

International cooperation successes of the German Bitumen Forum

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Industry solutions must work internationally

Today handling and classification of materials cannot be regarded any longer solely on a national basis. Manufacturers and distributors of materials are acting Europe-wide, or even globally. Manufacturers, above all manufacturers' associations, are less and less prepared to agree with solely national approaches for industrial safety. In particular, the chemical and oil industries, being the major manufacturers and distributors of materials, are acting internationally. Thus, national solutions are increasingly less relevant [1; 2]. Manufacturers or their associations are hesitant to agree to voluntary agreements on a national basis, because such actions could trigger different approaches being implemented in each of the 27 European Union member states, let alone in other parts of the world.

Right from the start the German Bitumen Forum was aiming to support international cooperation in its fields of expertise. Minutes of each meeting were translated by international members and provided to representatives of the bitumen, asphalt and roofer industry worldwide. Additionally, the website of the German Bitumen Forum is offered in a German and English version [3].

The German Social Accident Insurance for the Construction Industry (BG BAU) has taken the leadership and coordination within the German Bitumen Forum. The following international case studies demonstrate that an international cooperation lays a solid foundation for the furthering and implementation of harmonized national industrial safety standards. In particular, these case studies confirm that industry – led by the German Bitumen Forum – has already taken pioneering very positive steps to ensure the safe use of bitumen products in all types of applications now and in the future.

Measurements in France and Slovenia

Max von Devivere (Eurovia, France) and *Jens Arnold* (Sasol Wax, Hamburg)

Essentially developed in Germany, the technology of producing and laying traditional Hot Mix Asphalt as well as mastic asphalt (Gussasphalt) at lower temperatures by means of adding a zeolite or an organic additive was quickly adapted by a number of other countries. Since specialists of the German BG BAU had monitored already numerous "Warm Mix Asphalt" jobsites in Germany, they were asked to also accompany such jobsites in France and Slovenia (Figures 1 and 2). The measured data confirmed the results obtained in Germany. Of course, this additional data was included into the

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Figure 1. Research personnel of the BG BAU accompany the construction of Warm Mix Asphalt on A 81 near Laval in France.



Figure 2. Installation of Warm Mix Asphalt in close proximity to Ljubljana in Slovenia.

main data pool of the BG BAU. Additionally, it became clear that the installation of Warm Mix Asphalt in these countries follows the same practices and principles as in Germany – an aspect that is very important regarding the planned revision of the IARC Monograph on bitumen.

The measured low exposures were consequently one of the substantial reasons for the fact that hundreds of kilometers of Warm Mix Asphalt have been laid on French motorways so far, with a production of more than 520,000 tons of Warm Mix Asphalt in 2009 alone.

Although exact data is difficult to obtain, it can be safely stated that in the past decade many million tons of Warm Mix Asphalt have been used all over Europe. The applications are proven and authorities need to recognize this by accepting and specifying Warm Mix Asphalt as a proven technology instead of using it under trial protocols.

Promotion of warm mix asphalt

Gary Fore (National Asphalt Paving Association – NAPA, USA) and *Jürgen Reifig* (Deutscher Asphalt Verband – DAV, Germany)

Papers dealing with the several positive effects of temperature reduced asphalt mixes with regard to exposure of workers to fumes and aerosols from bitumen (called "asphalt" in the USA) had come to the attention of NAPA in the USA through publications of the German Bitumen Forum. This was the first exposure of NAPA to the concept of temperature reduced asphalt [4]. "Warm Mix Asphalt" soon emerged as name for this technology in the USA. Two study tours were organized in 2002 and 2007. Delegates from NAPA, the U.S. Federal Highway Administration, research institutions, and asphalt companies visited Germany to collect information on this technology. Focal points were health and safety, environmental protection, reduction of energy input, and improvement of pavement performance and quality.

NAPA and the Bitumen Forum discovered a shared value during early meetings – that of ensuring the protection of workers' health, safety and the environment through international cooperation, involvement of key stakeholders, and a focus on sustainable solutions. This sharing of information, experience and practical science has resulted in rapid introduction and acceptance of Warm Mix Technology in the USA in 2002, the discussion was about one or two potentially viable temperature reduction technologies. Today the list of potentially viable technologies tops 20 and Warm Mix Technology is revolutionizing the pavement industry in the USA. It is estimated that Warm Mix Asphalt production is currently in excess of 20 million tons per year and growing exponentially. Most important, the technology is proving to meet all economic, environmental and social criteria for sustainability and is gaining interest in other parts of the world.

