

# **VARIATION IN RECOVERED BINDER PROPERTIES BASED ON MIX SAMPLING LOCATION**

**WARM MIX TECHNICAL WORKING  
GROUP MEETING**

**OCTOBER 27-28, 2010**

**OKLAHOMA CITY, OK**

**by**

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# WORK PROCESS

- Sample mixes produced with virgin binders at 3 locations in the production & paving process
  1. Drum Discharge (Time = 0) Temp=
  2. Discharge from silo to truck (Time = 1) Temp=
  3. Sample taken at paver (Time = 2) Temp=
- Extract & recover binders from each mix and determine amount of aging due to time and temperature at which mix has been held

# WHY DO THIS

- At the last WMA TWG meeting concerns were expressed that we don't understand what is happening to binders in HMA due to mixing temperatures and times at which the mixes are being held before paving
- Suggestion was made that a NCHRP study was needed to investigate this issue
- My belief was that this is a very simple question to investigate and an extensive study was not needed

# WHAT HAS BEEN DONE

- MIX FROM 5 PROJECTS HAS BEEN COLLECTED
  - 4 VIRGIN HMA MIXES (3 BOXES  $\cong$  12000 g FOR EACH MIX + 1 QT OF BINDER)
    - 1 OF THE VIRGIN MIXES IS A SMA USING PG 70-28 PMA BINDER
  - 1 WMA MIX WITH 5% RAP
- 2 MIXES HAVE BEEN TESTED SO FAR IN OUR LAB

## Impact of Field Mixing on Virgin Binder Aging

Location Description: \_\_\_\_\_

Sample Source: \_\_\_\_\_

Plant #: \_\_\_\_\_ Test Date: \_\_\_\_\_

Drum Type:  Parallel Flow  Counter Flow  Double Drum  Double Barrel  
 Other: \_\_\_\_\_

Drum Length: \_\_\_\_\_ feet Drum Mixing Zone Length: \_\_\_\_\_ feet

Storage Tank - AC Temp \_\_\_\_\_ °F Stack Temp: \_\_\_\_\_ °F

Binder Grade: \_\_\_\_\_ Mix Discharge Temp: \_\_\_\_\_ °F

AIR TEMP Low: \_\_\_\_\_ °F High: \_\_\_\_\_ °F

Aggregates	Source	% In Blend	Moisture Content
1	_____	_____%	_____
2	_____	_____%	_____
3	_____	_____%	_____
4	_____	_____%	_____
5	_____	_____%	_____

Mix Temp. @ Silo: \_\_\_\_\_ °F Time In Silo: \_\_\_\_\_ minutes

Mix Temp. @ Paver: \_\_\_\_\_ °F Haul Time: \_\_\_\_\_ minutes

Mix Production Rate: \_\_\_\_\_ tons / hour

Target AC Content: \_\_\_\_\_ %

# Impact of Field Mixing on Virgin Binder Aging

Location Description: Hwy 14 Richland Center - Mathy Portables

Sample Source: Mathy, Onalaska

Plant #: 24 Test Date: 10/4/2010

Drum Type: Parallel Flow Drum Length: \_\_\_\_\_ feet Drum Mixing Zone \_\_\_\_\_ feet

Storage Tank - AC Temp 270 °F Stack Temp: 275.0 °F

Binder Grade: PG 58-28 Mix Discharge Temp: 280.0 °F

AIR TEMP Low: 32.0 °F High: 65.0 °F

Aggregates	Source	% In Blend	Moisture Content
1	<u>5/8" Bosstown Kraemer</u>	<u>49</u> %	<u>6.4</u>
2	<u>Pink Screenings Williams</u>	<u>5</u> %	<u>5.9</u>
3	<u>Man Sand MS House Boulder Kraeme</u>	<u>21</u> %	<u>7.2</u>
4	<u>Sand BS Godfrey</u>	<u>25</u> %	<u>4.2</u>
5	_____	_____ %	_____

