The bitumen emulsion industry
a worldwide review

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Outline

- the IBEF: what, where, who, why?
- Figures
- The market
- The challenge
- The reputation
- The techniques
- Conclusions
What is IBEF?

• International Bitumen Emulsion Federation
• An association that gathers national associations dealing with bitumen emulsions
• Individual members from countries with no association
• IBEF represents more than 70% of the emulsion volumes worldwide
Where is IBEF?
Who is IBEF?

• National associations dealing with bitumen emulsions

• National associations dealing with bitumen industry and pavements

• National associations dealing with road construction
  – SFERB/ USIRF (France), AMR (Morocco)

• Individual companies
  – Insung (Korea), Ooms (Netherlands)
Why the IBEF

• A worldwide forum
• To promote the uses of bitumen emulsion worldwide
• To work on standards & regulations
• To organize, support, endorse, international and national events
Some figures

- Data collected for the WOE 2010
Some figures

- Emulsion v/s bitumen
Some figures

- TOP 10 = 74% of the total volumes
The market

- Do we know our market?
  - Volumes, uses
- Yes we do
  - Japan (every month), UK & France (quarterly)
  - France & UK reports to differentiate spraying / mixing emulsions
- Data collection through an intermediate independent third party
- An attempt in the USA
The market

• Emulsion is mainly designed for maintenance works
• Road maintenance = pavement preservation
• Level of owner awareness
  – Low in emerging market where the focus is on new construction
  – Fair in most of mature markets; lower attention at local level
  – High in countries such as Australia and in Korea where PMS is implemented
  – Politicians do not pay enough attention
• Politicians
  – Politicians do not know the value of road assets
  – In the USA, “pavement preservation is included in the transportation bill now being debated in the Congress” (FP2)
The market

- Emulsion is mainly designed for maintenance works
- Road maintenance = pavement preservation = asset preservation
- Conscientiousness of road owners
- Politicians
- Allocated funds
  - Insufficient...
  - South Africa: “Central Treasury now insists on road authorities having a PMS in place prior to allocation of funds”
  - India: “excise is imposed on sale of petrol and diesel. This money is used for pavement construction and preservation”
  - Spain: “serious problem of widespread public debt”
The market

- Allocated funds are insufficient
  - Volumes are shrinking
  - Hot mix asphalt volumes are decreasing
The market

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The market

• Allocated funds are insufficient
  – Japan: -50% v/s 2000
  – France: ¼ of the needs for national roads

• Needs for road maintenance are constant, increasing

• “More for less”

• A real challenge

• How can the asphalt emulsions industry address this challenge?
The market challenge

- Allocated funds are insufficient
- Use the right technique in the right place
- Example 1: “Guidelines for the preservation of High-Traffic-Volume Road ways”

<table>
<thead>
<tr>
<th>technique</th>
<th>Slurry seal</th>
<th>Micro surfacing</th>
<th>Chip seal</th>
<th>UTFC</th>
<th>HMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost / yd² $</td>
<td>0.75 - 1.00</td>
<td>1.50 - 3.00</td>
<td>1.50 - 2.00</td>
<td>4.00 - 6.00</td>
<td>3.00 - 6.00</td>
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</tbody>
</table>
The market challenge

- Allocated funds are insufficient
- Use the right technique in the right place
- Example 1: comparison South East of France

<table>
<thead>
<tr>
<th>technique</th>
<th>Micro surfacing</th>
<th>Micro surfacing 2 layers</th>
<th>Chip seal</th>
<th>Very thin asphalt concrete</th>
<th>HMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost / m² €</td>
<td>2.04</td>
<td>3.04</td>
<td>2.33</td>
<td>6.20</td>
<td>7.90</td>
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</tbody>
</table>
The market challenge

- Allocated funds are insufficient
- Use the right technique in the right place
- Example 1: comparison Italy (Modena Province)

<table>
<thead>
<tr>
<th>technique</th>
<th>chip seal one layer</th>
<th>chip seal two layers</th>
<th>micro surfacing</th>
<th>HMA 30 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost / m² €</td>
<td>2,30</td>
<td>4,00</td>
<td>2,45</td>
<td>4,14</td>
</tr>
</tbody>
</table>
The market challenge

- Allocated funds are insufficient
- Use the right technique in the right place
- Example 2: maintenance program for the Versailles district (France)
The market challenge

- Allocated funds are insufficient
- Use the right technique at the right place
- Example 2: maintenance program for the Versailles district (France)
The market challenge

• Allocated funds are insufficient
• Use the right technique in the right place
• Example 3: development of emulsion techniques v/s other bitumen based techniques in the UK
The reputation

