



HAPAS and Warm Mix Asphalt

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Highway Authorities Product Approval Scheme

- Set up by Highways and local highway authorities
- Certification scheme to ease specification of proprietary products
- Proprietary products applies responsibility to suppliers
- Need buy in from suppliers
- Concerns about stifling innovation

Highway Authorities Product Approval Schemes (HAPAS)

- Schemes currently in place
 - SG1 - High-friction surfacing systems
 - SG2 - Over-banding
 - SG3 - Thin asphalt surfacing systems
 - SG4 - Modified bituminous binders
 - SG5 - Cementitious repair materials
 - SG6 - Parapet anchors
 - SG7 - Bridge-deck waterproofing
 - SG8 - Reinstatement materials (HAUC)
 - SG9 - Coloured surfacings (durability)
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Definition of Thin Surfacing

- “A proprietary bituminous product with suitable properties to provide a surface course that is laid at a nominal depth of less than 50 mm”
- Permits:
 - Hot mixed asphalts
 - (Multiple) surface dressings
 - Slurry surfacings / microasphalts
- Categories of nominal thicknesses:
 - Type A < 18 mm
 - Type B 18 mm to 25 mm
 - Type C > 25 mm to < 50 mm

BBA-HAPAS procedure for thin surfacing systems

- Quality assessment
- System installation trial
- Three 2-year system performance trials
 - Mandatory properties
 - Optional properties
- Laboratory testing
 - Mandatory properties
 - Optional properties

Tests for HAPAS approval of thin surfacing systems

- Mandatory
 - Laboratory tests
 - PSV and AAV
 - Wheel-tracking
 - Torque bond
 - Water sensitivity
 - Road tests
 - Visual condition
 - Texture depth
- Optional
 - Stiffness modulus
 - Retained stiffness in diesel
 - Ageing
 - Resistance to stripping

 - Noise reduction
 - Improvement in regularity
 - Spray Reduction
 - Enhanced skid resistance

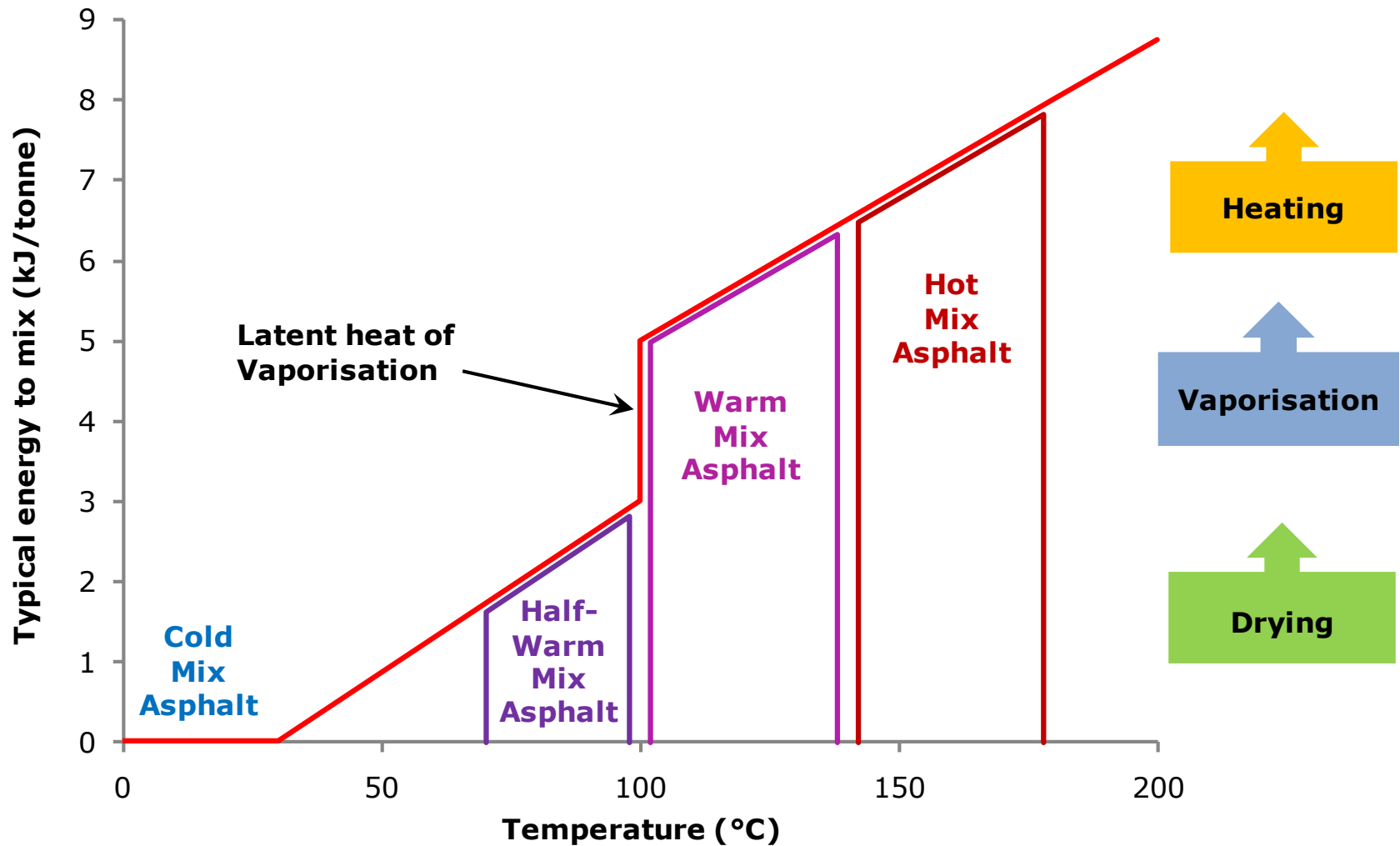
HAPAS procedure for high-friction surfacings