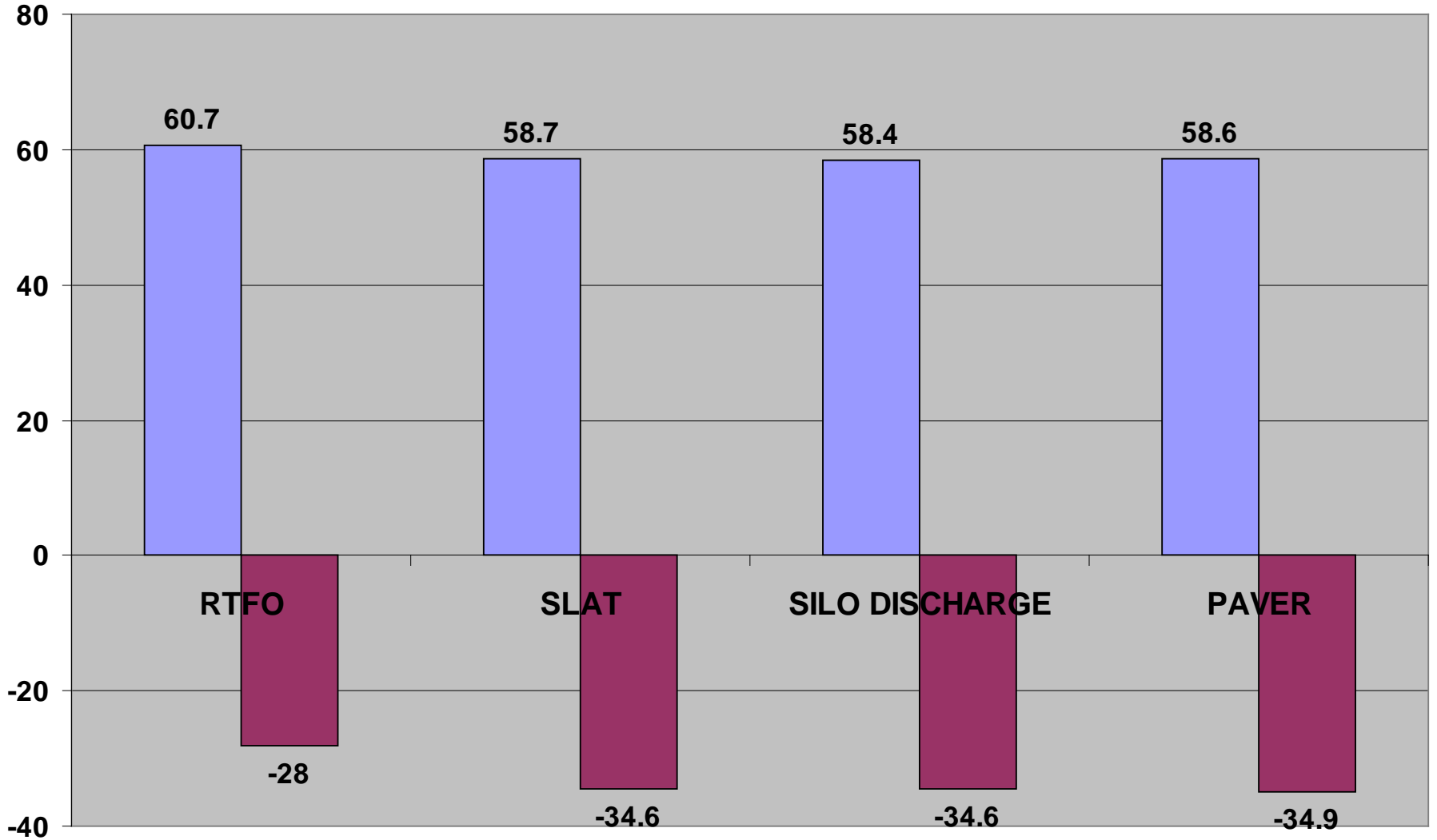
Mix Temp. @ Silo: 280.0 °F Time In Silo: 5 minutes

