Shell Bitumen

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Delivering Innovation to your Advantage

Shell Bitumen

Technical Publications and Patents from 2005-2007

Shell Bitumen

Contents:

Shell Bitumen Technical Publications

Shell Bitumen is a global business operating in >30 countries and aspires to continue to grow and move into new markets. Recent acquisitions, for example the purchase of Koch in China, and the construction of new plants (for example, a PMB plant in Uluberia, West Bengal, India) demonstrate the commitment to the market that our customers, governments and the general public expect from a world class organisation.

Our commitment to you – whether you are an asphalt manufacturer, a road building contractor, in government or a member of the local community – remains the same, 'we bring you the benefit of our formidable technological capabilities with a keen emphasis on partnership and delivery' – a combination which we believe sets us apart from the competition. As one of the world's leading marketers of bitumen products globally, Shell has been a pioneer in innovation and we aim to make a measurable difference to your business performance. Not only that, but we endeavour to do this whilst maintaining the highest level of HSSE commitment, protecting you, us and the environment.

Further information

Attached to this document is a summary of a selection of recent publications that give an insight into what matters to us and what we are doing to meet the needs of our customers, governments and society as a whole. If you require further information or details about any of these articles (or any other matter), please go to the following website for contact details:

www.shell.com/bitumen

Our commitment to you

- We are a Bitumen solutions provider that offers global supply coverage with demonstrated international experience. Through over 140 refineries, plants and depots across the globe, we have unrivalled supply and delivery capability, whilst still retaining the local knowledge and customer service through dedicated sales and customer service teams within countries
- Our high quality standards which enables us to deliver asphalt and bitumen components on specification, on time, every time, through our world class manufacturing, technical and supply operations
- Our technical advantage which provides reliable and cost effective life-time solutions for all our customers. With technical facilities in France, UK, Malaysia, Thailand, Philippines, China and Argentina and plans to develop facilities in India, we have specialist Bitumen and Asphalt engineers available to provide support whatever the problem
- We are continually developing innovative solutions to meet the needs of our customers, both now and in the future. We are investing in our product and solution technology, both through academic research and our own R&D facilities.

Our commitment to Sustainable Development

Sustainable Development is about meeting present needs without compromising those of the future. We share rising public concerns about the environment and social equality. At Shell Bitumen, we take our responsibilities to support the sustainable development agenda very seriously. We aim to become the leading force in sustainable pavement solutions, delivering important social and environmental benefits to the world, by:

- Providing and developing pavement solutions that reduce the impact on the environment or actively improve our environment
- Improving the quality of life for both the developing world and inner city areas in developed nations

We at Shell Bitumen recognise that Sustainable Growth is difficult, but do not believe it is impossible. We are committed to using our technology and persistence to meet this challenge. We have some solutions already but don't have all the answers. We are determined though, to continue to develop more sustainable technologies that can make a real difference.

General Publications

TITLE: Bitumen Rheology:
Past, Present and Future Expectations

AUTHOR(S): Sophie Nigen-Chaidron,
Shell Global Solutions

PUBLISHED IN: Whither Rheology, Institute of Non-Newtonian Fluid Mechanics; 2–4th April 2007, Lake Vyrnwy, Wales, UK

