



Warm Mix Asphalt

The Future of Flexible Pavements

Caltrans
Warm Mix Asphalt
Demonstration
San Luis Obispo
May 7, 2008

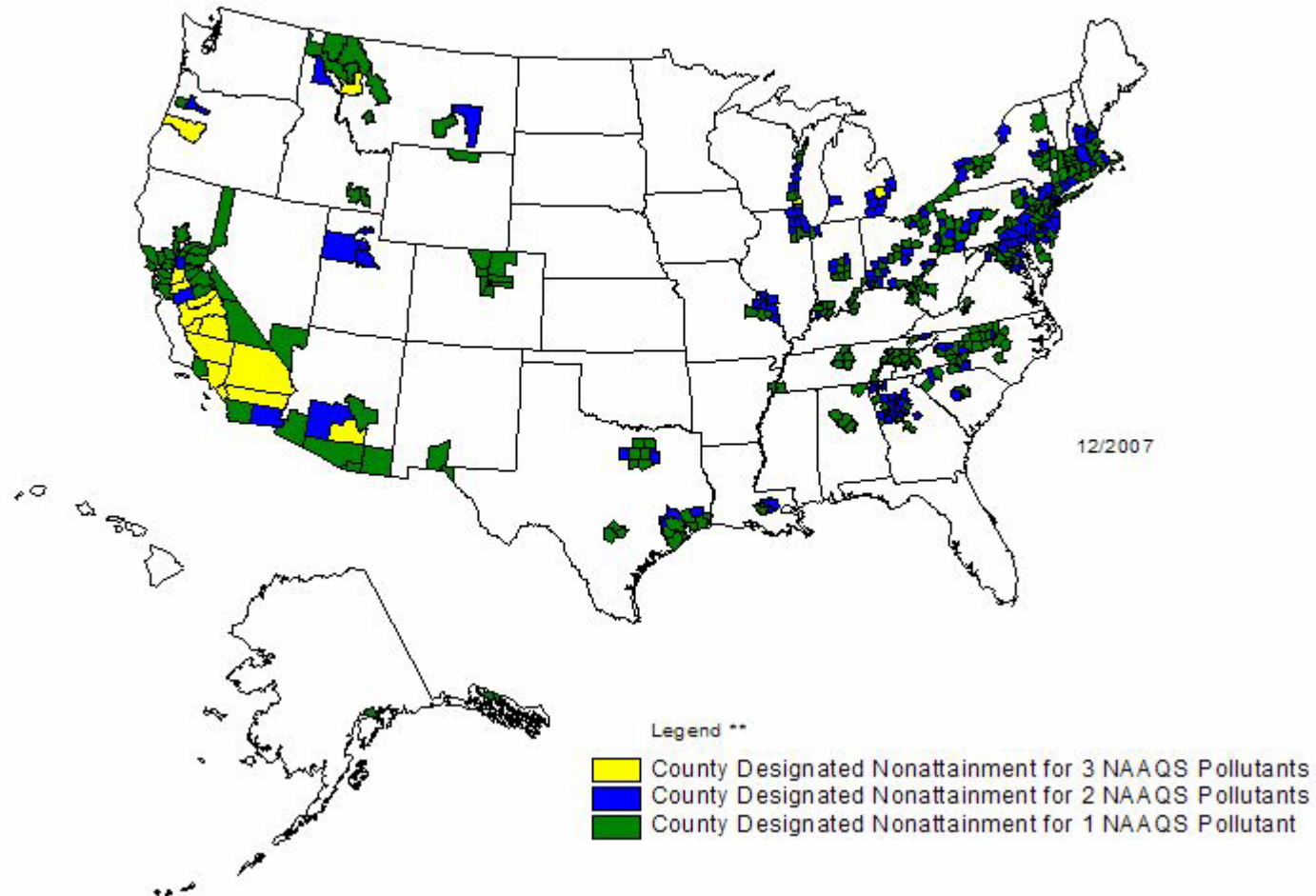
General Trends

- Regulations
- Activism
- Higher Production Temperatures
- Increasing Energy Costs

