

## Vapours and Aerosols of Bitumen - exposures and classification

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German BITUMEN Forum

AAPA 2012 Study Tour of Europe, 18 June 2012, BAST

- BITUMEN Forum
- Exposure
- REACH
- IARC
- Accidents of workers on construction sites

Vapours and Aerosols of Bitumen

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In fall 1996 in Germany  
limit values for vapour and aerosols of bitumen  
were on the agenda  
and  
according to EU criteria bitumen would remain  
in the group of suspected carcinogens



**The German BITUMEN Forum was founded**

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### The German BITUMEN Forum

Producer of

- bitumen
- asphalt
- membranes

User of bitumen products

- paving companies
- roofers
- construction companies
- Trade unions
- Health and safety organisations
- ...



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The BITUMEN Forum financed and accompanied many projects

- ⇒ Measurement of vapour and aerosols from bitumen (Germany, Europe, USA)
- ⇒ Determination of EPA-PAH and emissions of bitumen,
- ⇒ Animal inhalation experiment,
- ⇒ Health compliants of mastic asphalt workers,
- ⇒ Human Bitumen Study,
- ⇒ Promotion of warm mix asphalt,
- ⇒ Possible health effects of rubber asphalt
- ⇒ ...

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### Exposure descriptions for vapour and aerosols of bitumen on workplaces

- Production of bitumen
- Production of asphalt
- Transport of asphalt
- Rolled asphalt in road building
- Manual work with mastic
- Mechanical laying of mastic asphalt
- Working with joint fillers
- Production of bituminous damping pads
- Production of bitumen membrane
- Roofing work

[www.gisbau.de/bitumen.html](http://www.gisbau.de/bitumen.html)

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Exposure description

**Paving of conventional rolled asphalt in road construction**

	Number	Minimal value	50 Percentile	95 Percentile	Maximum value
Forman	225	0.12	2.7	12.4	20.8
Paverdriver	161	0.12	2.4	8.9	17.6
Roll driver	56	0.17	0,9	2.5	3.1

vapours and aerosols from bitumen (mg/m<sup>3</sup>)

**Production and transport of asphalt**



Control center 0.8 mg/m<sup>3</sup>  
 Transport of asphalt 4.3 mg/m<sup>3</sup>  
 Vapour and aerosols of bitumen (95 percentile)

**Rolled asphalt (160°C)**



Screed operator 12.4 mg/m<sup>3</sup>  
 Paver driver 8.9 mg/m<sup>3</sup>  
 Roller driver 2.5 mg/m<sup>3</sup>

Vapour and aerosols of bitumen (95 percentile)

**Mechanical laying of mastic asphalt (conventional; 250°C)**



Charger on the mixer 57.8 mg/m<sup>3</sup>  
 Screed operator 38.1 mg/m<sup>3</sup>  
 Vapour and aerosols of bitumen (95 percentile)

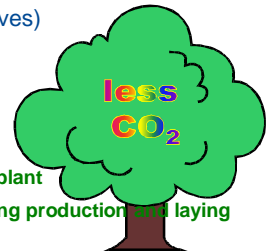
**Manual work with mastic asphalt (conventional; 250°C)**

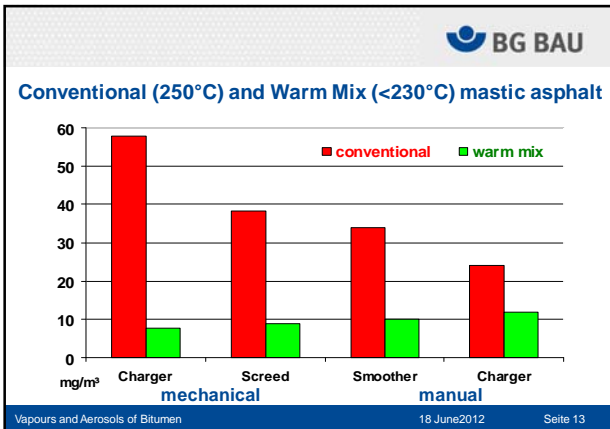


Smoothing 34.0 mg/m<sup>3</sup>  
 Transport in a bucket 32.8 mg/m<sup>3</sup>  
 Transport in a barrow 7.6 mg/m<sup>3</sup>  
 Vapour and aerosols of bitumen (95 percentile)

**Warm Mix Asphalt (with additives)**

- lower energy consumption
- reduced CO<sub>2</sub> production
- lower equipment wear
- lower emissions at the mixing plant
- minimal ageing of binders during production and laying
- fewer vapours and aerosols
- ...