ABSTRACT: Bitumen is a product used extensively in roads, airports, roofing and joint sealant applications. In these applications, bitumen acts as a binder and for waterproofing, ensuring the integrity of the whole structure. Simply described as a "black and sticky" matter, bitumen is a mixture of complex hydrocarbons mainly derived from the distillation of selected crude oils. Its mechanical properties can vary a lot depending on the grade and one of the key ways to assess them properly is rheology. Rheologically speaking, bitumen is a complex fluid: extremely temperature sensitive, visco-elastic, with a viscosity ranging from constant to highly shear-thinning depending on the temperature. For decades, rheology of bitumen has been evaluated through empirical tests appropriate to the field. However, following technical innovations and the associated development of new products (polymer modified bitumen, multigrade bitumen and synthetic bitumen), these empirical tests have shown their limitations. More controlled and sophisticated rheological characterisations have been looked for, leading to the general use of parallel plate rheometry. This systematic approach started nearly 10 years ago and will go on for some time as we are indeed currently in the "understanding phase" of this complex product. Such a study is extremely rich because the deformations applied vary a lot from one use to another: from small roads to heavy loaded motorways, waterproofing in static and dynamic joint sealants, large and sudden deformations when an aircraft is landing, high thermal variations in roofing application. It is also challenging, because interactions with the different components are numerous and diverse. However, as indicated above, bitumen is generally not an end product and its uses are numerous. But, in a sense, the expectations from bitumen characterization are unique: forecasting properties and performances of an end product that does not contain only bitumen, the performances expected being application related. Two other parameters intensify the complexity of interpretation: first, a road is designed for up to 40 years (and may last for more than 100 years) so the approach and predictions have to be valid on a very long-term scale; second, bitumen being very thermally sensitive and used in outdoors constructions, the properties are climate dependent. To fully understand bitumen properties and performance a multidisciplinary approach will be needed, as rheometry is only one tool.

TITLE: Rheological Characterisation of Bituminous Binders for Specification Purposes

AUTHOR(S): Sophie Nigen-Chaidron,
Shell Global Solutions

PUBLISHED IN: 4th International Conference Bituminous Mixtures and Pavements; 19–20th April, Thessaloniki, Greece

ABSTRACT: Over the past few years, Shell Bitumen has been actively involved in extensive testing of a wide variety of conventional and modified binders. Amongst the tests currently being used, a very large amount of effort has been given to assessing the rheological measurement of complex properties at low, intermediate and high temperatures. The solid deformation, shear and elongational properties are investigated using the Bending Beam Rheometer (BBR), Dynamic Shear Rheometer (DSR) and Ductility test, respectively. The compilation of these data provides a full characterization of the tested bitumen, i.e. a fingerprint of its fundamental properties. In this paper, the focus will be on DSR measurements: frequency sweep between 10 and 80°C, Zero Shear Viscosity (ZSV) and Low Shear Viscosity (LSV). The extensive data collected on conventional and modified binders have been used first to illustrate the reliability of these rheological tests. In a second step, as these tests are very time-consuming, the obtained data have been analyzed from a purely rheometrical perspective to show that LSV values can be derived from frequency sweep measurements.

TITLE: "Bitumen ain't what it used to be" – The myth and reality of Australian Bitumen 1980–2005: Part 1

AUTHOR(S): Nigel Preston, Shell Bitumen

PUBLISHED IN: The proceedings of the AAPA Pavements Conference, Surfers Paradise, Australia, September 2005

This paper presents a coherent explanation of Shell's involvement in the supply of bitumen to the Australian Industry and to dispel some of the myths and rumours which have served to undermine the reputation of this engineering material.

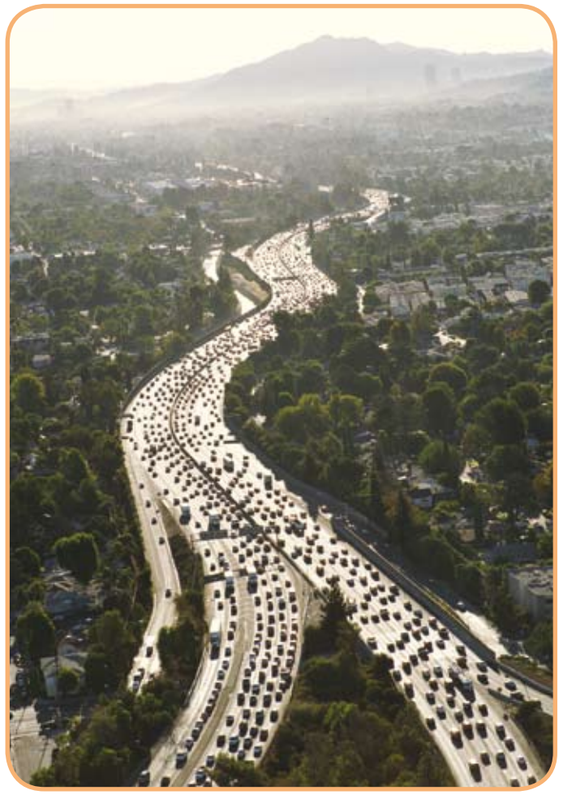
PATENT: Asphalt Composition

AUTHOR(S): Shell Internationale Research Maatschappij B.V.

