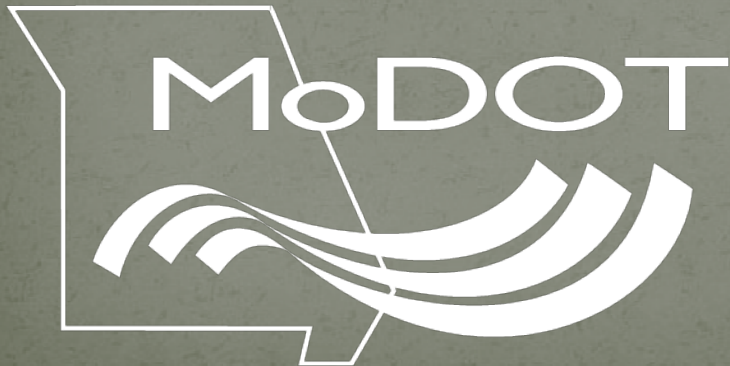


# Missouri's Experience Implementing the MSCR

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NCAUPG Annual Meeting 2012  
Indianapolis, IN  
February 15, 2012



Joe Schroer, PE  
Field Materials Engineer  
Missouri DOT

# Why MSCR?

- Polymer Modified Binders
- 2006
- Early Results
- First Specification
- 2011
- Changes in Properties
- Goals Achieved

# Polymer Modified Binders

- Added as Job Special Provision Sept. 2003
  - Rutting resistance
  - Reduced cracking – fatigue and reflective
  - Improved stripping resistance in mixtures
- Specify by Grading Spread and Elastic Recovery

Binder Characteristics		
Absolute Temperature Spread Between Upper and Lower Temperature for PG Binder Grade <sup>a</sup>	Elastic Recovery <sup>b</sup> , Percent, Minimum, AASHTO T 301	Separation Test <sup>c</sup> , Percent Difference, Maximum, ASTM D 5976
86 C	-	-
92C	55	10
98 C	65	10
104 C	75	10

# 2006

- Introduced to MSCR at NCAUPG Meeting in St. Louis
- Approached by GTR Supplier and DeGussa for Cross-Linked GTR in Asphalt
- Began Preliminary MSCR Testing  
(Donna Hoeller, MoDOT Chemist with Assistance by John Casola, John D'Angelo and Mike Anderson)

# Early Results

- Test Performed at High Temperature Grading  
Changed to Environmental Temperature
- Evaluating Percent Recovery  
Changed to Jnr
- Promising as Screening Test for Polymer  
Presence or Improved Performance

Producer	% Recovery				KPa
	100 pa	3200 pa	Difference	Elastic Recovery	Original DSR
<b>64-22</b>					
A1	4.11	1.41	65.7	N/A	1.32
D1	5.06	4.88	3.6	10.0	1.36
<b>70-22</b>					
A2	37.28	23.94	35.8	65.0	1.66
A3	30.07	14.38	47.2	60.0	1.26
A3	24.82	13.22	52.2	45.0	1.38
B	36.96	21.16	25.9	60.0	1.41
C	37.06	22.59	57.0	65.0	1.65
C	38.17	23.93	46.7	65.0	1.62
D2	17.43	7.72	42.7	55.0	1.48
D2	24.78	12.34	39.0	55.0	1.38
D3	42.61	25.14	37.3	60.0	1.29
D3	53.71	36.60	55.9	55.0	1.41
E	43.00	29.79	72.5	62.5	1.80
E	38.62	26.91	50.2	60.0	1.74
F	56.98	51.91	62.3	82.5	1.32
<b>76-22</b>					
A3	58.37	45.88	21.4	77.5	1.36
A3	58.64	48.23	17.8	80.0	1.24
A2	56.91	47.10	17.2	77.5	1.31
A2	46.51	29.76	36.0	72.5	1.60
A2	56.67	45.22	20.2	80.0	1.32
B	68.08	58.69	13.8	65.0	1.85
G	77.10	77.45	-0.5	12.5	N/A
D3	78.76	72.51	6.25	82.5	1.41

# DSR Gap 2mm vs 1mm - GTR

ID	Orig DSR		2 mm		1 mm	
	2mm	1mm	Jnr100	Jnr3200	Jnr100	Jnr3200
2084	1.32	1.38	1.009	1.676	1.009	1.634
2085	1.38	1.32	0.894	1.469	0.931	1.494
2086	1.55	1.55	0.902	1.425	0.870	1.450
2087	1.31	1.39	0.968	1.510	0.968	1.575
2088	1.33	1.33	0.892	1.390	0.900	1.410
2089	1.46	1.50	0.971	1.577	0.983	1.568
2090	1.53	1.50	0.830	1.359	0.792	1.355
2091	1.32	1.33	0.962	1.660	0.907	1.542
2092	1.55	1.53	0.892	1.469	0.832	1.419
<b>Avg.</b>	<b>1.42</b>	<b>1.43</b>	<b>0.92</b>	<b>1.50</b>	<b>0.91</b>	<b>1.49</b>

# 2008 First Specification

Binder Characteristics <sup>c</sup>	
Absolute Temperature Spread Between Upper and Lower Temperature for PG Binder Grade <sup>a</sup>	MSCR <sup>b</sup> , Percent, Minimum, AASHTO TP 70
86 C	-
92 C	15
98 C	35
104 C	55

- Addressing GTR
- Based on Current Level of Binders
- Percent Recovery at PG High Temp. Grading








# 2011

- Ground Tire Rubber in Standard Specification
- Optional Grading in Standard Specification
  - AASHTO MP-19 for AASHTO M 320
    - PG 64-22, Grade H for PG 70-22
    - PG 64-22, Grade V for PG 76-22

# Changes in Properties

	Testing At 64 C			
Grade	70-22	64-22 H	76-22	64-22 V
DSR, kPa	3.7	1.6	4.3	2.5
Elastic Recovery	65	45	75	60
Jnr	0.70	1.76	0.25	0.63

# Goals Achieved

Goal	Achieved	Pending
Performance Related Test		
Lowered Cost*		
Equity Between Materials		
Stripping Improvement		
Uniform Test Between States		

\* Up to \$80 per ton for differential

# Summary

- Optimized Polymer Content
- Material Savings
  - Differential from 64-22 to 76-22 (64-22 V)  
cut by almost half
- Better Workability?
- More Flexibility for Modifiers
- Negatives
  - Very stiff material can be unreliable

# Questions?



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