Directing traffic

Community intelligent traffic systems improve road safety and efficiency

THEY'RE BUILDING A NEW bridge in Kelowna, BC, a $100-million, five-lane structure that will span Lake Okanagan and, city officials hope, ease the traffic congestion that has become the number one issue with residents of this scenic community of 100,000. Every afternoon, says Transportation Manager Ron Westlake, downtown streets are clogged with vehicles due to the bottleneck created by the ageing, three-lane bridge that currently crosses the lake. During the peak summer months, when tourists flock to the Okanagan Valley, the line-ups frequently stretch two kilometres through the centre of Kelowna and motorists can be delayed an hour.

Unfortunately, the new bridge won't be finished until 2008. In the meantime, the city, the provincial Ministry of Transport, and B.C. Transit hope to find a partial solution through what is known as intelligent transportation systems (ITS). They plan to invest $500,000 in computer-driven technology that will coordinate traffic lights on municipally-owned side streets with those on the provincial highways that pass through the city. The system will have several other features, including one that will allow drivers of city buses and emergency vehicles to delay signal changes long enough to let them through an intersection. "Our buses get stuck in traffic and it messes up the schedules," says Westlake. "We hope the new signal system will provide some relief and allow us to maximize the capacity of our roads."

Courtesy: City of Toronto, Traffic Management Centre

Toronto's RESCU freeway traffic management system monitors for incidents, managing and controlling the city's approximately 2,000 signalized intersections, the Gardiner Expressway, Don Valley Parkway and Lake Shore Boulevard. An operator can control any of 60 CCTV cameras to locate incidents, identify the cause of problems and determine the appropriate response. A computer console allows him to display messages on large overhead electronic changeable message signs, and to relay traffic information to the media.

Municipalities across the country increasingly are turning to ITS as a solution to traffic problems. The technology comes in many forms allowing it to accomplish many things and there are real benefits. First, ITS helps motorists save time. It can save lives to the extent that it makes roads and highways safer. It reduces energy consumption, which is good for the environment, by keeping vehicles moving rather than stalled by traffic jams. It also allows municipalities to delay and in some cases avoid spending millions of dollars on high-cost projects to expand roads and freeways.

"We used to be able to just widen the roads, but that solution is no longer available," says Les Kelman, acting general manager of transportation for the City of Toronto. "In most cases there's no room for more roads. Or there's no desire on the part of the public, or we don't have the budgets. ITS allows us to squeeze more capacity out of our roadways."

Municipalities of all sizes are investing in ITS, but the country's big cities understandably rely more heavily on such technology than smaller ones. The City of Toronto, for example, spends about $30 million a year on the operation of its traffic management centre, signals at intersections, and cameras that monitor the movement of vehicles on freeways and major roads. The city also has sensors embedded in its expressways that are programmed to detect unusual patterns in traffic flow. The sensors and cameras relay information and images to the control centre, which occupies about 2,500 square feet and contains about 50 screens. Two operators monitor the screens at all times and can dispatch police or other emergency vehicles the moment they detect a problem.

"The quicker you respond, the less congestion you have," says Kelman. "We estimate that for every minute it takes to reach the scene of an accident, you create five minutes of congestion."

The Greater Vancouver Transportation Authority, which is called TransLink, has developed one of the most ambitious and effective ITS programs in the country. TransLink designs, builds and operates major roadways in Vancouver and 21 surrounding municipalities. In November, 2001 it completed an ITS strategic plan that includes 66 initiatives affecting 23 different services. Keenan Kitasaka, TransLink's Manager of ITS, says that the use of technology is having a major impact on transportation efficiency.

He cites the case of the 98-B Line, a 17-kilometre, north-south bus route between the downtowns of Vancouver and Richmond. At peak hours, there can be 20 buses moving in each direction and TransLink has installed global positioning system (GPS) antennae on all these vehicles. The antennae determine the position of a vehicle every 18 seconds as it moves along the route. A transponder relays the information from the bus to receivers at

Courtesy: City of Ottawa, Traffic Management Centre

Pictured is the traffic control desk at 175 Loretta Ave. North, where the City of Ottawa monitors the flow of traffic throughout the city with the help of its 57 cameras.

59 intersections and from there it is sent to a transportation management centre. Computers at the centre then predict the arrival times at various stops and this information is displayed on electronic message boards for passengers awaiting their bus, along with a countdown to the projected arrival.

And that's not all. The system also tells drivers whether they are ahead of schedule or behind, and it allows them to delay traffic light changes by up to 15 seconds to catch up when necessary. Kitasaka says that a 98-B Line evaluation study found that the average time required for buses to complete the trip has been reduced to 84 minutes from 100, which has led to significant savings. TransLink can provide the same level of service with five fewer buses than it used before adopting ITS technology _ which is worth some $3 million per year, says Kitasaka. At the same time, ridership has increased sharply.

"Customer satisfaction is consistently higher on the 98-B Line than other routes," he says. "People are shifting from autos to the bus. Overcrowding is a problem now."

Calgary is another municipality that has embraced ITS in a big way. ITS Specialist Ryan Vanderputten says the city adopted a 10-year strategic plan in 2003 that provided for investments of $3 million annually on traffic-related technology projects and equipment. The money is being spent in six areas, including systems to provide drivers with real-time information and images from local roads. As well, the city is erecting variable message signs at its downtown parking lots to tell motorists, once a facility is full, of other locations where spots are available, and it is replacing street-side metres with pay and display machines.

Vanderputten adds that ITS is being used, where warranted, to alleviate congestion and avoid high-cost capital works projects. In one such case, trains can tie up traffic for 20 minutes while crossing a major artery in an industrial area in the southeast section of the city. Vehicles can be backed up for a kilometre, sometimes to the exit ramp of an expressway. The city is putting up mobile message boards to advise motorists of alternate routes. As well, video technology monitors the movement of trains and, once a train has cleared the road, the information is used to ensure that traffic lights in the area remain on green until the line-ups have cleared.

The federal and provincial governments are also pumping money into ITS projects to improve the efficiency and safety of highways and municipal roads. Since 1999, Transport Canada has provided more than $18 million and, in January 2005, announced funding for 25 new projects worth $5 million. One of the most far-reaching initiatives is the Road Weather Information System (RWIS), which involves embedded sensors and tower-mounted cameras to monitor changing conditions. The data is relayed to provincial ministry of transport communications centres and used to direct the work of roads maintenance crews.

Dave Macfarlane, project manager for RWIS in New Brunswick, says sensors and tower-mounted weather stations have been installed at 50-kilometre intervals along the 200-kilometre highway between Fredericton and Moncton. The technology provides road crews with surface temperature and moisture of the pavement, air temperature and wind direction. Road crews use the information when deciding what chemicals to apply in advance of a storm. Environment Canada can also use the information to provide travel advisories about road conditions.

"The technology has proven very useful," says Macfarlane. "Without the sensors you have to make decisions based on staff experience. This is an additional tool and allows you to take steps ahead of a storm."

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