Pavement Materials for Sustainable Pavements

Use of High Recycled Content

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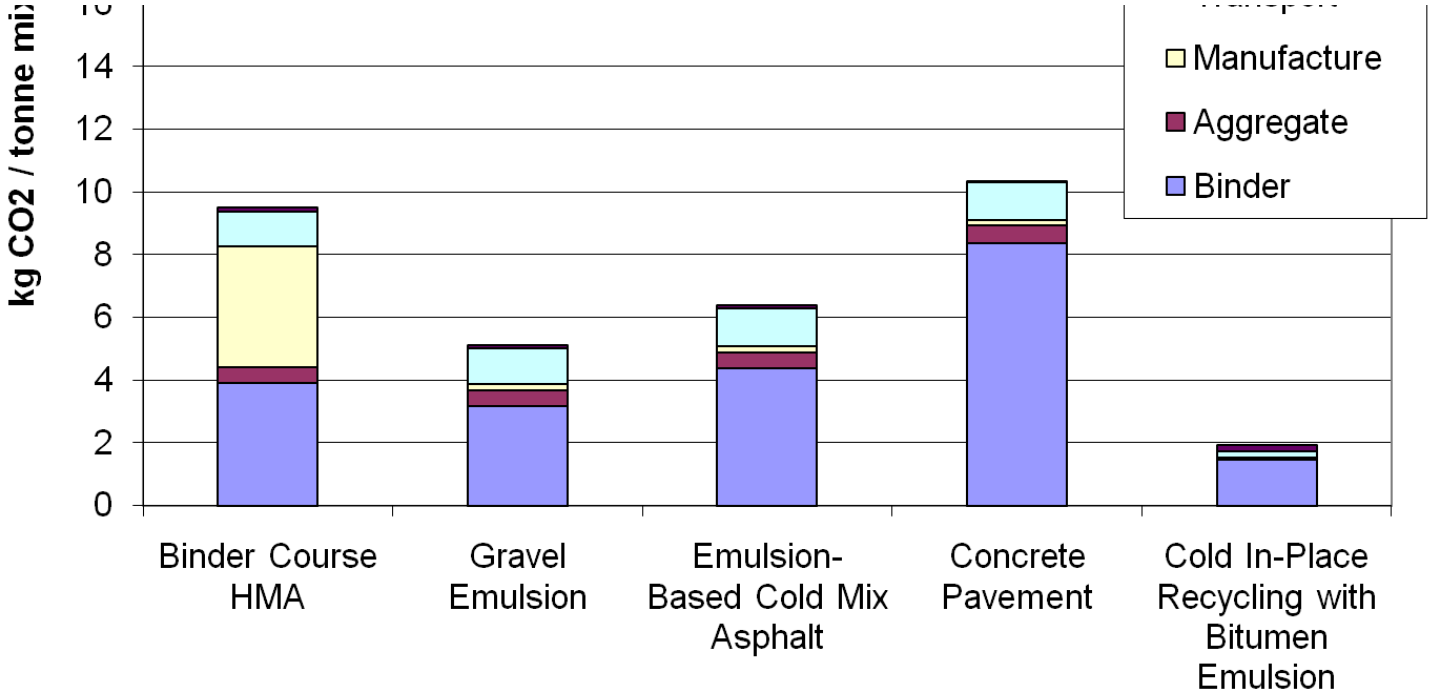
Motivations for High Recycled Content

- Today
  - Reduce cost of HMA production
    - Asphalt binder cost is THE main factor
- Tomorrow !
  - Cost, and possibly
  - Reduce impact on environment
- Both are possible and not contradictory
  - Remember HMA production is a business for profit

