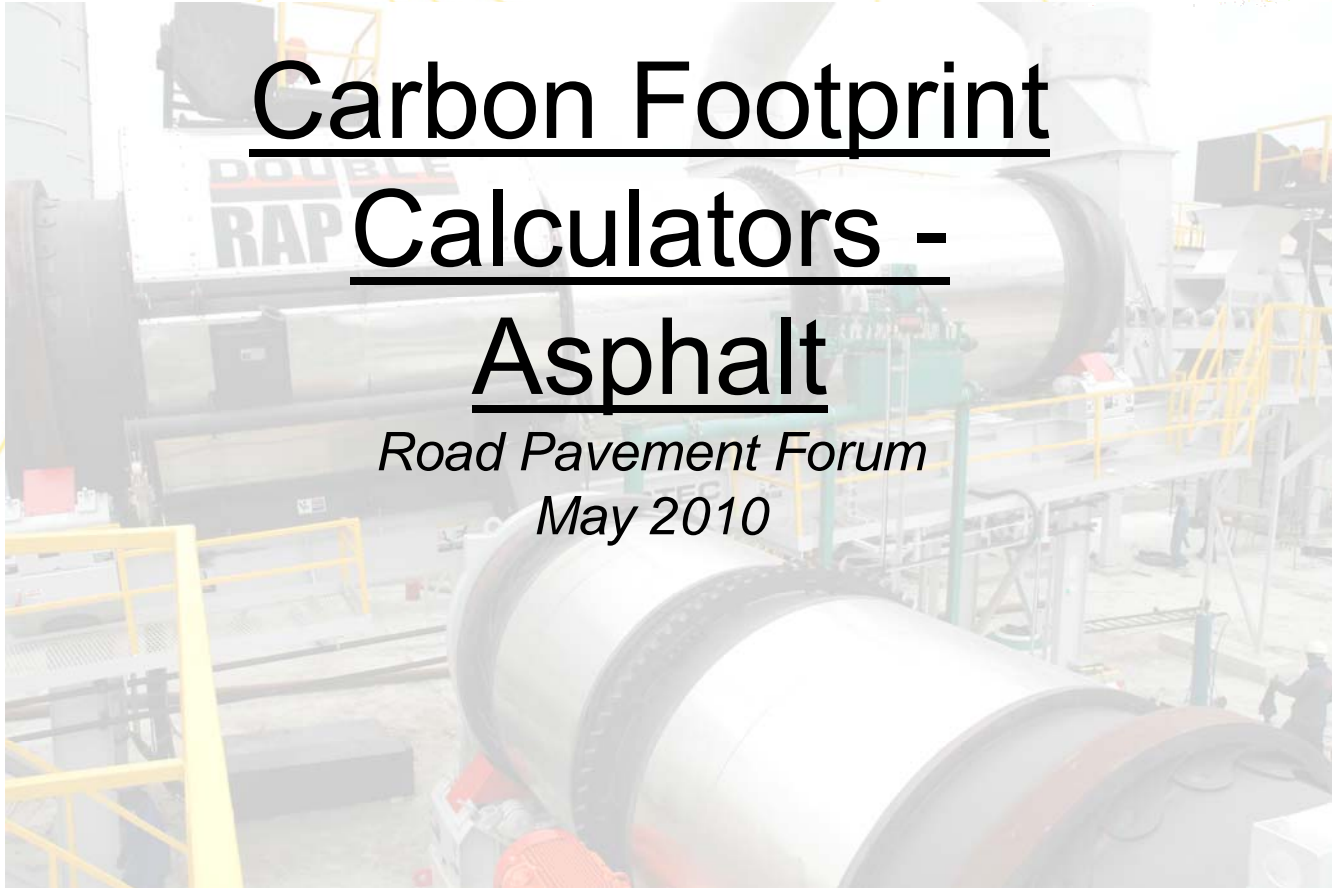




Carbon Footprint Calculators - Asphalt

Road Pavement Forum
May 2010



Brian Neville

Globalising Murray & Roberts



Carbon Footprint

- What is it?
 - Total amount of GHG emitted in activities
 - Includes both direct and indirect emissions
 - Unit: CO₂ - e

The demand on the bio-capacity required to sequester the CO₂ emissions from fossil fuel combustion. (Photosynthesis)



Asphalt Plant Footprint

- Measurable energy use
 - Aggregate heating fuel
 - Purchased Energy consumption
 - Electricity & Steam
 - Paraffin, Diesel & LPG consumptions
 - Loader
 - Bitumen Heating



