Table of Contents

Traffic Movement at Southwest Parkway and Lake Road

Figure 7.1: Traffic Before and After TDM

Source: http://www.region.halton.on.ca/ ppw/ PlanningRoads/Transp/ TDM/ default. htm

INTRODUCTION

Transportation Control Measures

Metropolitan Transportation Plans have the goal of improving mobility for persons and goods. This does not always mean construction of new roadways; it also includes reducing congestion and facilitating more efficient use of the existing system. This section will detail additional strategies for improving regional mobility, strategies that enhance the carrying capacity of the transportation system without adding roadway lane miles.

All transportation systems are subject to congestion; the challenge is to select beneficial and cost-effective strategies for managing the congestion so that it remains at an acceptable level. This management must be an ongoing process to evaluate, select, and implement measures of Travel Demand Management and/or Transportation System Management. These are collectively referred to as Transportation Control Measures (TCMs). The benefits attributed to these TCMs can include a net reduction in travel times, fuel consumption and the promotion of a cleaner environment by reducing the amount of exhaust emissions. The selection is an ongoing process because growth or change in patterns of land use, density, traffic generators, commute directions can affect the success of TCMs, and changing financial resources and priorities of the region can affect which TCMs are considered feasible, and to what degree.

Travel Demand Management

Continually widening existing and constructing new roads cannot solve increased traffic congestion and travel times experienced by road users. Construction costs, environmental impacts, and demands from businesses and residents will create the need for other solutions to fix failing traffic conditions

Travel Demand Management (TDM) is one series of potential solutions to help reduce traffic congestion and decrease travel times. The goal of TDM is to try to reduce the amount of single occupant vehicles traveling during peak congestion periods using various programs. The reduction of vehicles will increase the benefit to the environment by reducing green house gases, improve the reliability for goods movement and productivity, and improve the quality of life for residents by eliminating the time lost while waiting in traffic jams.

TDM measures are those which seek to reduce, shift, or alter the demand for transportation, rather than trying to affect the supply of facilities (lane space, transit capacity, etc.) TDMs are often considered low-cost means of “squeezing more capacity” out of an existing network.

<u>Vanpools and Carpools</u>

Single-occupant vehicles, while providing the greatest degree of flexibility of transportation, are not always the most efficient use of highway space. Vehicles with multiple occupants (high-occupancy vehicels or HOVs) allow people with similar origins or destinations to reduce the cost of driving, as well as reducing congestion. Pooling can be formal and scheduled; for example, three employees who live near each other can rotate driving one another to work. It can also be informal, occurring only on certain days. HOVs can be encouraged by allowing them to use travel lanes otherwise reserved for buses, by allowing them free or reduced-price

Figure 7.2: Traffic Monitoring Station

Source: http://tti.tamu.edu/researcher/v38n4/images/sh6_cameras.jpg

This monitoring equipment detects when a traffic incident (stall or accident) is blocking traffic. A tow truck and other necessary equipment is dispatched to the scene. Some systems are very complex. The New York DOT has installed a system that covers all major thoroughfares, bridges, and tunnels, and produces a new image at each location every second. In the New York system, a computer analyzes congestion points and automatically dispatches the tow truck.

tolls on bridges or other tolled facilities, or by subsidy of vehicle costs. Some transit authorities offer preferred pricing on leasing arrangements for vans, or provide vans for use by registered pools. It is also commonplace for lanes to be set aside for high-occupancy vehicles, at either some or all times. For example, south of Houston's downtown, a number of streets connecting to the Spur 527 freeway restrict the right-most lane of four to buses and HOVs at all times, and restrict the second-from-the-right lane as well during peak hours. These lanes may be striped differently or separated with a barrier.

Telecommuting

Telecommuting, or telework, is when employees work from home, with or without a computer link to the office. Potential beneficial transportation impacts of telecommuting include reductions in traffic congestion, energy consumption, and air pollution. Telework can be informal, when an employee takes paperwork home to do the following day, or formal, where one particular day each week (for example), the employee will answer e-mail or phone calls at home and/or work on documents on their own computer. In addition to reducing the level of traffic on the roads, telework also cuts out the time spent commuting to the workplace.

Peak Spreading

Peak Spreading is a phenomenon that takes place in response to traffic congestion. Essentially, travelers adjust their work schedule and/or departure times to escape the traffic congestion occurring at the busiest time. This often occurs without the thought of it being a larger phenomenon. For example, an office worker may work from 7:30 to 4:30 rather than 8:00 to 5:00, if traffic is lighter at those times. A stay-at-home parent may wait to run errands until 9:30 or 10:00, when morning rush-hour congestion has dissipated. Employers sometimes deliberately encourage peak spreading by allowing workers flexible start times, and in some regions employers or employees may receive incentives for doing so, if they can demonstrate a certain level of participation.

Related conceptually to Peak Spreading are work schedules where employees work four ten-hour days with one weekday off each week, or nine nine-hour days with one weekday off every other week. This sort of altered work schedule creates more air quality benefits than peak spreading, because fewer trips are occurring, thus slightly reducing the region's vehicle-miles traveled.

Transportation System Management

Incident Detection and Response; Motorist Assistant Program

Traffic accidents and stalled cars can cause major congestion even if travel lanes are not blocked, as motorists slow down or try to avoid the incident. Additionally, there is often a considerable time lag between the incident occuring, and an appropriate emergency response team (police, ambulance, or just tow truck) being dispatched. Setting up a motorist assistance program, can greatly speed up response to and clearing of the incident. There may be a dedicated phone number to call to report incidents, and/or call boxes along the roadside. These are especially useful on heavily-traveled rural roadways or on bridges. In addition, urban freeways or busy intersections may have cameras installed that emergency personnel can monitor, both for spotting accidents as well as

Figure 7.3: A Dynamic Message Sign

Source: www.virginiadot.org/ infoservice/faq-signage.asp

Dynamic message signs are also called "Changeable Message Signs." They warn of adverse conditions or congestion.