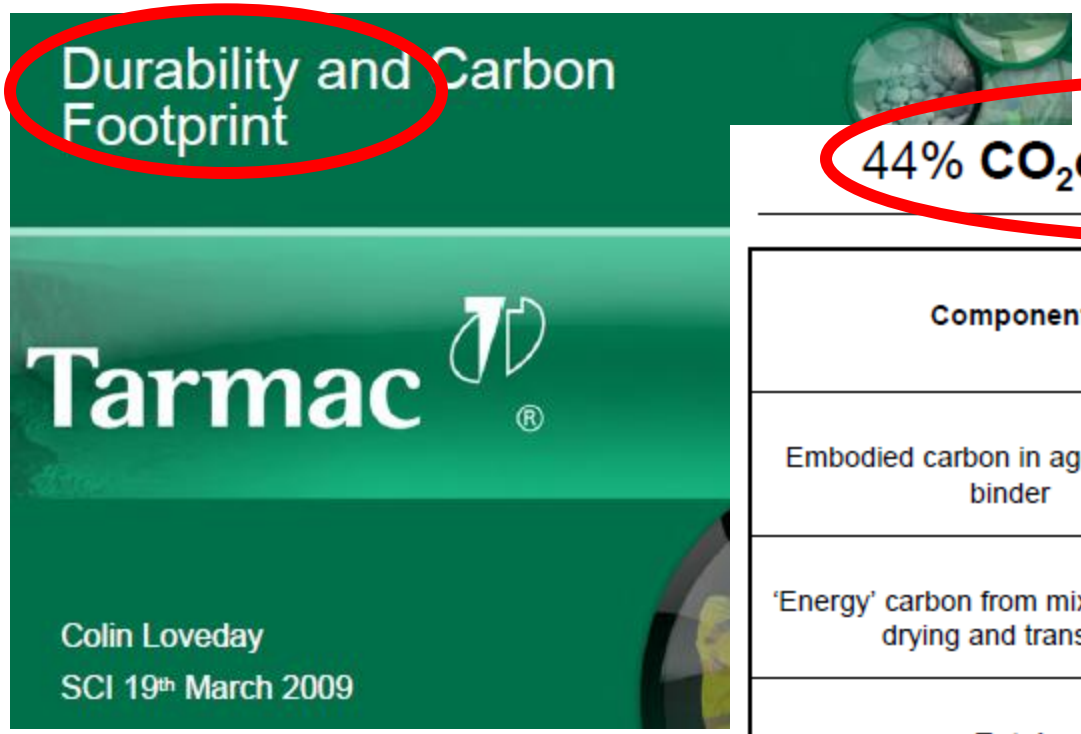
Can we reduce impact by recycling ?

Not simple to answer.. Can we get same value ?

How long will it last ?



Evolving recognition of enviro-benefits of asphalt recycling



44% CO_2e recovered on recycling

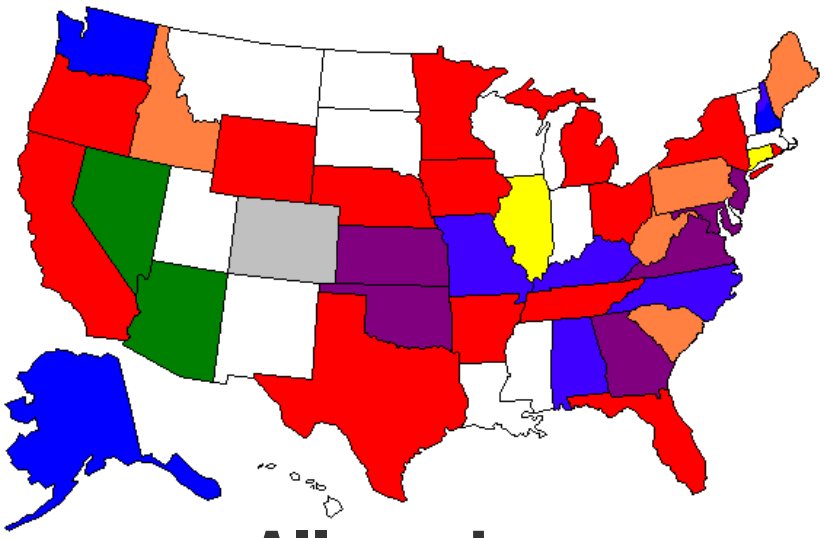
Component	CO_2e/tonne-asphalt
Embodied carbon in aggregate and binder	22
'Energy' carbon from mixing, heating, drying and transport	28
Total	**50**

Service life !

Current RAP use facts

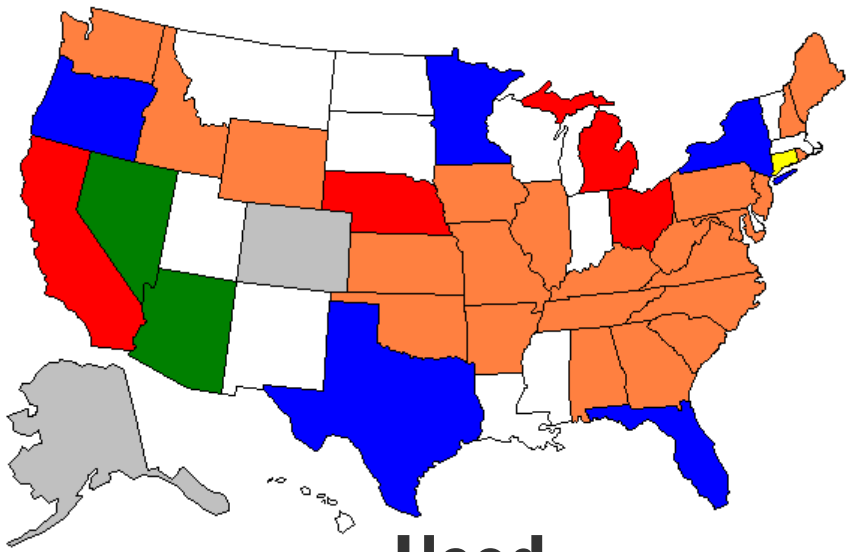
- Is there enough RAP ? … Yes
- Are we using all of It ? …. No
- Why
  - Agency barriers
  - Industry concerns