Asphalt Plant Footprint

- **Some Interesting Facts**
 - Asphalt footprint globally small
 - Biggest culprits
 - Coal Power Stations
 - Motor Vehicles
 - Deforestation (slash & burn)



GHG Calculators

- Many available
 - European Commission LCA
<http://lca.jrc.ec.europa.eu/lcainfohub/introduction.vm>
 - Greenhouse Gas Protocol Initiative
<http://www.ghgprotocol.org/calculation-tools/all-tools>
 - In RSA: SABITA – Energy/Carbon Footprint Calculator
 - asPECT – Asphalt Pavement Embodied Carbon Tool (LCA Tool)
<http://sustainabilityofhighways.org.uk/>



Calculator Results

	PROD TONNES	CO ₂ -e (tonnes)						kg CO ₂ -e per Tonne prod
		AGG HEAT	HEAT	ELEC	SCOPE 1 TOTAL	SCOPE 2 TOTAL	TOTAL	
CK	120,541.06	2246.955	38.86775	1,556.40	2,285.82	1,556.40	3,842.22	31.875
RPT	135,147.80	3197.76	5.559754	991.09	3,203.32	991.09	4,194.41	31.036
PMB	88,493.22	1644.616	3.941655	909.18	1,648.56	909.18	2,557.74	28.903

Location: Contermans kloof
 Plant Type : Batch

Figures year to date:

Fuel consumption 30,946 GJ
 Electricity 1,297,000 kWh
 Carbon footprint 3,825 ton CO₂
 Production 120,541 ton
 Key figure 296 MJ/ton
 Key figure corr. for Moisture 260 MJ/ton
 Carbon footprint per ton 32 kg CO₂/ton



Calculator Results

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PMB	88,493.22	1644.616	3.941655	909.18	1,648.56	909.18	2,557.74	28.903

Location: Pietermaritzburg

Plant Type : Drum

Figures year to date:

Fuel consumption	22,030 GJ
Electricity	700,433 kWh
Carbon footprint	2,455 ton CO ₂
Production	88,493 ton
Key figure	285 MJ/ton
Key figure corr. for Moisture	266 MJ/ton
Carbon footprint per ton	29 kg CO ₂ /ton



Calculator Results

The screenshot shows a Microsoft Excel spreadsheet with a 'View Existing Plants' dialog box open. The dialog box is blue and contains the following information:

- Select Plant: Roodepoort
- Plant Type: Continuous
- Annual Asphalt Production: 246,778 tonnes
- Annual Energy Consumption: 21,208,240 kWh
- Energy Details:
 - Electricity: 1,283,586 kWh
 - Other Fuel: 19,924,654 kWh
- Total Annual kg CO2e: 6,536,944.395
- Average kg CO2e/t Asphalt: 26.4892 (circled in red)
- Heating Profiles Defined: 3
- Materials Defined: 6
- Mixtures Available: 3

Buttons at the bottom of the dialog are 'Main Menu', 'Edit Plant', and 'Print Summary'. A red callout box points to the 'Average kg CO2e/t Asphalt' value, containing the text: **26.49 kg CO₂/tonne**.



Calculator Results

Roodepoort 1

Mix Comparison Summary

Mixtures from Plant

Plant	Mixture	Tonnage	Life Cycle Stage (kg CO ₂ e)						Total	Total / tonne
			1 to 3	4	5	6	7			
Roodepoort	BRASO	100,000.0	6,537,75	737,683.	2,641,24	324,327.	400.0	10,241,40	102.4	

Materials Direct to Site

Material	Tonnage	Life Cycle Stage (kg CO ₂ e)						Total	Total / tonne
		1 to 3	4	5	6				
<div style="border: 1px solid red; padding: 10px; display: inline-block;"> <p>102.4 kg CO₂/tonne for BRASO travelling 40km to site</p> </div>									

Buttons: Main Menu, Project Results Summary, Print Results



Calculator Results

Detailed Project Results

Roodepoort 1

Mix Comparison Summary

Mixtures from Plant

Plant	Mixture	Tonnage	Life Cycle Stage (kg CO ₂ e)							Total	Total / tonne
			1 to 3	4	5	6	7				
Roodepoort	BRASO	100,000.0	6,537,75	737,683.	2,641,24	324,327.	400.0	10,241,40	102.4		

		Total kg CO ₂ e	kg CO ₂ e / t
Steps 1 to 3	Material Extraction & Processing	6537750.0	65.378
Step 4	Transport to Plant	737682.98	7.377
Step 5	Asphalt Production	2641242.7	26.412
Step 6	Transport to Site	324327.5	3.243
Step 7	Laying & Compacting	400.0	0.004

Note: A red arrow points from the 'Total / tonne' value (102.4) in the main table to the 'kg CO₂e / t' column in the detailed breakdown table.