PUBLISHED IN: International Publication Number: WO 2007/113221 A1 (11th October 2007)

ABSTRACT: An asphalt composition is made by incorporating 4–18 weight %, based on the total weight of the composition, of a hydrogenated thermoplastic elastomer having a bromine number of 10g Br2/100g or less, a molecular weight of 50 000 to 200 000 and a styrene content of 15–40 weight %, and wherein 5–35 weight % of block copolymers of the aforesaid styrene is present at each of the two ends of the elastomer molecules, into an asphalt such as straight asphalt, blown asphalt or the like. The asphalt composition has excellent thermal stability and high temperature storage stability, and excellent durability in the temperature range from –20ºC to 600ºC.

General Publications



PATENT: Colourable Binder Composition
AUTHOR(S): Shell Internationale Research Maatschappij B.V.
PUBLISHED IN: International Publication Number: WO 2007/060241 A1 (31st May 2007)

ABSTRACT: A colourable binder composition with both excellent durability and application properties when used in coloured paving is provided. It contains 20–40 weight % in total of hydrogenated petroleum resin and non–hydrogenated petroleum resin, 1–10% weight % of hydrogenated thermoplastic elastomer of percentage hydrogenation 95% or more and 0.1–5 weight % in total of tall oil derivative of acid value 50–300 and/or tall oil fatty acid of acid value 50–300, the remainder being made up of petroleum solvent-extracted oil, has a composition wherein the ration of the aforesaid hydrogenated petroleum resin to the aforesaid non-hydrogenated petroleum resin (hydrogenated petroleum resin/non-hydrogenated petroleum resin) (weight ratio) is 10–30%, moreover, the viscosity at 150ºC is 500 mPa.sec or less, and the DS value of a mixture of dense granularity (13) is 1500 times/min or more.

PATENT: Asphalt-Epoxy Resin Compositions
AUTHOR(S): Shell Internationale Research Maatschappij B.V.
PUBLISHED IN: International Publication Number: WO 2005/000968 A2 (6th January 2005)

ABSTRACT: An asphalt-epoxy resin composition which contains in the indicated proportions (A) from 75 to 93 wt% asphalt, (B) from 1 to 5 wt% epoxy resin and (C) from 6 to 20 wt% maleic acid modified thermoplastic polymer wherein the total amount of (A) + (B) + (C) is 100wt%, and wherein the aforementioned epoxy resin (B) is a ternary copolymer comprising (i) lower x-olefin (ii) lower alkyl acrylate or methacrylate and (iii) glycidyl acrylate or glycidyl methacrylate, and the molecules have terminal glycidyl groups.

PATENT: Improvements in or Relating to Bituminous Materials
AUTHOR(S): Shell Internationale Research Maatschappij B.V.
PUBLISHED IN: International Publication Number: WO 2006/100239 A1 (28th September, 2006)

ABSTRACT: The use of a surfactant to improve the resistance of asphalt to degradation be a de-icer and/or an anti-icer, and optionally in addition to improve the resistance of said asphalt to degradation by water. The surfactant may be a fatty acid or a fatty acid derivative, such as at least one polymerised fatty acid selected from dimers and trimers of an unsaturated fatty acid, or one or more amine or substituted amine compounds, such as a reaction product of tall oil fatty acids and polyalkylenepolyamines.

