



**Up to....
100% Asphalt Recycling
with:
RheoFalt HP-AM
Old asphalt becomes...
NEW ASPHALT!!**

Hannover Principles EXPO 2000
William Andrews McDonough
Michael Braungart

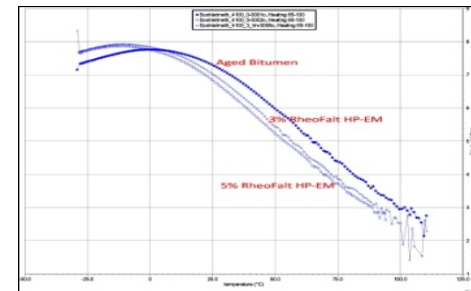
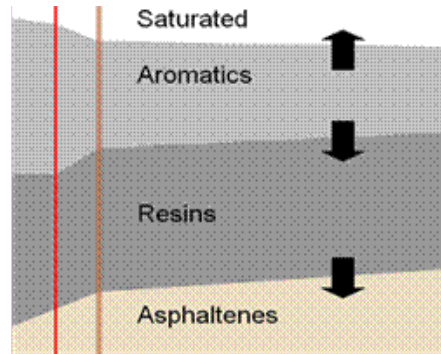
Copyright 1992



VENTRACO
Innovation Centre

02 Topics

- From idea to solution...
- Bitumen behaviour
- In Practice
- Business Model



03

Idea!!

Demand for sustainable products and solutions

Huge fluctuations in prices oil and oil-derivates like bitumen

Big competition based on high quality products

So.....



04

Idea!!

WOULDN'T IT BE GREAT IF ASPHALT COULD ALWAYS
BE **REUSED** IN THE HIGHEST POSSIBLE RATIO...



100 %!!!!!!

05

Actual problems

In Practice:

Grading of RAP is not uniform (not process-controlled)

Ageing of bitumen needs to be solved

Solutions ???...



- No difference in grading of minerals, either they are new or already used in RAP
- Minerals don't have been changed in **20 million years**, so they didn't change in the past **20 years**, bounded in asphalt.
- RAP contains the processed controlled produced minerals from 20 years ago....
- If RAP will be re-graded with the same accuracy as new minerals there, no difference in defined limits

USE THE SAME QUALITY PARAMETERS FOR DEFINING RAP STOCKS AS USED BY PRODUCING MINERALS, AND THE OUTCOME WILL BE LIKEWISE.

07

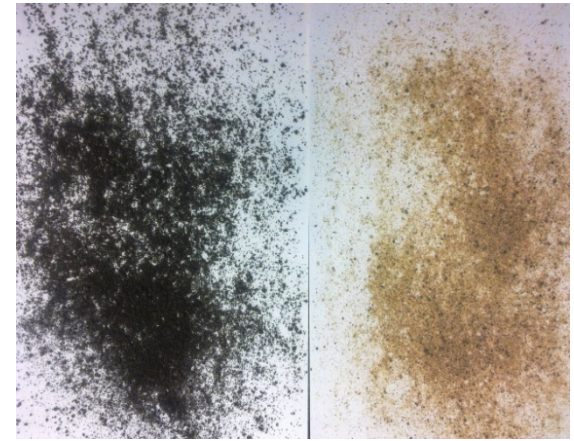
Process controlled grading



Stones (10/20mm)



Stones (3/10mm)



Fines (sand 0/3mm)

- Ageing due to **oxidation**
 - Loss of light components, mutating to heavier parts
- Ageing due to **physical hardening (crystallisation)**
 - Polar effect in asphaltenes (heaviest fraction) make structures and become more brittle. Loss of flexibility

09

Oxidation ?

Example of paint:

New paint flows into a smooth thin layer and sticks to the wooden structure

After ten years lighter parts are lost. The brittle layer is full of cracks and will lose the adhesion with the wooden surface

Lighter parts in the paint are lost by influence of UV radiation (**sunlight**) and **oxygen** (air)