An international Warm Mix Conference held November 2008 in Tennessee (www.warmmixasphalt.com) attracted in excess of 700 attendees and was so successful that it compelled some German attendees to publish a report about it. Indeed, there is now some fear that the development of Warm Mix Asphalt will repeat the story of the MP3 audio technology: it was invented in Germany but went to global success via Asia and the USA with the Germans only "watching from the sideline".

Meanwhile the use of temperature reduction technologies has been declared state of the art and has also been accepted by the German authorities for road infrastructure. However, projects that explicitly specify temperature reduced asphalt mixes are still few and far in between. In Germany, one of the most important questions is: Will the authorities pay for the additional costs? It is up to the Bitumen Forum to continue national and international activities in order to convince the public clients that this technology is the future for sustainable high quality road construction.

Comparison of international data on exposure to vapours and aerosols of bitumen

Antony Kriech (Heritage Research Group, Indianapolis, USA), *Jim O'Brien* (CSR Consulting, Ireland, President European Aggregates Association) and *Gary Fore* (National Asphalt Paving Association – NAPA, USA)

The International Agency for Research on Cancer (IARC) in Lyon/France plans to update its monograph on bitumen. IARC Monographs are based on all data available from scientific publications. Unfortunately, no international standard for the measurement of exposure to vapours and aerosols from bitumen yet exists. There was a real danger that some

data pools would not be available to IARC due to the multitude of different measurement methods and the inability to compare. A cooperative research agreement was reached between the Bitumen Forum, NAPA and the Asphalt Institute (AI) in the USA to conduct joint research. The Bitumen Forum agreed to conduct samples where the German and the U.S. exposure measurement systems were used in parallel on the same sites. The U.S. method results were evaluated by Heritage Research Institute in Indianapolis whilst the results obtained with the German standard were analysed by the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA) in Sankt Augustin. The very important result of the study was that both methods produce exposure data that is comparable. Thus, the data pool available to IARC is significantly expanded through the ability to utilize all data obtained with these two methods [5].

Exposure to vapours and aerosols from production and torching of bituminous membranes

Rainer Henseleit (Industrieverband Bitumen Dach- und Dichtungsbahnen e. V. – vdd, Germany) and *Paul Newman* (Bitumen Waterproofing Association – BWA, United Kingdom)

The preparation undertaken to update the IARC Monograph on bitumen also raised the question on exposures from manufacturing and torching of bituminous membranes. That is why the industrial associations vdd and BWA agreed to conduct measurements by the BG BAU in several European countries. The protocols also provided clarity if the same processes and technologies were applied by the various European manufacturers.

Samples were taken between 2007 and 2009 in Germany and seven other European countries during production of membranes and their application/torching on site. It is no surprise that the results for the production of membranes were quite congruent because there are only two companies which offer manufacturing equipment for bituminous membranes.

Measurements on roofer sites in Europe produced very low exposure rates, with findings only slightly above level of detection. These findings were not congruent with the 8.8 mg/m³ vapours and aerosols from bitumen that were found in German measurements originating from the 1990's and the early years of the 2000's. Recent German results now confirm the very low European measurement results. Obviously changes in work procedures have taken place in the last years. Roofers are by now using the torches much more sparingly. Today the membranes are not heated as much as they used to be years ago which in return considerably cuts the emissions of vapours and aerosols, as well as saving energy.

This cooperation between manufacturers of roofing membranes yielded valid and valuable descriptions of exposures during manufacturing and torching of roofing membranes (Figure 3) [3; 6]. The joint effort also served to rectify the previously measured higher exposure found in Germany. Today the exposure level lies significantly below the level found approximately ten years ago.

The roofing business in Germany profits from this international activity of the Bitumen Forum. The lower exposure levels will find their way not only into the IARC Monograph, they can also be used for REACH.

European Exposure Descriptions for Bitumen-Membranes

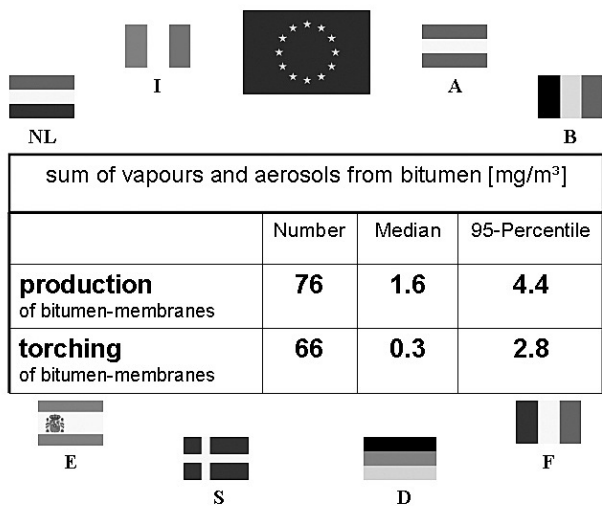


Figure 3. European exposure descriptions for the production and torching of bituminous membranes.

