USE OF FLY ASH FOR ASPHALT

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Overview

- The situation
- Statements from Europe
- The standard EN 13043
- How to use Fly Ash in Asphalt
- Market potential
- How to service the market
The situation

• From ECOBA Statistic 2010 there was 59 kton Fly Ash used for asphalt filler in EU 15. The total production in 2010 was about 31 mio tons.
• From a danish statistic in 2000 the use of Fly Ash for Asphalt in Denmark alone is about 37 kton.
• There is a European standard in place to advice and control the use of aggregates and Fly Ash for asphalt.
• On top of European standards there is – usually – a set of local rules for road construction that apply.
• The Fly Ash is used as filler and not as an active ingredient like in concrete.
Statements from a few European asphalt organisations

- In Belgium there is no direct use of coal fly ash as filler, whereas in the Netherlands there is a certain use.
- The Czech Republic: The use of coal ash is allowed in base layers for aggregates bound layers in combination with other binders like cement, but not for hot asphalt mixes.
- In Finland they use coal fly ash as an asphalt-filler. The guess is that 25-30 % is fly ash (of the added filler). The rest is limestone filler.
Road construction with asphalt

- Top layer
- Coarse base layer
- Very coarse base layer
- Subbase structure
Asphalt as product

• The general use is as Hot Mixed Asphalt:
  • A mixture of asphalt binder and graded mineral aggregate, mixed at an elevated temperature and compacted to form a relatively dense pavement layer.
  • ≈ 5% binder and ≈ 95% aggregate.
• Asphalt Binder, Bitumen e.g. heavy hydrocarbons etc.
• Mineral Aggregate: stone, gravel, fillers
• Air, exist in voids.
• Optional Modifiers/Additives:
  • Binder Modifiers/Additives (e.g., polymers, elastomers, fibers, rubber).
  • Aggregate Modifiers/Additives (e.g., lime, granulated rubber, anti-strip agents).
Important requirements for Asphalt

- Avoiding cracking
- Resistance to freeze, sun aging
- Avoiding wheel track formation
- Reducing water sprays
- Reducing noise
- Substantial need for use of recycled material, both in base and top layers.
- For bridge pavings etc, life expectancy beyond 50 years
- Price for material and labour force.
The standard EN 13043

• The Fly ash is considered "Filler aggregate, that passes the 0,063 mm sieve". All requirements on that material is found in clause 5.

• What must be satisfied, qualitywise
  • Unburnt: Range < 6%, e.g. 4%+- 3%, ie 1-7%
  • Particle density: Range <+/- 100 kg/m3,
  • Water content less than 1%.
  • Few other requirements that can easily be satisfied with Fly Ash

• The usual production control applies also in this case
Market potential 1

- It is estimated that Fly Ash is being used for both new roads and for repair.
- In Denmark an estimated use of Fly Ash per year is between 20-40 ktons. In 2000 a 37 ktons was reported.
- The length of roads with asphalt makes up about 73,000 km. In average use of 400 kg pr km asphalt road pr year.
- In a study from 2004 it is established that in the Asphalt quality GAB II there can be used up to 40 kg PFA per ton of ready mixed Asphalt.
## Market potential 2

<table>
<thead>
<tr>
<th>Country</th>
<th>Road length km</th>
<th>Fly Ash tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>951.200</td>
<td>380.480</td>
</tr>
<tr>
<td>Spain</td>
<td>681.298</td>
<td>272.519</td>
</tr>
<tr>
<td>Germany</td>
<td>644.480</td>
<td>257.792</td>
</tr>
<tr>
<td>*****</td>
<td>*****</td>
<td>*****</td>
</tr>
<tr>
<td>Denmark</td>
<td>73.197</td>
<td>29.279</td>
</tr>
<tr>
<td>*****</td>
<td>*****</td>
<td>*****</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>5.227</td>
<td>2.091</td>
</tr>
<tr>
<td>Total</td>
<td>6.701.415</td>
<td>2.680.566</td>
</tr>
</tbody>
</table>

Source:
What are the advantages

• According to studies performed by independant institutions PFA will perform to full satisfaction to replace limestone filler provided that the PFA is produced according EN 13043. PFA is dry per definition
• Furthermore the PFA must comply with REACH
• The use of recyclable Industrial By Products is not only of advantage to the Asphalt industry and their customers, at the same time it is an advantage to society and the Nature and the general economy. Not to mention the use of bright ideas rather than a conservative approach.
• Intelligent reuse is powered by innovation and the wish to be market
How to service the market

- Get acquainted with EN 13043
- Make sure you can produce according EN 13043
- Start a certification process
- Get in touch with potential customers to present possibilities
- Understand local road administration and the rules that apply
- Don’t forget that the market is already served by e.g. limestone suppliers
- But with Fly Ash there is in any case the resource efficiency advantage as well as the Byproducts advantage
Questions