Using Parking Technology to Improve Traffic Flow on City Streets

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Agenda

• Overview
• Parking Guidance Systems
  – On-Street
  – Off-Street
• Air Quality model - Case Studies
Overview

- Emissions caused by idling and slow moving vehicles
- Emissions can be reduced through:
  - Reduced cruising
  - More efficient transaction processing
  - Reduction in vehicular circulation
- PGS technology can result in significant reductions in greenhouse gases
Purpose of Presentation

We have the opportunity to achieve potential reductions in vehicular emissions through the implementation of new PGS technologies.

The implementation of new technologies can vastly reduce the vehicular emissions within a parking and transportation environment.
Parking Guidance Systems (PGS)
Purpose of On-Street PGS

- Improve traffic flow
- Track On-Street space use
- Improve utilization of parking
- Reduce vehicular emissions
- Higher level of customer service
Tools of PGS

- Sensors
- Websites and smartphone apps
- Command center management system
- Dynamic signs located prior to parking facilities
  - Display maximum of 2 options
  - Fairly generic at perimeter
  - Display more detail closer to parking facility
  - Provide patrons early options
  - Reduce cruising and backtracking
How Consumers Use Information

- Trip planning via smartphone and website
  - Route
  - Pricing
  - Available supply
- Destination choice
  - Direct route or best choice
  - Parking location
How Traffic Professionals use Information

- Manage traffic and parking
- Quantify vehicular emission reductions
- Maximize parking resources
- Consumer communication
- Improve emergency response
- Potential deferral of capital expenditures
Examples of Street Guidance Systems
City of San Jose

- The first Ethernet/fiber-based wayfinding solution that spans the entire downtown area
- Wi-Fi backbone provides communication
- Monitors and facilitates wayfinding to 6 parking structures
- Monitors approximately 10,000 parking spaces daily
- Centralized control of 13 roadway signs in downtown San Jose
- One workstation located at the traffic and transportation control center, and one at the parking control center.
The San Jose parking website offers a page that keeps customers informed of “current conditions” related to city operated parking facilities.

» You can sign up to get “parking condition updates” sent directly to your cell phone via text message.

» San Jose is also on the leading edge with parking guidance systems with real-time information.
The downtown wayfinding and signage program in Burbank, CA is designed to be read by motorists based on driving speeds.

- The variable message signs are internally illuminated for high visibility at nights.
- Burbank chose to only display “open” and “full” messages instead of specific space availability numbers.
- They also have the capability of being updated from remote locations.
Seattle, WA

Provided by TCS International
The first Transit PGS installed in North America
- Funded by a special government grant to reduce traffic congestion
- Solar powered dynamic message signs
- Wireless based solution across a large area
- Signs use the latest LED technology making each reliable and easy-to-view
- Very low power consumption
Other California Cities Implementing Parking Guidance Systems

- Santa Monica
- Culver City
- Pasadena
- Los Angeles
- San Francisco
- Berkeley
- Capitola
Parking Facility Guidance Signage
Monument Signs

At entry to garage
Number of Spaces per Level

Houston Airport and Charlotte Douglas Airport
Opening by Level

Charlotte Douglas Airport
Number of Spaces by Zone
Single Space Sensors
Single space sensors – cont’d
Kimley-Horn’s Air Quality Model
KHA’s Air Quality Model

Vehicular emissions can be calculated based on two types of systems:

• Entry and Exit lanes at parking facilities
• Parking Guidance Systems
  – Alert patrons to available parking
  – Reduce amount of cruising to find available parking
We calculate the baseline conditions using the following criteria:

- Type of Lane
- Average number of vehicles per hour per lane
- Hours of operation per day
- Days per year of operation
- Average Travel Length of Vehicle – or
- Delay per Vehicle
KHA’s Air Quality Model
Parking Guidance

• Ave length of time to find parking space
• Ave number of vehicles per hour
• Hours per day of operation
• Days per year of operation
• Average travel speed
• Approximate travel speed Emission Rate
Sample Projects

- DFW Airport – Parking Facilities
- Tambo International Airport (formerly Johannesburg International Airport) – Parking Guidance
Current DFW System

113 lanes of parking
revenue control
equipment
Current Configuration – North Entry Plaza
<table>
<thead>
<tr>
<th>Location</th>
<th>Cashiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Plaza</td>
<td>6</td>
</tr>
<tr>
<td>South Plaza</td>
<td>6</td>
</tr>
<tr>
<td>Remote North Lot</td>
<td>1 Cashier</td>
</tr>
<tr>
<td>Remote South Lot</td>
<td>1 Cashier</td>
</tr>
</tbody>
</table>

Total reduction of cashiered lanes  **55**
### KHA’s Air Quality Model

#### Baseline Conditions:

**I) Processing Lane Type I - Express (free-flow - AVI)**

- **# of Proc Lanes Type I Entering:** 1
- **# of Proc Lanes Type I Departing:** 1
- **Ave # of vehicles per hour per lane:** 50
- **Hours per day of operation:** 8
- **Days per year of operation:** 250
- **Average travel length (ft) at 5 mph:** 50

**II) Processing Lane Type II – Multi-Use (stop-n-go)**

- **# of Proc Lanes Type II Entering:** 1
- **# of Proc Lanes Type II Departing:** 2
- **Ave # of vehicles per hour per lane:** 35
- **Delay per vehicle (sec/veh):** 20
- **Hours per day of operation:** 8
- **Days per year of operation:** 250