Base Mixes – Specified & Used
Source: NC DOT – Mr. Cecil Jones



Allowed

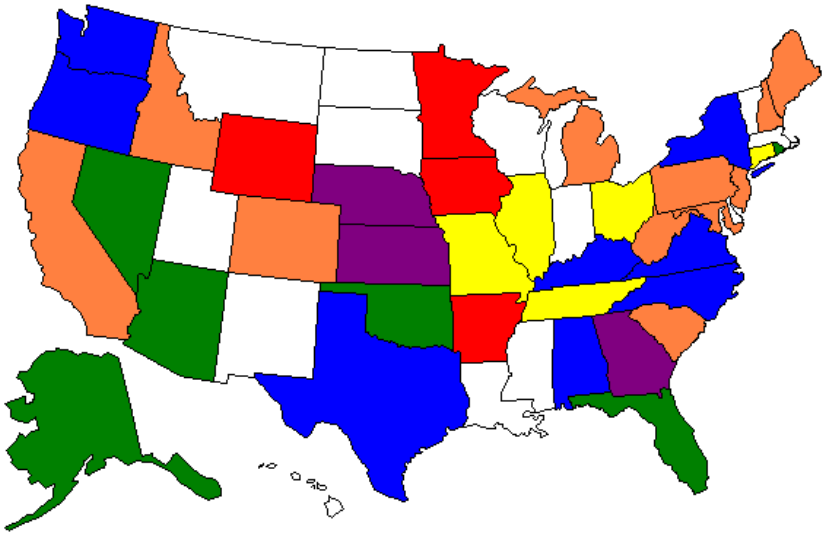
0%	
10%	
15%	
20%	
25%	
≥30%	
n/a	

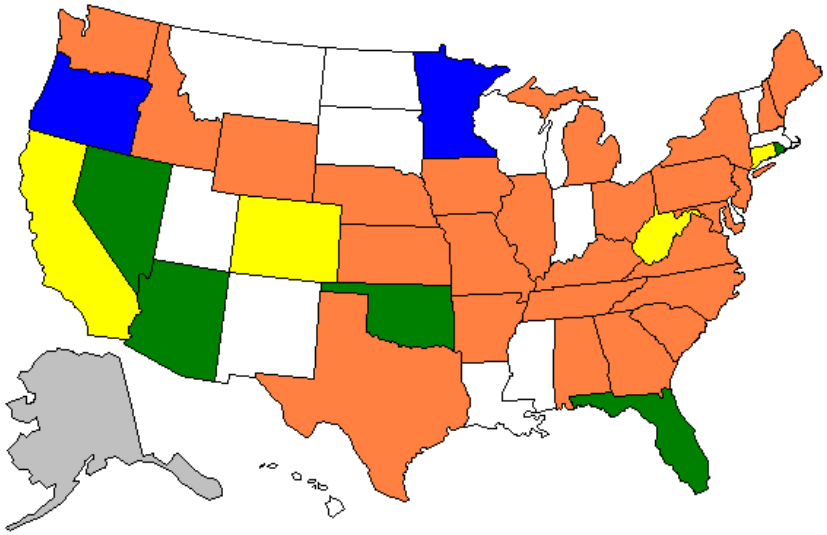


Used

0%	
1 - 10%	
10 - 20%	
20 - 30%	
≥30%	
n/a	

Surface Mixes – Specified & Used





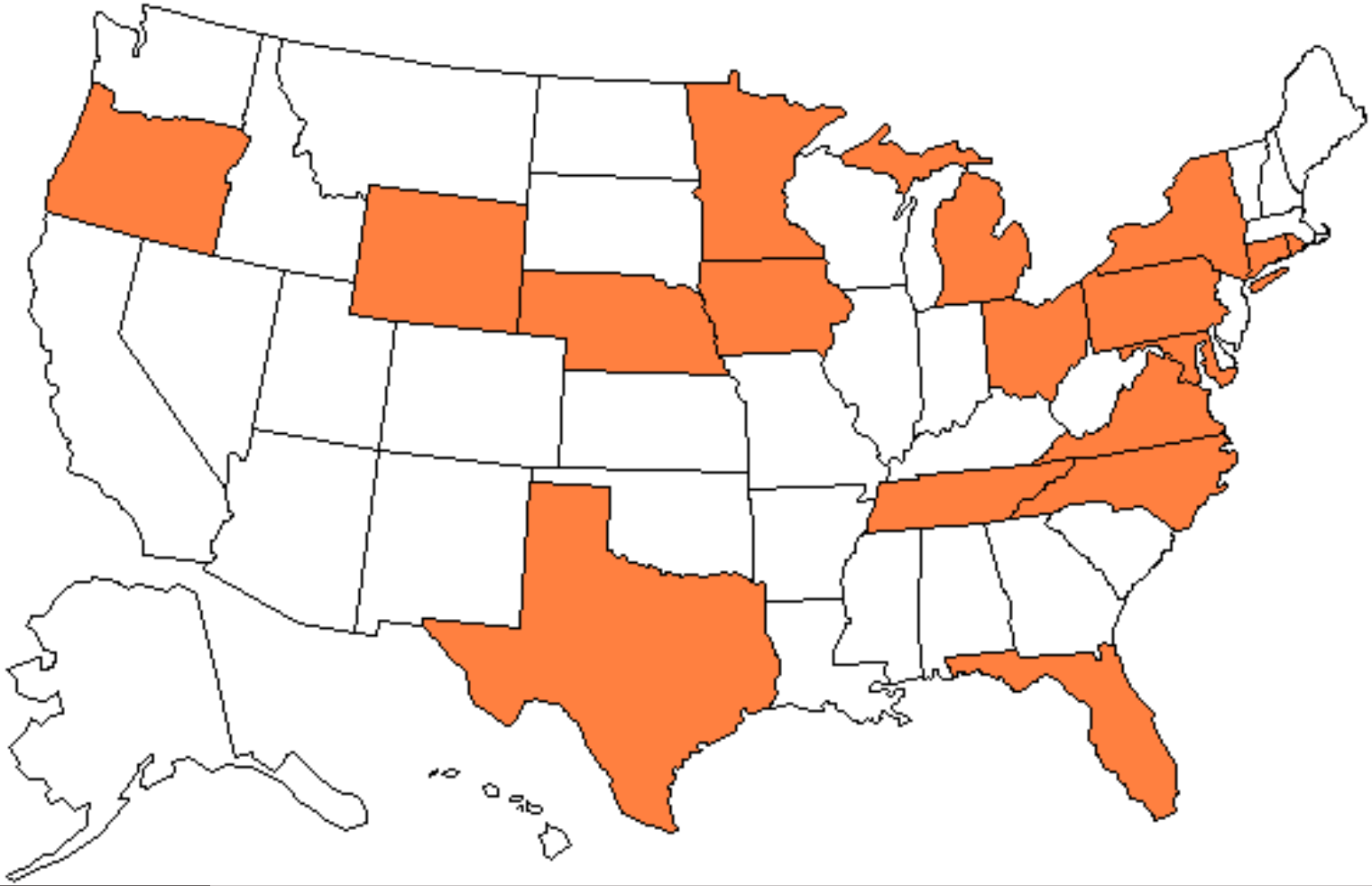
Allowed

0%	
10%	
15%	
20%	
25%	
≥30%	
n/a	

Used

0%	
1 - 10%	
10 - 20%	
20 - 30%	
≥30%	
n/a	

Recent Experience Using >25% RAP



Specification Barriers for Higher Use

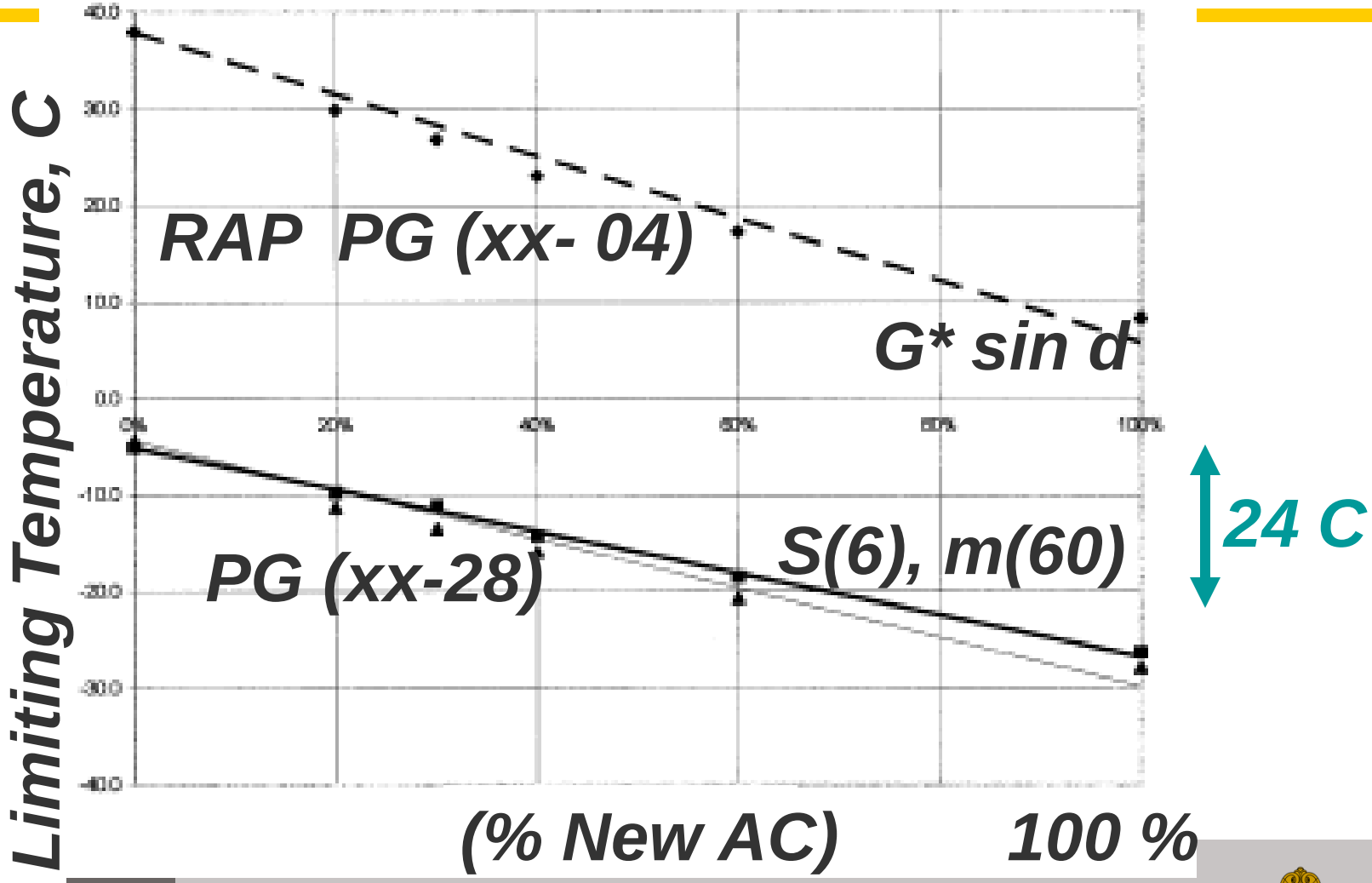
- Quality Concerns
- Consistency of RAP
- Durability of Mixes
- Ability to Meet Volumetric Requirements
- Stiffness of Binder
- Use with Polymers

Industry Barriers for RAP use in General

- Control of RAP
- Dust & Moisture
- Increased QC