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### Mastic asphalt since 2008 only as warm mix (<230°C)

**asphalt**

Nur noch mit abgesenkter Temperatur

Gensphäre zwischen Gefahrstoff- und REACH-Verordnung

Reinhold Rühl, Frankfurt am Main

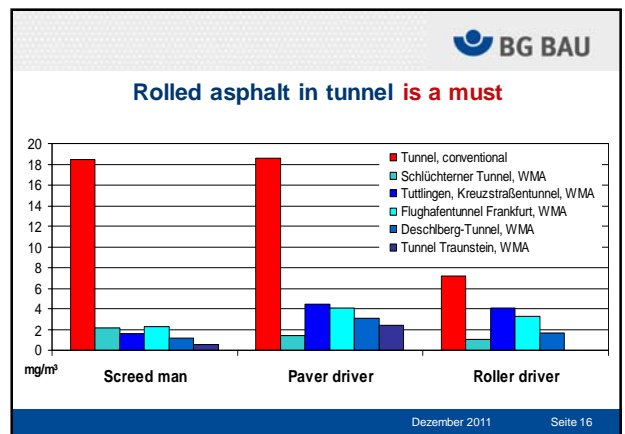
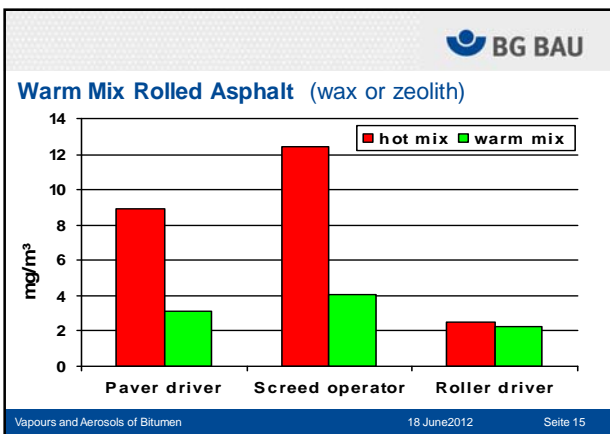
Der Autor, Referent für Gefahrstoffe bei der BG BAU und Chefredakteur des Gesundheitslexikons, macht mit diesem Beitrag deutlich, dass der Einsatz von Gensphäre seit Beginn 2008 nur noch temperaturabhängig möglich ist und nur durch geeignete Arbeitstechniken auch in Zukunft noch möglich sein wird.

1997, also vor über 10 Jahren, verabschiedete der Ausschuss für Gefahrstoffe (AGS) zwei Grenzwerte für Dämpfe und Aerosole aus Bitumen (25 mg/m³ für Arbeiter im Freien und 10 mg/m³ für Arbeiter im Freien und 5 mg/m³ für Arbeiter im Freien und 2 mg/m³ für Arbeiter im Freien).

Dieser stand fest, dass alle weiteren Maßnahmsmaßnahmen von Bitumen nur durch Wärmehalt- und Dampfabnahme im Experimente unter 20 mg/m³ Dämpfe und Aerosole ermöglicht werden, während die Exposition keine Einbußen von Gensphäre erleblich über einen Wert liegen. Die gesundheitliche Auswirkung aller im Vergleich zu Bitumen auszuscheidenden Instanzen und Fraktionen ermöglicht es, ein weitgehendes Bild zur arbeitstechnischen Beseitigung der Gensphäre zu erhalten.