Calculator Results

- **Benchmarks**

- 1st World: 25 kg CO₂-e/tonne (production only)
- Generally acceptable figures of 26 – 35 kg CO₂ -e/tonne
- Equates to 2,500 tonnes CO₂ for 100,000 tonnes production (car ≈ 6 tonnes p.a.)

- **SABITA Calculator**

- Only for primary asphalt production
 - Vehicles traveling from plant to site not covered



Calculator Results

- **Some Observations on SABITA Calculator**
 - Need to distinguish between different diesel usages (FEL vs bitumen heating)
 - Efficiency improvement can be small and will possibly not show up as an improved footprint
 - Electricity emission factors unconfirmed
- **asPECT Calculator**
 - Is a LCA calculator

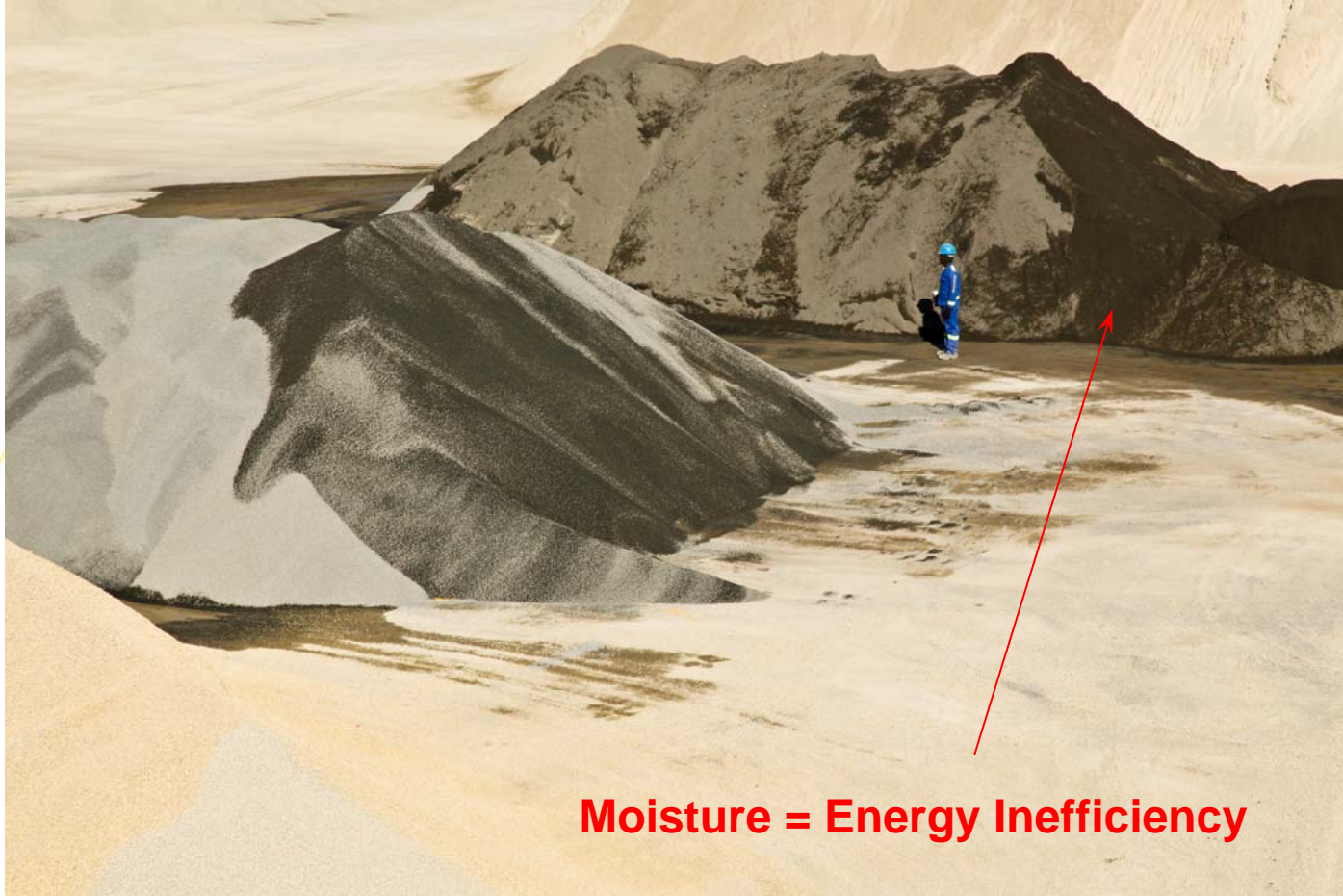


Calculator Results

- UK facts and figures used
 - Electricity Grid Factors
 - UK figures for transport
- Calculations are based on total plant production
 - Difficult to differentiate between different mixes