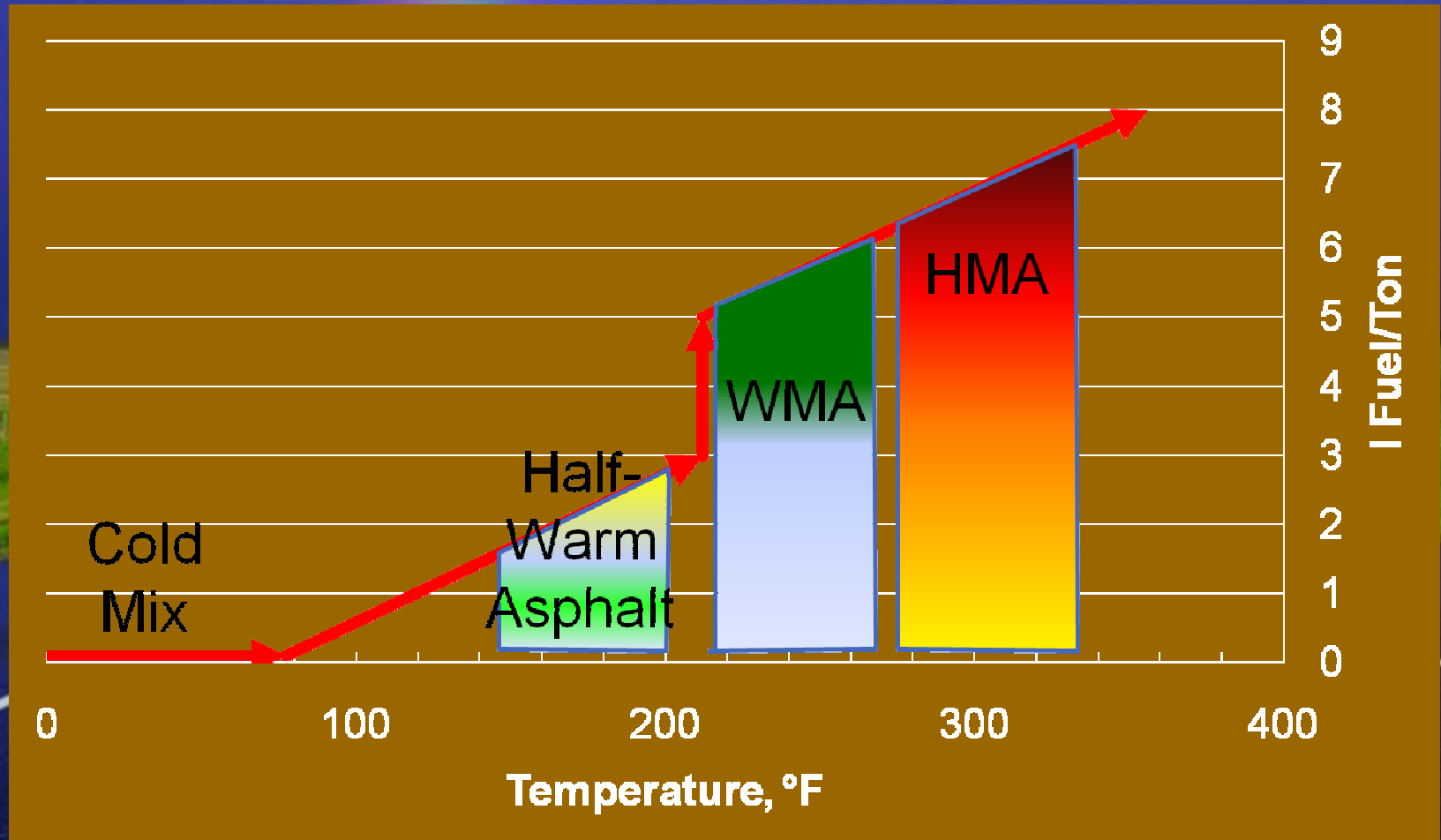
Current Non-Attainment Areas

Counties Designated "Nonattainment"

