

35,000 tons fabrik
Viborg, Danmark, I drift siden 1990
Kapaciteten fordobles til 70,000 tons i 2011

65,000 tons fabrik
Oranienburg, Berlin, Tyskland, i drift siden 2003

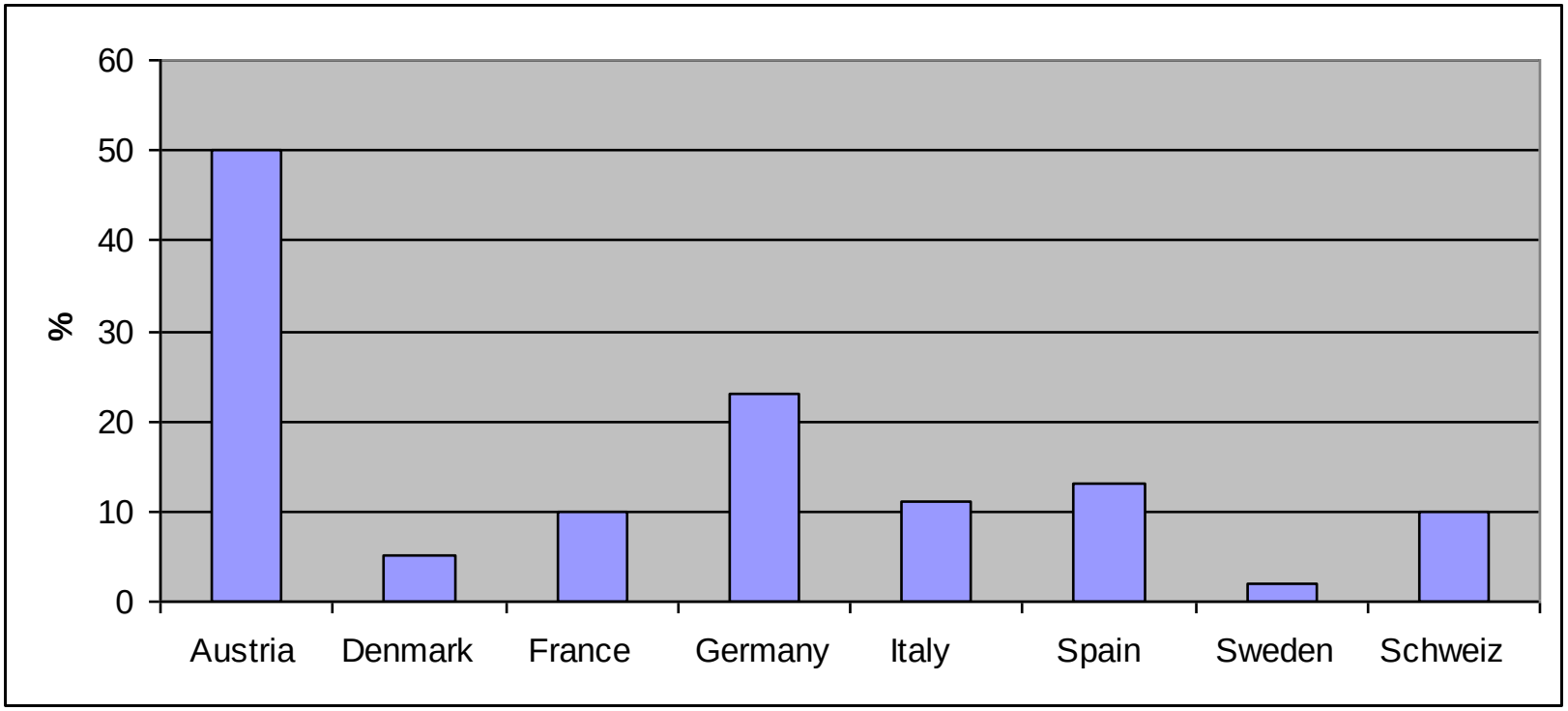
70,000 tons fabrik
Dorsten, NRW, Tyskland, i drift siden 2008

