Traffic Signal Optimization Project
South Bend, Indiana

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Presentation Outline

• Project Background
• Project Approach
• Travel Time Evaluation
• Summary
Project Purpose

- Signal timing optimization at the busiest intersections in the City to reduce fuel consumption
- Assessment of the existing Econolite Aries Traffic Management System
- Funded by Energy Efficiency and Conservation Block Grant Program from the U.S. Department of Energy
Benefits of Signal Timing Optimization

- A cost-effective approach to improve traffic operations
  - Reduce delay at intersections
  - Improve corridor bandwidth
  - Reduce vehicle crashes
  - Reduce carbon emissions and fuel consumption
Project Approach

- Step 1: Assessment of Existing Systems
- Step 2: Data Collection
- Step 3: Signal Timing Analysis
- Step 4: Implementation
- Step 5: Post-Implementation Evaluation
Step 1: Assessment of Existing Systems

- Within the city limits: 218 traffic signals
- Under City’s jurisdiction: 163 traffic signals
- Existing Aries server: 17 zones listed, 14 zones with connectivity
- Two additional signal systems in development
Study Corridors for Signal Optimization

• Five corridors cover more than 100 intersections within the City:
  – Michigan Street/Main Street (SR 933) (N/S one-way pair through downtown)
  – Lincolnway West
  – Bendix Drive/Cleveland Road (intersecting streets)
  – Miami Street
  – Ireland Road
Step 2: Data Collection

• Existing Signal Timings
• Intersection Turning Movements during Peak Hours:
  – At only 25 selected intersections
  – Would have liked to have done more!
• Bi-directional Hourly Volumes, MACOG
  – Limited number of locations
• Travel Time along Study Corridors:
  – “Before”
  – “After”
Step 3: Signal Timing Analysis

- Synchro
  - the main modeling tool
- ITE Recommended Minimum Yellow Change & Red Clearance Intervals
  - Minimums
- MUTCD
  - increase in pedestrian clearance interval(s) can significantly impact urban signalized intersections/signal systems operations
LaSalle Street existing

LaSalle Street proposed
Step 4: Implementation

- Download new signal timings
- Software training for city staff
Step 5: Post-Implementation Evaluation

• Comparison of “Before” and “After” Travel Time along Study Corridors
  – Floating Car GPS Data
  – Bluetooth Probe Data

• Fuel Consumption and Emissions
  – On-going
Floating Car GPS Data

• Collected during AM and PM peak hours for “Before” and “After”
• More than 10 runs for each peak
• Using USB GPS receiver with in-car laptop
  – No driver interaction required during runs
  – Post-processing using Tru-Traffic 9.0
Before and After Travel Time in AM Peak

<table>
<thead>
<tr>
<th>Location</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleveland Rd EB</td>
<td>141</td>
<td>478</td>
</tr>
<tr>
<td>Cleveland Rd WB</td>
<td>132</td>
<td>426</td>
</tr>
<tr>
<td>Bendix Dr NB</td>
<td>136</td>
<td>232</td>
</tr>
<tr>
<td>Bendix Dr SB</td>
<td>144</td>
<td>286</td>
</tr>
<tr>
<td>Lincoln Way EB</td>
<td>282</td>
<td>320</td>
</tr>
<tr>
<td>Lincoln Way WB</td>
<td>318</td>
<td>324</td>
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<tr>
<td>Miami St NB</td>
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<td>478</td>
</tr>
<tr>
<td>Michigan St NB</td>
<td>426</td>
<td></td>
</tr>
<tr>
<td>Main St SB</td>
<td>409</td>
<td></td>
</tr>
</tbody>
</table>
Bluetooth Probe Data

• Collected for 48-hours at each end of the study corridors for “Before” and “After”
• To supplement the floating car GPS data
  – Validate the GPS data during the peak hours
  – Provide extra information during off-peak hours
• Hardware and software by Traffax
DETECTION RATE PLOT
Station 9D5  Michigan N of Bartlett
Hour of day from 19-Sep-2011 to 21-Sep-2011
Bluetooth detections / 5 min

DETECTION RATE PLOT
Station 564  Michigan S of Chippewa
Hour of day from 19-Sep-2011 to 21-Sep-2011
Bluetooth detections / 5 min

Estimated Detection Rate: 10-15%
NB “Before” Travel Time Along Michigan Street Between Chippewa Ave and Bartlett Street

Travel Time for segment 564-9D5 to

Average of GPS Travel Time

Total Non-Outlier MAC_ID Match: 170
Summary

• Signal timing optimization is a very competitive alternative for transportation improvements and energy conservation

• Key factors for successful signal optimization projects:
  ▪ Promote funding $$$ / creative funding
  ▪ Proper assessment of existing signal operations (Data, Data, Data)
  ▪ Continuous monitoring and preventive maintenance
One More Thing…

• Currently discuss with the City upgrading their existing Aries system to a centralized ATMS system
Questions?

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