

Recycled Asphalt Shingles in HMA:

Effect on Binder Properties & Assessing Blending

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Outline

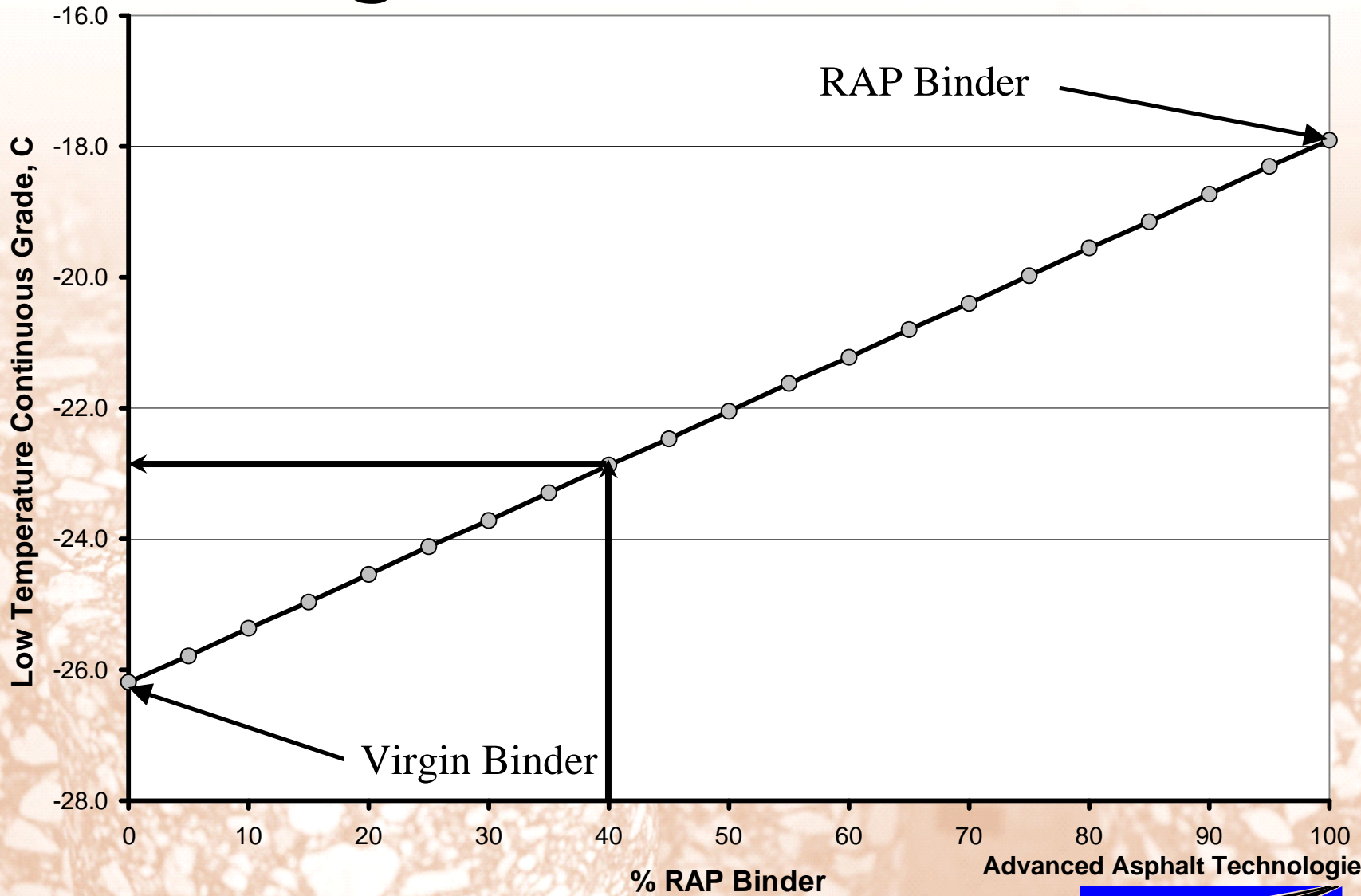
- RAS Blending Chart Problem
- Practical Solution
- Effect of RAS on Blended Binder Properties
- Mixing Analysis of RAS/RAP Blends

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Blending Chart



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RAS Issue

- Can't Grade Recovered RAS Binder
 - Critical High Temp
 - $>$ DSR Limit
 - Critical Low Temp
 - $S <$ BBR Min. Temp
 - $m >$ BBR Max. Temp

