

## Dutch Market

### Current Dutch Recycle Market

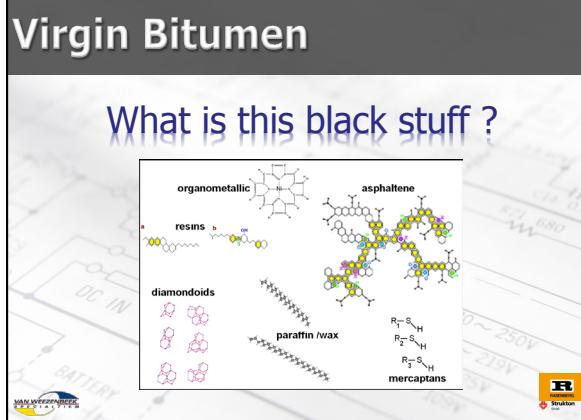
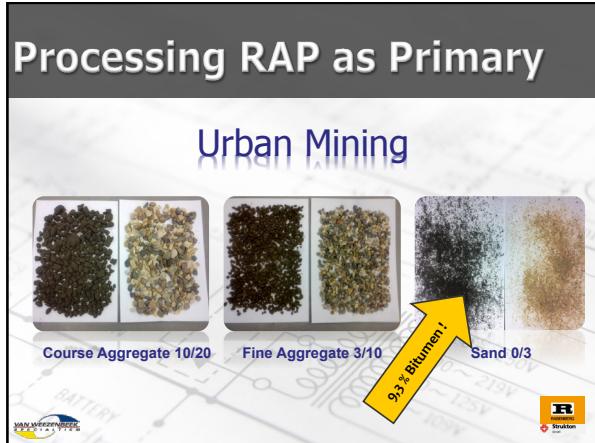
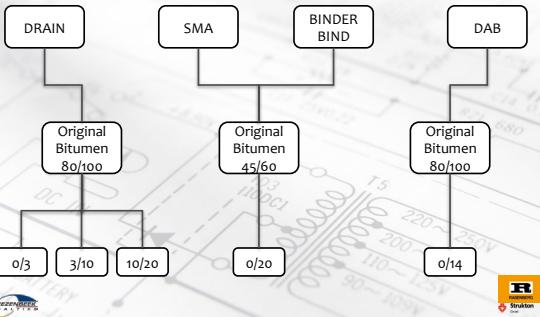
- Production 8,0 million MT/Y total
- RAP 6,0 million MT/Y total
- RAP recycled 2,8 million MT/Y (35% overall)

- Virgin materials:

- 5,2 million MT/Y
- 2,3 million MT stones
  - 2,3 million MT sand
  - 0,3 million MT filler
  - 0,3 million MT bitumen



## Processing RAP as Primary



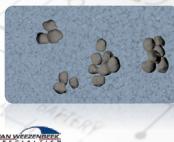
## **Virgin Bitumen**

Rheological and Chemical Tests of Superpave™ Performance Grade								
SOURCE	Range		S.A.R.A. in m/m %				Useful Temperature Interval (UTI)	Malteno Solubility (Psh)
	Highest Temp °C	Lowest Temp °C	Saturates	Aromatics	Resins	Asphaltenes		
PADD II US Gulf Coast	65,0	-24,3	2,2	78,1	9,3	10,4	89,3	8,1
Sweden Nynas 50-70	68,0	-22,8	5,1	68,8	13,9	12,2	90,8	8,0
France Total Brenstar 50-70	68,3	-24,1	3,1	71,5	13,1	12,3	92,4	8,0
Poland Orlen 50-70	67,4	-25,6	5,2	69,2	11,0	14,6	93,0	7,8
PADD IV US Rocky Mountain	66,7	-24,9	4,6	68,1	14,1	13,2	91,6	7,9
PADD V US California Valley	64,6	-9,6	6,0	66,8	23,6	3,6	74,2	8,8
PADD V US California Costal	64,4	-16,2	8,7	60,1	23,4	7,8	80,6	8,5

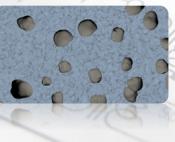
# Crystallization Process

## Steric Hindrance Slows Down Crystallisation

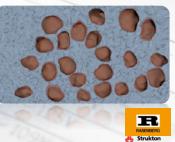
Old Bitumen  
Asphaltenes form  
Rigid Structures



