



Kirk Houser – City of Tyler Kent Kacir - Siemens

Adaptive Signal Control in Tyler Texas

June 16, 2007 Amarillo, TX

Agenda

- Transportation Planning and City Comprehensive Plan
- Description of the Corridor
- Operational Improvements
- Use of Adaptive Traffic Signal Control

Comprehensive Plan

2006-2007 City of Tyler Comprehensive Plan Update



- Public Survey Results:
- Traffic Congestion is #1 important issue for the City to address.
- Formed special Traffic Congestion/Transportation Tyler 21 Committee
- Adaptive Control identified as potential useful tool



Deployment Corridor -South Broadway (US 69)

Traffic Generators

 Tyler is regional retail hub in East Texas.

> Retail is most concentrated along S. Broadway Ave outside of Loop 323

 US 69 is the major North-South route thru region





Deployment Corridor -South Broadway (US 69)

SIEMENS

- Geometric Considerations
 - Tyler originally laid out as a 'hub and spoke' style city – streets are not on a grid
 - Side streets are irregularly spaced
- Existing Traffic Signal Infrastructure
 - Closed Loop Master
 - Hard wire 1200 baud communications
 - Mixture of Detector Loops and VIVDS



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Traffic Operations



There is a need to do better

- Growing traffic delays are ranked #1 concern in Tyler – not uncommon everywhere.
- Signal timing updated frequently, but not fast enough.
- Corridor traffic flows smoothly at peak times, but there are unpredictable time periods due to commercial nature of corridor.
- Traditional timing plans are weak:
 - Weekends
 - Midday
 - Holidays



National Report Card

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Implementation Plan for Tyler SIEMENS

- Upgrade communications speed
 - Spread spectrum Ethernet radio complete
- Upgrade signal controllers
 - Needed only to increase speed to 56k existing controllers up to 19.2k – complete
- Add set-back detection
 - Chose side-fire radar construction underway
- Upgrade signal control software to include ACS-Lite module - underway



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Goals for Adaptive Control SIEMENS in Tyler

Low cost design

Leverage existing infrastructure

- Standard US-style actuated controllers and logic (rings, phases, splits, barriers, gap-out/extension, etc.)
- Typical agency detector layouts
- Typical communications

Use NTCIP



Traffic Adaptive Control

- Low cost (relative) implementation
- Use of existing controllers (versions that support for NTCIP)
 - Siemens
 - Econolite
 - McCain
 - Peek
- Minimal detection
 - Use real-world tactical detection
 - Use stop bar detection, same as detection used for fully actuated traffic control.
 - Use advance detection
- Use common communication media
 - Copper, wireless, etc.
- Communication requirements are minimal
 - 9600 minimum
- Will support UDP/IP-based communications (i.e., Ethernet)

Example System Architecture



Detectors

- Relative flexible
- Detectors sized from 4' to 70'
- Stop line detection monitor volume and occupancy on green
- Advance detection monitor cyclic flow, identify arrivals of platoons, and are used to make adjustments to offsets to improve progression.
- No calibration required

Typical Detection Layout

Need detectors at stop-bar of coordinated phases for split tuning



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Adaptive Logic

- Monitors traffic signal operation
- Runs normal coordinated timing plans
- Then makes incremental adjustments to splits and offsets ~ 5 to 10 minutes.
- Cycle length is not changed (future)



Adaptive Logic (Cont.)

- Split adjustments are made based on measures of utilization of each phase.
- Adaptive logic estimates the degree of saturation for each phase.
- The adjustment logic reallocates green time from under saturated phases and gives it to the phases that need more time.
- Offset adjustments are based on cycle flow profiles (advance detection).
- Distributed logic: Each signal chooses the offset adjustment that maximizes traffic flow arrivals to the green lights.

Balance phase utilization on all splits

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Adaptive Logic (Cont.)

- Offset adjustments are based on cycle flow profiles, which are compiled by monitoring advance loops on the approach.
- Offset adjustment logic considers only incremental changes.
- The logic is distributed in the sense that decisions are made at each signal independently.
- Each signal chooses the offset adjustment that maximizes traffic flow arrivals to green lights.

Traffic Adaptive Flow Profile

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Expectations

- Purdue University Study results showed that this adaptive system ...
 - Significantly reduced delay for an arterial with non-updated timing.
 - No significant degradation to a system just re-timed using SYNCHRO.
- Sabra, Wang and Associates study results showed that, field studies in Ohio, Texas, Florida and California...
 - Average 22% reduction in delay
 - 29% reduction in stops
 - 8% reduction in fuel consumption



QUESTIONS ???