OBSI and How it is Being Used in Texas

Presented by: John Wirth from TxDOT
At RPUG Conference 10/28/2008
What is OBSI?

On-Board Sound Intensity
Standard Method of Test for Measurement of Tire/Pavement Noise Using the On-Board Sound Intensity (OBSI) Method

AASHTO Designation: TP 76-08
Single Probe OBSI

4"

3"

SIDE VIEW

TOP VIEW

TIRE PATCH

CENTERLINE OF TIRE

INTENSITY PAIR ON TRAILING EDGE

INTENSITY PAIR ON LEADING EDGE

(102 mm)
Research Program

• Goals
  - Construction/Pavement (CST)
    - Improved Designs
      - Safety/Durability (+) ...and Quieter
    - Measurement Protocol ...OBSI
  - Environmental (ENV)
    - Avoid Impacts = Avoid Noise Barriers
    - Measurement Protocol ...SPB and OBSI
      - SPB compared to TNM “Average”
      - Seek FHWA approved adjustment in TNM

• Status: Collecting Data
  - Two OBSI systems (TxDOT and CTR)
    - According to AASHTO TP 76-08 Standard
Data Collection Objectives and Work Plan

- Objectives
  - Process development
    - Characterize Texas pavements
    - Factors
    - Trends
    - Noise ‘Families’
  - Information support (CST- M&P)
    - Design guidelines
    - Project-level support
    - Facts / information exchange
  - Policy support (ENV)
    - Policy decision support
    - Facts / information exchange
• **Action Plan**
  - Become familiar with OBSI
  - Participate in state and national OBSI discussions
  - Analyze data collected, try to understand data types
  - Test Section selection (4–8 sites / sect.)
  - Monitoring schedule
  - Collection coordination (TxDOT/CTR)
  - Database management
• Action Plan – continued
  - Test Sections tested to date by ‘Family’
    - PFC 24
    - Other 2
    - SMA 1
    - Seal coat 1
    - Micro-Surface 4
    - PCC 8
  - Additional Test Sections planned
TxDOT & CTR OBSI Test Sections Collected to Date

- PFC 24
- Other 2
- SMA 1
- Seal coat 1
- Micro-Surface 4
- PCC 8
One Noise Test Section with 6 OBSI Test Sites
Tire/Pavement Noise Sound Intensity
Microsurface Pavement Test Sections, Near Marshall, TX - Comparison

<table>
<thead>
<tr>
<th>Test Section</th>
<th>Overall Level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH43 1-6</td>
<td>98.6</td>
</tr>
<tr>
<td>IH20_1EB #1</td>
<td>98.9</td>
</tr>
<tr>
<td>IH20_1WB #4-6</td>
<td>99.2</td>
</tr>
<tr>
<td>IH20_3 SMA-EB</td>
<td>99.5</td>
</tr>
<tr>
<td>IH20_2WB #10-12</td>
<td>100.2</td>
</tr>
<tr>
<td>IH20_3 MS-EB</td>
<td>100.7</td>
</tr>
<tr>
<td>IH20_2EB #8-9</td>
<td>100.8</td>
</tr>
<tr>
<td>IH20_2EB #7</td>
<td>100.8</td>
</tr>
<tr>
<td>IH20_2EB #7</td>
<td>102.7</td>
</tr>
</tbody>
</table>

Overall Level (dBA)

Test Section
Texas OBSI Rodeo’s
9/6/2007 & 7/15/2008

Participants

TxDOT
CTR
The Transtec Group, Inc.
Items to Note:

**TxDOT & CTR**
- Used Single Probe OBSI System
- Larson Davis Analyzer
- 2001 Chevrolet Malibu Test Vehicle
- 15” Tiger Paw AWP Test Tire (9/6/07 CTR & TxDOT)
- 16” Tiger Paw SRTT Test Tire (7/15/08 TxDOT only)

**Transtec**
- Used Dual Probe OBSI (TGI Design 9/6/07)
- Used Dual Probe OBSI (Donavan Design 7/15/08)
- Transtec Designed Sound Analyzer
- Buick Test Vehicle
- 16” Tiger Paw SRTT Test Tire
<table>
<thead>
<tr>
<th>Test Section</th>
<th>Overall Level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site #1 - FM 734 In Front of RRISD Stadium</td>
<td>100.0</td>
</tr>
<tr>
<td>Site #2 - US 183 North and South of McNeil</td>
<td>100.8</td>
</tr>
<tr>
<td>Site #3 - IH 35 Near Buda</td>
<td>105.0</td>
</tr>
</tbody>
</table>