for Clean Air Act's National Ambient Air Quality Standards (NAAQS) *



Warm Mix Classifications



Brief History

- 1997 German Bitumen Forum
- 2000 Second Euroasphalt & Eurobitume Congress (Barcelona)
- NAPA 2002 European Scan Tour
 - Germany and Norway
- NAPA 2003-2008 Annual Meetings
- World of Asphalt 2004
- 2005-2007 – Numerous U.S. Field Trials
- 2007 – FHWA/AASHTO Scan Tour



Advantages of Lower Temperatures

- Lower fumes and emissions (~30-90%)
- Lower energy consumption (~30%)
- Lower plant wear
- Decreased binder aging
- Early site opening
- Cool weather paving
- Compaction aid for stiff mixes
- Cooler working conditions
- Edge of mat is more vertical, making a better joint
- Eliminates bump at joint when overlaying concrete
- Eliminates the need for fume evacuation equipment on plant and paver

Warm Mix Asphalt Technical Working Group

- Members: FHWA, NAPA, SAPA, AASHTO, State DOTs, NCAT, Contractors, Labor, NIOSH
- Mission: Evaluate and validate WMA and share information
- Purpose: Guidance for research and implementation of WMA

NAPA Warm Mix Asphalt Task Force

- Leadership and Communication for
 - Research
 - Development
 - Deployment
- Goals
 - Forum
 - TWG Input and Feedback
 - Identify Technical Gaps
 - Review Educational and Technical Materials

Technology Providers

– Foaming Methods

- Advera - PQ
- Aspha-min - Hubbard
- Astec Double-Barrel Green
- Low Emissions Asphalt - McConnaughay
- Terex
- WAM Foam - BP

– Chemical Modifiers

- Evotherm - MeadWestvaco
- Rediset – Akzo-Nobel
- Revix – Mathy-Ergon
- Sasobit - Sasol

Applications

- Dense-graded mixes
 - Majority of projects
 - RAP – Wisconsin and Missouri
- SMA
 - Maryland – Washington Beltway
- Open-graded mixes
 - Florida
 - China
- Asphalt-Rubber
 - California