Fresh honey

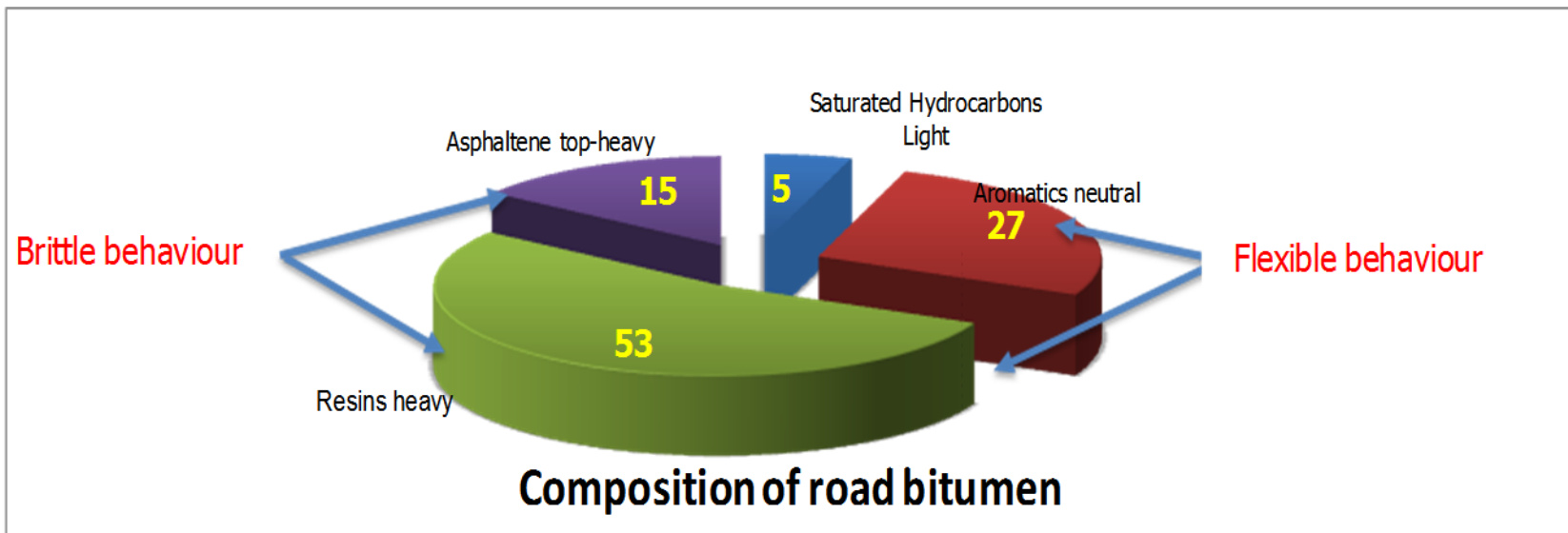


Same honey

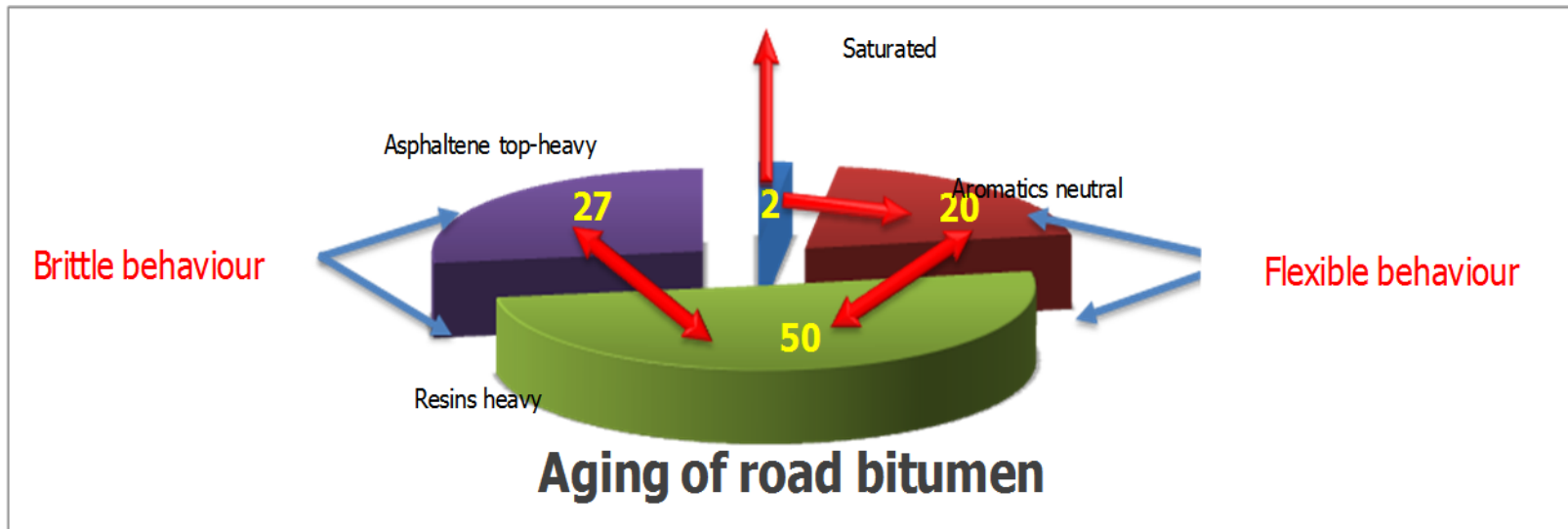


After some time staying