70,000 tons fabrik
Mindelheim, Bayern, Tyskland, 2010

100,000 tons fabrik
Første amerikanske fabrik åbnes i Houston, Texas i 2011

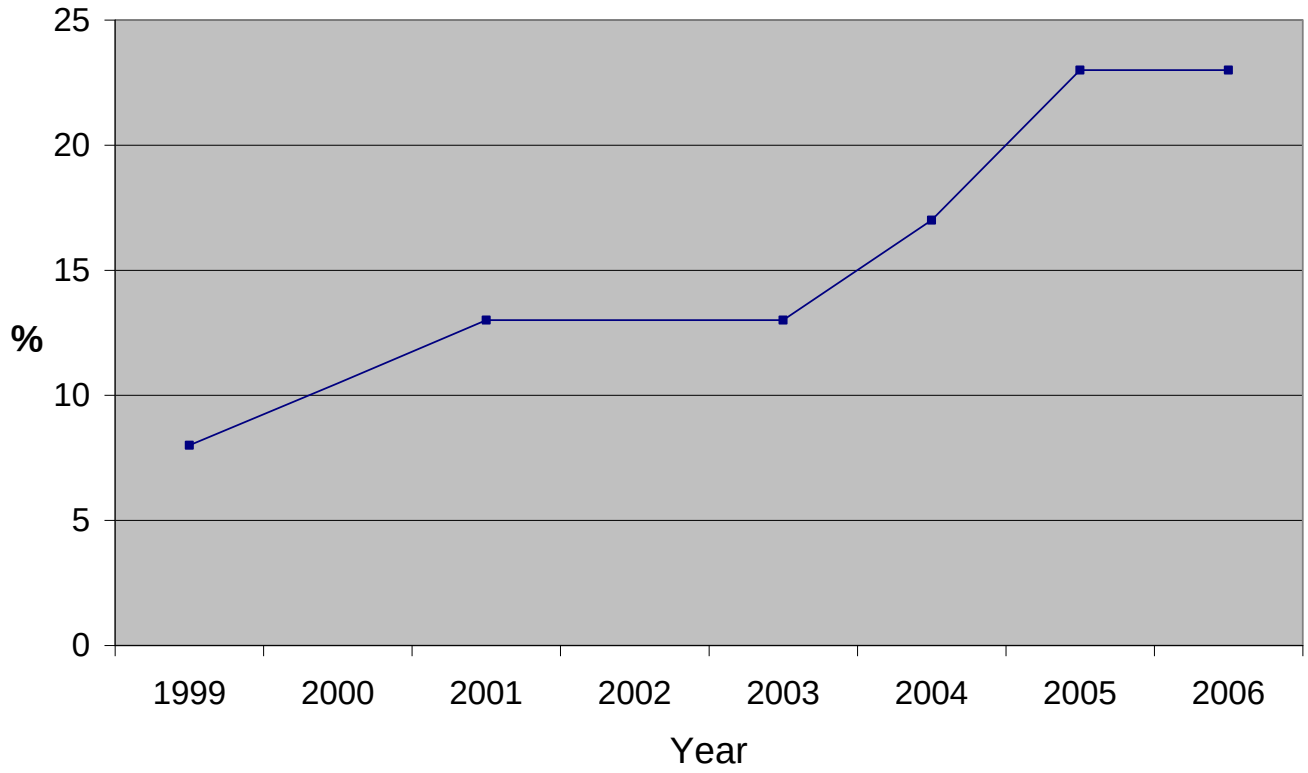
Total kapacitet i 2011: 365,000 tons

Polymer modificering af bitumen i Europa 2006



Kilde: European Asphalt Pavement Association 2008

Polymer modificering af bitumen i Tyskland



Kild: European Asphalt Pavement Association 2008

Hvad er Road+ ?