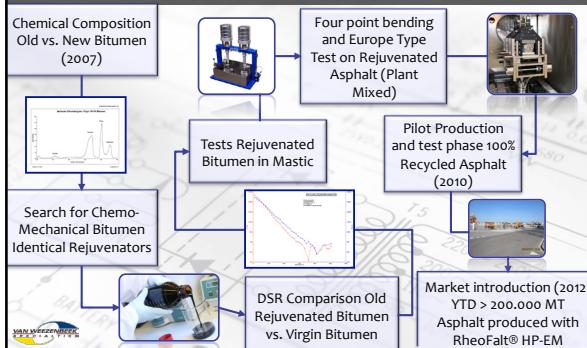
## Re-Heated Bitumen Break down the Structure



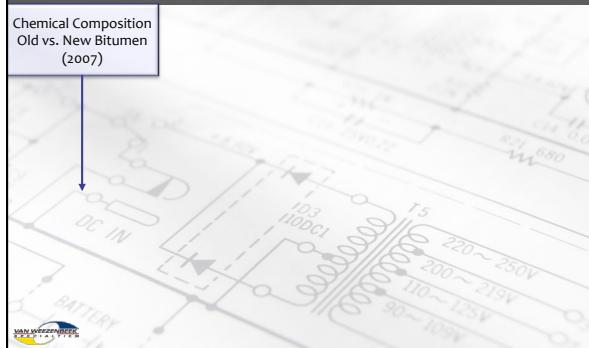
Rejuvenated Bitumen  
Steric Hindrance  
Prevents Structures



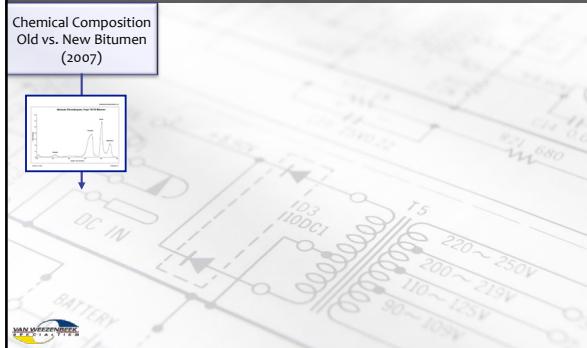
## The Road to Rejuvenation



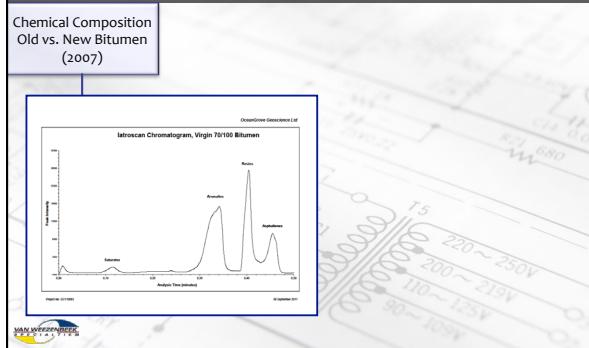
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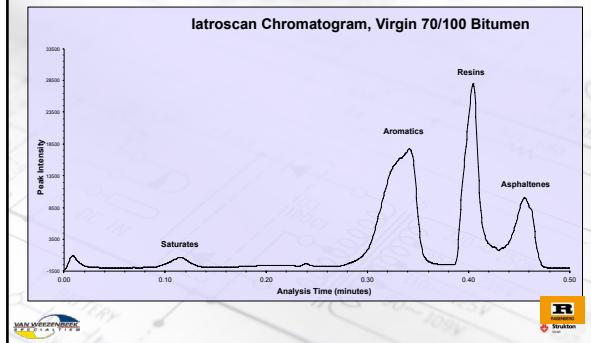
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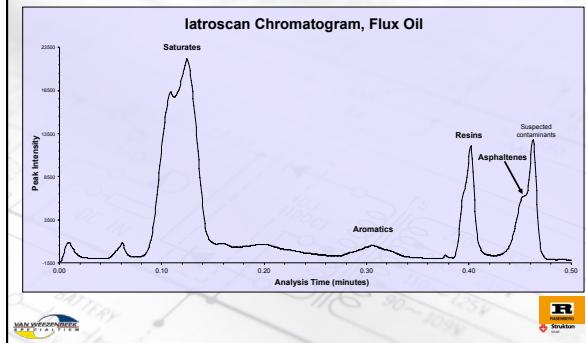
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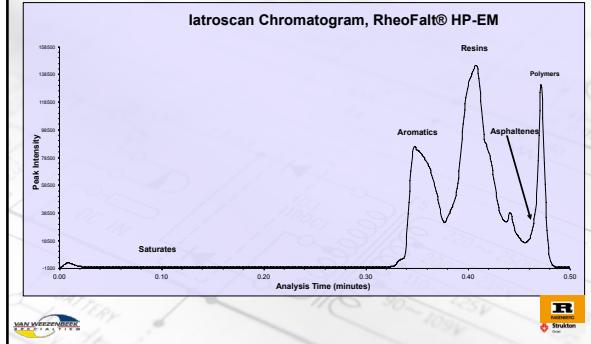
## The Road to Rejuvenation