• Feedback from the enquiry is good
• High credibility brought by the CME (World Congress on Emulsion) and WOE (World Of Emulsions) since 1993
• In Europe: increased credibility through the CE marking (factory production control)
• But still a lot of work to do, and the backdrop is constantly evolving
The reputation

• “Engineers and contractors are well informed and aware” (South Africa)
• “Engineers at the federal and state agencies know about emulsion as a concept, some know the details. This is not the case with many local agencies” (USA)
• “Most of [road engineers] have known that the asphalt emulsions are used only for tack coats” (Korea)
• “Basically, they understand the concept of asphalt emulsion” (Japan)
The reputation

• “Yes but it is still a battle, partly as the client has become more fragmented moving from mostly local & national authorities into outsourced consultant & contractor management of the network” (UK)

• “Due to the turnover of road engineers in the road stakeholders, we have to train and educate the new generation” (France)

• “Good [thanks to] advances in R&D” (Spain)

• A never-ending story!
The techniques

- In mature markets, the main uses for emulsions are surface treatments, typically spray seal and micro surfacing
- Organic growth will come from mixes and recycling
The techniques

• No technique has ever been prohibited for use after a technical failure

• The market is demanding
  – Long term texture depth for micro surfacing
  – Lower noise spray seal
  – SBS modified emulsions to counter the use of hot applied modified binders (South Africa, Australia)
  – Trackless tack coats
  – Emulsion based mixes for wearing course and base course
  – Sustainable solutions
Emulsion based mixes

1959: "Rock’n’roll is dead."
1991: "Mobile phones are not for everyone."
1996: "The Internet is a fad. It will pass."
2011: "Cold mix asphalt is just for small roads."

And the rest is history.

According to independent estimates, it can reduce carbon emissions by up to 80% and energy consumption by 90% – good for the environment and good for economics.
Spray seal

- Strong development of the use of modified emulsions
- Development in Europe

Spray seals in Germany

- 2001: 35% non modified emulsions, 15% modified emulsions, 25% non modified cut backs, 0% modified cut backs
- 2010: 40% non modified emulsions, 65% modified emulsions, 0% non modified cut backs, 20% modified cut backs

Spray seals in the United Kingdom

- 2001: 22% non modified emulsions, 20% modified emulsions, 6% non modified cut backs, 5% modified cut backs
- 2010: 80% non modified emulsions, 67% modified emulsions, 0% non modified cut backs, 0% modified cut backs

International Bitumen Emulsion Federation
Safety & environment

Conclusions of the IARC Working Group

A- Occupational exposures to oxidized bitumens and their emissions during roofing

The body of available data from cancer studies in humans points to an association between exposures to oxidized bitumens during roofing and lung cancer and tumours in the upper aerodigestive tract. In support of these findings, extracts and fume condensates of oxidized bitumens, which are used primarily in roofing applications, showed sufficient evidence of carcinogenicity in experimental animals. Taking these data together, the Working Group evaluated occupational exposures to oxidized bitumens and their emissions during roofing as “probably carcinogenic to humans” (Group 2A).

B- Occupational exposures to hard bitumens and their emissions during mastic asphalt work

Based on two positive studies among mastic asphalt workers, the Working Group concluded that there was limited evidence in humans for the carcinogenicity of occupational exposures during mastic asphalt work. This type of bitumens has not been tested in experimental animals. In consequence, occupational exposures to hard bitumens and their emissions during mastic asphalt work were classified as “possibly carcinogenic to humans” (Group 2B).

C- Occupational exposures to straight-run bitumens and their emissions during road paving

On the basis of an earlier meta-analysis, the IARC multi-center study and several more recent independent studies, the Working Group concluded that there was inadequate evidence in humans for the carcinogenicity of occupational exposures during road paving with straight-run bitumens. Also, there was inadequate evidence in experimental animals for the carcinogenicity of extracts and of fume condensates of this type of bitumens. However, studies of workers exposed to bitumen emissions during paving with straight-run bitumens showed mutagenic and genotoxic/cytogenetic effects in these workers. Similar effects were also observed in experimental systems under controlled conditions. This strong mechanistic evidence led to the classification of occupational exposures to straight-run bitumens and their emissions during road paving as “possibly carcinogenic to humans” (Group 2B).
Safety & environment

Evaluation of COVT for different temperatures

- Emulsion
- Recovered binder of emulsion
- Bitume 80/100
- Collifex
- Colhub Low Viscosity
- RMB5
- Colhub Classic

[Graph showing COVT values at different temperatures for various materials, with labels for each sample and temperature.]
Conclusion: the role & the future of IBEF

- IBEF is and will be what its members want it to be and to become
- A new logo, a new web site [www.ibef.net](http://www.ibef.net)
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