Mix Temp. @ Paver: 240.0 °F Haul Time: 15 minutes

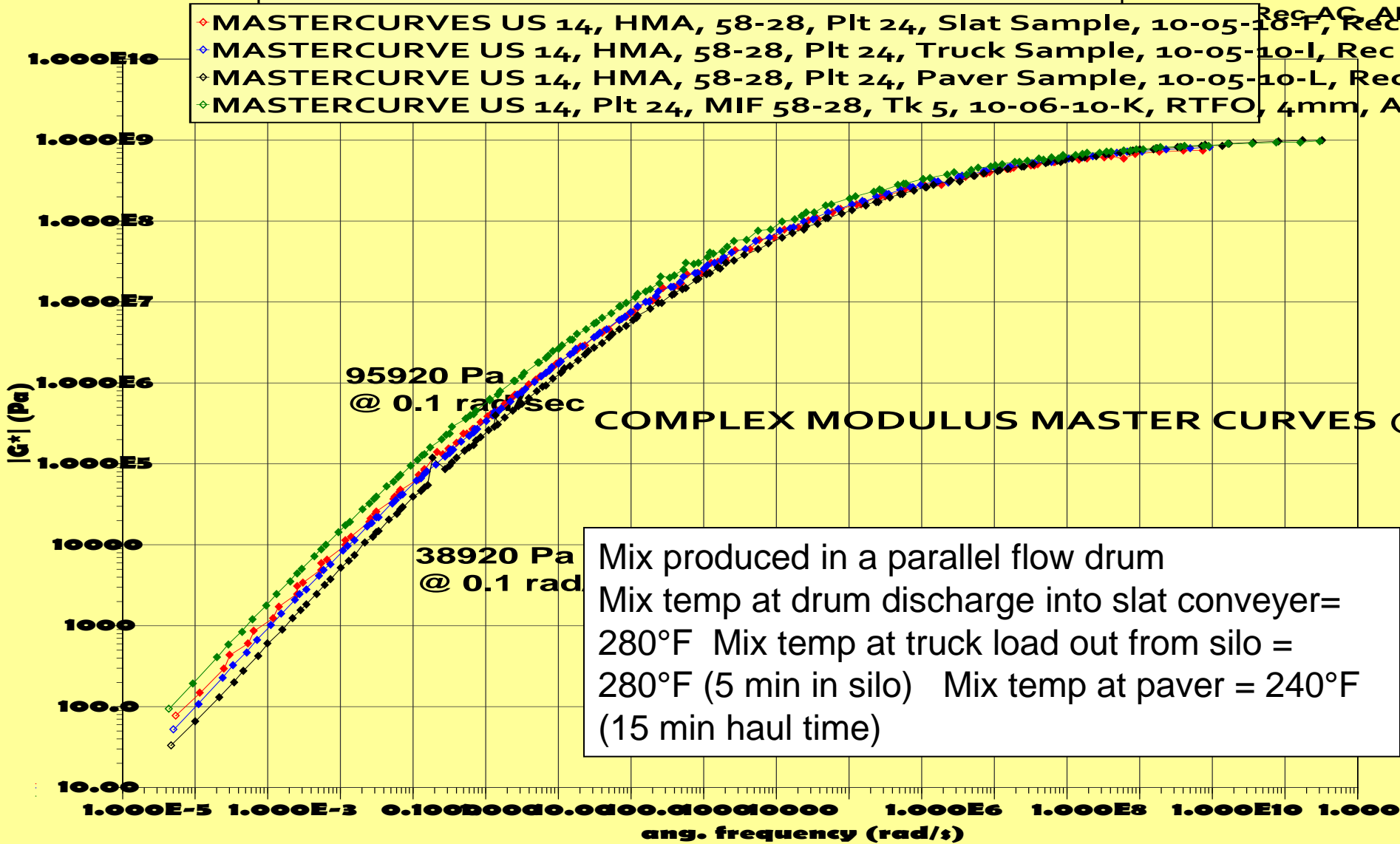
Mix Production Rate 365 tons / hour

Target AC Content: 5.0 %

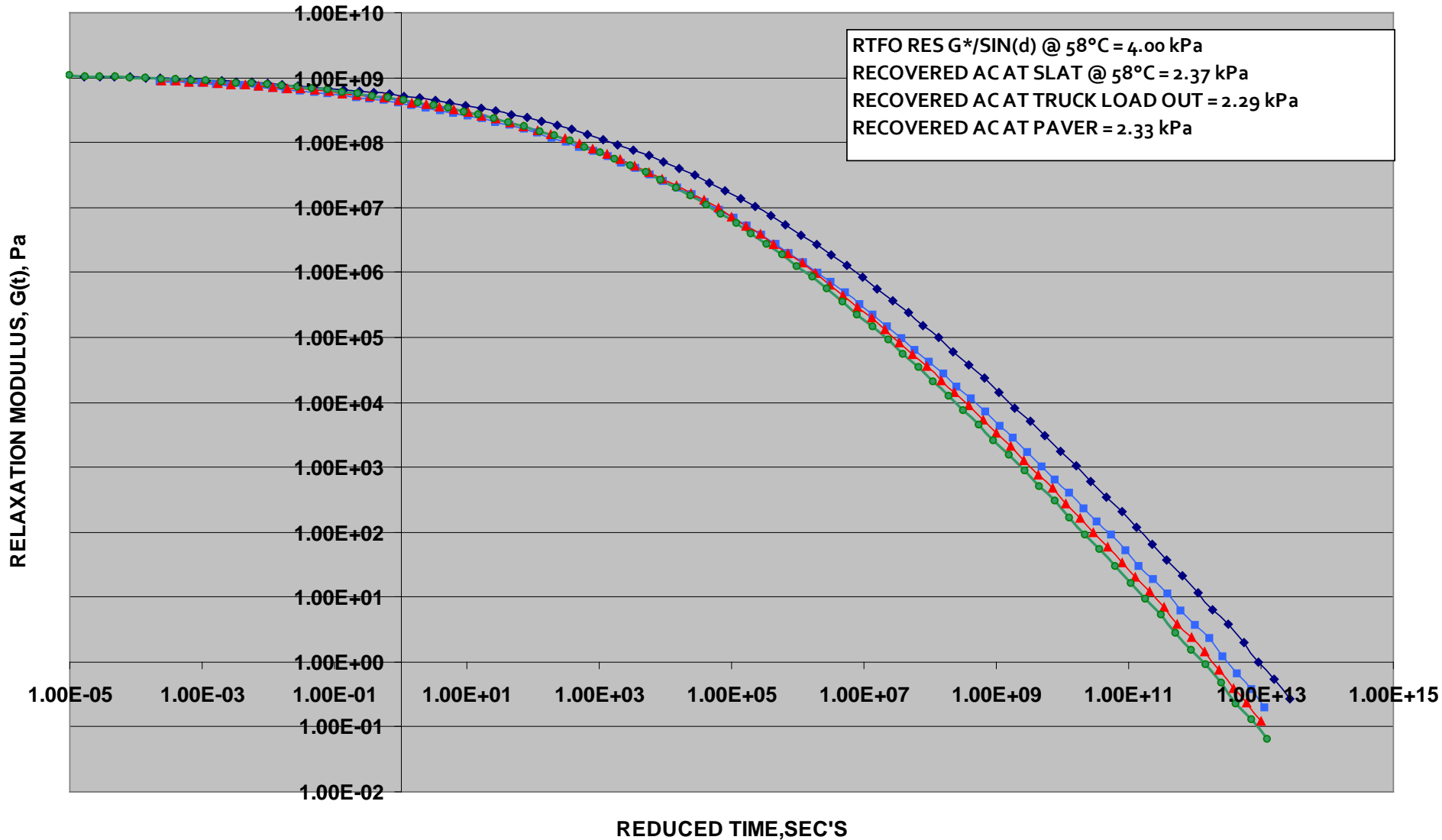
# PLANT 24 PG 58-28 HMA



■ PLANT 24 PG 58-28 HMA HIGH TEMP GRADE  
■ PLANT 24 PG 58-28 HMA LOW TEMP GRADE

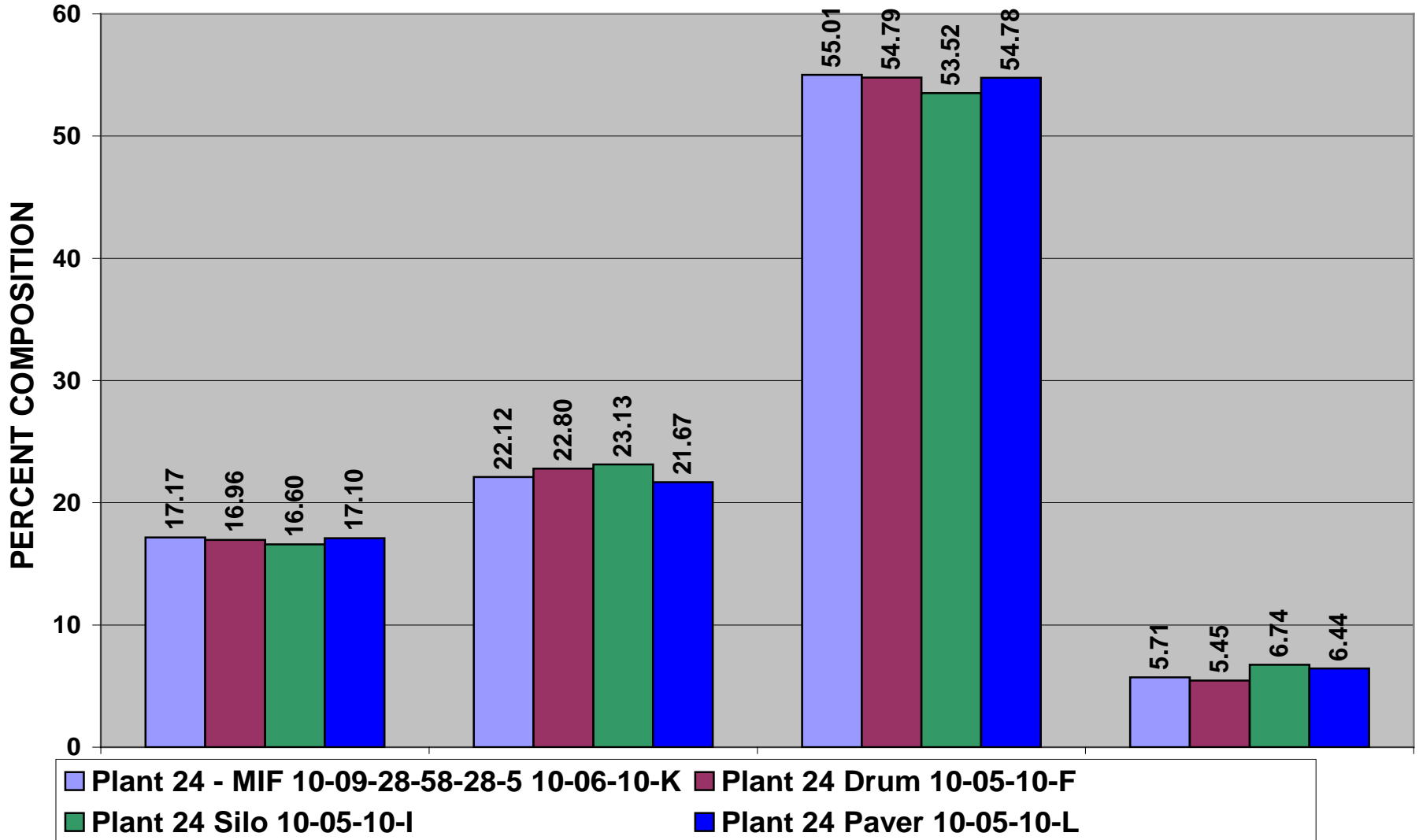


# RELAXATION MODULUS @ -28°C FOR PLT 24 58-28 HMA

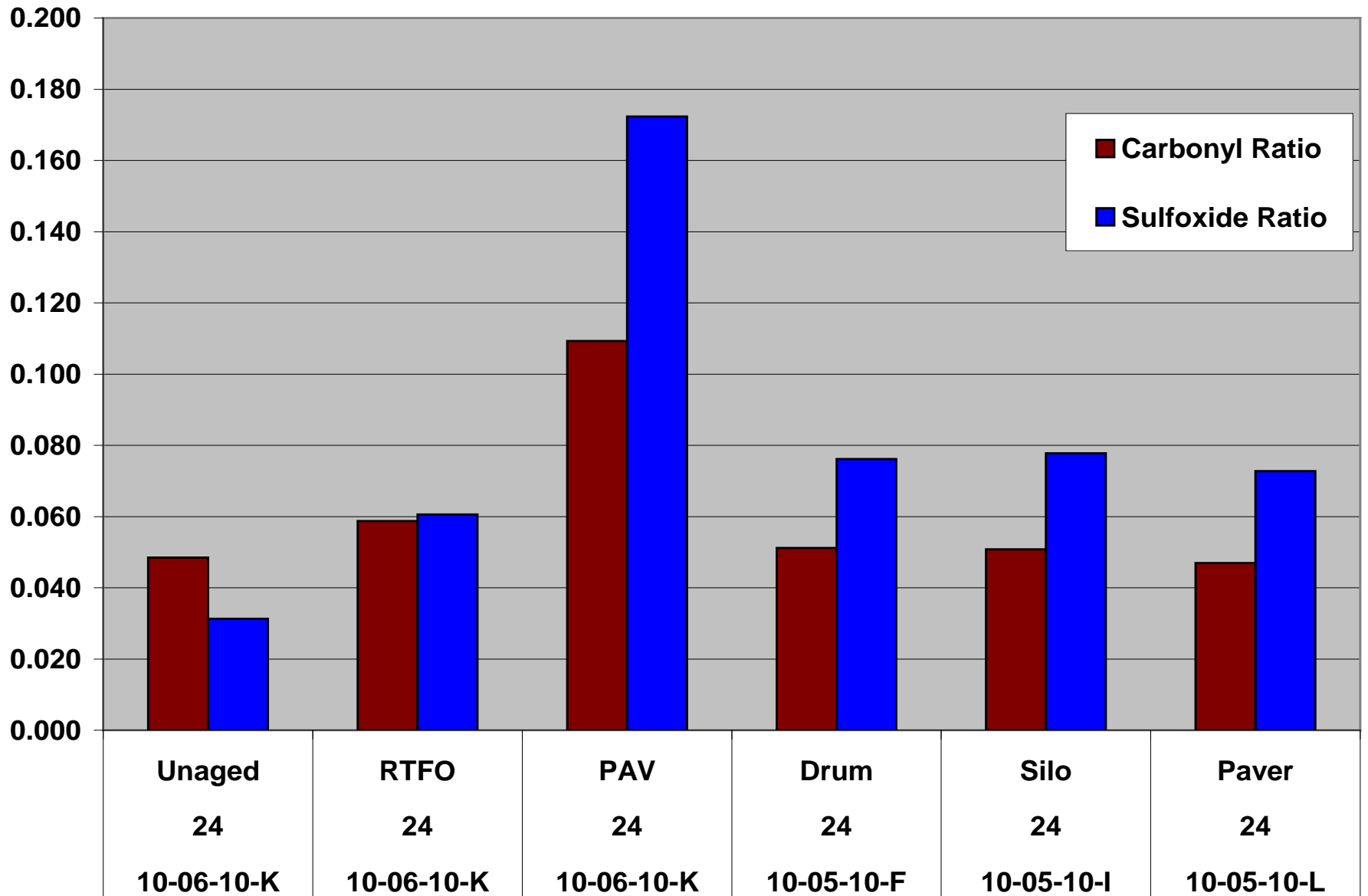