Registration of Bitumen for REACH

Jürgen Reifig (Deutscher Asphalt Verband – DAV, Germany) and Egbert Bewing (European Asphalt Pavement Association – EAPA, Belgium) REACH is a European Regulation that impacts on the manufacturers and distributors of chemicals. A dossier has to be submitted for each substance and each application that describes, amongst other data, the exposure levels and necessary measures for protection of exposed persons. It must be noted that a manufacturer is free to choose which application is registered.

The manufacturers of bitumen have pointed out already many years ago that use of bitumen in mastic asphalt happens at a critically high temperature. They have indicated that the safe handling temperature of 200 °C (30 °C below the flash point of the bitumen) will be maintained in their REACH dossier documentation. All current uses of bitumen will be re-

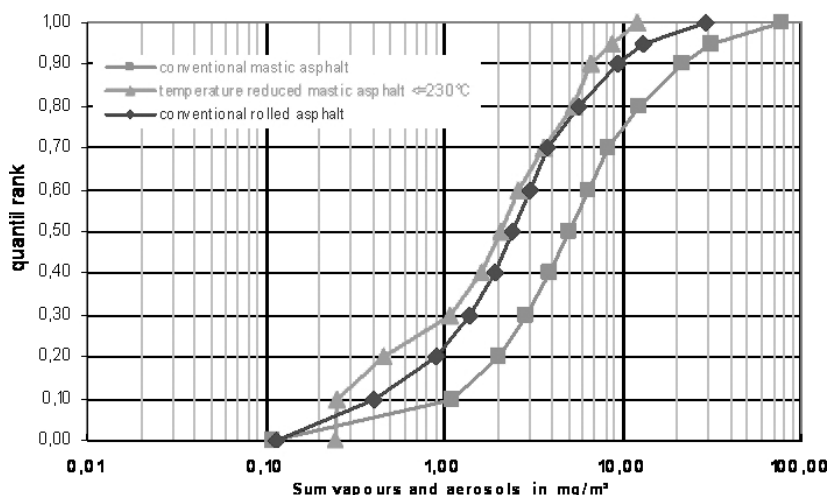


Figure 4. The exposure during low temperature mastic asphalt (gussasphalt) is comparable to emissions from conventional hot mix asphalt.

gistered, including mastic asphalt. The conditions of safe use will apply to all bitumen products. These conditions relate on one hand to the safe handling temperature and to the so-called DNEL (derived no effect level) for vapours and aerosols of bitumen on the other hand.

Only 0.5% of the bitumen in Europe is used for mastic asphalt. But especially in Germany mastic asphalt is used in sophisticated asphalt formulations, e.g. for bridge decking. More than 100 companies with more than 1,000 employees are working with mastic asphalt. Even in the future the safe handling temperature of 200 °C will have to be exceeded for many deformation resistant mastic asphalt formulations. This will not necessarily be the end of mastic asphalt. Article 37 of the REACH legislation requires entrepreneurs who wish to use a substance outside the conditions described in an exposure scenario to hold evidence that this use does not expose anyone beyond the level of an otherwise registered application. The Bitumen Forum can supply such evidence, based on the numerous measurements that show emissions from temperature reduced mastic asphalt to be comparable to emissions from conventional hot mix asphalt (Figure 4). Work prompted by the Bitumen Forum has already led to a cap of temperatures for mastic asphalt at 230 °C. This secures the future of mastic asphalt.

Within REACH dossiers the bitumen suppliers also need to specify a DNEL value for bitumen emissions. The DNEL describes the level of exposure that is without effect on human health. Instead of deriving the DNEL for bitumen from a rat exposure study, it should be possible to utilize the existing Bitumen Forum data pools and parallel studies on exposure. Using the animal study data would inherently require the use of safety margins which would lead to a prohibitively low DNEL. Use of the data on human exposure will hopefully lead to a DNEL that enables the continued safe use of hot mix and mastic asphalt – in all of Europe.

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