

Asphalt industry takes the lead in sustainability

The accelerating depletion of the full spectrum of world's natural resources – from oil to aggregates and clean air – relentlessly raises the spectre of a compromised world in which future generations are unable to match availability to necessity.

This frightening prospect, which calls into question the responsibility of current political and industrial leaders towards a long term future, has, alongside the rising awareness of global warming, given rise to a burgeoning world-wide trend towards sustainable practices in the utilisation of resources.

At an increasing rate, the same process is taking place in South Africa, and one of the leaders in this field is the Southern African Bitumen Association (Sabita), which has already started establishing protocols and industry standards for re-cycling asphalt pavements – one of the few industrial materials that is 100% recyclable.

Sabita CEO Trevor Distin said this week. "The motive is to ensure the perpetuation of South Africa's hot mix asphalt and road construction industry and thus ensure the sustainability of our industry. To achieve this objective will demand that today's leaders act today in order to ensure the availability of product for tomorrow, but there are also numerous downstream benefits."

Distin listed these as:

- improved cost-effectiveness in the construction and maintenance of road networks; by incorporating reclaimed asphalt pavements (RAP) in new asphalt mixes, the road owners are using materials they already own. While RAP provides a ready source of reusable aggregate, it also provides additional bitumen binder, thus reducing the demand for non-renewable virgin raw materials. RAP replaces large amounts of virgin aggregate (which constitutes around 95% of the volume of hot mix asphalt) when used in new asphalt mixes;
- developments in cold in-place recycling of damaged granular pavements utilising emulsions and foamed bitumen has encouraged the re-use of existing materials through bitumen stabilisation. At the same time cold in-place recycling will have a significant impact on reducing greenhouse gas (GHG) emissions, energy consumption and the industry's carbon footprint,
- the versatility of hot mix asphalt fosters the use of a wide range of materials that would otherwise be classed as waste. These include steel slag, rubber from scrapped tyres which are crumbed for modification of bitumen, cellulose fibres and even glass – all of which have acceptable engineering properties appropriate to new asphalt mixes. It is important to note that these materials, including the RAP itself, remains 100% recyclable, and may be re-used again and again;
- a resource which is seldom mentioned in this scenario is the rapid depletion of landfill sites. As a primary user of thousands of tons of materials, all of which can be recycled time and again, the hot mix asphalt industry is a major contributor to the process of minimising the proliferation of landfill sites;
- the environmental degradation caused by gravel roads is recognised as a serious problem in South Africa, where the majority of our rural roads are unsurfaced. The demand for regular re-gravelling places immense pressure on the environment for the ongoing supply of gravel, dust from these roads has adverse effects on both roadside crops and the health and lifestyle of residents living close to passing traffic, and the heavy machine use demanded by ongoing reshaping and re-gravelling adds significantly to costly fuel usage and the emission of GHGs. All these problems could be avoided through cost effective surfacing – which would also have the benefit of reducing road user costs and hence the price of consumer goods, and promoting cheaper mobility for rural residents.

"Like Sabita, which is committed to providing an adequate and efficient transport system with minimum impact on the environment and its resources, the Aggregate and Sand Producers Association of South Africa (ASPASA) has likewise declared its commitment to sustainability by balancing economic growth, environmental equilibrium and social performance," Distin said. "In a recent publication ASPASA made it clear that effective sustainability should enjoy the total buy-in of all stakeholders (industry, authorities, labour and the community), and that these controls and regulations should be enforced to create an equitable, enabling environment for sustainability.

"A major focus area for sustainability is the control of GHGs," Distin said, and noted a recent paper focussing on the contribution of the road construction and transport industries to the emission of GHGs Michel Chappat, Research and Development Director for the Colas Group (based in France) and Julian Bilal, the company's Divisional Manager for Structures Design.