Chattanooga - Loadout

Astec Double Barrel Green
Control WMA
Temp = 320°F Temp = 270°F



Yellowstone Paving

Control
Temp = 320°F



Warm Mix
Temp = 245°F

Production and Paving Notes

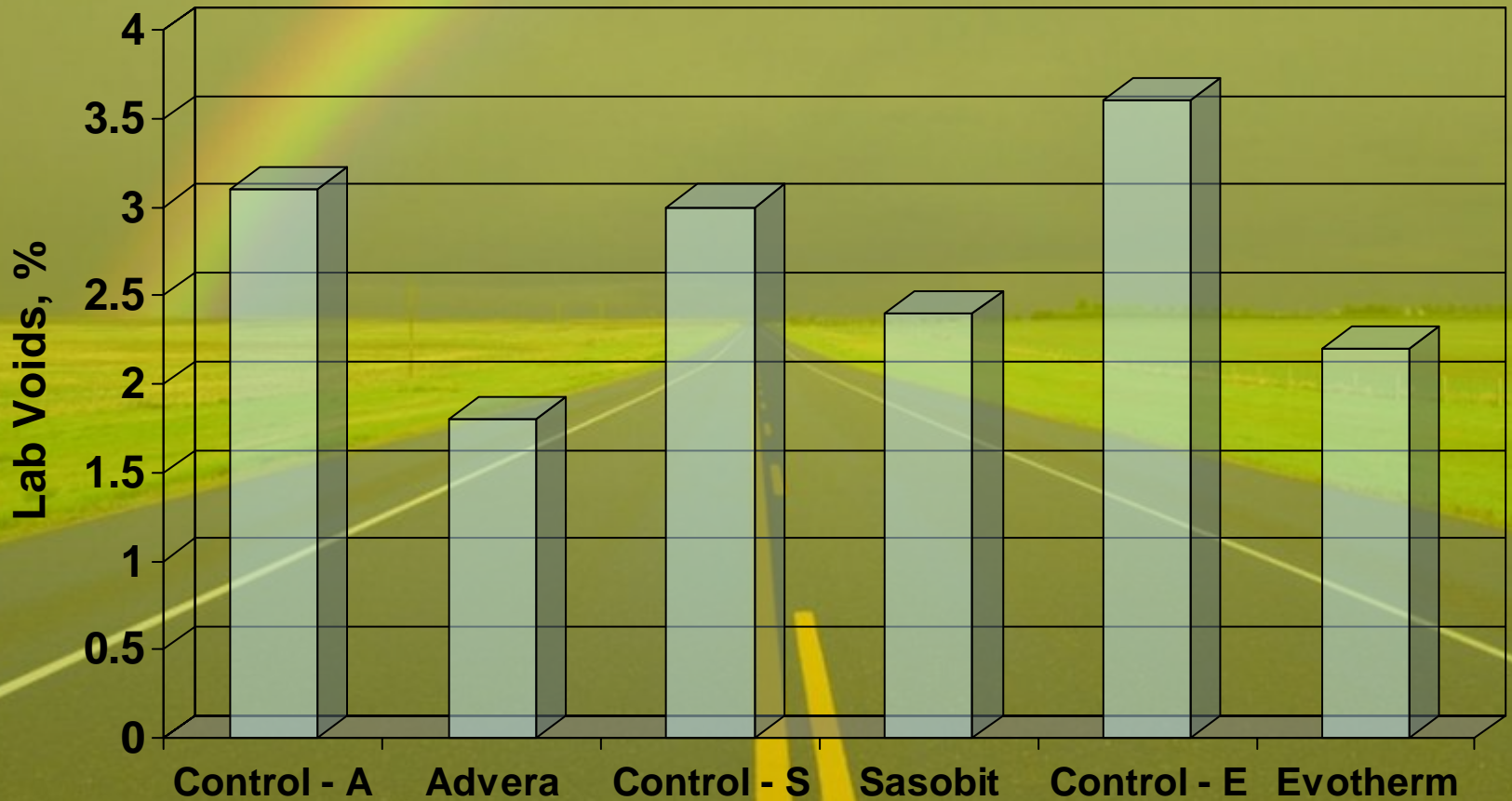
- Work to minimize aggregate moisture.
- Make sure the burner is tuned for the temperature.
- Keep baghouse temperature above condensation point.
- Consider superheating aggregate ahead of RAP.
- Follow normal placement practices.