**Day 1, Site #1 & #2**
- 4 Total Test Sections
- 10 Total Test Sections, can completed in one loop

**Day 2, Site #3**
- 4 SB + 3 NB10
- 7 Total Test Sections, can completed in one loop
US 183 Test Site, Section 5T
Newer CRCP
### 2007 Local OBSI Rodeo - TxDOT vs TGI - Austin, TX

#### US 183 - Newer Concrete

<table>
<thead>
<tr>
<th></th>
<th>TxDOT</th>
<th>TGI</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>5T</td>
<td>102.1</td>
<td>104.7</td>
<td>2.6</td>
</tr>
<tr>
<td>6T</td>
<td>102.7</td>
<td>105.5</td>
<td>2.8</td>
</tr>
<tr>
<td>7T</td>
<td>101.0</td>
<td>103.9</td>
<td>3.0</td>
</tr>
<tr>
<td>8T</td>
<td>101.2</td>
<td>103.5</td>
<td>2.3</td>
</tr>
<tr>
<td>9T</td>
<td>101.7</td>
<td>103.6</td>
<td>1.8</td>
</tr>
</tbody>
</table>

**Average**

|     | 101.7 | 104.2 | **2.5** |

**Avg Diff of Runs**

<table>
<thead>
<tr>
<th></th>
<th>106.2</th>
<th>108.0</th>
<th>1.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>10T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11T</td>
<td>106.3</td>
<td>108.1</td>
<td>1.7</td>
</tr>
<tr>
<td>12T</td>
<td>106.8</td>
<td>108.6</td>
<td>1.8</td>
</tr>
<tr>
<td>13T</td>
<td>106.4</td>
<td>107.7</td>
<td>1.4</td>
</tr>
<tr>
<td>14T</td>
<td>105.9</td>
<td>107.3</td>
<td>1.4</td>
</tr>
</tbody>
</table>

**Average**

|     | 106.3 | 107.9 | **1.6** |

**Avg Diff of Runs**

### IH 35 SB - PFC

<table>
<thead>
<tr>
<th></th>
<th>TxDOT</th>
<th>TGI</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>7T</td>
<td>101.0</td>
<td>101.9</td>
<td>0.9</td>
</tr>
<tr>
<td>8T</td>
<td>100.8</td>
<td>102.2</td>
<td>1.4</td>
</tr>
<tr>
<td>9T</td>
<td>100.4</td>
<td>102.0</td>
<td>1.6</td>
</tr>
<tr>
<td>10T</td>
<td>100.9</td>
<td>102.1</td>
<td>1.3</td>
</tr>
</tbody>
</table>

**Average**

|     | 100.7 | 102.0 | **1.3** |

**Avg Diff of Runs**

### FM 734 - CMHB-C

<table>
<thead>
<tr>
<th></th>
<th>TxDOT</th>
<th>TGI</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1T</td>
<td>101.0</td>
<td>105.2</td>
<td>4.1</td>
</tr>
<tr>
<td>#2T</td>
<td>101.7</td>
<td>105.6</td>
<td>4.0</td>
</tr>
<tr>
<td>#3T</td>
<td>100.2</td>
<td>104.4</td>
<td>4.2</td>
</tr>
<tr>
<td>#4T</td>
<td>101.6</td>
<td>104.9</td>
<td>3.3</td>
</tr>
</tbody>
</table>

**Average**

|     | 101.1 | 105.0 | **3.9** |

**Avg Diff of Runs**

### US 183 - Older Concrete

<table>
<thead>
<tr>
<th></th>
<th>TxDOT</th>
<th>TGI</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>10T</td>
<td>106.2</td>
<td>108.0</td>
<td>1.8</td>
</tr>
<tr>
<td>11T</td>
<td>106.3</td>
<td>108.1</td>
<td>1.7</td>
</tr>
<tr>
<td>12T</td>
<td>106.8</td>
<td>108.6</td>
<td>1.8</td>
</tr>
<tr>
<td>13T</td>
<td>106.4</td>
<td>107.7</td>
<td>1.4</td>
</tr>
<tr>
<td>14T</td>
<td>105.9</td>
<td>107.3</td>
<td>1.4</td>
</tr>
</tbody>
</table>

**Average**

|     | 106.3 | 107.9 | **1.6** |

**Avg Diff of Runs**

### IH 35 NB - PFC

<table>
<thead>
<tr>
<th></th>
<th>TxDOT</th>
<th>TGI</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>11T</td>
<td>99.9</td>
<td>100.9</td>
<td>1.0</td>
</tr>
<tr>
<td>12T</td>
<td>99.9</td>
<td>100.7</td>
<td>0.8</td>
</tr>
<tr>
<td>13T</td>
<td>100.1</td>
<td>100.6</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Average**

|     | 100.0 | 100.7 | **0.8** |

**Avg Diff of Runs**
Tire/Pavement Noise Sound Intensity
OBSI Local Rodeo Test Sections - Comparison

\[ y = 1.001x \]

\[ R^2 = 0.9666 \]