in kitchen without using

New bitumen



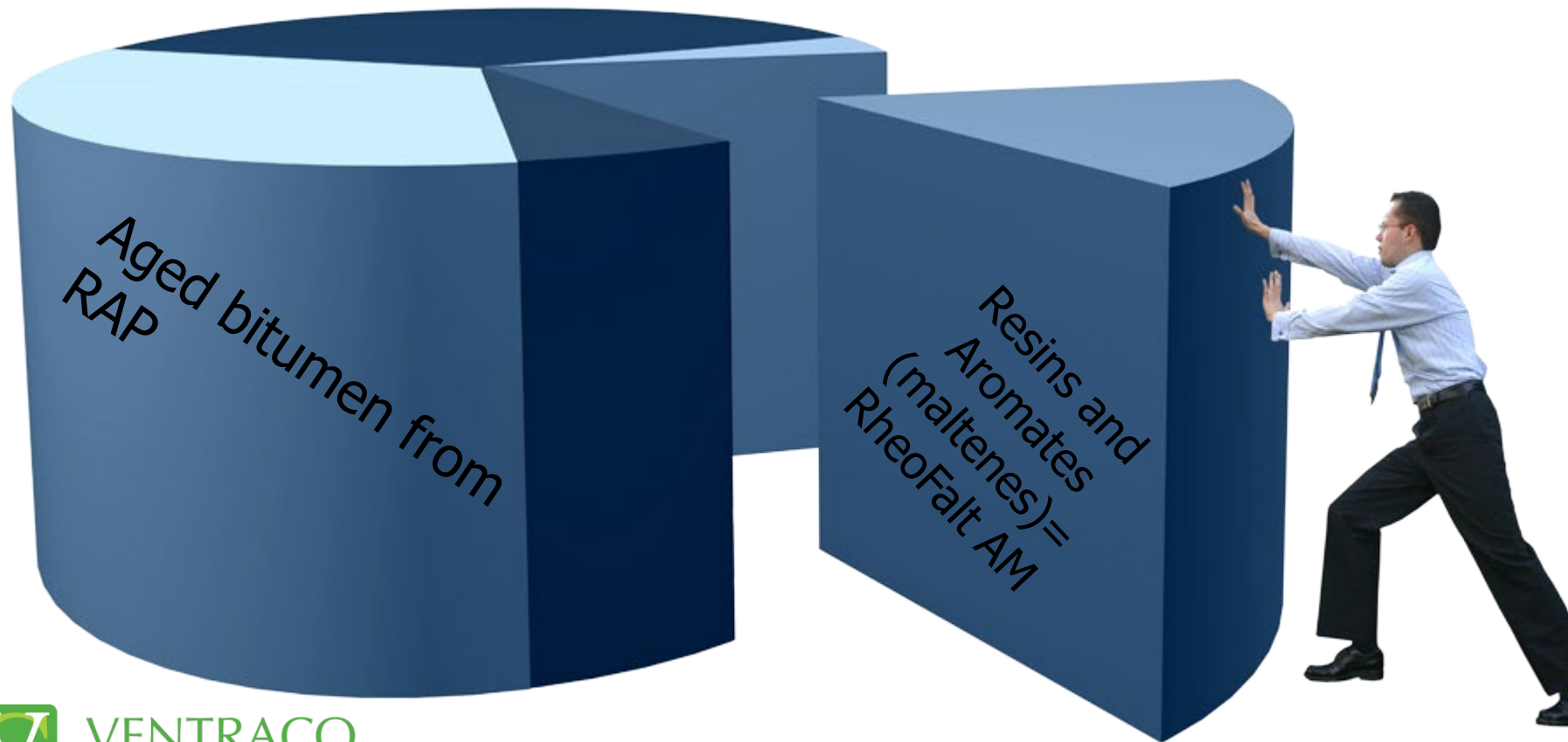
Bitumen from 20 year old RAP



13

Solution!!