HSSE

TITLE: Procedures for Identifying Hazards in Component Materials for Asphalt (Produced as part of the European SAMARIS[1] project)
AUTHOR(S): Cliff Nicholls & Piouslin Samuel (Transport Research Laboratory); Francois Deygout & Burgard Koenders (Shell Global Solutions)
PRESENTED AT: 4th International Conference, Bituminous Mixtures and Pavements, Thessaloniki, Greece (April 2007), EU SAMARIS project (Deliverable D23, end 2005) report

ABSTRACT: The use of secondary materials in road construction seems to be considered by some to be the preferred method for their disposal. However, such materials need to undergo a wide range of investigations to check their suitability, from simple to extensive, because of the distinct properties of the material at source. Various strategies to promote the use of by-products could be considered for adoption, but are not the subject of this investigation. The overall aim of the task within the SAMARIS project was to produce a methodology of testing alternative components for potential hazards. There are several materials known to have been used in pavements that require care should such pavements be used for recycling. However, for any procedure to be general and to allow for new potentially hazards to be considered, the circumstances that maximise the risk during the extraction of the old pavement together with the manufacture, paving and use of the recycled material have to be included in the procedure. A procedure has been developed around two known hazardous component materials and five more general situations with suitable tests being identified to check for them.

[1]SAMARIS is a European research project that is partially financed by the European Commission through the5th Framework Programme, under the GROWTH programme. The SAMARIS project involves 23 partners and 12 subcontractors. It contains 11 Work Packages of which Work Package 4, Safety and Environment, has the objective of encouraging the use of recycled and secondary materials in pavements by detailing how such materials shall be selected and tested in order to secure satisfactory performance, environmentally as well as functionally. The work discussed below is task 1 of Work Package 4.

HSSE

TITLE: Asphalt Worker Exposure to PAHs: Studying Aspects

AUTHOR(S): Francois Deygout & Patricia Le Coutaller, Shell Global Solutions

POSTER PRESENTATION: at 2006 symposium on HSE aspects of bitumen (Dresden, Germany). Summaries appeared in Occupational Hygiene Publication in Progress Annals of Occupational Hygiene

ABSTRACT: Due to its crude origin, bitumen contains very small quantities of polycyclic aromatic compounds (PACs), which are composed of polycyclic aromatic hydrocarbons (PAHs), polycyclic aromatic heterocycles and other derivatives (mainly methylated ones). Some of the PAHs and derivatives are known to have mutagenic, or carcinogenic activity. Qualitative/quantitative determination of these compounds is required in order to assess if there are any potential occupational health impacts on asphalt workers. The lack of a standardized methodology to analyse PAHs in bitumen fumes collected in the workplace atmosphere makes it exceedingly difficult to compare results from different studies. The scope of this study is to examine the key factors influencing the collection of certain PAHs in fumes emitted from hot bitumen or bituminous mixtures in field surveys. Because personal exposure measurements in field surveys can be influenced by many uncontrollable variables, Shell has developed an experimental laboratory apparatus in which bitumen fumes can be generated reproducibly under well-controlled conditions.

This fume generator has already demonstrated the key influences of temperature of use and bitumen volatility. Predictions can be made from these correlations in order to assess the amount of fumes (organic aerosols) to which asphalt workers may be exposed. However, there are few data regarding relationships between PAH generation on the lab scale and actual emissions in the field. This work aims first to study some influential parameters on PAH collection in the laboratory and secondly to compare these findings with actual PAH collection in field surveys conducted on the same bitumens. The key parameters chosen are:

1. The nature of the membrane used to collect the aerosols: fibreglass or PTFE-based membranes are commonly used for asphalt worker monitoring. Some comparative lab experiments demonstrate the effectiveness of each support for collecting PAHs.
2. The design of the sampler used for collecting the aerosols: the inhalable fraction of PAHs is generally collected either with the help of a 37 mm "total particulate" closed sampler or the American IOM open sampler designed by the Institute of Occupational Medicine. Some previous studies have shown an underestimation of the inhaled part by only taking into account the membrane without the inner cassette walls. These aspects are studied here and both samplers are compared. With the help of these experiments, lab and field measurements from two previous field surveys have been compared. The actual contents of some PAHs in fumes have then been optimized. This work is based on two commercially available bitumens. In addition, the capacity of these bitumens to emit PAHs is studied via:
   - The original PAH contents of the bitumens
   - The effect of temperature.

This paper describes the protocol subsequently established for PAH collection and presents recommendations to facilitate the standardization of protocols required for personal sampling.