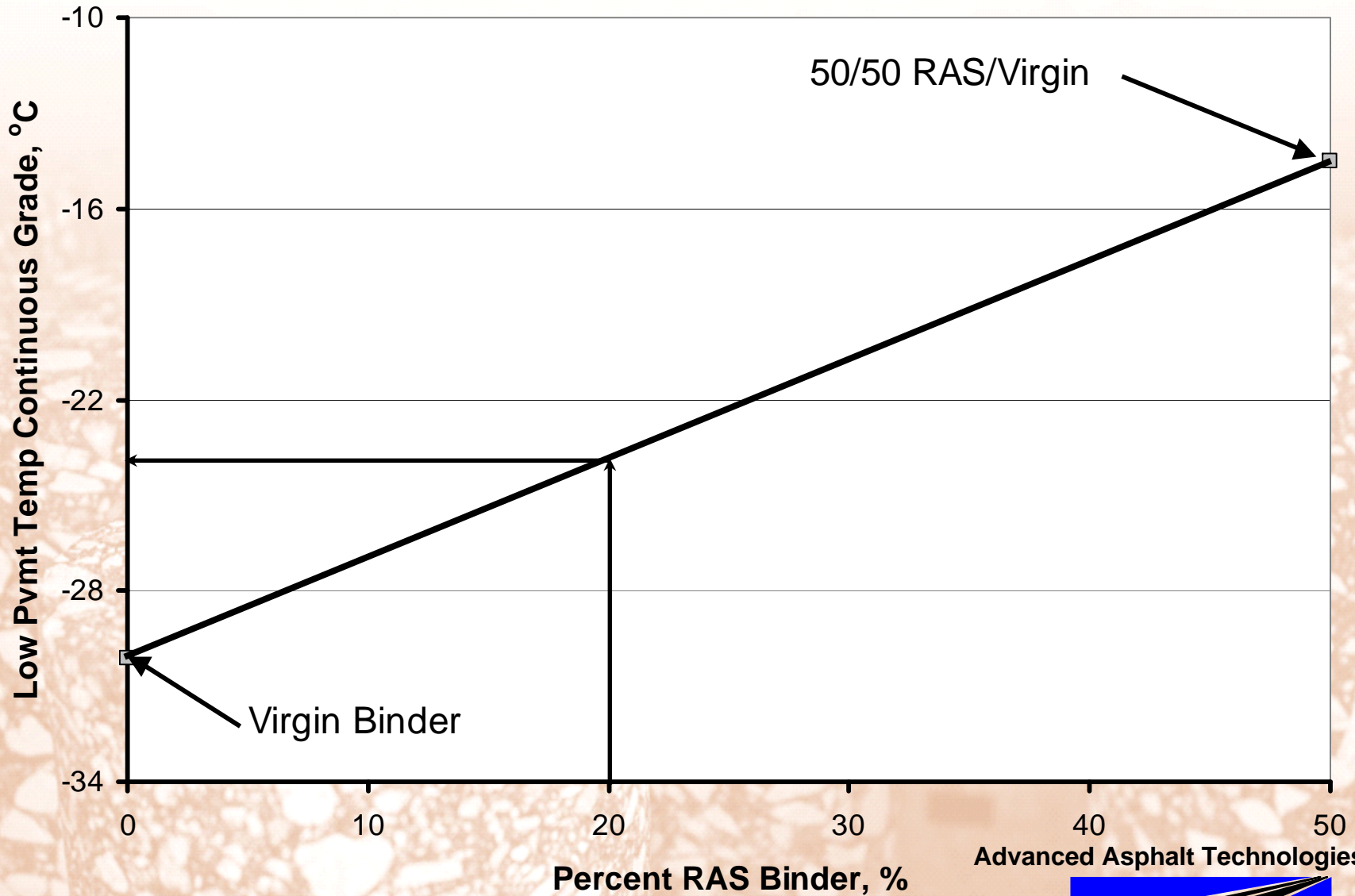


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AAT's Solution (PDA)