Restore original SARA composition

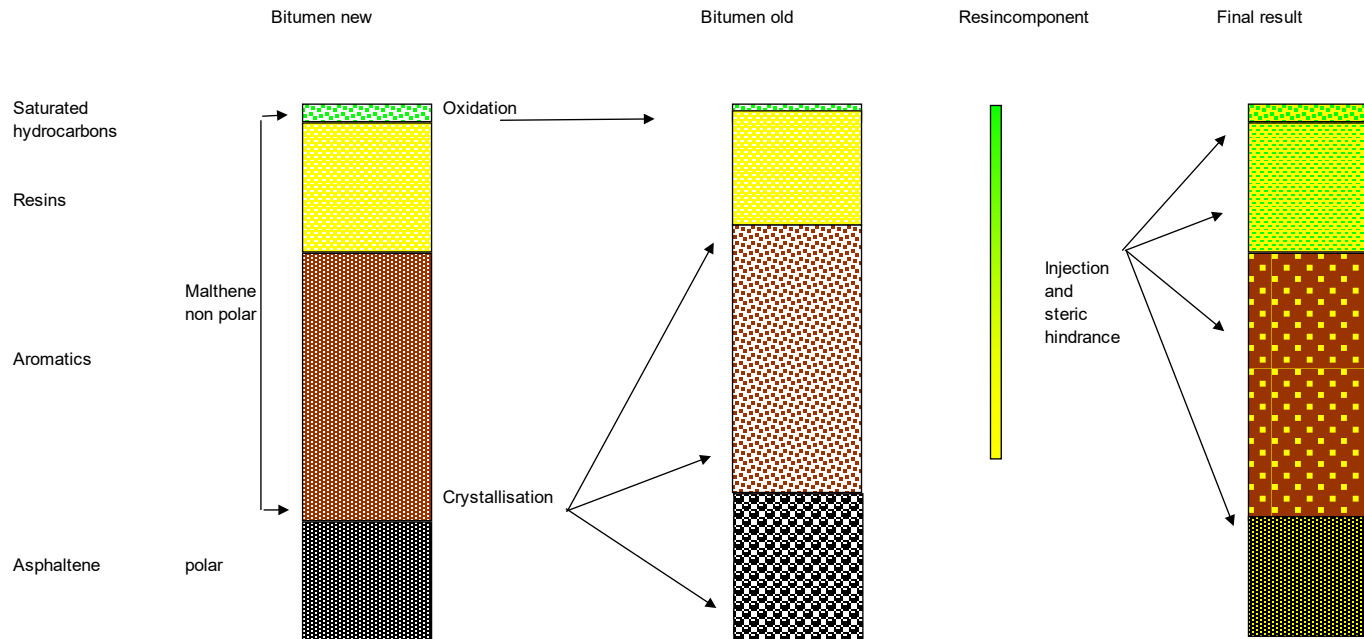


VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg
www.rheofalt.com

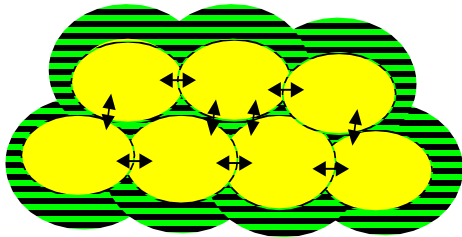
Restore original Sara composition

What goes out has to be refilled:
Aromates and Resins



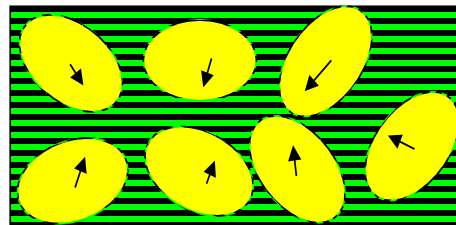
Aromates and Resins slow down physical hardening
Polar activity of asphaltenes can be chemically isolated