TITLE: Identification and Quantification of PAH in Bitumen by GC-Ion-Trap MS and HPLC-Fluorescent Detectors

AUTHOR(S): C.K.Huynh & T.Vu Duc (Institute University Romand de Sant'e au Travail, Lausanne, Switzwerland) & F. Deygout, P. Le Coutaller & F. Surmont (Shell Global Solutions)

PUBLISHED IN: Polycyclic Aromatic Compounds, 27: 107–121, 2007

ABSTRACT: Bitumen is a complex product with a large matrix of heavy aliphatic/naphthenic/aromatic hydrocarbons as well as a large number of isomeric compounds such as polycyclic aromatic compounds (PACs). Some PACs and derivatives are known to have a mutagenic and carcinogenic activity, and there is no generally satisfactory clean-up method for separating PACs from this very complex hydrocarbon matrix. Moreover, from an analytical point of view, the isomeric compounds usually co-elute in the same gas chromatography (GC) retention range, GC being one of the most widely used techniques in this area. However, the use of a suitable clean-up procedure for isolating the aromatic fractions, combined with two selective detection techniques such as mass spectrometry (GC-Ion Trap MS) and HPLC-Fluorescent detector (HPLC-FL), is expected to provide an effective tool for accurately determining certain PAC species in bitumen. In this paper we compare two quantitative extractions to analyze the 16 PAHs that occur in bitumen according to the US EPA reference list. Two clean-up protocols are assessed and compared by using both GC-Ion Trap MS and HPLC-FL chromatographic/detection techniques. The first extraction method combines well-established and proven clean-up operations with an automatic fractionation by semi-preparative HPLC (certification test program for PAHs in sewage sludge, in creosote-contaminated soil and in harbour sediment organized by the Community Bureau of Reference, BCR). The second method uses a multiple step-by-step liquid/liquid and liquid/solid extraction clean-up procedure. After the bitumen extracts are cleaned up, only the use of both GC-MS & HPLC-FL can provide reliable results. The more sensitive FL provides enhanced fluorescent selectivity signals that facilitate identification of PAH compounds. However, for their quantification, the capillary GC-ion trap mass spectrometric technique is preferred because of the insufficient resolution of the HPLC column and the possible quenching or co-elution effect of matrix compounds. Both detection techniques are regarded as complementary.

TITLE: Bituminous Solutions for Improved Road Safety

AUTHOR(S): C.P. Leong, C. Desmazes, Y. Janyajarasporn, Shell Bitumen

PUBLISHED IN: 7th MRC 2007

ABSTRACT: As the Malaysian Prime Minister, Dato Seri Abdullah Ahmad Badawi highlighted in 2004, "Road safety is an investment and not a cost so all must work together to address this urgent issue". Road safety can be improved by a variety of factors – like drivers attitude, car design and road structure. This paper is aimed at exploring road design options, by focusing on improvements to the bituminous road structure that have the ability to help to prevent the loss of lives. Improved road safety can be made easier by the usage of specific wearing courses. Examples of pavement solutions are discussed that make use of premium binder technology. The usage of coloured materials as safety enhancer is to be explored. Coloured pavements can be used as traffic separators, as coloured warnings codes for intersections or in tunnels. An example is displayed with the usage of coloured cycling lanes in Europe.

HSSE

TITLE: A novel approach towards producing an analytical marker for the prediction of mutagenicity and carcinogenicity of bitumen and bitumen fumes, based on comprehensive two-dimensional gas chromatography (GCxGC)

AUTHOR(S): Jan Blomberg & Francois Deygout, Shell Global Solutions

PRESENTED AT: International Symposium on Polycyclic Aromatic Compounds in Toronto (mid 2005)

This paper demonstrates that through the use of two-dimensional gas chromatography, an analytical marker can be produced, which correlates the chemical characteristics rather than the individual compounds, with mutagenicity and carcinogenicity. The key advantage of this technique is that it far simpler to use, than the very complex experimental set up that was previously required.

