What DOT’s Really Think About the Use of Ground Tire Rubber in Asphalt:

Looking through a national lens

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Objectives

- Project History
- The collaborative model for success
- Limiting factors in the collaborative process
- Navigating the “mind” field
- Literature review and survey results
- Next steps

Photo credit: DEQ Staff, Tulsa Co. road identified for chip seal
Project History

- 27A O.S. § 2-11-401.5
- Accrued funds can be used for remediation of tire dumps and projects to increase market demand for products made from Oklahoma used tires.
- Prioritization for projects with the greatest potential to benefit schools, communities and local governments.
Project History

- Literature review (OU)
- Demonstration Project (Wagoner County)
- Testing and Evaluation (OU)
Project History

Photo credit: DEQ Staff

Photo credit: University of OK School of Civil Eng. and Env. Science
The Collaborative Model

Photo credit: Ferrella March, Norman, OK
The Collaborative Model

Problem Identification

Evaluate

MUTUAL GOAL

Educate

Plan

Resolve Conflict

"If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas." - George Bernard Shaw

Source:: USEPA (2008, June)
Limiting Factors

- Logistics
- Cog in the wheel dilemma
- Timelines not always in alignment
- Legislative actions and budget cuts
- Personality differences
Navigating the “Mind” Field

- The Dominator
- The enforcer
- The manipulator
- The unrealistic optimist
- The pessimist
- The smartest person in the room

Source: Trafton, A. (2011, Jan 28)
The Dominator

- Dominates discussions
- Wants it their way
- Takes up most of the table but brings little to the feast
- Takes control of the situation
- Always pushing onward

Source: Looney Tunes, Clip art
The Enforcer

- Takes shots at the other team members
- Overly vigilant
- Always looking for the catch
- Worried about the legal implications
- Keeps things on track
- Serves as a check for ideas

Source: Looney Tunes, Clip art
The Manipulator

- Likes to talk
- Charming and makes you feel good
- May offer up a deal but has a hidden agenda
- Can see all sides
- Can effectively organize a compromise

Source: Looney Tunes, Clip art
The Unrealistic Optimist

- Everything is always good even when it is not
- Unaware of potential issues/complications
- Gives everyone a sense of security
- Uplifting during stressful times
- Encourages a better final product

Source: Looney Tunes, Clip art
The Eternal Pessimist

- Brings down morale
- Idea squasher
- Nothing is ever good enough
- Provides balance to unrealistic ideas
- Feels there is always room for improvement

Source: Looney Tunes, Clip art
The Smartest Person in the Room

- Not always the smartest person in the room
- Needs to state ideas
- No other ideas are as good
- A wealth of knowledge
- Full of ideas because they are “genius”
Literature Review and DOT Survey

- Comprehensive literature review
- Provide summary of knowledge
- Identify research needs
- Document major findings in pertinent studies

Photo credit: Ferrella March
- Observed enhancement of mix performance from scrap tire rubber
- Some studies showed that wet process CRM mixes resulted in better performance compared to dry process CRM mixes (Volle, 2000; Choubane, 1999; Bandini, 2011).
- Recent studies indicate successful experiences with the dry process CRM mixes (Bennert et al., 2004; Willis et al., 2012; Shen et al., 2015)
- 75% of DOTs have never tried the dry-process (Bandini, 2011)
- Performance of gap-graded CRM mixes seems to be more desirable and consistent than dense-graded CRM mixes.
Application of CRM-modified SAMIs improve the overall pavement performance (AZ and FIL); mixed reviews in other states (Flintsch, et al., 1994)

Larger GTR sizes are allowed to be used in the interlayers and chip seals compared to asphalt mix layers

Crumb rubber additions of approximately 5% and 10% produce one and two PG bumps in asphalt binders, respectively

Rubber size, type, and grinding process affect but do not materially impact binder or mix modification

CRM binders are great for improved rutting resistance
Crumb rubber cook time in binder beyond 30 to 60 minutes does not materially improve binder performance

With proper mixing, low and no-cook CRM asphalt seems to perform as well as terminal blend CRM asphalt, both in the lab and in the field

Wet and dry process CRM asphalt perform as well or better than PMA (better fatigue and moisture resistance, lower permanent strain accumulation with rubber)

Separation of rubber and binder in terminal blends is a real risk
Total Participants = 40

48% GTR Users
52% Others
Reason for not incorporating GTR in asphalt mixes

- Unsuccessful experience: 33.3%
- Concern over performance: 61.1%
- Lack of performance data: 27.8%
- Not cost effective: 22.2%
- No incentive
- No crumb rubber producer
Main reasons for using GTR in asphalt pavements

- Cost Effectiveness: 25%
- Better Performance: 67%
- Incentives: 50%
- Other: 21%
Type(s) of mixes in which GTR is used by agencies

- Hot Mix Asphalt (HMA): 26%
- Warm Mix Asphalt (WMA): 30%
- Non-Structural Thin-Lift Overlay (<1.5 in.): 22%
- Structural Overlays (> 1.5 in.): 57%
- Mill-and-Fill Operation: 57%
- Chip Seal: 57%
- Fog Seal: 52%
GTR applications

- Interstate Highways: 74%
- City road: 39%
- State Highway: 78%
- Other (please specify): 30%
Type of process used by agencies

- Dry Process: 14%
- Wet Process (Terminal Blend): 55%
- Wet Process (Field Blend): 77%
Next Steps

- Statutory changes effective November 1, 2017 is projected to increase the Fund
- More tire dumps cleanups
- Market development projects
  - Smaller scale
  - Short term
  - Criteria ready to go
- Explore other funding sources for smaller scale demonstration projects
Next Steps

- Look for ways to leverage efforts
- Continue to plant seeds, nurture them and watch them grow

Photo credit: Ferrella March
“The way a team plays as a whole determines its success. You may have the greatest bunch of individual stars in the world, but if they don’t play together, the club won’t be worth a dime.”

-Babe Ruth

Source: Valdez, J. (2016, April 27)
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Literature review can be retrieved from:


References