Old
Cold
Rigid
Physical hardening = crystallisation



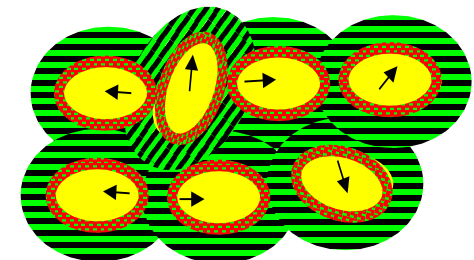
Polar effect asphaltene

Old
Hot
Liquid



Disconnecting physical hardening

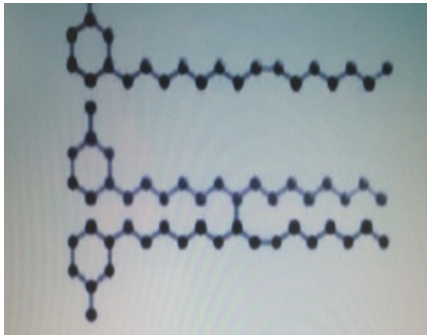
Injected with resin
Cooled down
Steric hindrance prevents physical hardening
Flexible



16

Chemically isolation

Asphaltenes



Polar
molecule tips

Di- and tri-mers



RheoFalt AM

Adhesion



on molecule
tips

Agglomeration



not possible

17

Endresult

100 % recycled asphalt



Asphalt as it used to be...

18

In Practice



Heavy truckload performance



100% recycled asphalt



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

19

In Practice, grading and sieving old asphalt



20

In Practice, grading and sieving old asphalt



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

21

In Practice, grading and sieving old asphalt



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

22

In Practice, bitumen rejuvenation and producing



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

23

In Practice, bitumen rejuvenation and producing



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

24

In Practice, Producing with heating drum



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

25

In Practice, bitumen rejuvenation and producing



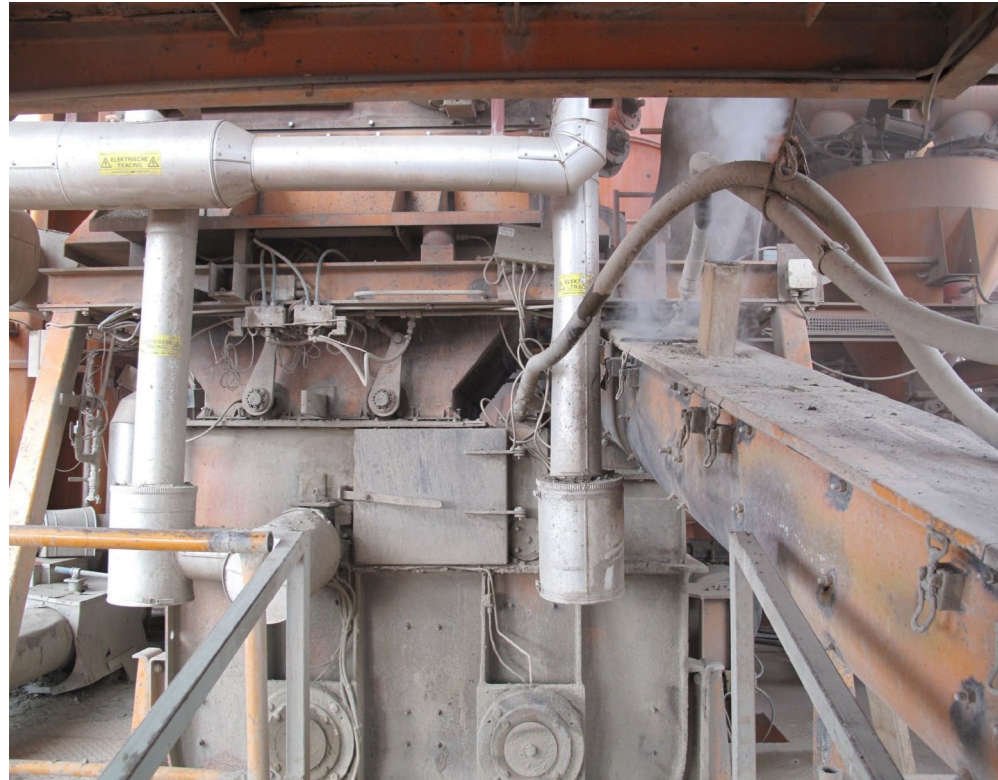
VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

26

In Practice, bitumen rejuvenation and producing



VENTRACO
Innovation Centre

24-01-2019 | Erik Molenberg

www.rheofalt.com

Asphalt out of 100% RAP is possible with adding **RheoFalt AM**
It has identical properties and acts like common asphalt in all aspects

Adding **RheoFalt AM** clearly shows total recovering from ageing to performance as new bitumen .