- Quality assessment
- System installation trial
- Performance trial
- Laboratory tests
 - Thermal movement test
 - Scuffing test
 - Wear test
 - Tensile adhesion test
 - Heat-ageing conditioning procedure
 - Freeze/Thaw conditioning procedure
 - Diesel Susceptibility conditioning procedure
- Optional tests
 - Installation temperature
 - Substrate texture depth
 - Concrete substrate

HAPAS Schemes

- Thin surfacing systems
 - Multiple properties (often mutually exclusive)
 - Need to specify each property required
 - Applicability to traffic assessed from trials
- High-friction surfacing systems
 - Primarily interested in skid resistance and durability
 - Allow classification into three classes

Categories of lower temperature asphalt



Approaches to produce cooler mixtures

- Many different approaches
- Categories in many ways
- Generally:
 - Organic additives
 - Chemical additives
 - Emulsion-based processes
 - Water-bearing additives
 - Water-based processes

Organic additives

- Waxes, amides and sulphur
- Reduce the viscosity of the binder above the melting point
 - Possible to reduce the production temperature
- Increase the stiffness of the binder below the melting point
- Melting point must be higher than in-service temperature
 - Permanent deformation may occur
 - Minimise embrittlement at low temperature
- Products
 - Asphaltan-B
 - Cecabase RT
 - Ecoflex
 - Isomerized Paraffin
 - Licomont BS 100
 - Sasobit
 - Shell Thiopave
 - Sübit

Chemical additives

- Includes surfactants
- Emerging group of additives for WMA
- Improves ability of bitumen to coat aggregate particles at lower temperatures
- Does not reduce the bitumen viscosity
- Some added similarly to anti-stripping agents
 - Concentrations as low as 0.3 % by mass of the bitumen
- Products
 - HyperTherm
 - Low Emission Asphalt
 - Qualitherm
 - Rediset WMX
 - REVIX

Emulsion-based processes

- High-residue bitumen emulsion mixed with hot aggregate at mixing temperatures between 85 °C and 115 °C
- Water flashes off as steam
- Bitumen emulsion specifically designed for the HWMA process
 - Includes additives to improve coating, workability and adhesion
- Modified process, called dispersed asphalt technology (DAT)
 - Same chemical package diluted with a small amount of water
 - Injected into asphalt line just before the mixing chamber
- Products
 - Evotherm / Evotherm DAT
 - Warm Recycling

Water-bearing additives

- Small amounts of water added to a warm mixture via
 - Foaming nozzle or expansion chamber
 - Incorporating a hydrophilic material such as zeolite
 - Having damp aggregate
- Water vaporises and encapsulated into the binder
 - Steam bubbles are forced into the continuous phase of the bitumen
 - Expands until thin film of bitumen holds bubbles through surface tension
 - Volume of water expands by factor of 1,673 when it turns to steam
- Dispersion of water in hot asphalt expands binder phase
 - Corresponding reduction in the mix viscosity
 - Improvement in the workability
- Product
 - Advera WMA
 - Aspha-min
 - ECOMAC
 - LEAB
 - LT Asphalt

Water-based processes

- Modified binder/aggregate mixing process to achieve lower mixing and placement temperatures
- Some require additives of various types
- Several proprietary processes based on:
 - Mixing the binder (in foam or liquid state) with coarse and fine aggregates sequentially
 - Mixing the aggregate with two different binders (again in foam or liquid state) sequentially
- Relatively inexpensive
 - Provided plant modifications are minor
- Products
 - Many

Water-based processes

- Products

- Accu-Shear Dual WMA System
- Aquablack WMA
- Double Barrel Green
- Eco-Foam II
- Green Machine
- Half-Warm Foamed Bitumen Process
- HGrant Warm Mix System
- Low Emission Asphalt (LEA)
- Low Energy Asphalt
- Meeker Warm Mix
- Terex WMA System
- Ultrafoam GX
- WAM Foam

Will warm mix asphalt save the planet?

- Lower temperature = Less heating
- Less heating = Less energy (as well as less cost)
- Q.E.D. more sustainable
- **BUT**
- That implies concrete more sustainable than asphalt !!!
- Need to include components
 - Winning
 - Preparation
 - Transport

Lower temperature asphalt

- What is it?
 - It is cool alternative to hot mix asphalt
- How is it done?
 - In various ways for various proprietary products
- Can it be made?
 - Construction is generally very similar to hot mix asphalt
- Does it work?
 - It can work
- Will it save the planet?
 - It can help to save the planet, but not as much as might be expected
- But it is worth consideration



Do You Have Any Questions?