Figure 7.4: Signal Timing

Source: FHWA

Poorly timed signals can cause severe congestion.

avoiding congestion when personnel must travel elsewhere in town.

Dynamic Message Signs

Signs mounted on major roadways can inform motorists of congestion ahead, accidents, travel time, or other notices. They are most effective in conjunction with an incident detection system that can trigger pre-programmed warnings: "Accident 1 mile ahead; 1 left lane blocked." Message signs can advertise transit routes or other facilities, as well as community events.

TxDOT currently maintains two DMS locations along the Interstate 44 corridor. Messages can be changed from the TxDOT Traffic Operation Center.

Traffic Operations Center

Many of the concepts discussed above, such as the incident monitoring, presupposes a location where traffic personnel are actively managing signalization or other system activities. An example of this is Houston TranStar, a joint project of the City of Houston, Harris County, the Texas Deparment of Transportation, and the Metropolitan Transit Authority of Houston/Harris County (METRO). The four agencies have a joint venture located in a shared facility. The Houston TranStar center is part of a national effort to establish an Intelligent Transportation System (ITS) infrastructure throughout the nation. Many state-of-the-art technologies are in use to help managers at the center improve transportation conditions in the region. These technologies include: Closed Circuit Television Cameras (CCTV), Dynamic Message Signs (DMS), Synchronized Traffic Signals, Speed Sensors, Highway Advisory Radio, and other high-tech devices.

The TranStar facility serves double duty as a work location for the Harris County Office of Emergency Management; the input and resources of the four partner agencies can be used to streamline emergency response to hurricanes, floods, industrial explosions or law-enforcement incidents. Houston Transtar, which covers an area with over 3 million people, operates continuously; a similar facility for a smaller jurisdiction may choose to operate only at peak hours, when traffic congestion is more likely, or when hurricanes or other severe weather is impending.

The City of Wichita Falls uses a Siemans / Eagle ACTRA (ITS) as the basis for its Traffic Operations Center (TOC). The ACTRA system provides a central monitoring and control point for 89 signalized intersections. This system provides for time of day signal progression plans, emergency response as well as traffic responsive signal timing plans. The system is also capable of collecting and archiving traffic count data. Although the system is not monitored 24 hours a day, a running event log is kept and reviewed each workday. Also, a real-time map is displayed providing status information of every intersection on the system as well as congestion levels along key areas in the system.

TxDOT is in the process of completing its Traffic Operations Center. When complete the TOC will monitor 9 CCTV locations, 2 complete weather information stations as well as pavement sensor locations along the Interstate 44, 281/287 corridor. This system will be monitored by TxDOT employees during normal work hours and will be monitored by Wichita Falls Police Dispatch after hours.

Figure 7.5: Signal Interconnection

Source: http://tti.tamu.edu/documents/1845-S.pdf

- Because queues at busy intersections and railway crossings may develop that are longer than 200 ft, there are methodologies to determine whether interconnection should be included in signal design.

Traffic Signal Timing and Coordination

Traffic-Actuated signals are those whose cycles are influenced by the presence or absence of traffic. The most common means of traffic detection is a loop detector, a metal wire embedded in the road surface which senses the magnetic signature of large metal objects (vehicles) and communicates this to the signal controller. Traffic signals can be designed to alter the cycle length, or skip or repeat phases such as protected left turns, all dependent on the amount and approach direction of traffic.

Video detection is another common means of vehicle detection. Video detection uses a video camera placed on each approach of an intersection. Detection zones are determined by defining areas on the video image that are desirable for vehicle detection. The video image is then scanned for changes in contrast. A vehicle is sensed when a significant contrast is noted in the defined detection zone. Wichita Falls currently has 25 intersections equipped with Video Detection Systems.

A further refinement of traffic signal behavior is pre-emption, where emergency vehicles and/or trains can alter the signal cycle so that opposing traffic is stopped. This is most commonly done through the use of special transponders in the emergency or rail vehicle, whose detectors are mounted near the traffic signal and wired to its controller. Wichita Falls currently has 3 intersections equipped with Emergency Vehicle Pre-emption equipment and 2 locations equipped for rail pre-emption.

Progression

Traffic signals are designed to minimize delay for two intersecting streams of traffic. On all roads, vehicles tend to group into "platoons" traveling together. Once a platoon is established, overall delay can be reduced by keeping the platoon moving together through successive signals. The coordination of signals to achieve a continuous flow through multiple signals is affected by intersection spacing, cycle length (based on cross traffic needs), and desired travel speed. Typically progressions are set for both morning and evening peaks, in opposing directions.

The ACTRA System is used to manage signal progression. Intersections are placed into timing groups. ACTRA then selects the proper timing plan based on the time of day, day of week, day of year. ACTRA can also choose other timing plans based upon traffic conditions or emergency inputs.

Interconnection

Traffic signals can operate independently at each intersection, or as part of a coordinated system. Especially in the case of actuated signals, interconnection allows neighboring signals to be aware of one another's cycle and adjust timings to maintain progression (described above) in response to congestion levels. Wichita Falls uses three 900 megahertz spread spectrum radio systems as a means of signal interconnection to the ACTRA System.