The Use of Scrap Tires in Asphalt & as an Aggregate

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Rubber Manufacturers Association
• Represents the 8 US tire manufacturers
• Created scrap tire program in 1990
• Focus on development of sound markets and management for 100% of annually generated scrap tires
• Elimination of all scrap tire piles in an environmentally and economically sound manner

What is Rubber Modified Asphalt?
• Rubber modified asphalt is a generic term used to describe all technologies that incorporate tire rubber into any portion of asphalt pavements
• There are 4 basic technologies:
  – Wet process
  – Dry process
  – Warm mix
  – Terminal blending
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Ground Tire Rubber

Advantages of Asphalt Rubber

• Reduces impact of aging
  – Antioxidants & antiozidants in tire rubber
• Reduces cracking
• Use as an overlay on distressed roads delays need for reconstruction
• Reduces “spray” effect when raining

Advantages of Asphalt Rubber

• Reduces braking distances
• Reduces road noise
• Allows usage of very high binder contents which greatly improve aging properties
• Very good in resisting reflective cracking

Other Considerations

• Highway & road construction now being viewed as a “quality of life’ issue
• Focus will be on reducing road noise
• Reduction of road noise can be obtained by building sound walls or use of rubber modified asphalt, or both
• Cannot be used on all roads; where used properly good results obtained
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Other Considerations

• Cost of asphalt & modifiers likely to remain at current levels
• Use of tire rubber could actually decrease cost of construction via substitution for more expensive asphalt & binders
• DOT budgets unlikely to be increased soon: AR good for repair & overlays

Conclusions

• Rubber modified asphalts have specific applications where they have competitive advantages
• Understanding the technology is a key to a successful application
• Likely, continued increases in asphalt costs will change construction practices
• Federal & state agencies will place greater emphasis on “green” roads

The Use of Tire Shreds in Roadway applications

• Defined as the use of scrap tires, usually shredded, in lieu of conventional construction materials
• A substitute for gravel, sand, light-weight fill materials
• Today referred to as tire-derived aggregate (TDA)

Tire Shreds?

Michael Blumenthal - 2014 FHWA Sustainable Materials Webinar - IndustrialResourcesCouncil.org
### Specifications

- **Type A** – drainage and insulation
  - 100% passing 100-mm sieve
  - Minimum of 90% passing 75-mm sieve
  - Maximum of 5% passing 4.75-mm (no. 4) sieve
- **Type B** – lightweight fill
  - 100% smaller than 450 mm max. dimension
  - 90% smaller than 300 mm max. dimension
  - Maximum of 25% passing 37.5 mm
  - Maximum of 1% passing 4.75-mm (no. 4) sieve

### Guidelines

- ASTM D6270 “Civil Engineering Applications of Scrap Tires”
- Guidelines to limit heating
- Water quality studies: Above & below groundwater table + comprehensive compendium of all leachate reports

### Why Use Tire Shreds?

- Tire shreds have properties that civil engineers need
  - Lightweight (1/3 weight of soil)
  - Low earth pressure (1/2 of soil)
  - Good thermal insulation (8 times better soil)
  - Good drainage (10 time better than soil)
  - Compressible

- Light weight and low earth pressure are very beneficial where there is poor soil structure
  - Weak foundation soils
  - Increase slope stability
  - Reduce settlement
  - Landslide stabilization
Why Use Tire Shreds?
- Tire shreds can improve engineering performance
- Tire shreds are often the least cost alternative if you need their unique properties

Roadway Applications
- Lightweight fill for highway embankments
- Retaining wall backfill
- Insulation to limit frost penetration
- Vibration attenuation for rail lines

Tires Used as Lightweight Backfill
- Tire shreds have relatively lower bulk density re: stone and clean fill
- Can use rough shreds (6-8 inches long)
- Lower cost than other lightweight backfill materials

Placing tire shreds behind abutment
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Construction Procedure

Leachate from Tire Shreds Above/Below Water Table
- Primary drinking water standards
  - No effect
- Secondary drinking water standards
  - Manganese & iron
    - Not significant
- Organics
  - No effect

Available Information
- +120 reports on CE applications
- Leachate studies (U. Maine)
- Scrap tire market reports
- Advanced training course on use of tire shreds in landfills (provided by RMA)
- EPA RCC DVD on TDA
- www.rma.org/scrap_tires

Conclusions
- Tire shreds have properties that engineers need
- Tire shreds are cost effective
- Civil engineering applications can use large quantity of tires & can be quickly done
- Specifications and guidelines exist
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QUESTIONS?