Warm Asphalt Technology

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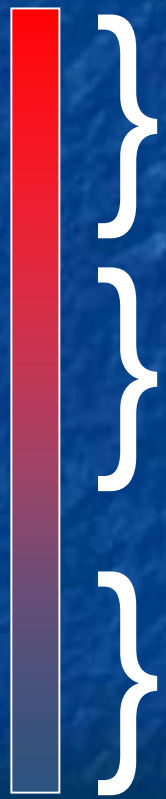
What is Warm Mix Asphalt?



Hot Mix Asphalt – 140 to 155°C

Warm Mix Asphalt – 100 to 135°C

Cold Mix Asphalt – 10°C

Brief History

- 1995 Preliminary Lab Experiments
- 1997 German Bitumen Forum
- 2000 First International Conference of Asphalt Pavements (Sydney)
- 2000 Second Euroasphalt & Eurobitume Congress (Barcelona)
- NAPA 2002 European Scan Tour
  - Germany and Norway
- NAPA 2003 Annual Convention
  - San Diego

Warm Asphalt

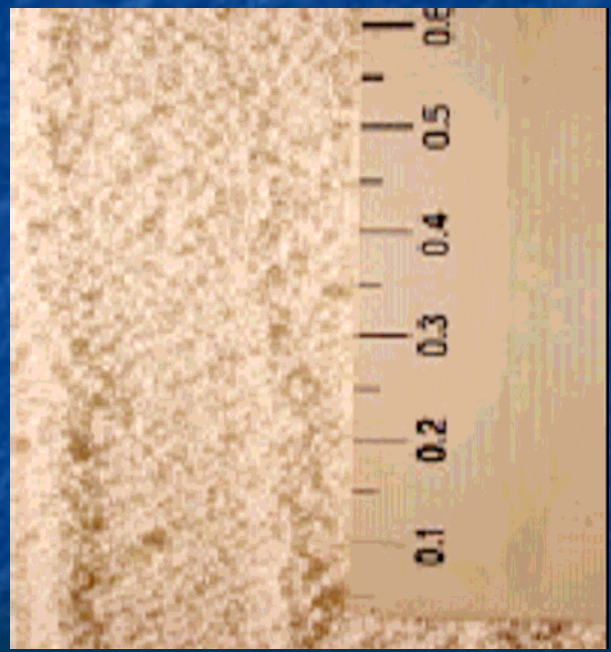
- Heating cost for aggregate greatly reduced
- Reduces environmental impact of fumes
  - NOx and SOx are cut in half
- Several processes
  - Aspha-Min® (Zeolite additive), Evotherm® (emulsion additive), Sasobit ® (wax additive), WAM-Foam® (foamed in the mixer), and more
- All run at lower placement temperature
  - Typically 90°C to 125°C
- Used for airport and highway work in Europe
- Many trials in US and Canada to date
  - Procedure shows promise but few long term sites

Aspha-Min®

- Produced by Eurovia Services (Germany)
- Synthetic Zeolite – Sodium Aluminium Silicate
  - Framework silicates have vacant spaces in their structures that can trap water
  - Spaces interconnected forming long wide channels
  - Typically 21% water by mass
- Can lose and absorb water without damage to crystal structures

Aspha-Min®

- The trapped water is driven off by heat at 85 to 185°C
- Add 0.3 percent by mass to mix
- Foams the asphalt
- Reduces viscosity
- 20°C reduction in mix temperature reported
- Fuel savings of 30%



Sasobit®

- Product of Sasol Wax (Germany)
  - Fischer-Tropsch paraffin wax
  - Fine crystalline long chain aliphatic hydrocarbon
- Produced from coal gasification
- Available in flakes or powdered form
  - 2, 5, 20 and 600 kg bags

Sasobit®

- Wax softens at 100 to 115°C
- Asphalt mixture laid at lower temperature
- Better compactability
- Increased resistance to deformation at high in service temperatures by forming lattice structure in the binder phase

Evotherm®

- Developed by MeadWestvaco (USA)
- Innovative chemical additive technology
- Chemical structure developed and optimized for warm mix performance
- Molecular structure imparts coating, workability, strength and adhesion
- Dispersed Asphalt Technology (D.A.T.) delivery system
  - Mix and compaction temperatures as low as 70°C in the lab and 90°C

Evotherm®

- Openly available to end users – no licensing
- No plant modifications required
- No unit operations problems encountered
- Reduced dust generation
- Mix can be stored in silos

WAM-Foam®

- Process technology
- Developed Shell (UK) and Kolo-Veidekke (Norway)
- Two stage binder addition to the aggregate
- Soft asphalt is added to warm aggregates and mixed to coat aggregates
- Harder asphalt is foamed in mixing chamber

WAM-Foam®

- Requires modification to the plant
  - Water line and foaming chamber
  - Second asphalt line
- Sometimes requires an adhesion improver
  - Depends on aggregate

Other Processes

- Low Energy Asphalt
  - Asphalt mixed hot coarse aggregate
  - Undried fine aggregate added to cause foaming
- Asphaltan®
  - Naturally occurring Montan wax
  - Similar to FT wax – long carbon chain


Frankfurt Airport - July 2004
LIEBHERR
Runway 25R/07L

Project Details

- Started in April 2003 – 4000 metre runway, 61 m wide
- Each night they replace 15 m length by full runway width.
- Completed over 300 nights
- 600 mm asphalt layer on the compacted gravel and sand runway foundation with conduits imbedded in the mat
- First 240 mm in one lift to accommodate 200 mm conduits
- Low temperature asphalt with Sasobit in the beginning
- Later Shell bitumen with a paraffin wax

Project Details

- Started at 11:30 each night
- Temperature of asphalt at top of pavement not allowed to be higher than 85°C at 06:30 hours in the morning
- When 150 to 200 metres constructed (longitudinally) they milled off 40 mm of top layer
- Then new SMA surface layer 0/11 with PmB 45 – SBS modified
- Total project is € 38 million ($ 62 million Can).
- Each night was about € 120,000 ($ 192,000 Can).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Warm Asphalt

Thank you