100 dele gummi pulver fra Genan

4,5 dele Vestemaner® fra Evonik

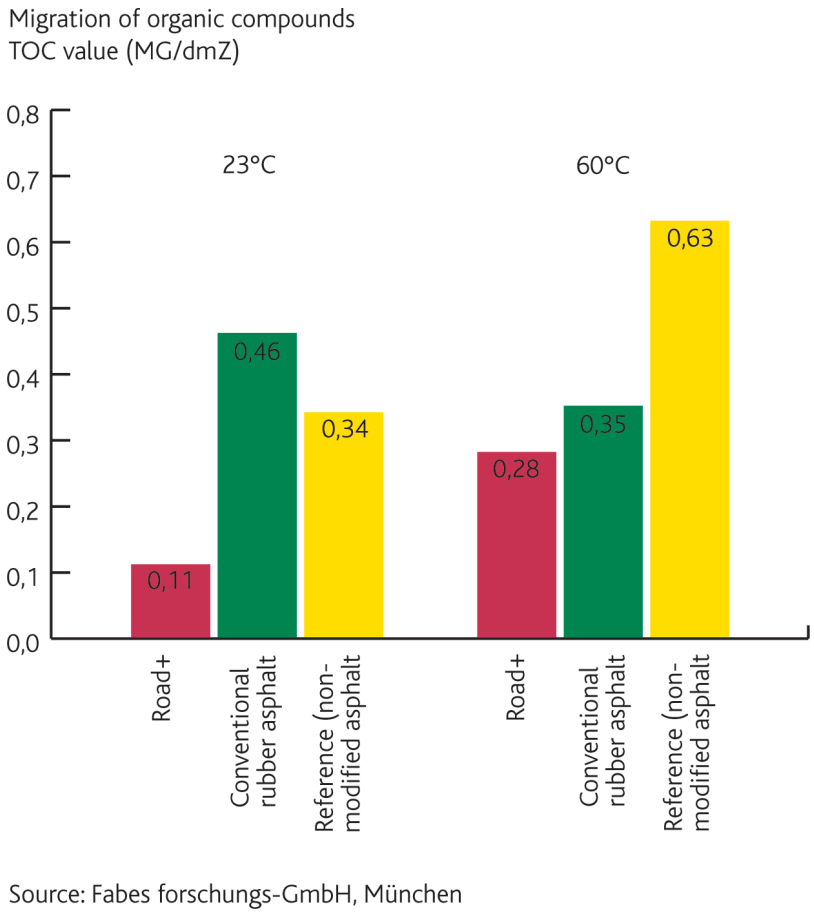
Road+

Sammenligning af Road+ vs. SBS i forholdet 2,5:1

Dokumenteret bedre performance når det drejer sig om:

- **Sporkørsel**
- **Revner**
- **Støjdæmpning**
- **Høje såvel som lave temperaturer**
- **Høje såvel som lave belastninger**

Miljøet - Udvaskning



Source: Fabes forschungs-GmbH, München

➔ Mindre udvaskning af organiske materialer

Miljøet - Emissioner

- **Emissioner er målt både ved blanding og udlægning**
- **Ingen konstatering af N-nitrosamines**
- **Mindre emissioner af VOC'er og SVOC'er sammenlignet med konventionel polymer modificeret asfalt**

The results of the emission study can be summarised as follows:

Parameter	Road+		PMB	
	paving	mixer	paving	mixer
	[mg/m³]	[mg/m³]	[mg/m³]	[mg/m³]
SUM (VOC)	21,8	0,06	30,6	0,14
SUM (SVOC)	0,29	0,005	1,03	0,06
SUM (PAH)*	0,04	0,002	0,04	0,002
SUM (N-nitrosamines)	n.a.	n.d.	n.a.	n.d.

*) according to EPA (Environmental Protection Agency)

n.d. – not detectable, i.e. amount below detection limit (DL = 0,1 µg/m³)
n.a. – not assessed

Abbreviations:
VOC – volatile organic compounds
SVOC – semi-volatile organic compounds
PAH – polycyclic aromatic hydrocarbons
PmB - polymer modified bitumen

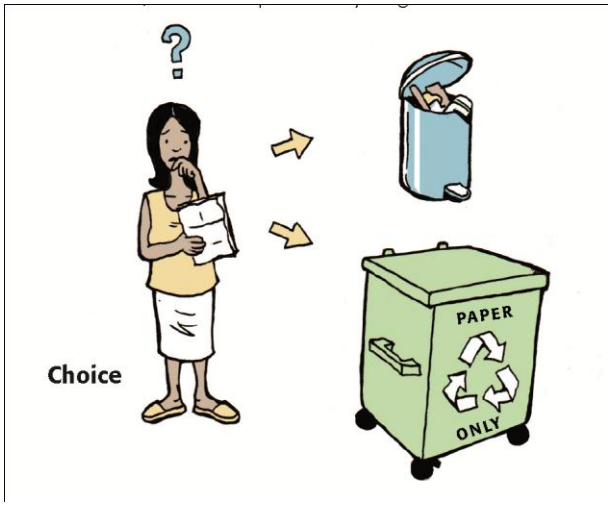
Source: FABES Forschungs-GmbH für Analytik und Bewertung von Stoffübergängent

Life Cycle Assessment

Recycling versus Co-incineration and Civil Engineering Applications

What is a LCA-study?