“After exhaustive research examining the total energy required to extract raw materials, manufacture and lay various road construction materials, these leading practitioners concluded that:

- energy consumption and GHG emissions linked to pavement construction are very much less than those caused by total cumulative traffic using the road during its life (less than 1% in the case of bituminous and semi-rigid pavements carrying moderate and high levels of traffic);
- for hot mix bituminous pavements the two main processes responsible for GHG emissions are binder and asphalt manufacture. However, in the case of reinforced concrete pavements the main processes responsible are cement and steel manufacture;
- For new pavements the most polluting structures are reinforced concrete and the least polluting are those using bitumen emulsion technology;
- For rehabilitation, in situ bitumen emulsion recycling is by far the process that consumes the least energy and contributes least to the greenhouse effect.

“Sabita currently has several far reaching initiatives underway to improve the technologies appropriate to sustainability, to introduce and entrench protocols aimed at maximising resource utilisation and to optimise both the re-use of existing asphalt and the introduction of products currently regarded as waste,” Distin said. “These projects are grounded in a commitment throughout the bituminous products industry to responsible best practice, which demands that we ensure that bottom line profit is not pursued at the expense of existing health, safety and environmental concerns, nor of the long term viability of the industry.”

He added that several misconceptions about the sustainability of road pavement materials needed to be cleared up to ensure that decision makers were able to reach informed conclusions when allocating funding.

- When making a comparison between asphalt and concrete to determine their respective energy consumption and green house gas (GHG) emissions, life cycle inventories covering the entire process from the manufacture of the raw component materials to the construction of the final pavement need to be carried out. Such inventories studies have shown clearly that flexible pavements are more environmentally friendly than rigid pavements (concrete). (Refer to study by Gambatese and Rajendran, 2005: *Sustainable roadway construction: energy consumption and material waste generation of roadways*. American Society of Civil Engineers, Proceedings of 2005 Construction Research Congress. (<http://www.pubs.asce.org/wwwdisplay.cgi?0520020>))
- Although the manufacture and construction of a reinforced concrete pavement is a cold process, the manufacture of cement and steel is carried out at temperatures of up to 1600°C.

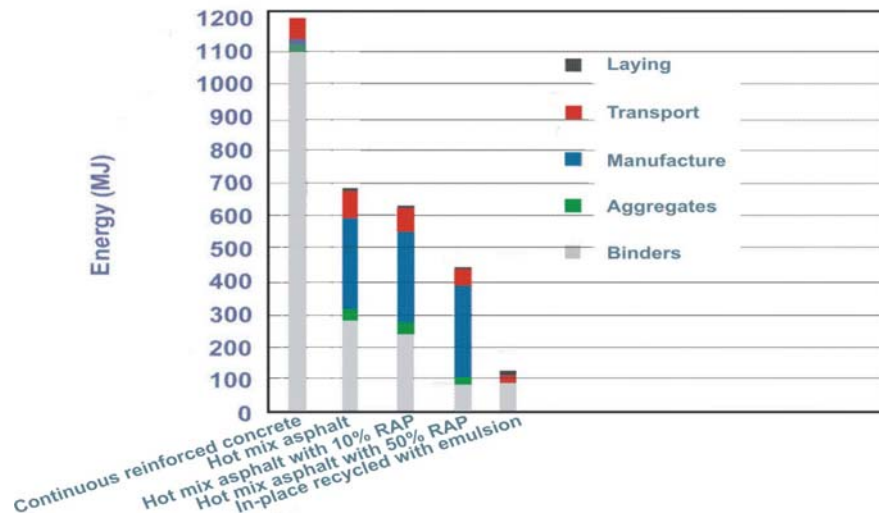


Figure 1: Energy consumption per ton of laid material

- Asphalt is mixed and laid at temperatures above 130 °C, and the bitumen itself is distilled at a temperature below 375 °C. However, bituminous materials can also be manufactured and placed at ambient temperatures by emulsifying the bitumen with chemically treated water, with significant reduction in GHG emissions;
- Additives can also be added to the bitumen during the manufacture of asphalt to reduce the mixing and paving temperatures by up to 40°C;

