Asphalt Pavement Recycling for Hong Kong

Seminar on Road Pavement Recycling
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The Special Administrative Region of Hong Kong

- Area of 400 square miles
- Population of 6.5 million
- 1900 km road network
- 75% asphalt surfaced
Flexible Pavement Waste –
A Growth Industry

('000 tonnes)

The Waste Reduction Challenge – (HK is About Making Money!)

- To find ways to make money by conserving resources
- To forge “win-win” partnerships between key stakeholders
Construction & Demolition Waste

- Hong Kong produces 12.0m tonnes each year!
- Australia (three times Hong Kong’s population) produces 6.5m tonnes
- Pavement waste is only a small part (3%) of Hong Kong’s C&D waste volume
Recycling Pavement Waste in Hong Kong

- Ideal environment for recycling
- Small, densely populated area
- Immense competition for available land
- HK surfacing very consistent
Asphalt Pavement Recycling for Hong Kong

- Project duration: June 2000 to March 2002
- Literature Review
- Workshop in Hong Kong
- Preliminary Guidelines
- Laboratory Assessment
- Preliminary Catalogue of Designs
Appropriate Processes for Hong Kong

- Structural pavement failure rare
- Close proximity of residential and commercial properties
- Complex geometry and topography
- → Hot in Plant Recycling (HIPR)
Workshop in Hong Kong

- Interviews with key stakeholders
- Suitability of HIPR confirmed
- “Breakout Sessions” in 3 sub-groups
Group A – Policy and Planning: Issues

- “Carrot” and “Stick”

- Selection and storage of RAP
  - Cheaper land!
  - Co-ordination by EPD

- Development of a suitable specification

- Site investigation and materials testing
- Small % RAP: little change required
- Large % RAP: binders / rejuvenators / plant currently unavailable
- Maintenance work/ low % RAP: recipe
- Major work / high % RAP: performance
Group C – Minimising Excess Supply: Issues

- Co-ordinated approach by Government (HyD, TD, EPD)
- Cultural change
- Alternative uses for RAP (e.g. in concrete)
- Longer lasting pavements
Key Constraints

- Mindsets
- Physical barriers
- Suitable specifications
- Establishing technical competence of RAP
Laboratory Testing: Binder Properties

The graph depicts the complex modulus (Pa) as a function of temperature (°C) for different binders. The axes are labeled as follows:

- Y-axis: Complex Modulus (Pa)
- X-axis: Temperature (°C)

The graph includes the following data points:

- RAP 1
- RAP 2
- 60/70 Pen
- Blend 1
- Blend 2
- Blend 3

The data points are shown with different markers and line styles to differentiate between the binders.
Laboratory Testing: Mixture Fatigue

- Microstrain vs. Cycles to Failure
- Graph showing different mixtures with varying RAP percentages (50%, 30%, 10%, 0% RAP) and a control group (0% RAP, Site 4)
- The graph illustrates the decrease in microstrain with increasing cycles to failure for each mixture type.
The Hong Kong Asphalt Market

- 1.2 million tonnes / annum
- 4 suppliers
- Approximately 50/50 new/maintenance
- Prior to 1998, no suppliers with dedicated asphalt recycling capability
Government Policy

“The environment is an important part of Hong Kong’s future development”

Tung Chi Wah, Chief Executive, HKSAR, 1998
One Contractor’s View

- In 1998, Anderson Asphalt decided their next plant would have recycling facility.
- Invested HK$20m in double drum batch plant (conventional HK$14m).
- Incorporation of 60% RAP possible.
Implementation

- First steps: 1st August 2002
  - Up to 15% RAP in (road) base
  - Draft Particular Specification

- RAP in other layers to follow as experience gained
Full Scale Trials

- Rehabilitation / widening of major HK highway in 2003
- 5700 m³ RAP to be recycled in base (binder) / roadbase (base)
- Landfill costs of HK$ 712,500 saved
- Reduced transport / air pollution
One Contractor’s View

- Sums do not add up – yet!
- Slow, conservative market
- Some initiatives have not materialised (e.g. premium for using RAP)
- Long term initiative - others will follow
Client’s View (HyD)

- Conventional contracts
  - Risk with Government

- Move to performance testing and contractual risk sharing
  - Greater utilisation of recycling
Remember:

“Every grain of rice in a bowl counts”
THANK YOU!