◆ RTFO RESIDUE    ■ SLAT CONVEYER REC AC    ▲ TRUCK MIX FROM SILO    ● MIX AT PAVER

# IATROSCAN RESULTS FOR PLANT 24 PARALLEL FLOW 58-28 HMA



# PARALLEL FLOW PG 58-28 HMA



# Impact of Field Mixing on Virgin Binder Aging

Location Description: CJ Monya Quarry Elkader Iowa

Sample Source: River City Paving, Kieler

Plant #: 49 Test Date: 10/1/2010

Drum Type: Parallel Flow Drum Length: 33 feet Drum Mixing Zone 13 feet

Storage Tank - AC Temp 285 °F Stack Temp: 246.0 °F

Binder Grade: PG 64-22 Mix Discharge Temp: 240.0 °F

AIR TEMP Low: 48.0 °F High: 63.0 °F

Aggregates	Source	% In Blend	Moisture Content
1	<u>5/8" x 3/8" Crush Moyna</u>	<u>20</u> %	<u>3.8</u>
2	<u>3/8" x 3/16" Crush Moyna</u>	<u>22</u> %	<u>4.4</u>
3	<u>Man Sand Moyna</u>	<u>22</u> %	<u>4.6</u>
4	<u>Washed Sand Moyna</u>	<u>31</u> %	<u>3.4</u>
5	<u>RAP ABC08-101</u>	<u>5</u> %	<u>3.0</u>

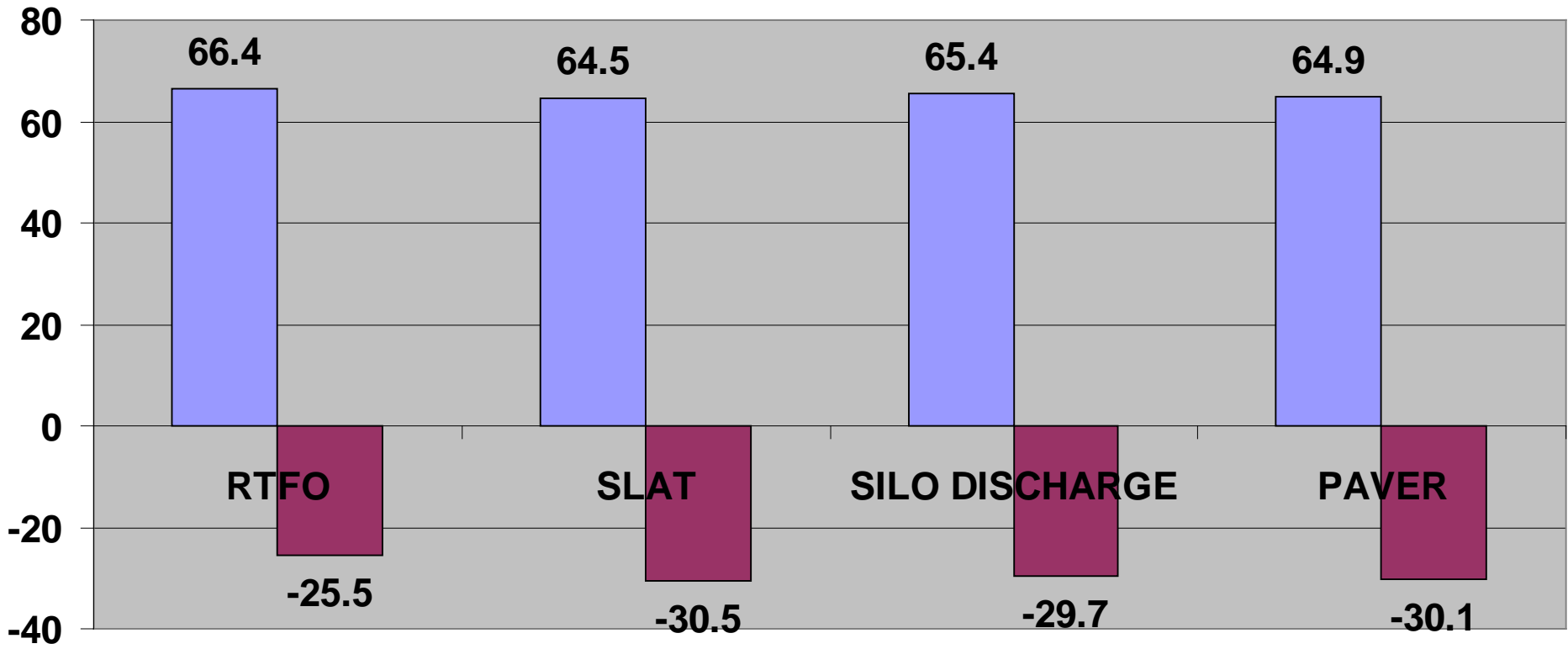
Mix Temp. @ Silo: 243.0 °F Time In Silo: 7 minutes