**III) Processing Lane Type III - Cashiered (stop-n-idle)**

- **# of Proc Lanes Type III Entering:** 20
- **# of Proc Lanes Type III Departing:** 20
- **Ave # of vehicles per hour per lane:** 18
- **Delay per vehicle (sec/veh):** 45
- **Hours per day of operation:** 8
- **Days per year of operation:** 250

**Total Yearly CO Emissions:** 3,245 Lbs/yr  
**Total Yearly VOC Emissions:** 374 Lbs/yr  
**Total Yearly NOx Emissions:** 218 Lbs/yr
The mass of 2 Lbs is roughly equivalent to a 1 liter bottle.
# Total Emissions Reduction

<table>
<thead>
<tr>
<th>Location</th>
<th>CO</th>
<th>%</th>
<th>VOC</th>
<th>%</th>
<th>NOx</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Lanes</td>
<td>(3,580)</td>
<td>(39%)</td>
<td>(405)</td>
<td>(39%)</td>
<td>(244)</td>
<td>(38%)</td>
</tr>
<tr>
<td>Exit Lanes</td>
<td>(7,452)</td>
<td>(72%)</td>
<td>(850)</td>
<td>(72%)</td>
<td>(504)</td>
<td>(71%)</td>
</tr>
<tr>
<td>Totals</td>
<td>(11,032)</td>
<td>(56%)</td>
<td>(1,255)</td>
<td>(56%)</td>
<td>(748)</td>
<td>(56%)</td>
</tr>
</tbody>
</table>

Reductions are shown in Lbs/yr
5+ tons/year of CO
Off-Street Parking Guidance Systems

Tambo International Airport
Tambo International Airport

- Roadway signs installed
- Monument signs installed at entrance to garages
- Install individual space sensors within the parking garages (replaced inaccurate inductive loops)
- Average search time per vehicle was reduced from 25 minutes to 2.5 minutes
Tambo International Airport
formerly Johannesburg International Airport

Parking Guidance System Input Values:

<table>
<thead>
<tr>
<th>Baseline Conditions:</th>
<th>Single Space Sensor System:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave length of time to find parking space: 900 sec</td>
<td>Ave length of time to find parking space: 150 sec</td>
</tr>
<tr>
<td>Ave # of vehicles per hour: 25</td>
<td>Ave # of vehicles per hour: 25</td>
</tr>
<tr>
<td>Hours per day of operation: 20</td>
<td>Hours per day of operation: 24</td>
</tr>
<tr>
<td>Days per year of operation: 365</td>
<td>Days per year of operation: 365</td>
</tr>
<tr>
<td>Ave travel speed: 15 mph</td>
<td>Ave travel speed: 20 mph</td>
</tr>
<tr>
<td>Approximate travel speed CO Emission Rate*: 14 gm/mi</td>
<td>Approximate travel speed CO Emission Rate*: 12 gm/mi</td>
</tr>
<tr>
<td>Approximate travel speed VOC Emission Rate*: 0.9 gm/mi</td>
<td>Approximate travel speed VOC Emission Rate*: 0.6 gm/mi</td>
</tr>
<tr>
<td>Approximate travel speed NOx Emission Rate*: 1.4 gm/mi</td>
<td>Approximate travel speed NOx Emission Rate*: 1.1 gm/mi</td>
</tr>
</tbody>
</table>

(*see below for value based on travel speed)

<table>
<thead>
<tr>
<th>Lbs/yr</th>
<th>Lbs/yr % Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Yearly CO Emissions: 21,078</td>
<td>Total Yearly CO Emissions: 4,818 <strong>77%</strong></td>
</tr>
<tr>
<td>Total Yearly VOC Emissions: 1,355</td>
<td>Total Yearly VOC Emissions: 242 <strong>82%</strong></td>
</tr>
<tr>
<td>Total Yearly NOx Emissions: 2,107</td>
<td>Total Yearly NOx Emissions: 442 <strong>79%</strong></td>
</tr>
</tbody>
</table>
## Emissions Reductions

<table>
<thead>
<tr>
<th></th>
<th>Lbs/yr</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>16,260</td>
<td>8.0</td>
</tr>
<tr>
<td>VOC</td>
<td>1,113</td>
<td>.6</td>
</tr>
<tr>
<td>Nox</td>
<td>1,665</td>
<td>.8</td>
</tr>
</tbody>
</table>
In Summary
Benefits of PGS

- Improved traffic flow
- Prevents queuing and congestion
- Space Detection and/or Dynamic Signage increases the use of all parking space inventory. No longer do you need to create large ‘buffers’ in the counting portion of the system.
- Fewer incidents and accidents occurred because congestion was minimized
Benefits – cont’d

- Space Detection can monitor short term and specialty use spaces and allow better utilization of enforcement staff.
- Enhanced Customer Service
- Reduced congestion in the parking facilities and streets
- Reduced pollution as cars circulate for less time and produce fewer emissions
- Potentially stressful situations are minimized as the customers find parking in a timely manner
Conclusions

• Manage parking and traffic assets more efficiently
• Reduce operating costs by installing new technologies
• Enhance customer service
• Reduce vehicular emissions by as much as 70%
• New technology can help in achieving sustainable goals
• Defer capital and maintenance improvements to streets or facilities
THANK YOU FOR ATTENDING