Engineering City Paving Mixtures Through The Balanced Mix Design Concept

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What’s more important: cracking resistance or rutting resistance?

Economics or performance?

Have we placed too many restrictions trying to prescribe what “good hot mix” should look like on paper?

Can we simply specify performance?
Most Common Pavement Distresses

CRACKING DISTRESS

RUTTING DISTRESS
Engineering City Paving Mixtures

**MAC Mix** was developed to find a balance between historical data from Specialty Mixes and empirical data from Test Analysis.

**Historical Data:**
- **CAM**
- **TOM**
- **SMA C**
- **SMAD**
- **SP C**
- **SP D**
- **DG C**
- **DG D**

- **Best Mixes**
- **Good Mixes**
- **Poor Mixes**

**Empirical Data:**

*Note:* MAC Mix is a concept based on performance and it is not proprietary to TexasBit.
Nolan River Road, City of Cleburne

Nolan River is 5 lanes wide and is a major roadway for the City

• Higher Traffic Counts
• Lots of isolated base failures
• The Chisolm Trail Tollway connects to this roadway

• Major entry corridor of the City of Cleburne
Nolan River Road, City of Cleburne
The City of Cleburne was looking for creative solutions to get the most out of their limited pavement maintenance funds.

We needed to fix the road but did not have funds to rebuild:
- limited funding to do a full 2” Mill and Overlay
- base failure repair was the needed most

Wedge Mill and a 1.5” MAC Mix Overlay was the solution:
- Suggested by Texas Bit – History of successful projects
- Test Section in Rio Vista
- 1.5” overlay with MAC mix
Nolan River Road, City of Cleburne

BMD SP-D PG 64-22 w/15% GTR with 11% RAP and 4% RAS
Nolan River Road, City of Cleburne

Current Condition?
- Nolan River is a major corridor and it has only been a little over a year, the conditions and ride quality has been excellent

Was it worth it?
- This option provided a solution based on the specific issues that the City faced with this section of roadway

Would use it again?
- If the situation warranted it…
TxME for Asphalt Overlays

AC Overlay
(Specific material properties)

Input

Traffic
ESAL’s Spectra

Existing Pavement Structure/Condition

Environment (ECIM)

Models

Reflection Cracking Model

Rutting Model

Output

Cracking Data and Chart

Rutting Data and Chart
TxME - % Fatigue Cracking (Dallas)

The graph shows the percentage of fatigue cracking over time for two different mixes of asphalt concrete:

- **MAC Mix** (blue line)
- **Dense_Type D** (yellow line)

The graph also includes the **Max Limit** (red dashed line) for fatigue cracking, which is 94 months.

At 94 months, the % Fatigue Cracking for both mixes reaches a significant level, indicating the need for maintenance or replacement of the asphalt concrete.
MAC Mix
Dense_Type D
PG64-22 w/20% RAP
Max Limit

% Fatigue Cracking

Time (months)

125 months
NCAT Test Track

Research Case Study at NCAT Test Track

- Validation of lab versus field performance

Pavement Test Track at National Center for Asphalt Technology
NCAT Test Track BMD Test Section

In 2018 TXDOT sponsored two test sections on the NCAT test track comparing a volumetric design and a BMD design. Both test sections utilized Item 344 SP-C PG 70-22 w/18% RAP.
Central Design Lab

Capabilities
- Aggregate Testing
- Mix Designs
- Performance Testing
  - Hamburg Rutting Test
  - Overlay Cracking Testing
  - Ideal CT
- Auto Extraction Machine
  - Forensics Testing
  - Extract binder for testing
- Research
  - Binders
  - Additives – WMA, Fibers, etc.
  - New concept mixtures
- Tours
Questions

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