 - Some differentiation only in production rate and heating time
- Calculator still in Beta phase
 - Lots of problems still



Reducing Carbon Emissions

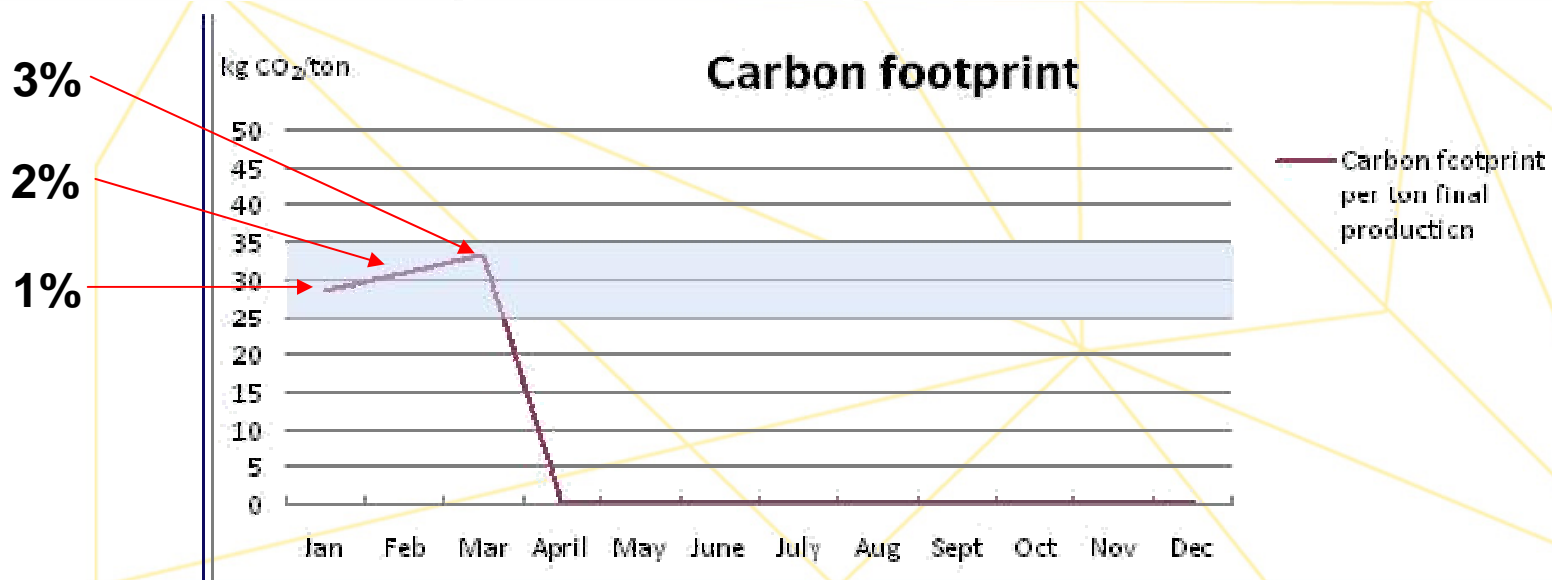


Moisture = Energy Inefficiency



Reducing Carbon Emissions

Key Figures	Key figures per ton final production	Key figures corrected for Moisture	Carbon footprint per ton final production
	MJ/ton	MJ/ton	ton CO ₂ /ton prod
Jan	288	283	29
Feb	321	310	31
Mar	352	335	33



Reducing Carbon Emissions

- WMA
 - Additives
 - Carbon emissions not quantified
 - Definite fuel saving – 1 lit/tonne (in trials)
 - Foaming
 - Capital outlay
 - Expected fuel saving



Conclusion

- GHG are part of our lives & activities
- CO₂-e emissions can be calculated
- We have a tool to benchmark ourselves against
- There are ways to reduce and/or offset carbon emissions
- We can make a difference albeit small



Fin