Evaluates and measures all known environmental impacts of a specific choice



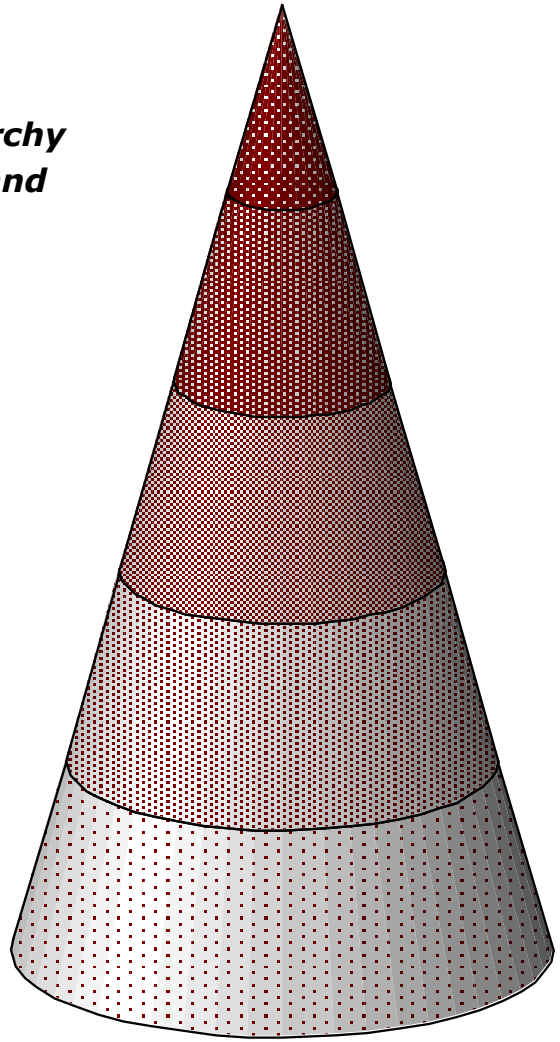
….. of all steps in the complete life cycle of a particular product

Waste Hierarchy - Tyres

Best solution

Does the waste hierarchy adopted by the EU stand for a detailed LCA-analysis within the topic of scrap tyres?