Original Data Collection on 9/6/2007
Original Data Collection on 9/6/2007

Tire/Pavement Noise Sound Intensity
OBSI Local Rodeo Test Sections - Comparison

TxDOT & CTR

TGI

FM 734 TxDOT
FM 734 CTR
US 183 Newer TxDOT
US 183 Newer CTR
US 183 Older TxDOT
US 183 Older CTR
IH 35 SB TxDOT
IH 35 SB CTR
IH 35 NB TxDOT
IH 35 NB CTR
1:1
Original Data Collection on 9/6/2007

Tire/Pavement Noise Sound Intensity
OBSI Local Rodeo Test Sections - Comparison

- Linear (CTR): $y = 0.855x + 13.059$, $R^2 = 0.8128$
- Linear (TxDOT): $y = 0.8085x + 18.013$, $R^2 = 0.848$

Graph showing data points and trend lines.
**2007 Local OBSI Rodeo - TxDOT vs TGI - Austin, TX**  
Follow-Up with TxDOT using a SRTT Tire: Data Collected on 7/15/08

<table>
<thead>
<tr>
<th>US 183 - Newer Concrete</th>
<th>FM 734 - CMHB-C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TxDOT</strong></td>
<td><strong>TGI</strong></td>
</tr>
<tr>
<td>5T</td>
<td>102.9</td>
</tr>
<tr>
<td>6T</td>
<td>103.0</td>
</tr>
<tr>
<td>7T</td>
<td>102.6</td>
</tr>
<tr>
<td>8T</td>
<td>103.1</td>
</tr>
<tr>
<td>9T</td>
<td>103.4</td>
</tr>
</tbody>
</table>

| Avg  | 103.0 | 104.5 | 1.5 | Avg  | 103.2 | 104.4 | 1.2 |

**Avg Diff of Runs**  
1.5  
1.2

<table>
<thead>
<tr>
<th>US 183 - Older Concrete</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TxDOT</strong></td>
<td><strong>TGI</strong></td>
</tr>
<tr>
<td>10T</td>
<td>106.4</td>
</tr>
<tr>
<td>11T</td>
<td>106.7</td>
</tr>
<tr>
<td>12T</td>
<td>106.8</td>
</tr>
<tr>
<td>13T</td>
<td>106.4</td>
</tr>
<tr>
<td>14T</td>
<td>106.1</td>
</tr>
</tbody>
</table>

| Avg  | 106.5 | 107.3 | 0.8 |

**Avg Diff of Runs**  
0.8

- **0.7** dBA = Tire Age Difference
- **0.2** dBA = Microphone Spacing
- **0.3** dBA = Environmental Correction

**1.2** dBA = Average Difference FM 734
Follow-Up Data Collection on 7/15/2008

Tire/Pavement Noise Sound Intensity
OBSI Local Rodeo Test Sections - Comparison
Follow-Up with TxDOT using a SRTT Tire: Data Collected on 7/15/08

CTR vs TxDOT
1:1
Linear (CTR vs TxDOT)

\[ y = 0.9922x \]
\[ R^2 = 0.9081 \]
Follow-Up Data Collection on 7/15/2008

Tire/Pavement Noise Sound Intensity
OBSI Local Rodeo Test Sections - Comparison
Follow-Up with TxDOT using a SRTT Tire: Data Collected on 7/15/08

\[
y = 1.3314x - 36.988 \\
R^2 = 0.9326
\]

\[
y = 1.0308x - 4.4251 \\
R^2 = 0.8303
\]
Tire/Pavement Noise Sound Intensity
US 183 Test Section - 9T - 7/15/2008

Overall Level (dBA)

Frequency Range Analyzed

9T-TX
9T-CTR
9T-TGI
Tire/Pavement Noise Sound Intensity
FM 734 OBSI Local Rodeo Test Sections - New Vs Older SRTT Tire Comparison
Tires Run on TxDOT & Transtec Vehicles - 7/15/2008

Overall Level (dBA)
Special thanks for help and support:

- CTR
- The Transtec Group (Rob Rasmussen)
- Dr Paul Donavan (Illingworth & Rodkin, Inc)
Thank You!

John Wirth  
Texas Department of Transportation  
125 E 11th St – CST/M&P-BC39  
Austin, TX 78701-2483  

Phone: (512) 465-7334  
Email: jwirth@dot.state.tx.us