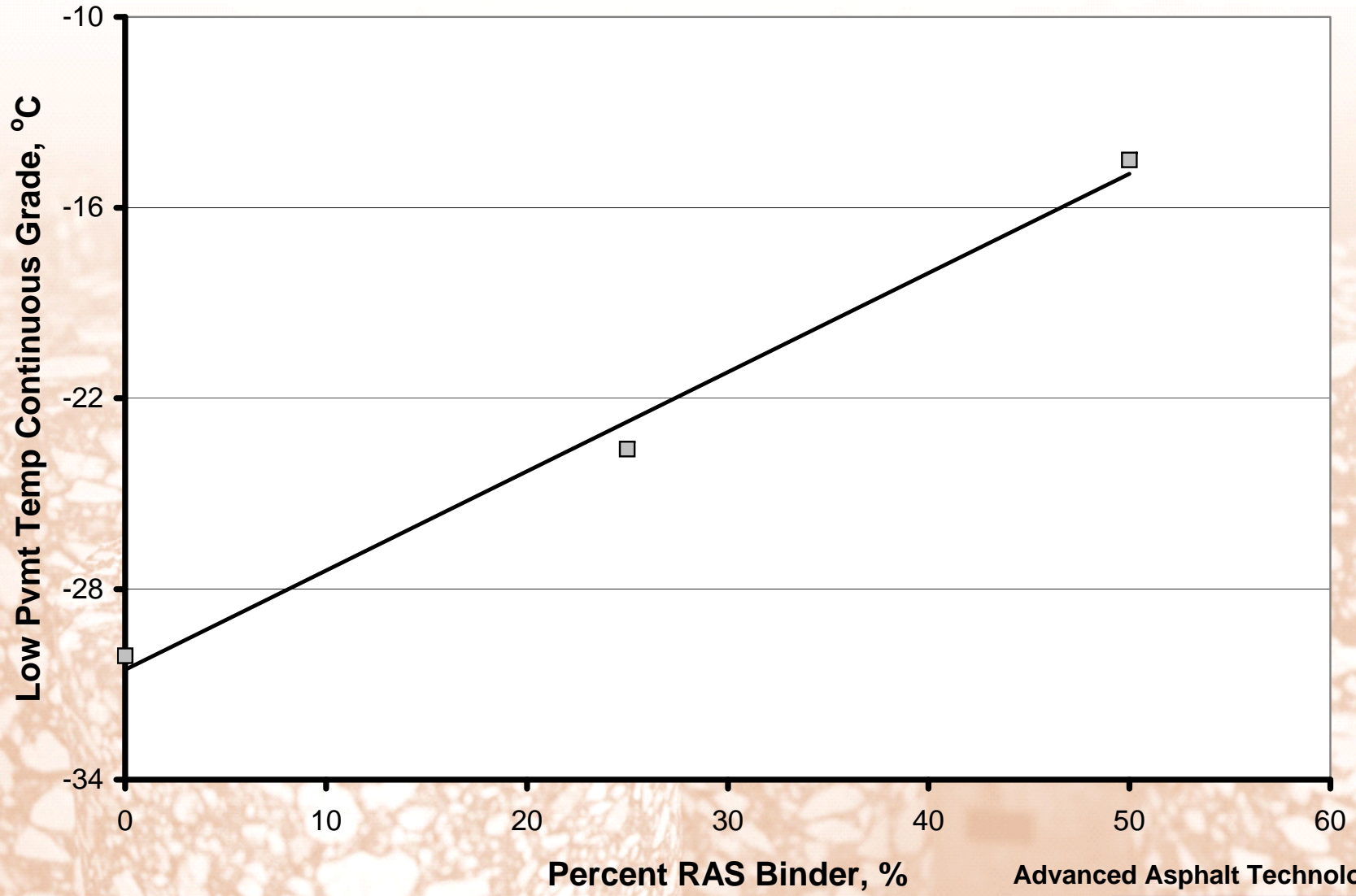


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Low Temp Grade

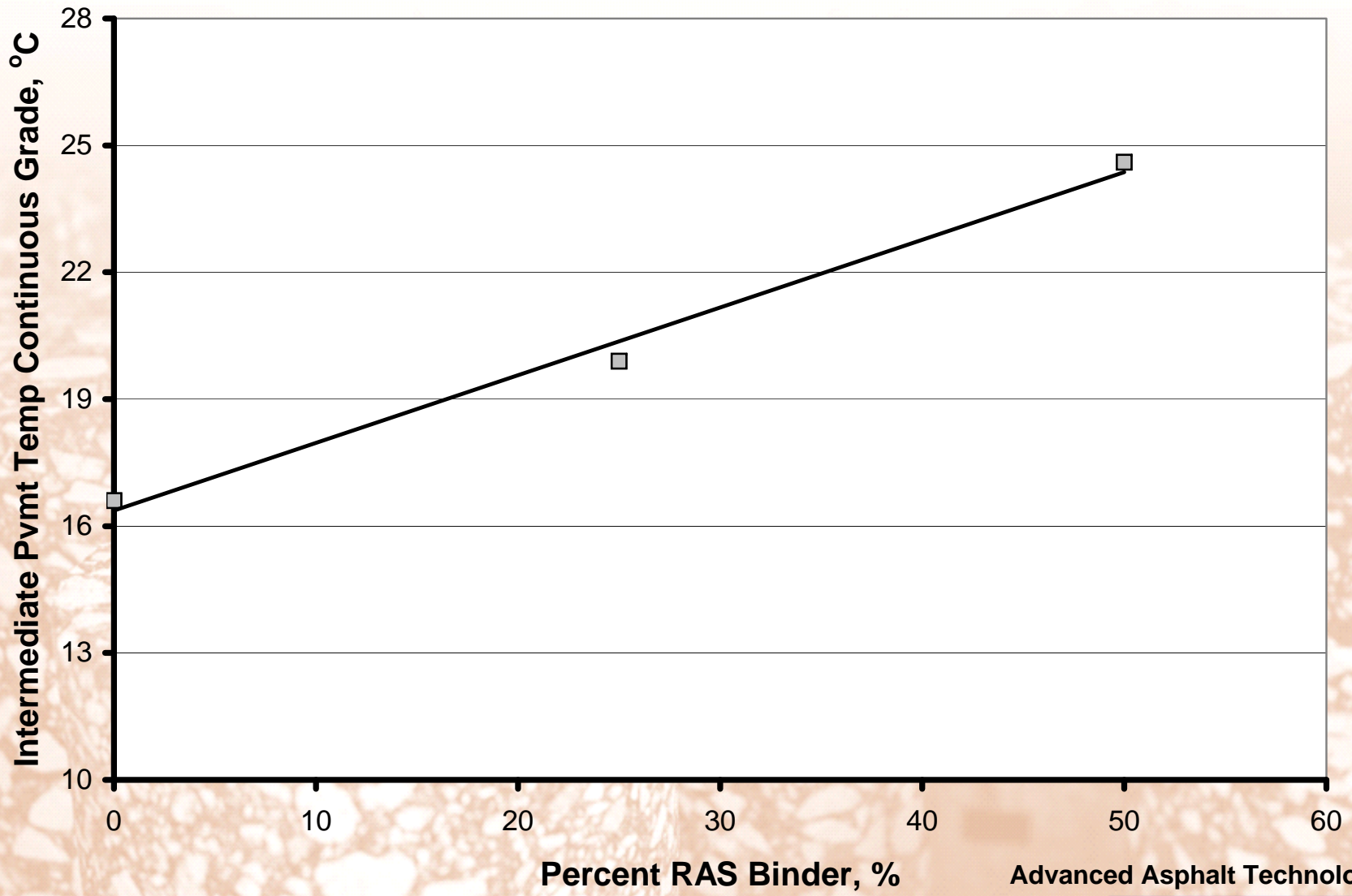


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Intermediate Temp Grade

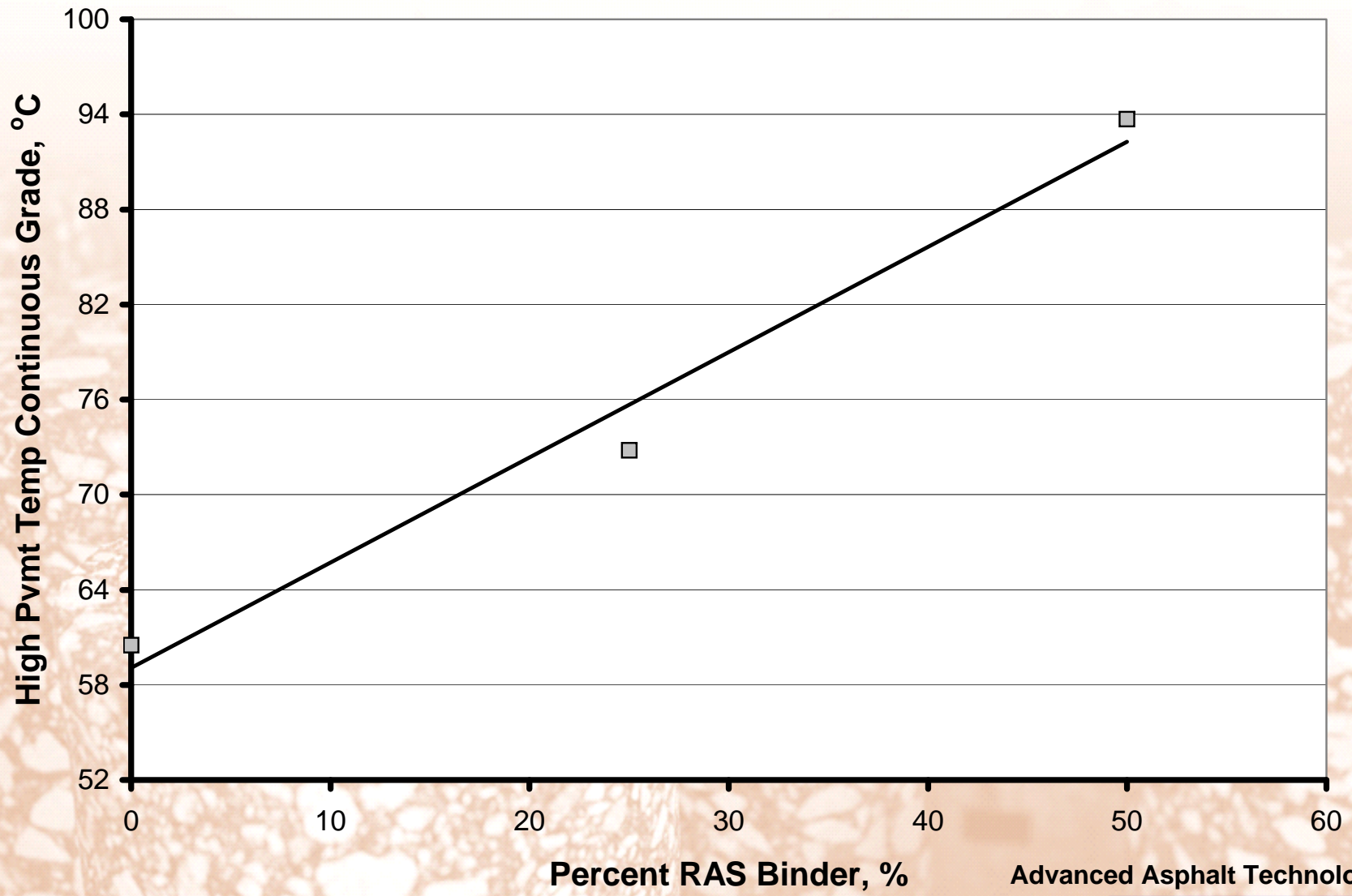