Bild 1: Straßbau, Straßenschilder bei Nacht

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### Agreement of the Bitumen Forum


- Outside warm mix if possible
- In tunnel always warm mix

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[www.gisbau.de/bitumen.html](http://www.gisbau.de/bitumen.html)

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**REACH** **Situation since December 2010**

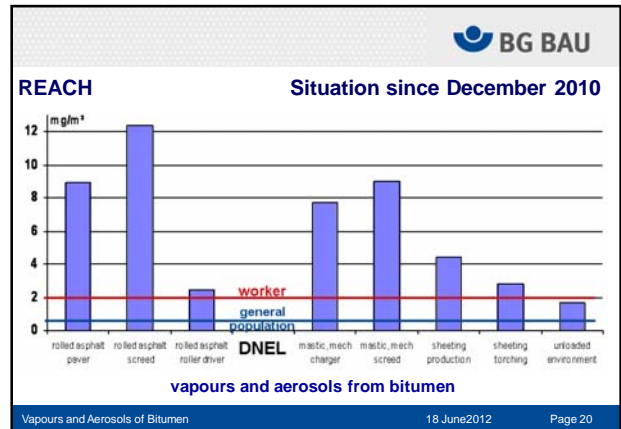
From a safety data sheet for Asphalt (Bitumen)


Derived No Effect Level

Product/ingredient name	Type	Exposure	Value	Population	
Asphalt	DNEL	Long term Inhalation	8 hours TWA	2.9 mg/m <sup>3</sup>	Workers
	DNEL	Long term Inhalation	24 hours TWA	0.6 mg/m <sup>3</sup>	Consumers

**2.9 must be divided by 1.5  
to be comparable to the German exposure data**

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**REACH** **Situation since December 2010**

In Germany, the BITUMEN Forum has found a way out of this dilemma.  
The workers are examined every two years for occupational medicine to determine whether health effects occur at work above the DNEL.

This approach is possible because

- field experience show no problems with irritative effects on asphalt workers, and
- in Germany the DNEL is not regarded as a limit value by law, but as a help in risk assessment.

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**REACH** **Situation since December 2010**

But, how is the trend in other European countries?

DNEL → national OEL ?  
and then  
European OEL = 2mg/m<sup>3</sup> ?

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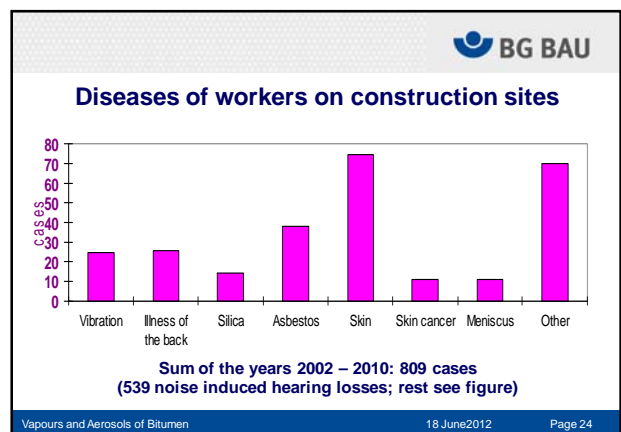


**IARC**

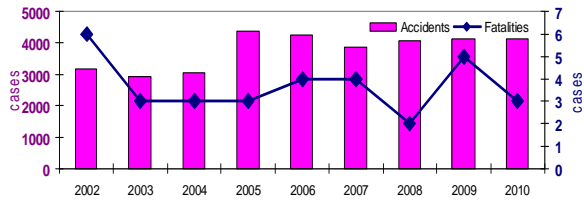
We have many questions

- Why is the evaluation related to the application?  
If oxidized bitumen is a problem, why only durin roofing?
- How will IARC define oxidized bitumen?  
Air rectified bitumen has the same CAS number than fully oxidized bitumen.
- ...

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Accidents of workers on construction sites



*Questions?*

[www.gisbau.de/bitumen.html](http://www.gisbau.de/bitumen.html)