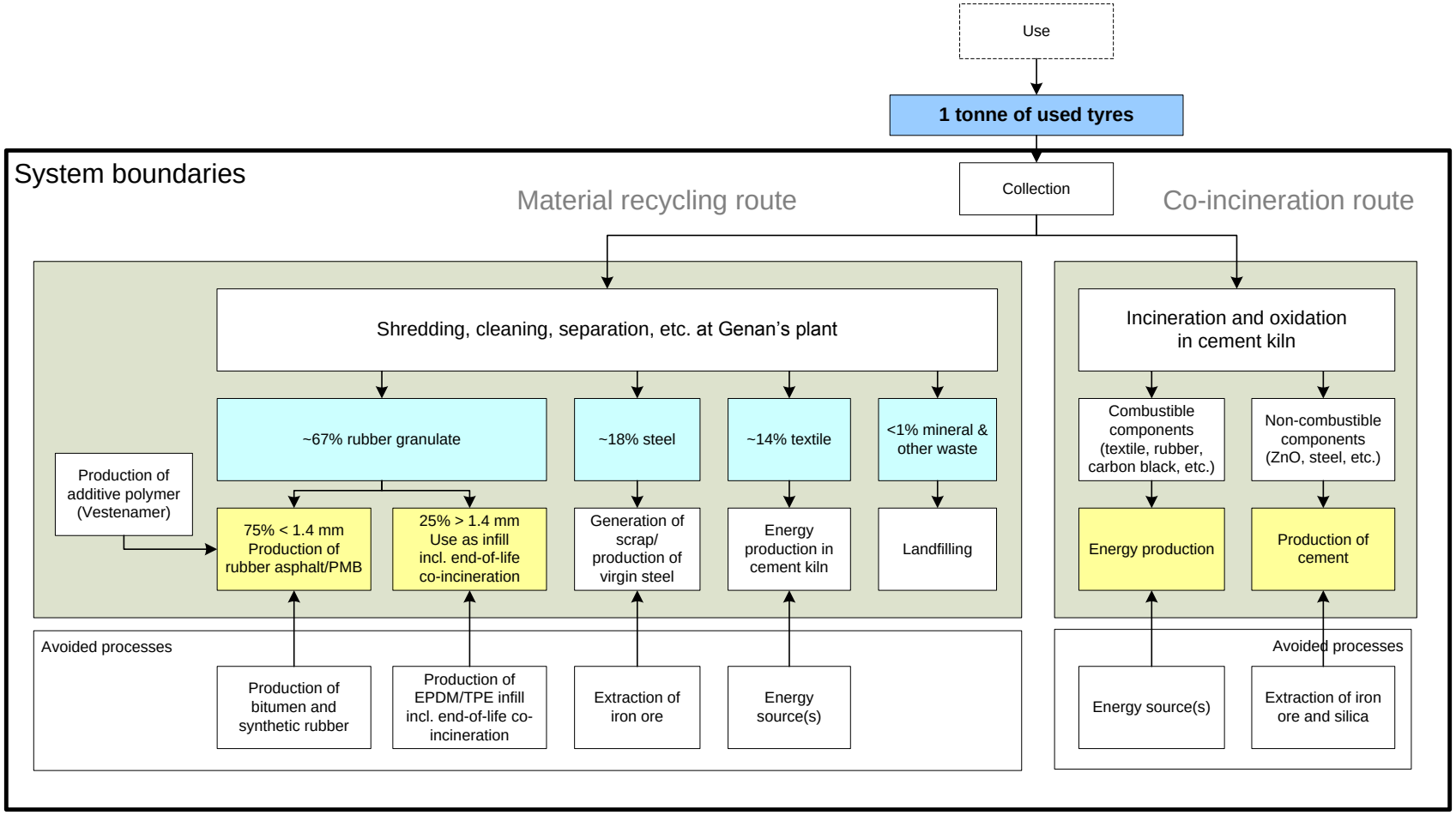
Worst solution



- Reduction
  - Traffic policy
- Retreading
  - Uneconomic
- Material recovery
  - Genan concept
- Incineration
  - Cement kilns
- Landfill
  - Now banned in the EU