TITLE: Procedures for Identifying Hazards in Component Materials for Asphalt

AUTHOR(S): J.C.Nicholls & P.Samuel (TRL Limited), V. Mouillet (Laboratoire Régional des Ponts et Chaussées d'Aix-en-Provence (France)), B.Koenders & F.Deygout (Shell Global Solutions)

PUBLISHED IN: 4th International Conference Bituminous Mixtures and Pavements; 19–20th April, Thessaloniki, Greece

ABSTRACT: The use of secondary component materials and recycling in the production of asphalt generally results in no exceptional hazards for operatives, the general public or the environment. However, such materials need to undergo a wide range of investigations to check their suitability because of the properties of the material. The wider use could mean that the use or re-use of some non-standard materials may have health, safety and environmental implications. Various strategies to promote the use of by-products could be considered for adoption, but are not the subject of this investigation. The overall aim of the task was to produce a methodology of testing components for potential hazards. For any procedure to be general and to allow for new hazards to be considered, the circumstances that maximise the risk during the extraction of the old pavement together with the manufacture, paving and use of the recycled material have to be included in the procedure. A procedure has been developed around two known hazardous component materials and four more general situations. Suitable tests have also been identified to check for such component material.

Emulsions

TITLE: Road Emulsions in Latin America

AUTHOR(S): Mario Roberto Jair, Shell Bitumen

PUBLISHED IN: 4th World Congress on Emulsions, Lyon (France); October 2006

ABSTRACT: This document summarizes the current situation of the use of asphalt emulsions in the road market in Latin American countries. Cold –processed technology appears to be highly suitable for this whole region with its extensive network of secondary and more minor roads, added to the fact that the majority of the countries are affected by substantial budgetary restrictions. These are the reasons why the excellent technical and economic balance of these materials makes them so suitable. In addition to the use of the best-known types of emulsion, others have recently been introduced such as modified emulsions, special impregnation emulsions and specials emulsions for slurries and microsurfacings applications. In order to review the situation in the main countries, the document divides the LA region into four major zones:

- Southern Zone: Argentina, Chile and Uruguay.
- Northern Zone: Colombia and Ecuador
- Eastern Zone: Brazil
- Central América Zone: Salvador, Nicaragua, Guatemala, Honduras and Mexico.

TITLE: Bitumen Emulsion Technology – The Right Solution for Construction and Maintenance Works on the Chinese Road Pavement Network

AUTHOR(S): Kathy Wang Ying, Michael Cai Mingkang, Merlin Zhou Zhaohui, Qian Peizhong, & Frits De Jonge, Shell Bitumen

PUBLISHED IN: 4th World Congress on Emulsions, Lyon (France); October 2006

ABSTRACT: After the first expressway was opened to traffic in China in 1988, the road network has developed rapidly. By the end of 2005 the total mileage of expressway reached 34,000 km, ranking the second in the world, and the total mileage of road in-service is 1,900,000 km. To preserve this huge infrastructure investment it is of no surprise that road maintenance technology is growing in importance when compared to new pavement construction techniques. To ensure a sustainable future of the Chinese road pavement infrastructure, bitumen emulsion technology has developed a strong position as the right choice solution for road pavement maintenance This paper describes the evolution of emulsion paving technology in China over the last decade with a key focus on the development of prime sealing, slurry sealing and micro surfacing technologies. It also presents an overview on the efforts made by the emulsion industry and how those efforts have changed the business landscape from perceived low quality product to high-end technology available for new construction and maintenance of the Chinese road network.

Sustainable Development

TITLE: Shell Bitumen and Sustainable Development
AUTHOR(S): Richard Davies, Shell Bitumen
PUBLISHED IN: 23rd World Road Congress – Paris, Sept 2007

ABSTRACT: Sustainable Development is about meeting present needs without compromising those of the future. We share rising public concern about the environment and social equality. At Shell Bitumen, we take our responsibilities to support the sustainable development agenda very seriously. We aim to become the leading force in sustainable pavement solutions, delivering important social and environmental benefits to the world, by:

- Providing and developing pavement solutions that reduce the impact on the environment or actively improve our environment.
- Improving the quality of life for both the developing world and inner city areas in developed nations.

Difficult but not Impossible – We at Shell Bitumen don't believe that Sustainable Growth is impossible. It may be difficult but we have no other option and so we will use technology and persistence to meet this challenge. We have some solutions already but admit that we don't have all the answers. Our determination though, is to continue to develop more sustainable technologies that can make a real difference.