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High Temp Grade

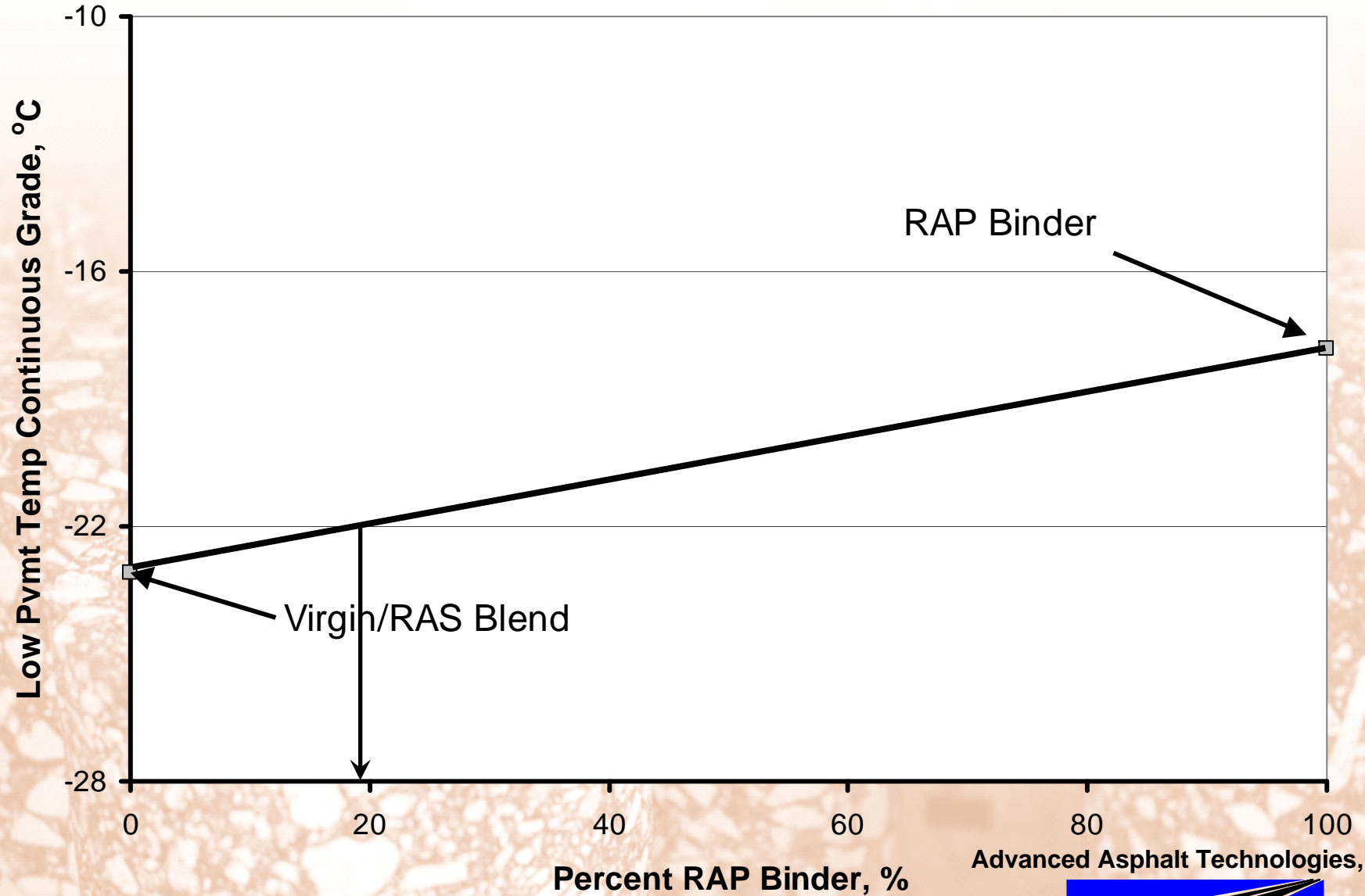


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RAS/RAP Blend

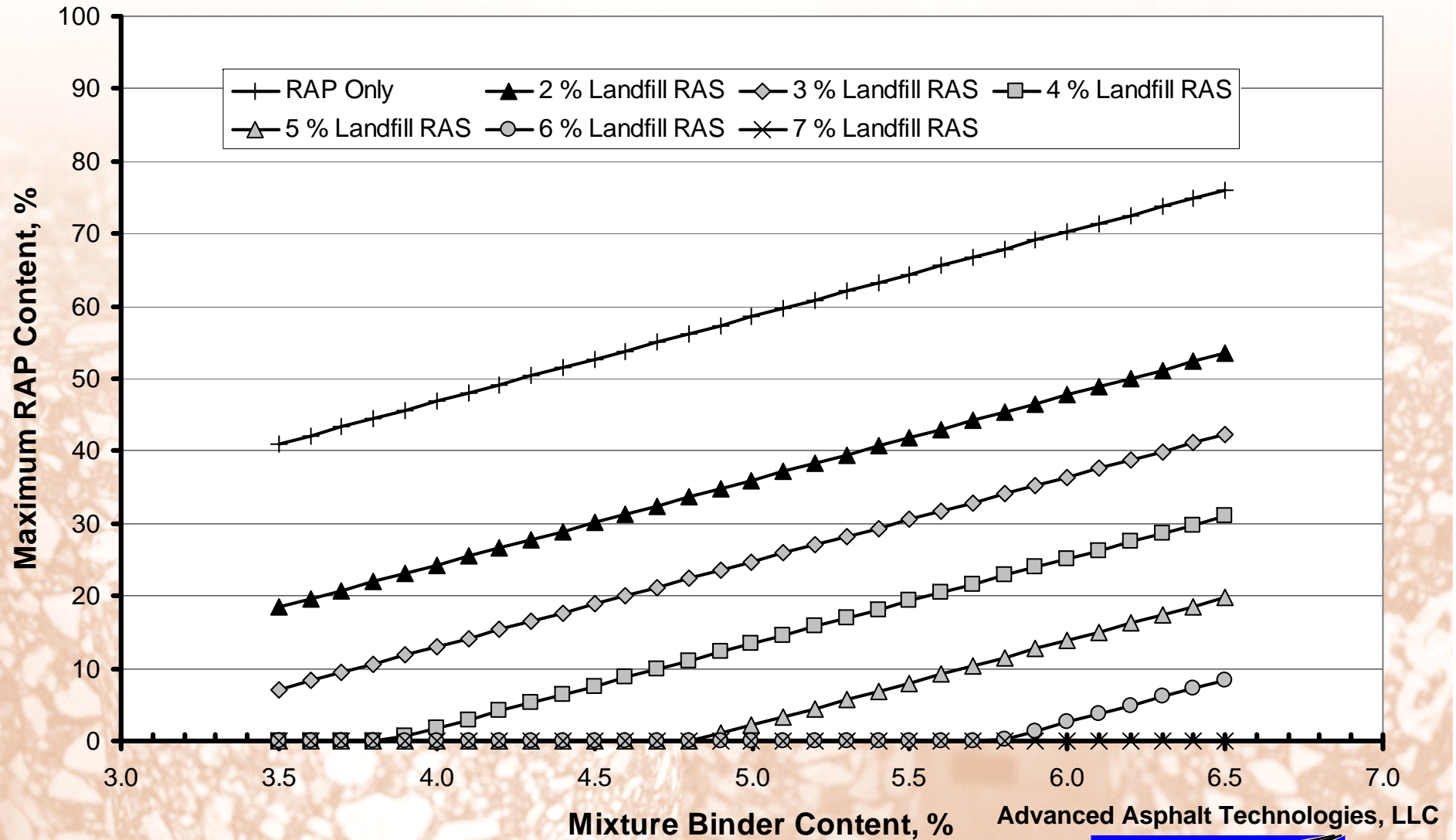


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Selecting Recycled Content



