IMPORTANCE OF ASPHALT RELEASE AGENTS

Partners in Quality Road Tour 2019
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CHALLENGES

Build-up

Rubber tire roller pick-up

Sticking to other equipment
OUTDATED SOLUTION: DIESEL

No longer used because:

- Possible contamination of job site and nearby ground water
OUTDATED SOLUTION: DIESEL

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- When mixed with asphalt, it creates a hazardous waste by-product
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- Fumes can affect the health of the paving crew
OUTDATED SOLUTION: DIESEL

No longer used because:

- Possible contamination of job site and nearby ground water
- When mixed with asphalt, it creates a hazardous waste by-product
- Fumes can affect the health of the paving crew
- Dilutes the binder, cutting through the asphalt mat decreasing the strength and quality
TODAY’S SOLUTION: ASPHALT RELEASE AGENTS

Common ARA bases:
- silicon
- vegetable oil
- emulsified wax
- soap
- citrus
BEST PRACTICES FOR USING ASPHALT RELEASE AGENTS

#1 - Prevention

- Spray equipment you want to protect BEFORE you start
- Once the equipment is hot, you should need less ARA
- Reapply as needed – Truck Boxes should be good for 3 loads before reapplication
BEST PRACTICES FOR USING ASPHALT RELEASE AGENTS

#1 - Prevention

- Spray equipment you want to protect BEFORE you start
- Once the equipment is hot, you should need less ARA
- Reapply as needed – Truck Boxes should be good for 3 loads before reapplication

#2 - Cleaning

- ARAs can be used as a cleaner but more time might be needed to allow the product to penetrate the asphalt
WHY USE AN ASPHALT RELEASE AGENT
PERSONNEL & ENVIRONMENTAL SAFETY

- Safe for Personnel:
  - No toxic fumes
  - No unpleasant smell
  - No aspiration hazard
PERSONNEL & ENVIRONMENTAL SAFETY

- Safe for Personnel:
  - No toxic fumes
  - No unpleasant smell
  - No aspiration hazard

- Environmental Impact:
  - Biodegradable
  - Will not accumulate in the soil or affect ground water
  - Will not have a negative impact on aquatic life

Health icon by Guilherme Furtado and plants icon by BGBOXXX Design; all from the Noun Project
ROAD QUALITY & TEMPERATURE

- Road Quality:
  - Won’t degrade the binder or affect road quality/durability
ROAD QUALITY & TEMPERATURE

- Road Quality:
  - Won’t degrade the binder or affect road quality/durability

- Temperature:
  - Special formulations for cold weather paving
  - Many are non-flammable for use on hot equipment
COST IMPLICATIONS

#1 – Costs of not using an ARA?

- Loss of time cleaning equipment
- Loss of material from asphalt not being used since it is stuck on equipment
- Loss of road quality by old asphalt mixing in with hot asphalt or rubber tire roller pickup
COST IMPLICATIONS

#1 – Costs of not using an ARA?
- Loss of time cleaning equipment
- Loss of material from asphalt not being used since it is stuck on equipment
- Loss of road quality by old asphalt mixing in with hot asphalt or rubber tire roller pickup

#2 – Cost saving measures when using ARAs?
- Some ARAs can be diluted
- Some ARAs can also be used as cleaners
- Reapplication is not usually required if the equipment is hot from constant use
OUTSTANDING QUESTIONS

- How do the ARAs compare with respect to performance?
- How do the ARAs impact road quality?
PERFORMANCE STUDY

Research project in collaboration with CPATT – Centre for Pavement and Transportation Technology at the University of Waterloo
# TESTING ARA

<table>
<thead>
<tr>
<th>CanSlipt SE</th>
<th>CanSlipt 2000</th>
<th>CanSlipt Late Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Concentrated ARA&lt;br▪ Diluted 1:10 with water</td>
<td>▪ Ready-to-use ARA&lt;br▪ Dilution not recommended</td>
<td>▪ Ready-to-use ARA for colder weather&lt;br▪ Dilution not recommended</td>
</tr>
</tbody>
</table>

**ARA-A: Detergent**
- Concentrated ARA
- Dilution required

**ARA-B: Proprietary Blend**
- Concentrated ARA
- Dilution required
ASPHALT SLIDE TEST

- **Goal**
  Determine how well the ARA prevents the asphalt from sticking to the steel by simulating a truck bed carrying a hot asphalt

- **Asphalt Mix**
  Conventional mix with PG 58-34
ASPHALT SLIDE TEST

Applied ARA to the surface
APPLIED ARA TO THE SURFACE

ADDED 1200G OF ASPHALT AT 150°C
APPLIED ARA TO THE SURFACE

ADDED 1200G OF ASPHALT AT 150°C

APPLIED 20KG LOAD TO THE ASPHALT

ASPHALT SLIDE TEST

30 MIN
ASPHALT SLIDE TEST

Applied ARA to the surface

Added 1200g of asphalt at 150°C

Applied 20kg load to the asphalt

Inclined to 45° and measurements taken
ASPHALT SLIDE TEST

Data Collected

- Mass of the asphalt residue left on the plate
  - Ideal: Little to no binder or aggregates remaining on the plate
  - What it shows: How well the ARA will prevent the asphalt from sticking to surfaces