TITLE: Asphalt Sustainability: An Innovator's Dream or a Researcher's Nightmare?
AUTHOR(S): John Read, Shell Bitumen
PUBLISHED IN: JMU Conference, 2007; UK

ABSTRACT: Any paper on sustainability should ask what is sustainable development? A question that was very succinctly answered, by the United Nations, in 1987. Sustainable development is 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. So this tells us to conserve resources for the future whilst requiring us to develop for the present in a manner that has no impact for the future. In the past these two contradictory statements created great difficulty for companies, as Shareholders demanded short-term returns with scant regard for the impact that the activities to deliver these may have on future generations. However, Corporate investment is now far more geared towards social and sustainable portfolios, partially because society has gone on an emotional journey over climate change and partially because of the potential returns for the future. No picture better exemplifies why it is necessary to act now than those visually showing the difference in the size of the ice caps. By its very nature then any research that could help deliver such a future is long term but this needs to be balanced against the short-term need in delivering shareholder returns. Therefore, rather than specifically looking at technologies associated with asphalt sustainability this paper outlines a methodology that allows:

- The research portfolio to be balanced between the short and long term
- Management of the increasing risk associated with long-term research
- Management of the assumptions that need to be made when dealing with sustainable development due to the ever changing planet
- Acceleration of those projects that are delivering
- Stopping those projects that are failing to deliver

This provides a way for asphalt sustainability projects to compete fairly with both long and short term calls on the money that any company has to expend on R&D across its various functions. Hopefully then, the Innovator who can imagine the opportunities for the future has a tool to allow those ideas to be funded and the researcher has a methodology that will ensure that the project will deliver on the need of the future or be stopped and the effort placed elsewhere.

TITLE: Overseas Developments in Low Temperature Asphalt
AUTHOR(S): Andy Self, Shell Bitumen UK
PUBLISHED IN: JMU Conference, 2006; UK

ABSTRACT: This paper details some of the more recent developments and successes in reducing mixing and application temperatures of asphalt products. The knowledge exchange and best practice transfer associated with this technology has meant that many countries are now interested in ways to reduce application temperatures. This paper concentrates on the development of the 'S' Class range of binders by Shell Bitumen and describes the benefits they offer and how they have been used. It is clear that reducing temperature is a solution that offers a wide variety of stakeholder benefits for producer, contractor, road user and the general public:

- Improving workability
- Extending the laying window
  - Improvement in logistics
  - Savings in energy costs
  - Reducing emissions

The paper describes how asphalt can be produced at lower temperatures by using examples to demonstrate where this technology has been successfully implemented.

TITLE: Emission and Occupational Exposure at Lower Asphalt Production and Laying Temperatures
AUTHOR(S): M. Lecomte, F. Deygout (Shell Bitumen) A. Menetti (Contech, Italy)
PUBLISHED IN: 23rd World Road Congress – Paris, Sept 2007

ABSTRACT: It is well known that reducing asphalt production temperatures has significant environmental benefits on emissions, occupational exposures and energy consumption. The hot mix asphalt industry has been aware of this for many years. The biggest challenge however has always been to achieve adequate asphalt mixture quality at lower or ambient operating temperatures. In recent years, new production processes at temperatures between 80 – 120°C have attracted much interest because of the possibility to approach or even obtain hot mix quality and having reductions in energy consumption, emissions and occupational exposures. Results of recent measurements on a site in Florence in Italy show that decrease in temperature offers a dramatic reduction in greenhouse gases emission and a considerable reduction of fume emissions and workers exposure, together with a 30% energy reduction. This confirms the great potential of this solution for the environment.