The performance can be defined by using different amounts of adding **RheoFalt AM** and are fully controlled with the usual known penetration grade knowledge





Energy savings:

- No mining minerals

- No energy needed in production and transportation of minerals (High influence on CO2 footprint)

Energy needed (extra):

- Extra energy to accurate RAP processing

- Extra energy to dehumidify RAP (more than with new minerals)

A years production level of 100,000 MT of asphalt means:
Energysaving of 31,200,000 MJoule!

This stands for the reduction of
8,400 ton CO₂



Which is comparable with the total energy use of...

Calculated by Royal Haskoning (NL) according to normatives of Green House concept

Small urban city with 1000 households



Import:

Only Rheofalt AM as rejuvenator, less than 1%
Only bitumen to complete mix less than 2%

Highest technology on recycling as possible

Benefits:

No buying new minerals and bitumen, reduces cost with
40%!!!

Environmental very friendly

Independancy for a lot of import

Investment in future exposure , green image building



Steenen Hoofd te Breda	Zwaar belast	base en bind 0/22 IB	2010	geen schade	1600 ton
Opslagterrein Freesmateriaal AC rasenberg	Zwaar belast	surf 16 DL-C	2011	geen schade	400 ton
Aanleg infra Bio vergistingsinstallatie CZAV	Zwaar belast	base en bind 022 en 0/16	2012	geen schade	2400 ton
Aanleg bypasses N320	Provinciaal	Bind 0/16 OL-C	2014	schade	400 ton
Aanleg opslagterrein Dycore beton Breda	Zwaar belast	Base0/22 OL-IB	2012	geen schade	1300 ton
Oude Veerweg Dordrecht (Hera)	buitenweg	base 22 OL-C	2012	geen schade	600 ton
Schiphol Airport (Hera)	zwaar belast	base/bind 0/22	2015	geen schade	400ton
Benedenlindsedijk Dordrecht Hera	ontsluitingsweg	base 0/22	2014	geen schade	600 ton
N285 Terheiden Wagenberg	Provinciaal	SMA 0/8	2017	geen schade	700 ton
Geertruidenberg gemeente	Fietspad	AC16 bind	2018	geen schade	280 ton
N284 Hapert	Provinciaal	SMA 8G+	2018	geen schade	145 ton
N286 Oud Gastel	Provinciaal	SMA8G+	2018	geen schade	1170 ton
A27 Rws nabij Werkendam	Rijksweg	AC22bind	2015	geen schade	100 ton
A58 RWS nabij Roosendaal	Rijksweg	ZOAB PR 15%	2013	Geen schade	800 ton