Mix Temp. @ Paver: 227.0 °F Haul Time: 30 minutes

Mix Production Rate 245 tons / hour

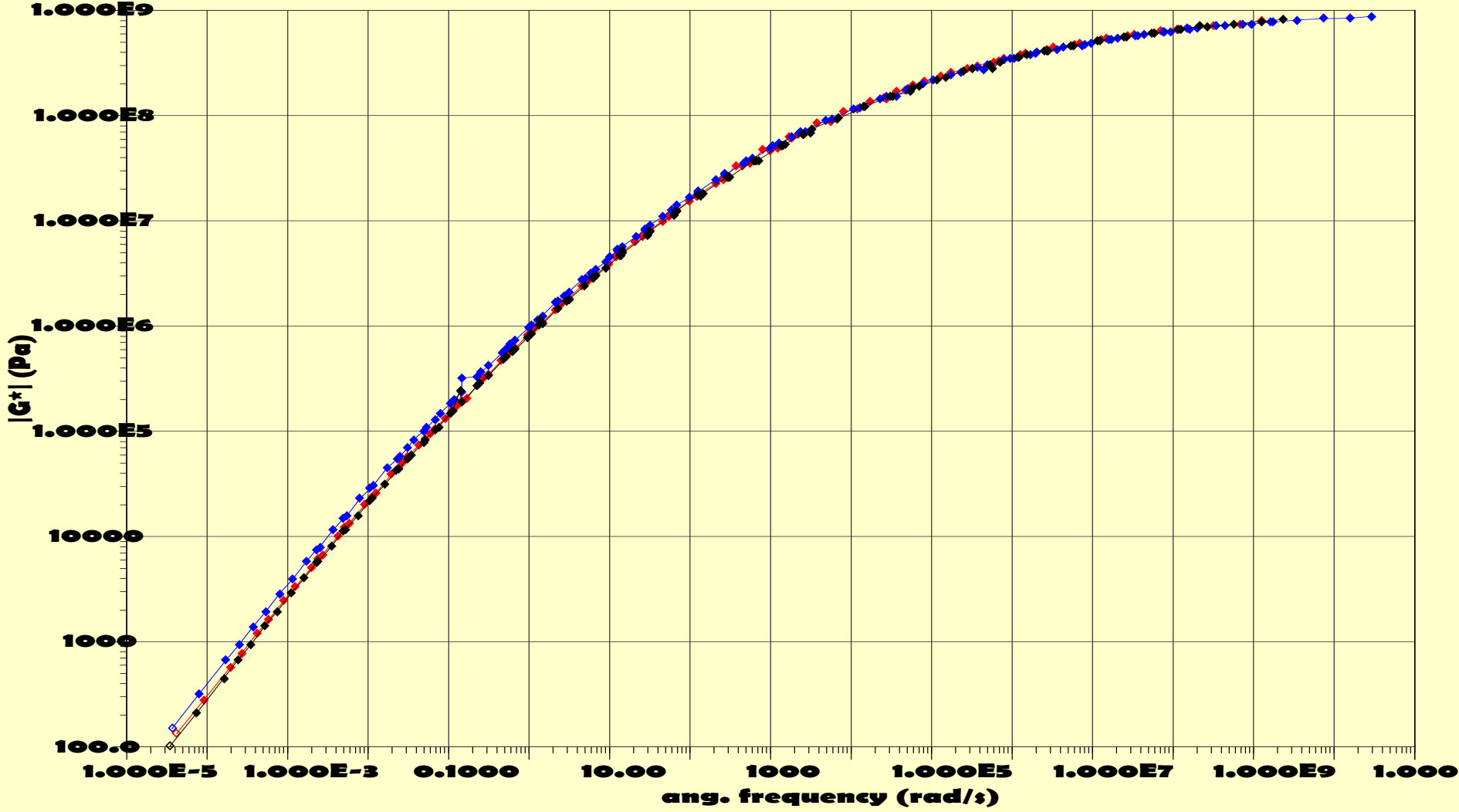
Target AC Content: 6.4 %

# PLANT 49 PG64-22 WMA (5% RAP)

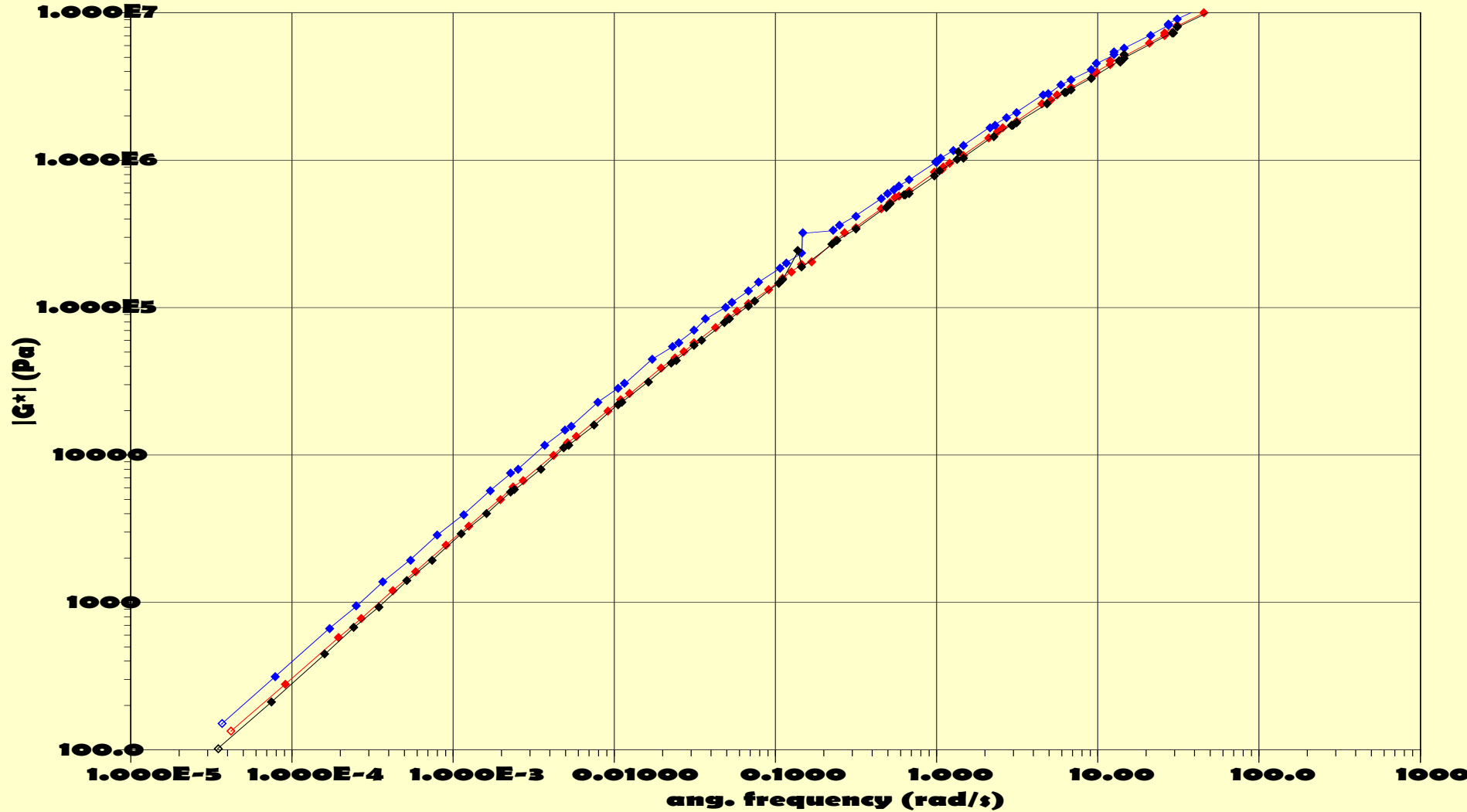


- PLANT 49 PG 64-22 WMA WITH 5% RAP HIGH TEMP GRADE
