MIOVISION

Reducing Congestion and Optimizing Signal Timing Systems With Miovision Solutions

Peterborough Case Study

Miovision TrafficLink and Surtrac Adaptive Traffic Signal Control Systems

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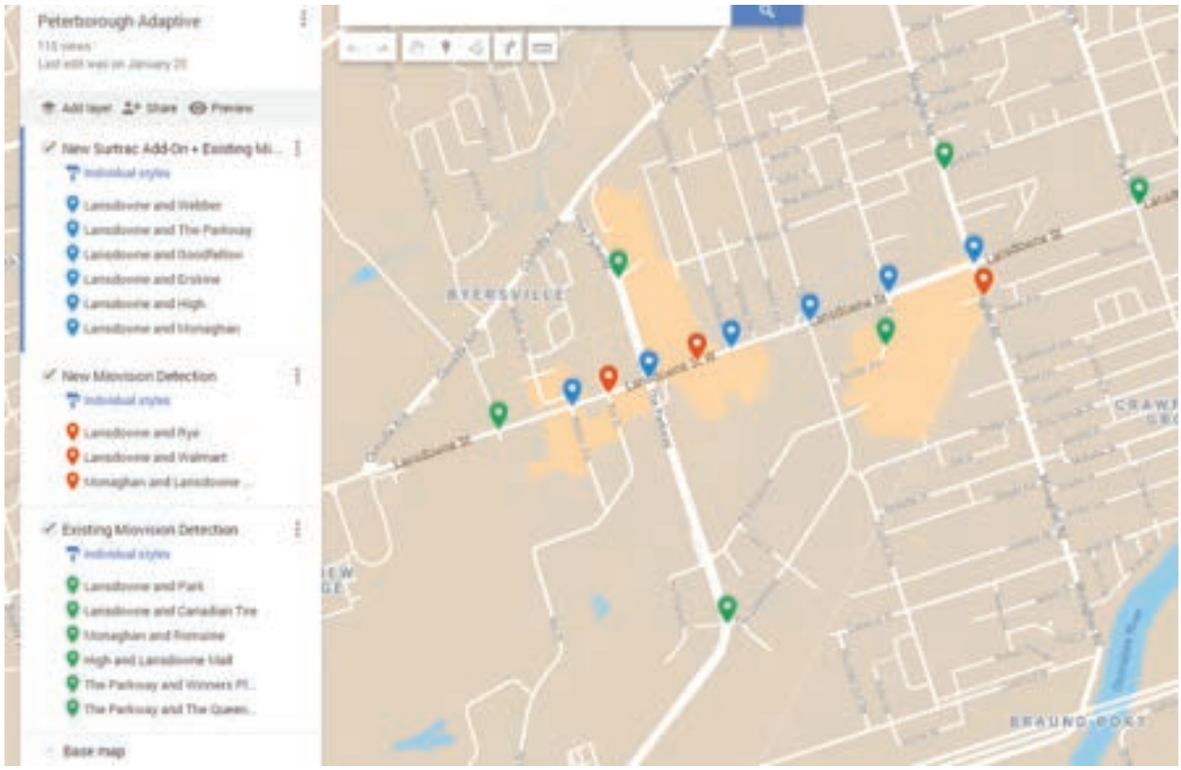
Executive Summary

Traffic congestion is a significant problem plaguing cities worldwide. Severe traffic congestion increases the risk of accidents and CO2 emissions. With global initiatives focused on reducing greenhouse gas emissions and improving public road safety, cities benefit from implementing traffic congestion reduction measures. One of the most effective methods of reducing congestion is the implementation of signal timing infrastructure that is **customizable and adaptable** to the ebb and flow of traffic in any particular corridor as it happens in real time.

The City of Peterborough, Ontario, is one of many cities struggling with traffic congestion on its busiest streets. Using Miovision TrafficLink solutions with Miovision Surtrac adaptive traffic signal control systems, the City of Peterborough initiated a pilot project to compare traditional signal timing systems with adaptive signal systems. The project resulted in close to $1 Million in reduced user costs, reduced vehicle emissions by 20%, decreased vehicle delay by 41.3% and split failures by 46.4%. Furthermore, it raised the overall level of service for the corridor selected.



The selected corridor, with intersections included, the Surtrac deployment (blue), the additional Miovision detection locations (red) and the existing Miovision detection deployment locations (green) located near the corridor.

Lansdowne Street Smart Traffic Signal Project

In August 2021, the City of Peterborough initiated the Lansdowne Street Smart Signal Pilot Project for a corridor spanning Lansdowne Street from Webber Avenue to Monaghan Road. The 1.75km corridor, the city's busiest, is made up of almost exclusively commercial buildings, including a shopping mall, gas stations, and several plazas. The corridor also serves numerous commercial developments that access Lansdowne Street via Route 49. The corridor is a four-lane, high-capacity arterial road with a center left-turn lane (5 lane cross-section) that carries between 23,000 and 29,500 vehicles per day.

The City of Peterborough received council approval to install Miovision TrafficLink hardware solutions with Surtrac adaptive traffic signal control system to implement an Adaptive Traffic Signal Control System (Smart Signal System).

The City used Miovision hardware solutions to collect continuous data on traffic volumes, speeds, travel times, and congestion along the corridor, allowing the system to make immediate adjustments to signal timings and settings. Using Miovision Trafficlink, the City of Peterborough's Smart Traffic Signal Pilot Project could leverage the existing traffic detection equipment already implemented throughout the City.

