Truck Rollover Warning Systems Evaluation

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SEH Inc.
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  – Dan Rowe
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• Contributors
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  – International Road Dynamics (IRD) Corp.
  – American Transportation Research Institute (ATRI)
Agenda

• Project Purpose
• Problem Definition
• System Descriptions
• System Data
• System Comparisons
• Summary
• Questions
Evaluation of two different systems aimed at preventing commercial truck rollover accidents.
The Problem
The 2 Systems

• System 1 – Truck Rollover Warning System (TROWS)

• System 2 – Traffic Management System Improvements
System 1

- Ramp from Sbd I-694 to Ebd I-94
  - Frequency of truck rollovers – one / year

- MnDOT Innovative Idea Project

- Weigh-in-motion sensors and inductive loops
  - Vehicle classification
  - Speed/deceleration

- Road surface condition detector

- Warning signs and flashers
System 1 Location
System 1

- September 2012 – MnDOT upgraded signing
- August 2014 – Shadow testing
- September 2014 – Began operation
- July 2015 – Turned over to MnDOT
Signing

20 MPH

CONTINUOUS STAINLESS STEEL HINGE

HIGH OUTPUT AM
STAB 1/4-TUR

1/25" THK E

1/25" THK. ANTI-GLARE POLYCARBONATE FACE

(2) DRAIN HOLES LOCAT THE BOTTOM CORNE
Speed Measurement Areas

Section 1

Section 2

Section 3
## System 1 Speed Comparison

### TROWS Truck Average Speeds (mph)

<table>
<thead>
<tr>
<th></th>
<th>Aug-14</th>
<th>Sep-14</th>
<th>Oct-14</th>
<th>May-15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entry Point</strong></td>
<td>28.7</td>
<td>28.9</td>
<td>28.8</td>
<td>28.8</td>
</tr>
<tr>
<td><strong>Activation Point</strong></td>
<td>24.0</td>
<td>23.9</td>
<td>23.6</td>
<td>23.8</td>
</tr>
<tr>
<td><strong>Shut-Off Point</strong></td>
<td>23.3</td>
<td>22.8</td>
<td>22.6</td>
<td>22.5</td>
</tr>
</tbody>
</table>

### TROWS Truck 85th Percentile Speeds (mph)

<table>
<thead>
<tr>
<th></th>
<th>Aug-14</th>
<th>Sep-14</th>
<th>Oct-14</th>
<th>May-15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entry Point</strong></td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td><strong>Activation Point</strong></td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td><strong>Shut-Off Point</strong></td>
<td>26</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>
# System 1 Sign Activations

## TROWS Sign Activation Data

<table>
<thead>
<tr>
<th>30 Day Time Period</th>
<th># of Trucks</th>
<th># of Sign Activations</th>
<th>% Trucks Activating Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shadow Test</td>
<td>64,211</td>
<td>50,407</td>
<td>79%</td>
</tr>
<tr>
<td>Sept. 2014</td>
<td>70,280</td>
<td>52,371</td>
<td>75%</td>
</tr>
<tr>
<td>Oct. 2014</td>
<td>71,237</td>
<td>52,270</td>
<td>73%</td>
</tr>
<tr>
<td>May 2015</td>
<td>62,729</td>
<td>48,224</td>
<td>77%</td>
</tr>
</tbody>
</table>
System 2

- Wbd I-94 prior to the Lowry Tunnel
  - Frequency of truck rollovers – 3 in the past 5 years
- RTMC design which included a micro surface overlay
- Vehicle classification by height and speed by lane
- Warning signs and LED flashing borders
- July 2015 – Began operation
System 2 Location

Location 1

Location 2

Warning Sign for Trucks
Signing
System 2 Speed Comparison
## Speed Comparison

### Summary of System 1 & 2 Truck Speed Changes

<table>
<thead>
<tr>
<th></th>
<th>System 1</th>
<th>System 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>System Data</td>
<td>ATRI Data</td>
<td></td>
</tr>
<tr>
<td><strong>Average Speed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Before</td>
<td>23.3</td>
<td>22</td>
<td>45.25</td>
</tr>
<tr>
<td>- After</td>
<td>22.5</td>
<td>21</td>
<td>43.50</td>
</tr>
<tr>
<td><strong>MPH Change</strong></td>
<td>0.8</td>
<td>1</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>3.4%</td>
<td>4.5%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

### 85th Percentile Speed

<table>
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<tr>
<td></td>
<td>System Data</td>
<td>ATRI Data</td>
<td></td>
</tr>
<tr>
<td>- Before</td>
<td>26</td>
<td>25</td>
<td>48</td>
</tr>
<tr>
<td>- After</td>
<td>25</td>
<td>24</td>
<td>46</td>
</tr>
<tr>
<td><strong>MPH Change</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>3.8%</td>
<td>4.0%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>
Costs

- **System 1 = $257,153**
  - Design, installation, 11 months monitoring, maintenance, operation, and training

- **System 2 = $197,500**
  - Did not include cost of the existing overhead structures
Summary

• Similar goals with different conditions
• Similar reduction in truck speeds
  – Statistically significant
• System 2 also showed a reduction in small vehicle speeds
• No rollovers
Questions?