- PLANT 49 PG 64-22 WMA WITH 5% RAP LOW TEMP GRADE

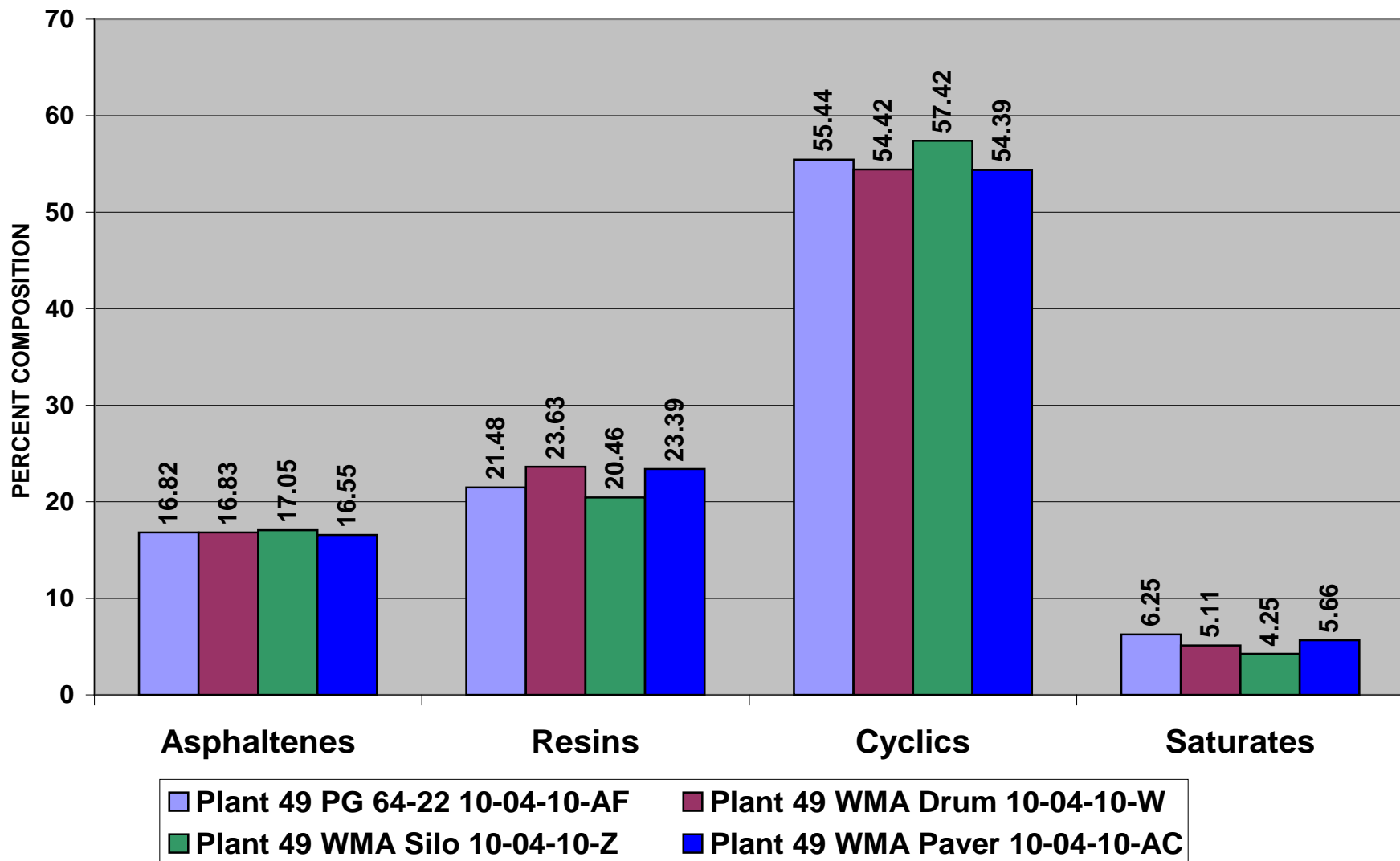
- ◇ MASTERCURVE US 13, WMA, 64-22 w5% RAP, Plt 49, Slat Sample, 10-04-10-20
- ◇ MASTERCURVE US 13, WMA, 64-22 w5% RAP, Plt 49, Truck Sample, 10-04-10-20
- ◇ MASTERCURVE US 13, WMA, 64-22 w5% RAP, Plt 49, Paver Sample, 10-04-10-20