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## The Road to Rejuvenation



## The Road to Rejuvenation

Search for Chemo-Mechanical Bitumen Identical Rejuvenators

## The Road to Rejuvenation

The Products Should be:

- In The Malthene phase
- Temperature Stable
- Non Toxic
- Compatible with bitumen
- Hydrophobic
- Readily Available
- Cost Effective
- Environmental friendly



Searching for Maltenes

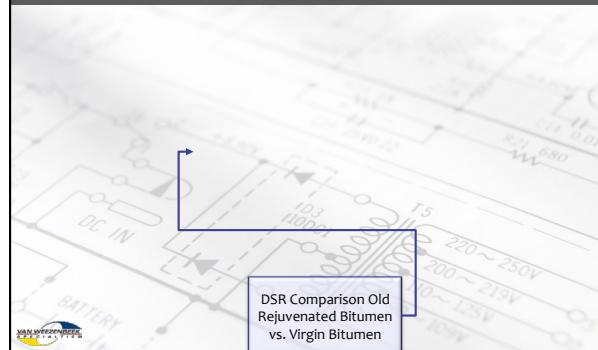
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Search for Chemo-Mechanical Bitumen Identifiers

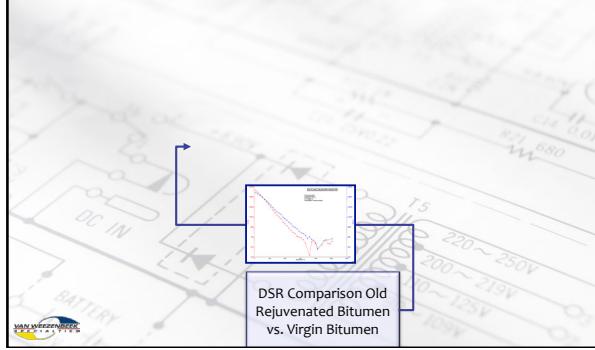
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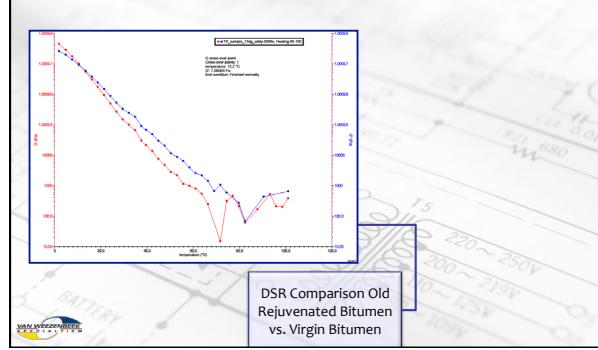
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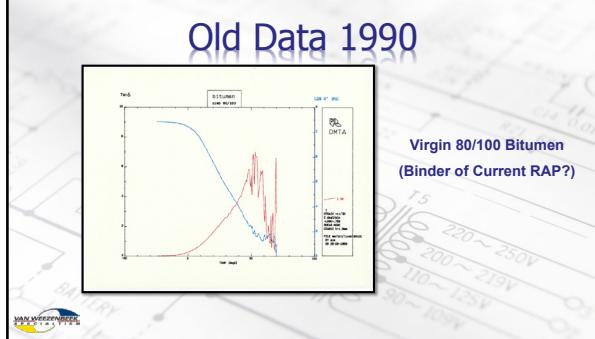
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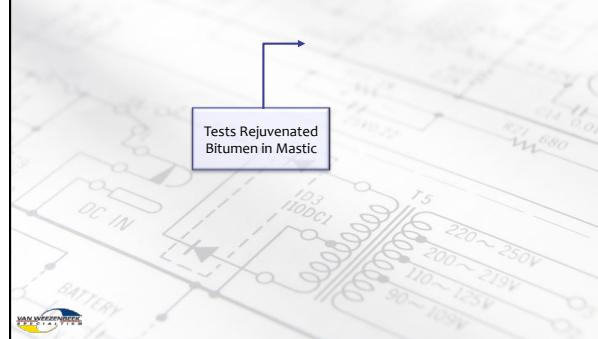
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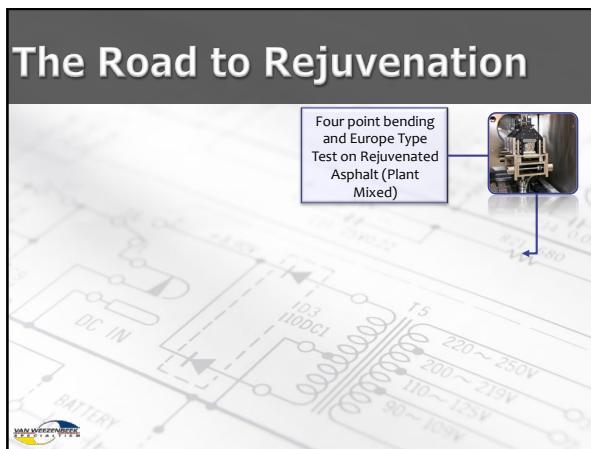
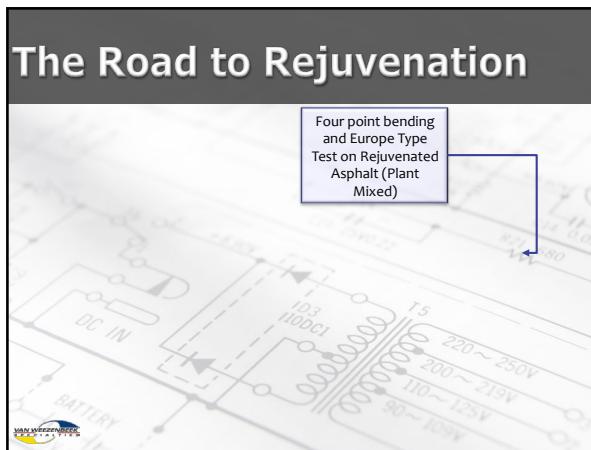