CDOT WMA Project I-70

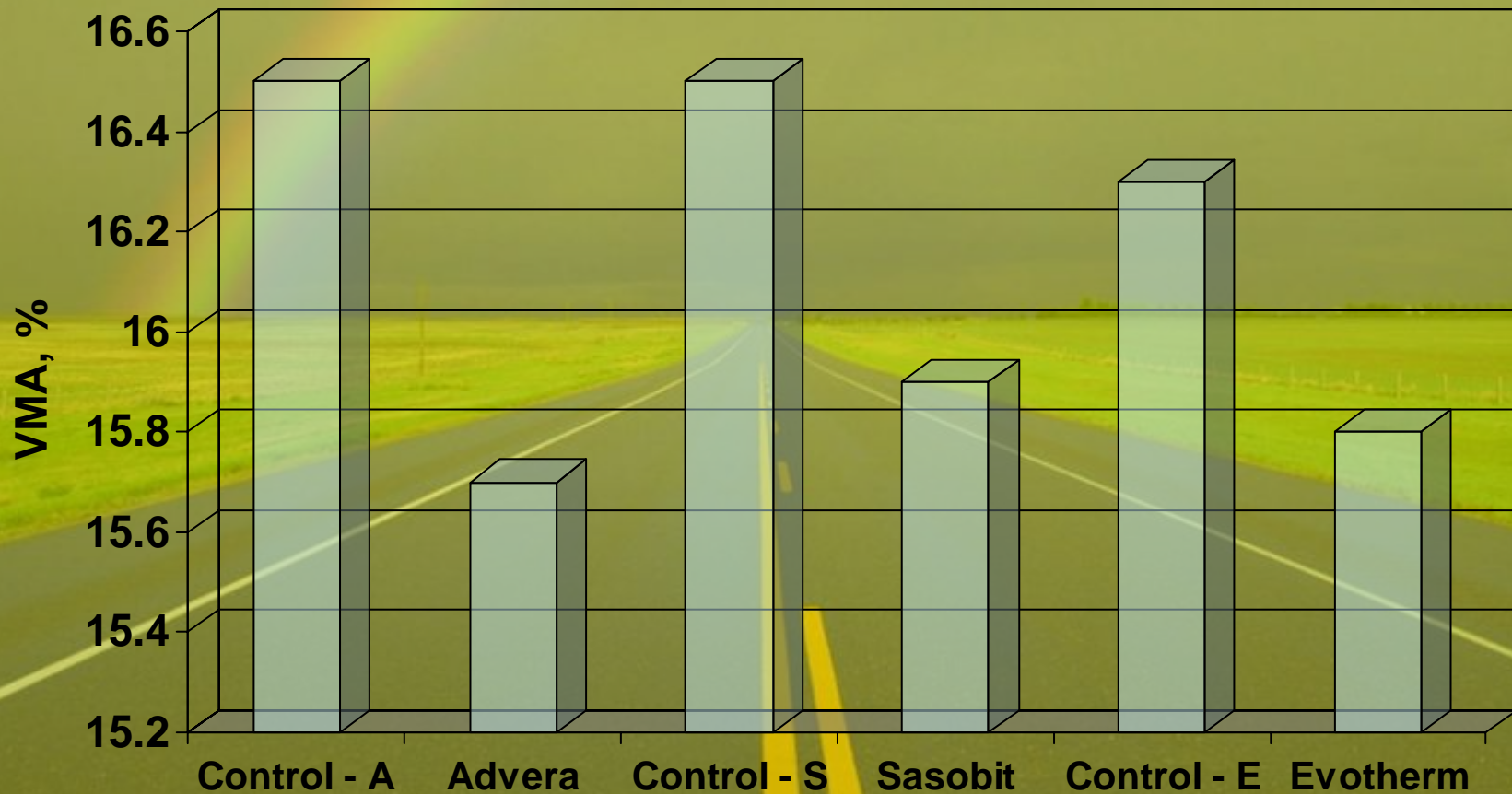
Performance



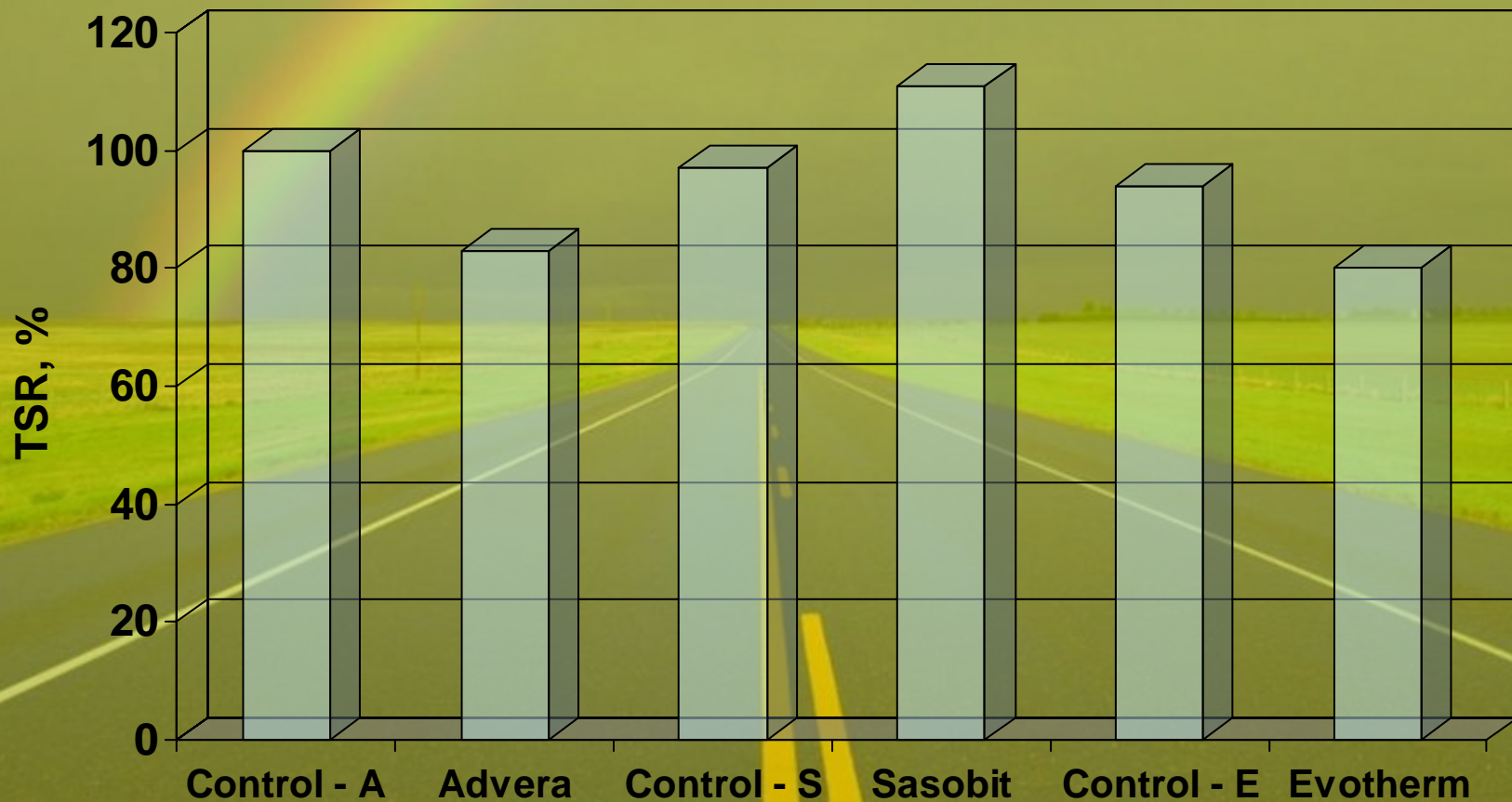
Performance Colorado I-70



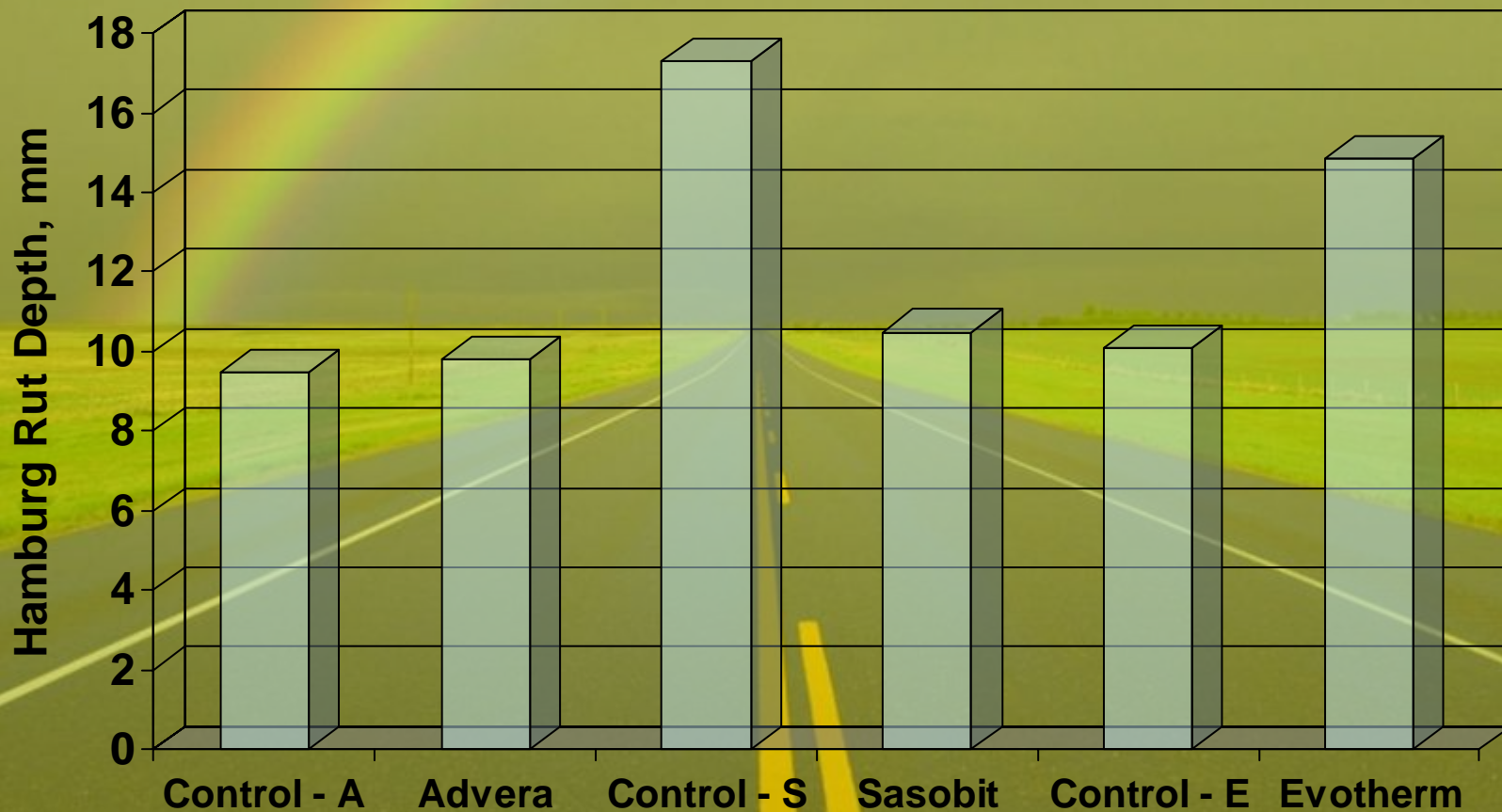
Performance Colorado I-70



Performance Colorado I-70



Performance Colorado I-70



LEA Field Density

Mix	Avg. Gmb	Avg. %Gmm	SD
HMA control – Rt. 96B	2.278	94.1	1.43
LEA control – Rt. 96B	2.298	95.6	0.51

Reduced Emissions

Data provided by suppliers.

- Aspha-min – North Carolina – 265°F
 - 17.6% decrease in SO₂
 - 3.2% decrease in CO₂
 - 35.3% decrease in total hydrocarbons
 - 6.1% decrease in NO_x
- Evotherm – Canada – 140°F
 - 45.8% decrease in CO₂
 - 63.1% decrease in CO
 - 41.2% decrease in SO₂
 - 58% decrease in NO_x
- Direct comparisons are discouraged – different plants, different weather, different temperatures

Why we need Warm Mix

- Better air quality
- Better energy efficiency
- Better performance
- Better compaction
- Better working conditions

Conclusions

- Warm Mix is the Future of Asphalt Mixtures.
- Technology providers coming forward.
- Industry and agencies must work together to make it happen.
- Advantages outweigh concerns.
- Will add to versatility of the material.