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Effect of RAS

- 25 % RAS Binder
 - Low Temperature
 - One Grade Level Poorer
 - Intermediate Temperature Grade
 - 3 °C Higher
 - High Temperature Grade
 - Improves 2 Grade Levels
- Proper Virgin Binder Selection Key to Obtaining Acceptable Blended Binder Properties



Assessing Blending

- How Well Does the RAP Binder Mix with the New Binder?
- Process Specific
 - Plant Type
 - Plant Operations
 - RAS Processing



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One Tool

- Dynamic Modulus
 - Test Is Highly Sensitive to Binder Stiffness
 - Assess Degree of Mixing of New and Recycled Binders
 - Relatively Easy to Perform with the Asphalt Mixture Performance Tester



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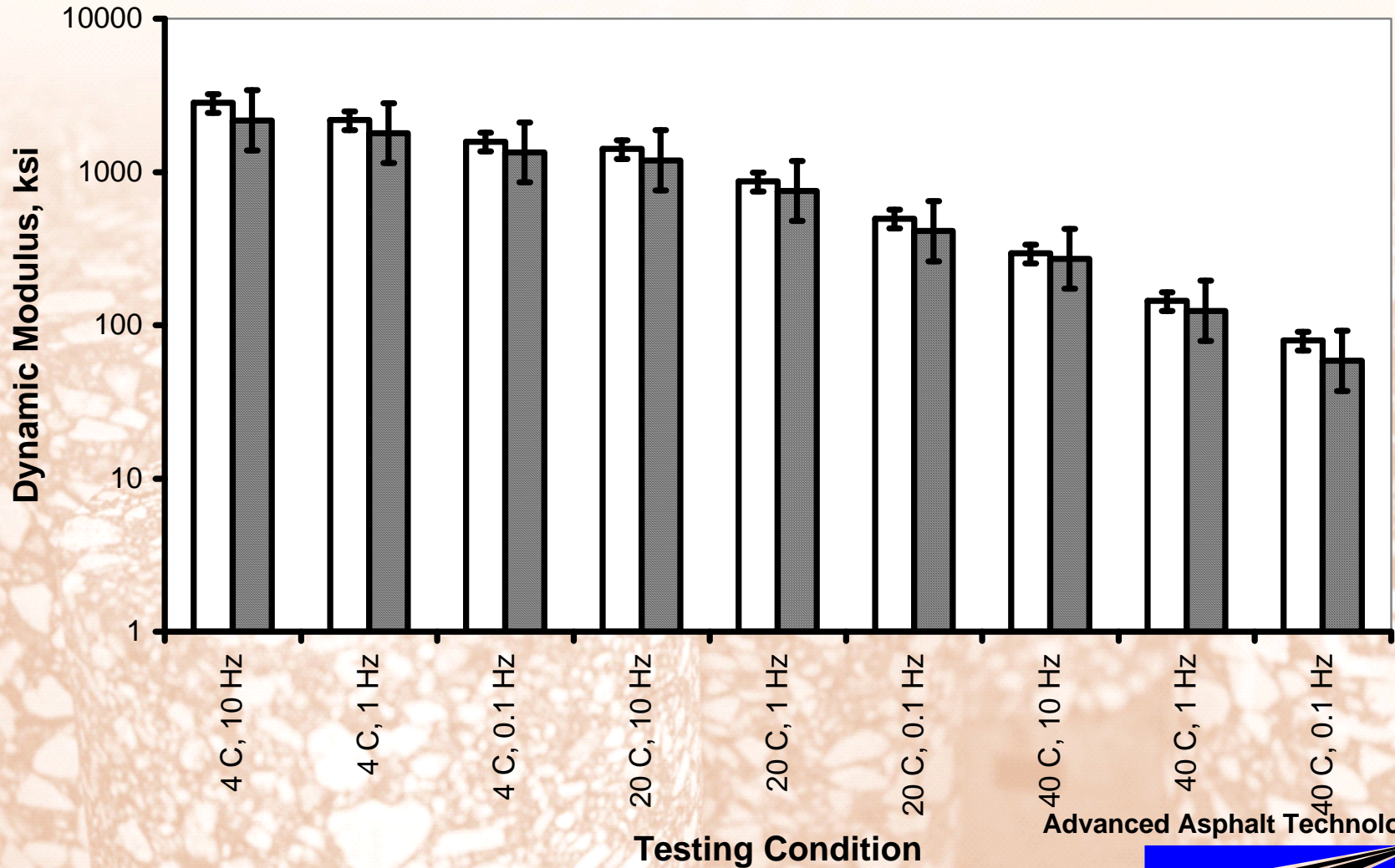
How?