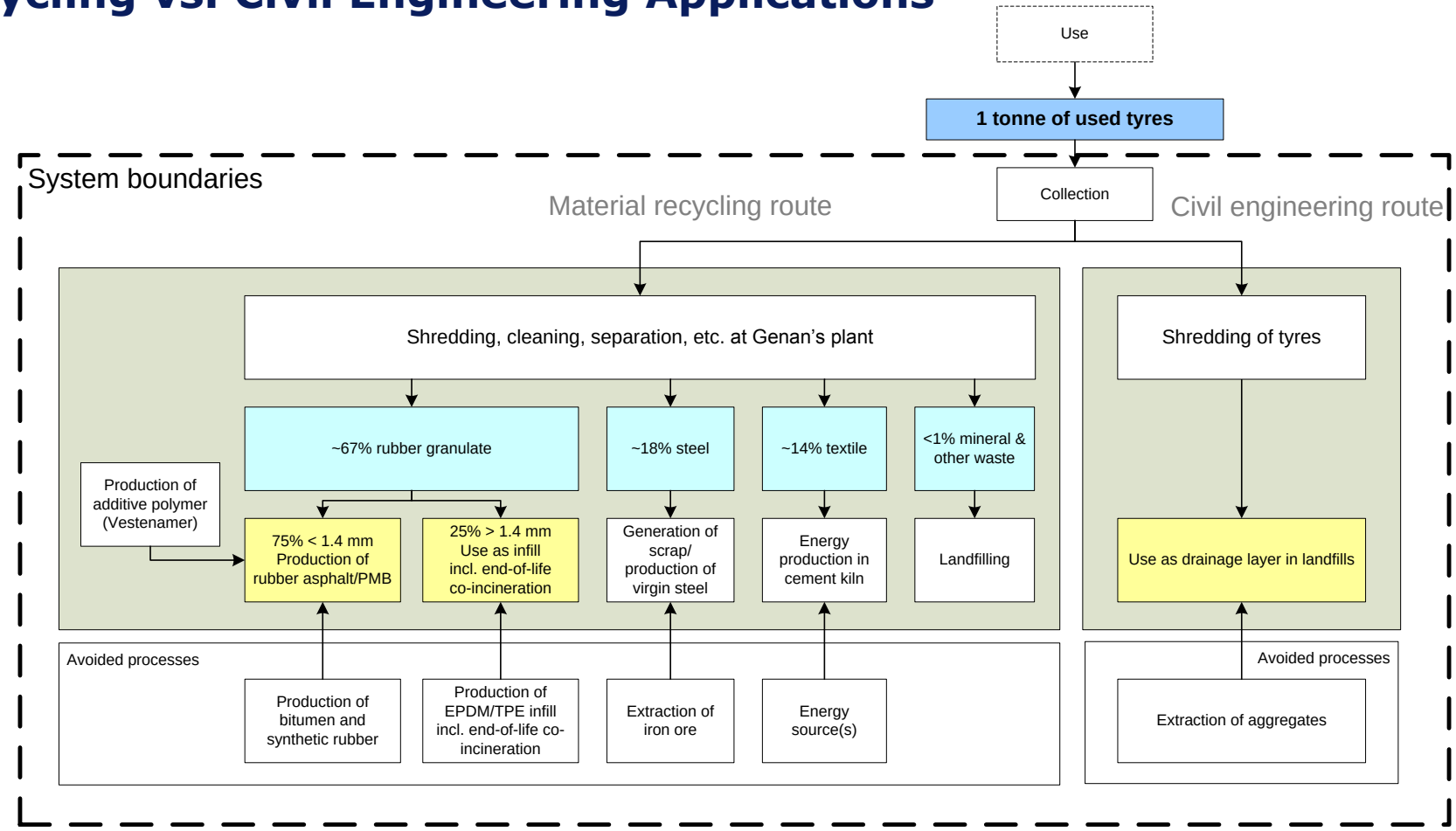
The choice to be analyzed

Recycling vs. Co-incineration



The choice to be analyzed

Recycling vs. Civil Engineering Applications



Quality Standard

ISO 14040

ISO 14044

All elements described as compulsory in the above mentioned ISO standards are included.

Report written by:

Material Recycling vs. Co-incineration

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Material Recycling vs. Civil Engineering

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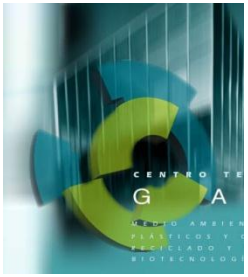

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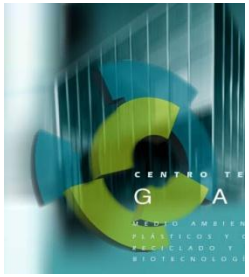
Material Recycling vs. Civil Engineering Applications



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Impact Categories Researched

- **Global Warming Potential ***
- **Acidification potential ***
- **Nutrification potential, water**
- **Nutrification potential, soil**
- **Toxicity potential (carcinogenic risk)**
- **Toxicity potential (acute humane PM10)**
- **Photochemical ozone creation potential**
- **Cumulative energy demand (balance of fossil fuel use) ***
- **Non-energy resource depletion (iron)**

Results – Comparison with Co-incineration

GWP Base case	**1.1 ton/ton**
GWP Waste subst.	**2.6 ton/ton**
Acidification	**5.3 kg/ton**
5 other categories	**Sign. positive**
2 other categories	**Insignificant**

In the EU 1,098,000 tons scrap tyres are yearly incinerated

The potential CO2 savings are therefore in the area of 2.9 Mton

Comparison with civil engineering applications

GWP savings approx. 1.8 tons CO2/ton scrap tyre input

Overall conclusion

- **Civil Engineering applications are filling operations with no environmental benefits**
- **Co-incineration in cement kilns is better than civil engineering and landfills**
- **Recycling is, however, far more beneficial than co-incineration with robust and clear benefits in 7 out of 9 environmental indicators**
- **2 indicators not statistically significant**