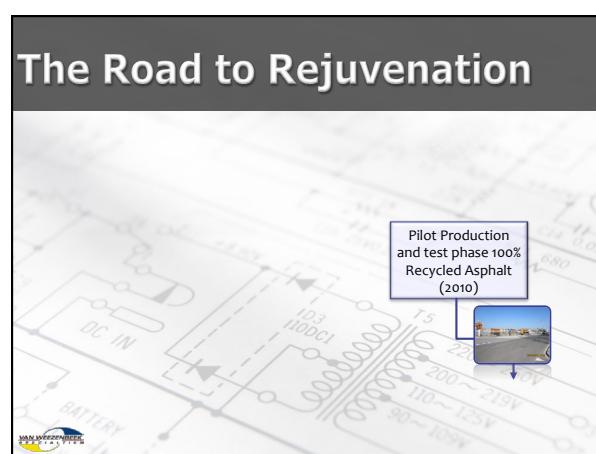
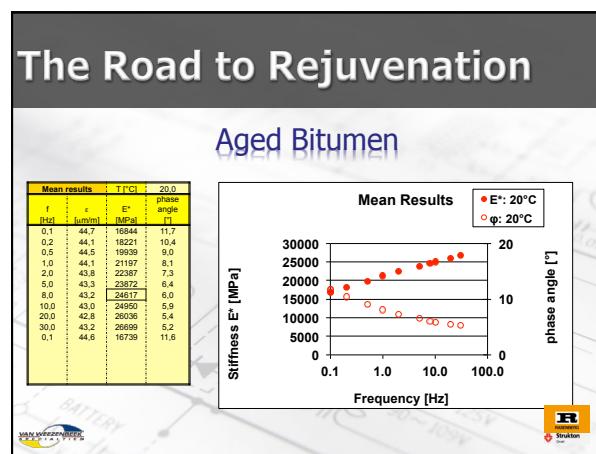
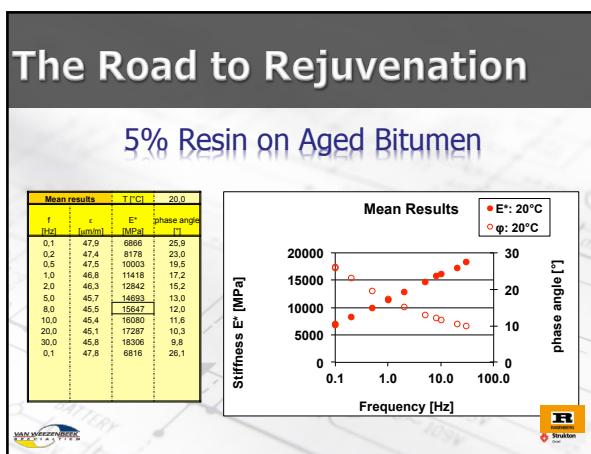
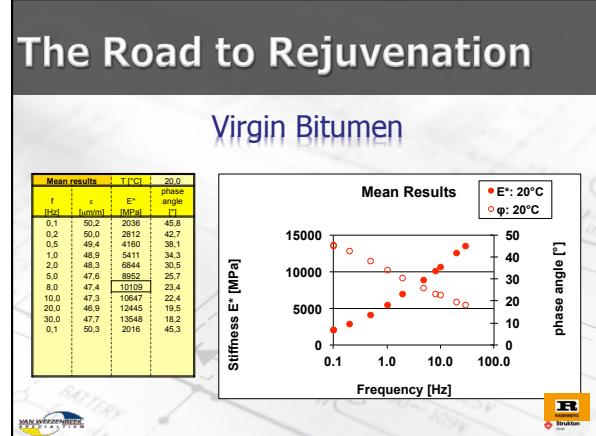
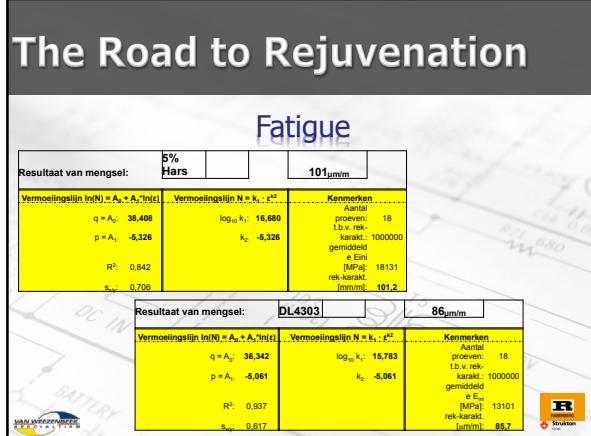
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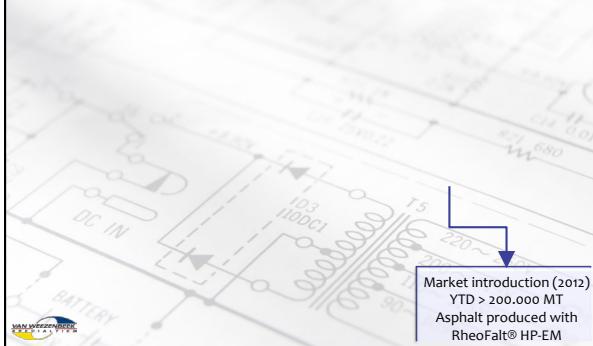
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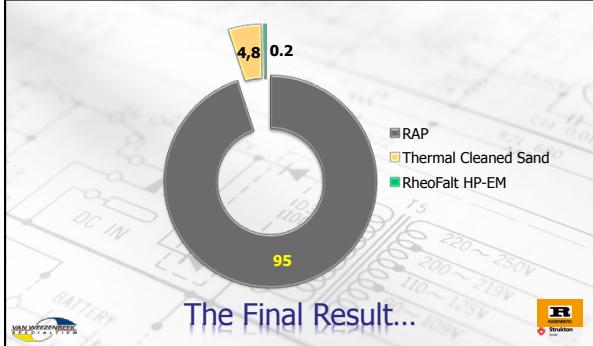
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## 100% Recycling



## The Balance

A year production of 100,000 ton:  
A savings of 31,200,000 MJoule!

This means saving  
**8,400 ton CO<sub>2</sub>**



This stands for the energy need of 2000 households

Calculated By Royal Haskoning (NL)



## Conclusion



- 100% Recycled asphalt is possible with this **Resin**
- The Recycled asphalt has comparable characteristics and can be used in regular asphalt
- The influence of the **Resin** shows clearly improved results
- The characteristics are controlled by the amount of **Resin**

➤ **(Via LogPen calculation)**



## RheoFalt® HP-EM

Thank you for your attention



100% Asphalt Recycling starts now