- State Specifications
  - Maximum allowed
  - Binder grade change

No agreed upon tools for estimating impact

Blending of RAP Binder with Virgin Binder



Ten Obstacles for Increased RAP Use
RAP Expert Task Group – USA -May 2007

- **10 Obstacles for Increased RAP Use**
  1. Study to evaluate and/or develop a performance test that can be used as a guideline for evaluating RAP
  2. Development of a best practices manual for mix design and construction to highlight the advantages of RAP with varying levels of RAP
  3. Develop a method to characterize RAP which avoids hazardous solvents that address how to quantify Gsb, Pb, and binder grade
  4. Evaluation of whether or not binder grade changes are necessary

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5. Evaluation of the degree of co-mingling of binders (RAP/virgin) in plants
6. Documenting field performance of high rap mixes
7. Replicating RAP and virgin plant heating in labs
8. Getting states with no or low % RAP specs up to speed with current practices
9. Variability of RAP—(agg, ac/content, modification, binder characterization
10. Processing/fractionating RAP

Closing Remarks- How to increase RAP use

- **Better methods for**
  - Defining quality of recycled materials
  - Processing the recycled materials
  - Design mixtures with recycled materials
- **Major challenges**
  - Develop Non solvent separation of binders or mastics
  - Develop realistic lab blending methods
  - Check compatibility and aging
  - Estimate variability in stock piles and agree on typical values for use