Tollway Application of Life Cycle Assessment for Flexible Pavements

Illinois Bituminous Paving Conference & North Central Asphalt User Producer Group

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Sustainability Tools to Measure

- Life Cycle Cost Analysis
- Life Cycle Assessment
- Sustainability Rating System

Sustainable

Illinois Tollway
Rating System Implementation For Qualitative Measurements of Sustainability

- Illinois Tollway rating system will be FHWA’s
  - Many systems evaluated for applicability
  - $150,000 grant received from FHWA to help implement

- Includes economic, environmental and social impact

Infrastructure Voluntary Evaluation Sustainability Tool (INVEST)

www.sustainablehighways.org
Illinois Tollway Project Development Module
Baseline Scores for 2013

- Sharp increase in scoring is expected when comparing year 2000 project scores to 2013 scores.

- Scores will be available at the end of 2014.
Life Cycle Assessment
Quantitative Measurement of Sustainability

Why must we quantify?

- If it is not quantified, it is not valued
  - Without value, it won’t get done
  - Without value, it cannot be improved upon
  - Without value, there is no incentive
Tollway LCA Tools Being Developed

- Pavement LCA
- Landscape LCA
- Drainage LCA
- Lighting LCA
- Structures LCA

Tollway LCA
Preliminary Tollway Case Study – I-90

*Conducted by ARA

- Jane Addms MP 69.9 – 62.3 (1 contract of many)
  - 12” Full-depth HMA (97,986 sq. yds)
  - 15” Full-depth HMA (70,967 sq. yds)
  - 6-in HMA Shoulders (105,070 sq. yds)
  - 9-in HMA Shoulders (13,870 sq. yds)
  - Total asphalt production of 172,000 tons
  - Prime Coat (28,303 gallons)

- Included Materials & Construction
  - No Maintenance Activities, No Use Phase, No End-of-Life (yet)

- Investigating the effects of implementing improvements from 2000s to 2014 actual project
The difference in the mixes

- **2000 Mixes**
  - No recycle content
  - SBS-modified binder

- **2008 Mixes (as constructed)**
  - SMA surface and binder for mainline
  - ABR content ranging from 15 to 47 percent
  - GTR binder

- **2014 Mixes (similar projects)**
  - Warm-Mix Asphalt (WMA)
  - ABR content ranging from 24 to 53 percent
  - Includes RAS
The results are remarkable

- **CO₂ Output**: ~13% Less
- **Energy Required**: ~13% Less
- **Single Score**: ~15% Less
What does this mean for that I-90 construction

- The environmental impact improvements between 2000 and 2013 construction equate to:
  - Burning 934 short tons of coal to produce electricity
  - Electricity use of 172 households for 1 year in IL
  - The production and use of 107,000 gallons of gasoline
Thank you