- Time that it takes the mixture to start sliding down after the plate is inclined
  - Ideal: Quick time to slide down the plate
  - What it shows: Whether or not the asphalt release agent will perform in the desired amount of time
ASPHALT SLIDE TEST

<table>
<thead>
<tr>
<th>% of Asphalt Removed</th>
<th>Time to Slide Initiation (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.9%</td>
<td>2 s</td>
</tr>
<tr>
<td>99.8%</td>
<td>2 s</td>
</tr>
<tr>
<td>99.8%</td>
<td>2 s</td>
</tr>
<tr>
<td>6.7%</td>
<td>120 s</td>
</tr>
<tr>
<td>99.9%</td>
<td>3 s</td>
</tr>
<tr>
<td>99.3%</td>
<td>8 s</td>
</tr>
</tbody>
</table>

SE 2000 LS ARA-A ARA-B Diesel
BINDER DEGRADATION TEST

- **Goal**
  To determine how aggressive the ARAs are on the asphalt binder to ensure that the asphalt quality will not be affected.

- **AC used**
  PG 58-34
BINDER DEGRADATION TEST

The AC was prepared in 12g pucks
BINDER DEGRADATION TEST

The AC was prepared in 12g pucks

The pucks were placed in a beaker and ARA added to cover the binder

24 hours
20°C
BINDER DEGRADATION TEST

The AC was prepared in 12g pucks

The pucks were placed in a beaker and ARA added to cover the binder

The ARA was collected & the beakers weighed to determine the AC remaining

24 hours
20°C
BINDER DEGRADATION TEST

Data Collected

- Weight of the beaker and remaining binder – the Bitumen degradation percentage is calculated as the difference between the mass of the binder before and after the test
  
  - Ideal: Weight is similar to the starting weight
  
- What it shows: How the ARA will degrade the binder and decrease the road quality
BINDER DEGRADATION TEST

% of Binder Unaltered after Test

<table>
<thead>
<tr>
<th>Material</th>
<th>% Unaltered</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>98%</td>
</tr>
<tr>
<td>2000</td>
<td>99%</td>
</tr>
<tr>
<td>LS</td>
<td>99%</td>
</tr>
<tr>
<td>ARA-A</td>
<td>100%</td>
</tr>
<tr>
<td>ARA-B</td>
<td>91%</td>
</tr>
<tr>
<td>Diesel</td>
<td>33%</td>
</tr>
</tbody>
</table>
INDIRECT TENSILE STRENGTH

- **Goal**
  Assess whether the moisture introduced by the ARA causes damage to the asphalt

- **Asphalt Mix**
  Conventional mix with PG 58-34
INDIRECT TENSILE STRENGTH

Loose asphalt mix was heated in a 145°C oven for two hours.
INDIRECT TENSILE STRENGTH

Loose asphalt mix was heated in a 145°C oven for two hours

ARA was added to the loose asphalt
INDIRECT TENSILE STRENGTH

Loose asphalt mix was heated in a 145°C oven for two hours

ARA was added to the loose asphalt

The asphalt was compacted by the Superpave Gyratory Compactor

Air void level: 6.5 ± 0.5%

3 Weeks
INDIRECT TENSILE STRENGTH

Asphalt cylinder placed in the apparatus
INDIRECT TENSILE STRENGTH

Asphalt cylinder placed in the apparatus

Force was applied to top and bottom
INDIRECT TENSILE STRENGTH

Asphalt cylinder placed in the apparatus

Force was applied to top and bottom

Failure force/pressure was recorded and the indirect tensile strength calculated

\[ I'' = \frac{2000\&}{t \cdot d} \]
INDIRECT TENSILE STRENGTH

Data Collected

- Comparison in the change of indirect tensile strength as compared to the control (asphalt with no ARA)
  - Ideal:
    Little to no change
  - What it shows:
    Whether or not the asphalt will be more prone to cracking after the use of asphalt release agents
INDIRECT TENSILE STRENGTH

% of Tensile Strength Maintained

- SE: 94%
- 2000: 88%
- LS: 65%
- ARA-A: 54%
- ARA-B: 63%
NEXT STEPS

- Finish performance analysis
  - Repeating the slide test with a rubber plate to simulate rubber tire roller pickup
  - Repeat the tests with PG 70-28

- Develop an ARA specifically for use with polymer modified AC that won’t degrade asphalt quality, in partnership with CPATT

- Improve injector/delivery system for applying ARA to truck boxes
QUESTION FOR YOU

What problems do today’s asphalt release agents still present?

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