- During an analysis period of, say, 40 years it may be true that a concrete pavement would only require limited, periodic maintenance and repair measures. An asphalt pavement, on the other hand, will normally be designed to undergo periodic rehabilitation or strengthening in the form of overlays. This staged construction, typical of asphalt pavements, is a major financial or economic advantage, for both tax payers and investors in concessioned highways; expenditure streams are more closely matched to current road usage or cash income from tolls;
- Full depth asphalt pavements, know as perpetual pavements, can be constructed (USA and Europe) to ensure longer life and lower maintenance costs over the full design life of the structure;

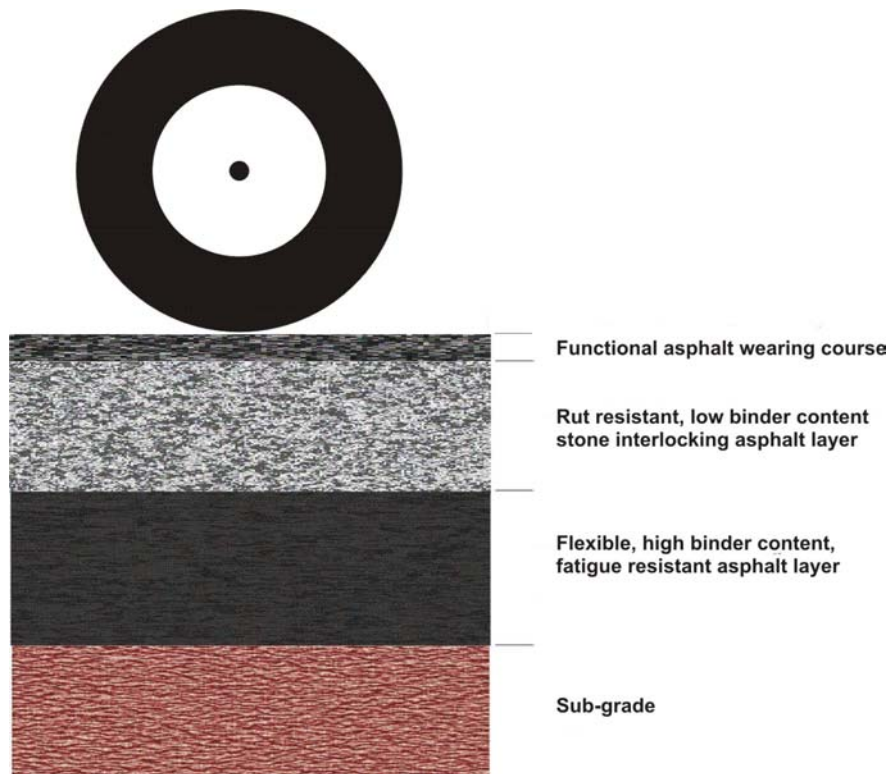


Figure 2: Concept design for a perpetual pavement

- The perception that concrete pavements have a traffic carrying capacity significantly in excess of that associated with asphalt pavements has not always been vindicated by experience with this type of pavement in SA. It is also true that high modulus asphalt technology currently available which elevates the traffic carrying capacities of asphalt pavements to levels previously unattainable;
- Concrete is not economically viable as a cost effective pavement for low trafficked roads because of its high initial cost;
- Up to 80% of Southern Africa’s flexible pavements are surfaced with a bituminous surface treatment as opposed to asphalt or concrete due to their cost effectiveness

“In the environment of diminishing resources and increasing costs in which the road construction sector operates, and given South Africa’s overriding need to facilitate cost-effective infrastructure provision, a duty of care must be borne by industry association such as Sabita to ensure that decision makers at all levels have accurate, up-to-date, and relevant information,” CEO Trevor Distin said. “Sabita has now undertaken to facilitate a thorough analysis of all the issues outlined above. The resulting information will be presented in an objective way and disseminated for the guidance of both government and industry.”

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