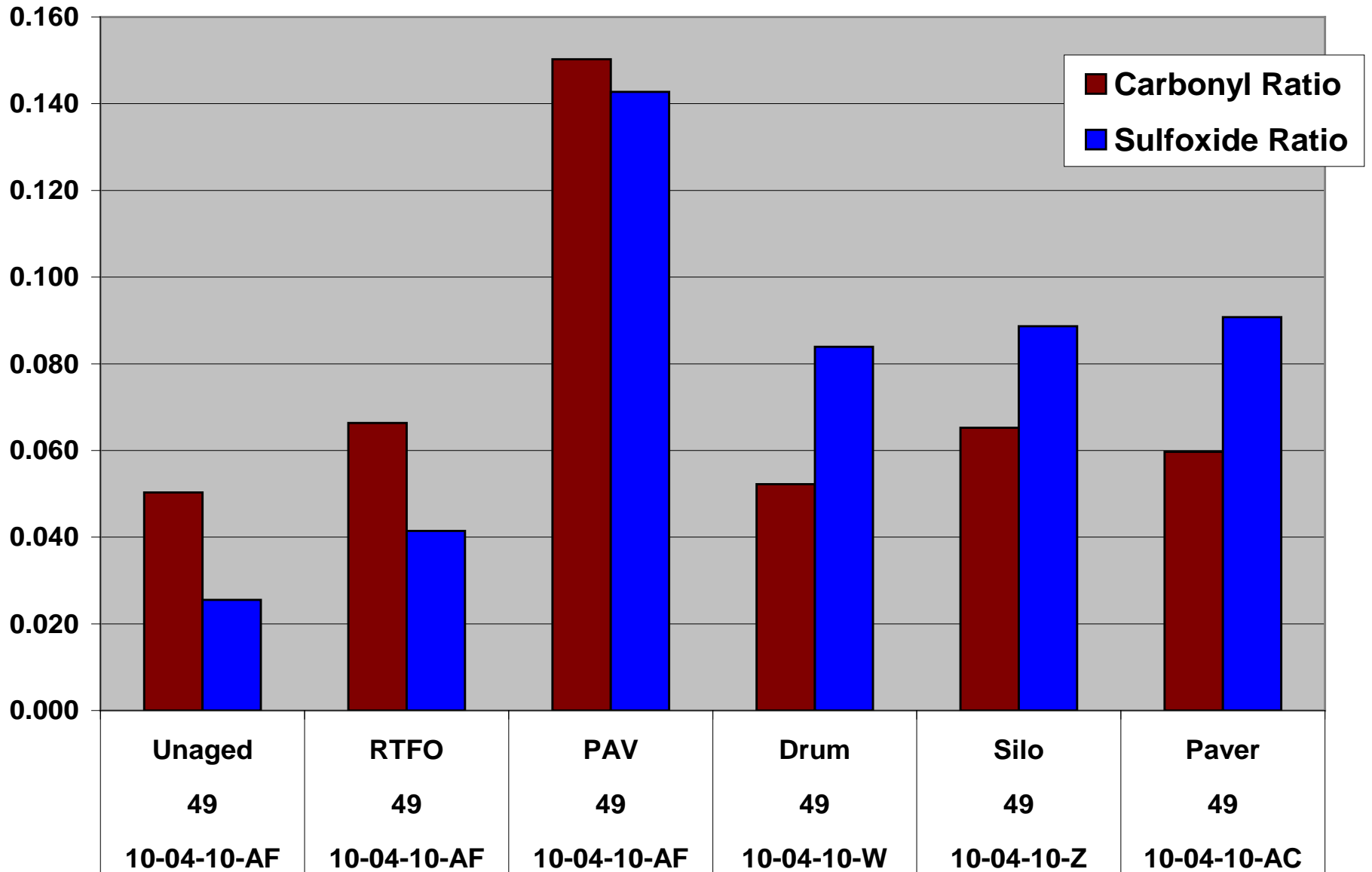
◇ MASTERCURVE US 13, WMA, 64-22 w5% RAP, Plt 49, Slat Sample, 10-04-10-2  
◇ MASTERCURVE US 13, WMA, 64-22 w5% RAP, Plt 49, Truck Sample, 10-04-10-2  
◇ MASTERCURVE US 13, WMA, 64-22 w5% RAP, Plt 49, Paver Sample, 10-04-10-2



# IATROSCAN RESULTS FOR PLANT 49 PARALLEL FLOW 64-22 WMA



# PARALLEL FLOW PG 64-22 WMA (5% RAP)



**QUESTIONS**

**DISCUSSION**