- Perform Dynamic Modulus Tests on Plant Produced Mixture
 - Plant Mixed Condition
- Recover Binder, Test and Estimate Dynamic Modulus Using Predictive Model
 - Fully Blended Condition
- Compare Measured and Estimated



5 % RAS + 20 % RAP

Measured Estimated for Complete Mixing

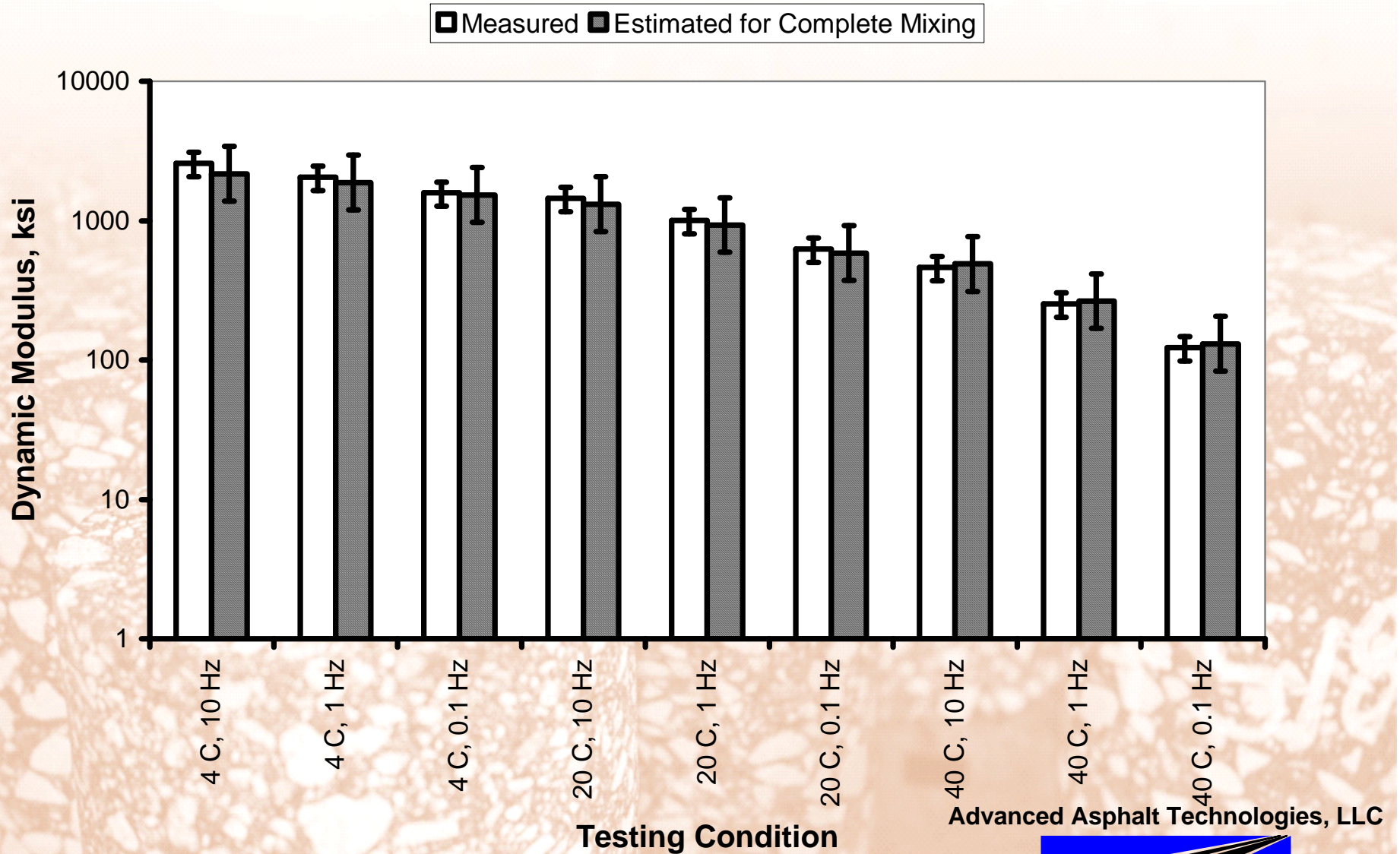


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8 % RAS + 20 % RAP

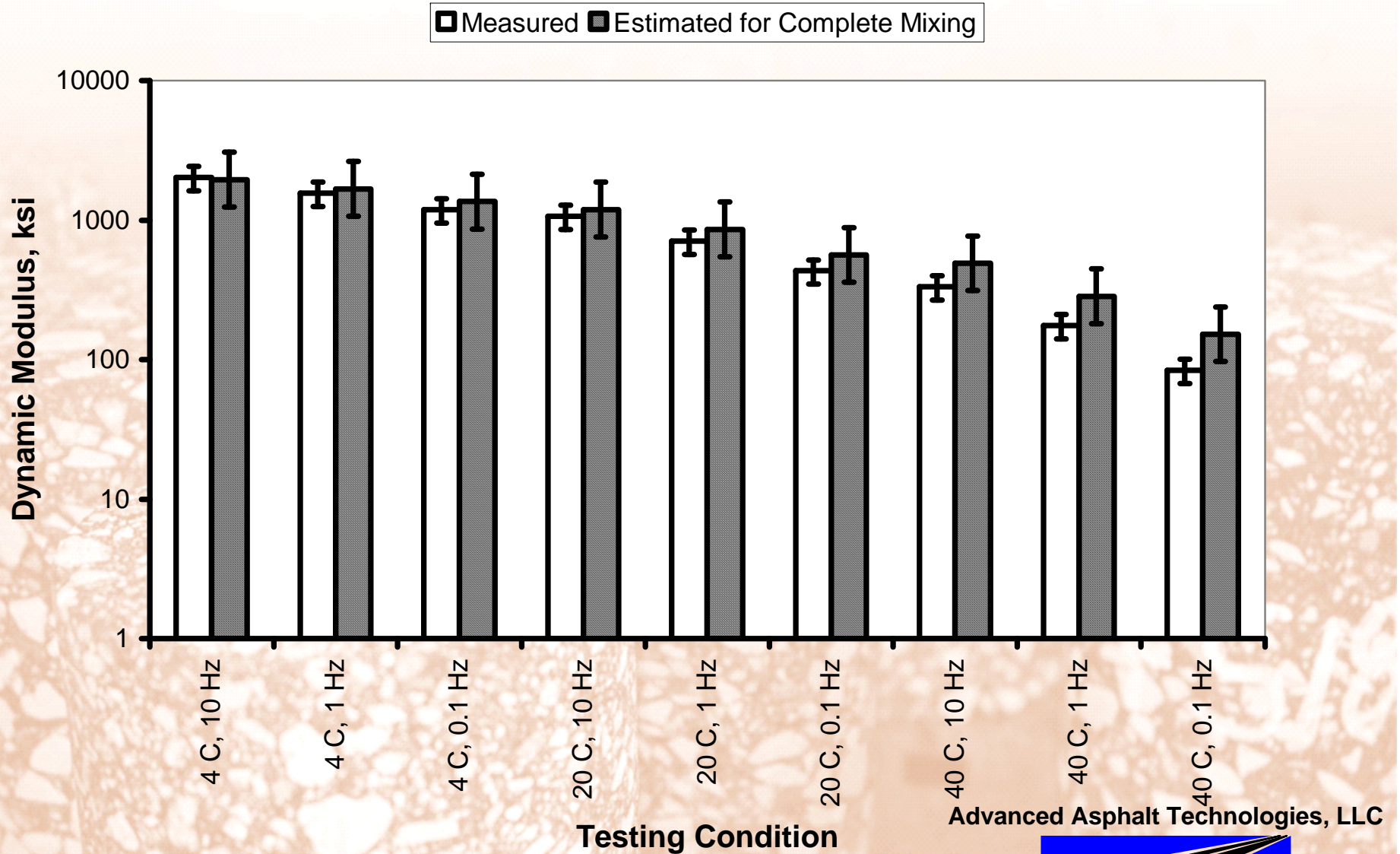


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10 % RAS + 20 % RAS



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Assessing Blending

- Possible to Obtain High Degree of Mixing of New and RAS Binders
- Changes in Processing/Plant Operations Needed to Use High RAS Contents?

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Conclusions

- RAS/RAP Blends Can Be Used Effectively in HMA
- Requires Engineering Analysis
 - Select Appropriate Virgin Binder Grades and RAS Percentages
 - Degree of Blending of Recycled and Virgin Binders



Questions/Contact

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