Sustainable Development

TITLE: Laboratory Investigation of Recycled Binder Performance

AUTHOR(S): Laurent Porot & Sophie Nigen-Chaindron, Shell Bitumen

PUBLISHED IN: JMU Conference, 2007; UK

ABSTRACT: Recycling is becoming more and more important for both economical concerns and environmental aspects. Technologies for recycling Reclaimed Asphalt Pavement have been developed in recent decades for hot or cold recycling as well as for in place or in plant recycling. Step by step, some rules and guidelines have appeared, mainly based on experience. In the US, thanks to the performance-related SUPERPAVE approach, the reuse of RAP in new mixtures is now facilitated up to 50%. In Europe, the new set of standards for Asphalt Mixtures allows the use of RAP up to 20% without specific restrictions. Even if such practices have shown acceptable results on roads, the real performance of recycled binders has not yet been widely and systematically investigated. In this context, it appears of interest to further investigate the effects of products usually used in recycling. To start addressing this issue, the present paper discusses the basic characteristics and some rheological characteristics of an aged conventional binder rejuvenated with recycling agents currently in use. The rate of recycling was set at 50% and 85% in order to investigate the limits of such technology.

TITLE: INSTAPAVE, an Innovative Road Technology for Rural Development

AUTHOR(S): Henk Hoppen & Mary Ann de Chabez, Shell Bitumen

PUBLISHED IN: 23rd World Road Congress – Paris, Sept 2007

ABSTRACT: The rural road network plays an important role for the development of rural economies and the livelihoods of the local communities. Benefits of rural road access include market opportunities for farmers, improved access to healthcare, schools and social welfare. Lack of access to reliable road infrastructure is often seen as one of the central features of poverty. Generally gravel is used for surfacing rural roads, but issues with gravel are numerous (dust generation, gravel loss, safety hazard, health hazard, discomfort and nuisance, air pollution, inaccessibility of roads during rain season, etc.). In this paper INSTAPAVE is presented as a cost effective paving technology for upgrading low and medium volume rural roads. A case study in the Philippines describes the application of the system on a secondary national road near Puerto Princesa, Palawan. The results demonstrate the INSTAPAVE system performs well under the medium volume traffic conditions and in this way it can contribute to the development of rural areas. The INSTAPAVE system enables local authorities to afford projects, which replace gravel roads with bound pavements. For the same budget, more roads can be treated, meaning that more children have wider access to schools, more farmers can reach markets and more families have improved access to healthcare.

TITLE: Road Trials with Vegetable Oil Based Binders in Norway

AUTHOR(S): E.Andersen, J.Vasudevan, D. Stoker (Shell Bitumen) E. Hagen (Mesta AS), R. Bragstad (Norwegian Asphalt Institute), B. O. Lerfald (SINTEF Building and Infrastructure, Road and Railway Engineering)

PUBLISHED IN: 23rd World Road Congress – Paris, Sept 2007

ABSTRACT: In recent years, the asphalt industry has conducted a significant amount of research to ensure sustainable development and a focused shift towards environmentally sound practices. In the effort to transfer research into practice, two different trials with vegetable oil based binders have been conducted in Norway. The first trial was an application in Hot Mix Asphalt (HMA) using vegetable oil based viscosity grade V10000 bitumen and conventional V10000 bitumen as a reference. V-grade binders, being very soft bitumen grades, are typically used on low volume roads in Scandinavia where poor and varying bearing capacity often requires flexible asphalt layers. A second binder was developed for a fast moving train hot surface dressing application. This binder, named BL9000R, is an environmentally friendly slow curing type cutback used for this type of application in Norway. In this trial, the vegetable oil based BL9000R was developed purely as an alternative for the conventional BL9000R product. Both products were included in the trial for comparison. Comparative laboratory analysis on the vegetable oil based binders and reference binders as well as mixtures were performed for both trials. In the comparison of the two V10000 bitumens, it was seen that the vegetable oil based binder was less temperature susceptible. Both BBR and TSRST testing show that the vegetable oil based binder has better low temperature properties as compared to the reference binder. Regarding other specification parameters, the vegetable oil based binder meets all requirements and is comparable to the reference binder. The laboratory testing for the surface dressing trial did not reveal any significant differences between the vegetable oil based BL9000R and the reference BL9000R. In the field application of V10000 and BL9000R in the two trials, fewer emissions were observed for the vegetable oil based binders. The details of the laboratory analysis and the data from the field trials are presented and discussed in this paper.