Great Britain

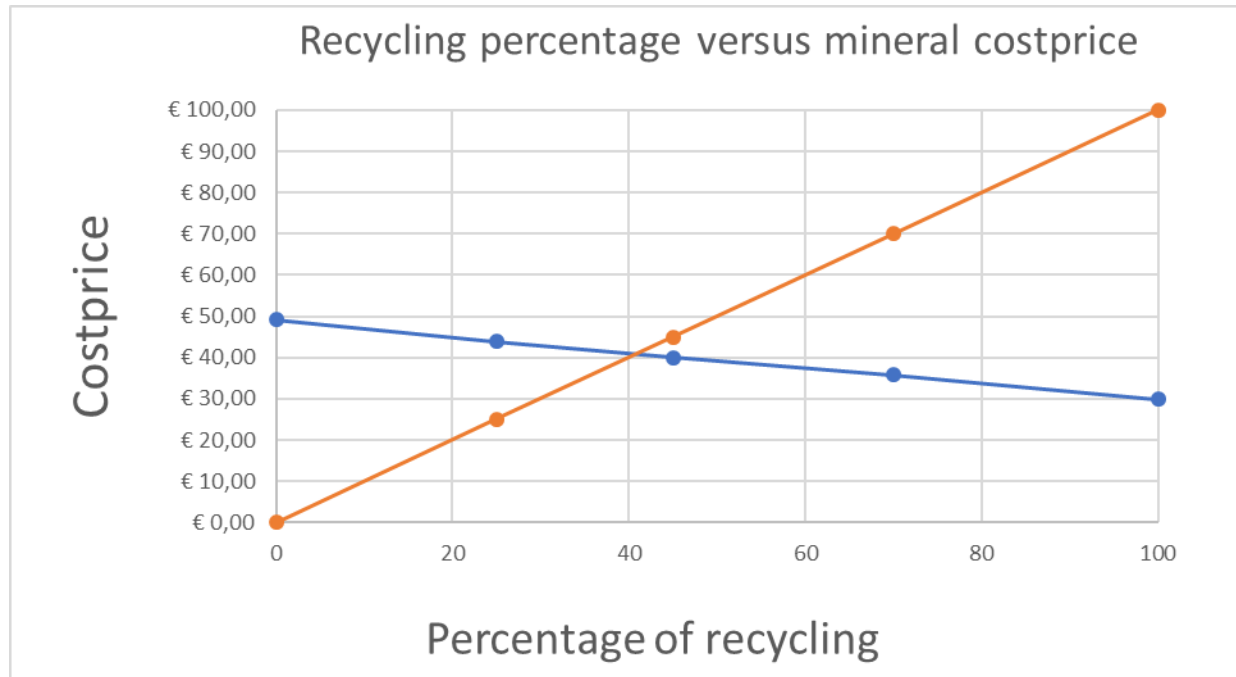
Norway

Denmark

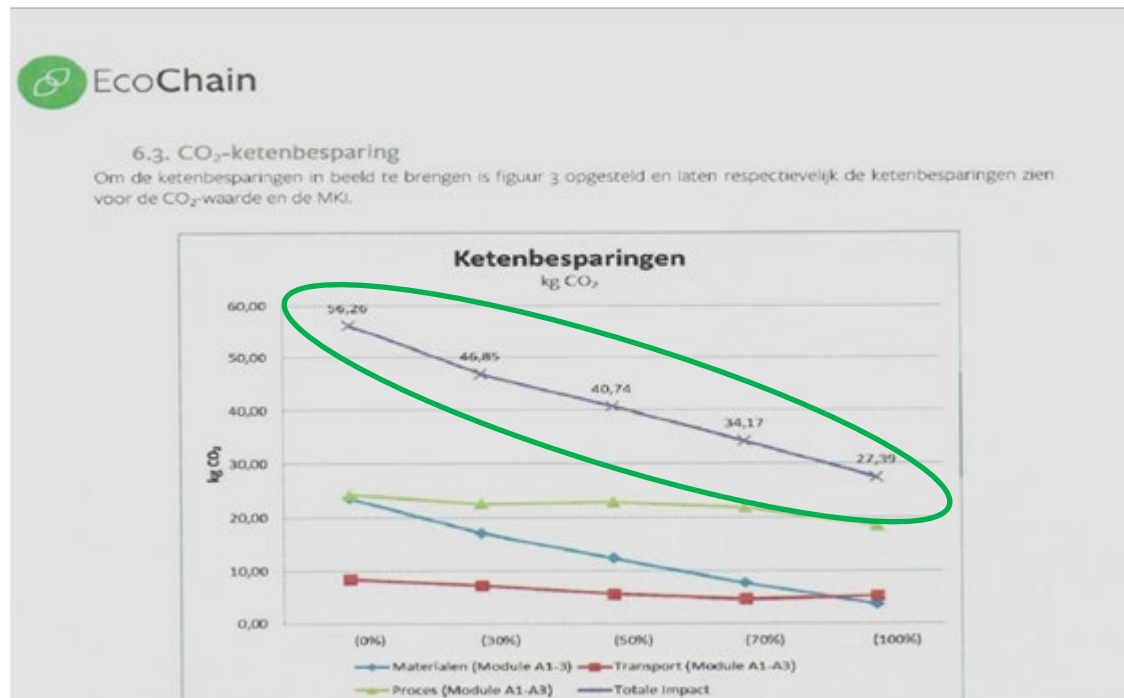
Sweden

Germany





*CO₂ (in kgCO₂) reduced by different recycling percentages
Official green house calculation of 1MT asphalt*



36

No future dream but today's reality



Recycling in Practice ,delivery rejuvenator, quality controll
– **Ventraco Innovation Center**

RHEOFALT[®]

SMART ADDITIVES TO MODIFY ASPHALT AND BITUMEN



WELCOME TO OUR BRAND NEW WEBSITE

WWW.RHEOFALT.COM