Adaptive Traffic Signal Operations

Many cities, including the City of Peterborough, traditionally employ the standard Time-of-Day (TOD) method for their traffic signal timing. TOD plans are static programs that establish signal timing settings based on historical traffic volumes and require initial configuration by city staff. To change a configuration, staff must conduct an analysis before deploying the new settings in the field and monitoring performance. This existing process requires significant labor, budget, and timing capacities the city provides that appear outdated and inefficient.

Adaptive signal control software employs multiple detection zones in each traffic lane to simulate a model of vehicles approaching each intersection in real-time. The adaptive signal system communicates with the neighboring intersections to achieve coordination between adjacent traffic signals.

Miovision TrafficLink enables adaptive systems to maximize traffic throughput during busy peaks, providing smooth traffic flow and minimizing queuing on side streets during lighter dips in traffic. With TrafficLink, the adaptive traffic signal system automatically switches between both objectives based on actual traffic demand.

Performance Measures Evaluated

Using Miovision TrafficLink software, the City of Peterborough analyzed and compared the performance of adaptive control against traditional TOD control.

The City employed "ON-OFF" testing, conducted by alternating adaptive control with traditional TOD plan control daily over two weeks. The City used Miovision solutions to collect significant vehicle and traffic signal data during the evaluation period, providing a complete picture of the corridor and traffic network health. The data collected included reports on Travel Time, Side Street Vehicle Delay, Corridor Stops, and Corridor Level of Service.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
November 8 Surtrac	November 9 TOD	November 10 Surtrac	November 11 TOD	November 12 Surtrac	November 13 Surtrac	November 14 Surtrac
November 15 TOD	November 16 Surtrac	November 17 TOD	November 18 Surtrac	November 19 TOD	November 20 TOD	November 21 TOD

Travel Time

With Miovision TrafficLink dashboards, the city was able to define and compare travel time differences between the adaptive signal timing and TOD systems. During off-peak traffic flow periods, adaptive control and TOD control kept similar travel times along the corridor. During free-flow traffic, vehicles took 126 seconds to travel through the tested area at the speed limit, assuming no stops.

Using the existing TOD control during peak times, the average travel time through the corridor was approximately 253 seconds in the eastbound direction and 270 seconds in the westbound direction. Compared with the adaptive control system, the travel time through the corridor was reduced by approximately 28 seconds (11%) in the eastbound direction and 80 seconds (30%) in the westbound direction

Reduction in travel time during the day improved by 28 seconds (11%) at 3pm (15:00)

Reduction in travel time during the day improved by 1 minute 20 seconds (30%) at 2pm (14:00)

Side Street Vehicle Delay

Miovision TrafficLink revealed that with the adaptive control system, side street vehicle delay increased an average of 63% during peak periods. This was an expected outcome as the adaptive software automatically adjusts the signal timing to current traffic needs by reallocating green time from side streets to manage the heavier traffic flow on the main street. An increase in side street delay was shown to be most pronounced at intersections with heavy turning volumes or where geometric deficiencies affect the ability of side street vehicles to utilize the available green time.

Intersection	Average Side Street Delay increase	Average Side Street Delay Increase (Peak Periods)
Monaghan	+26%	+37%
HIgh Street	+90%	+100%
Erskine Avenue	Not enough side street data	Not enough side street data
Goodfellow Road	+75%	+81%
The Parkway	+25%	+36%
Webber Avenue	+59%	+60%

Corridor Stops

Corridor stops occur when vehicles are forced to stop on the main thoroughfare street due to insufficient green time. On average, TrafficLink highlighted that the adaptive signal system reduced corridor stops on Lansdowne Street by 37% in the eastbound direction and 53% in the westbound directions. This key performance measure reduced the overall travel time along the corridor.

Corridor Level of Service

Corridor level of service is a performance measure determined by vehicle speed, density, and congestion used to categorize traffic flow. TrafficLink performance measures and the adaptive signal control system reduced congestion, delay, and travel time, improving the level of service in both the Eastbound and Westbound direction. The overall improved level of service equates to an approximate 6% increase in corridor capacity.

PM Peak – Corridor and Intersection View

User Cost Savings

Using Miovision TrafficLink with the adaptive control signal system, there was an overall reduction in user travel time in the pilot study area. The results of the pilot estimated travel time savings over a typical year to be approximately $977,000 in reduced user costs. User cost savings are calculated as the value of reduced delay time for vehicle passengers, multiplied by the average vehicle occupancy (1.2 for cars and 1.0 for trucks). They are based on the median hourly wage rate for all occupations ($19.64 / hr for passenger vehicles and $55.24 / hr for trucks).

The estimated fuel saving from implementing the adaptive signal control system within the pilot corridor was approximately 106,700 liters per year, an additional savings of about $213,000 annually based on an average fuel price of $2.00 per liter. The reduction in fuel use by drivers generated an estimated reduction of 273 tons of CO2 emissions annually within the pilot project study area.

Success on Lansdowne Street

Utilizing Miovision TrifficLink and Surtrac adaptive traffic signal control system, the City of Peterborough constructed compelling and thorough data insights, reports, and analyses to present to traffic ministries, agencies, and other stakeholders. The project emphasized the benefits of a more comprehensive application of this adaptive signal technology to other major road corridors in the City. These results led to the City of Peterborough being approved for $1,000,000 in capital funding to expand the "Smart Signal System" to other high-traffic corridors, allowing the City to install Miovision TrafficLink solutions at up to 20 intersections with currently approved funding.

Implementing the adaptive system significantly changed traffic flow on Lansdowne Street by organizing approaching vehicles through the corridor in a more coordinated progression. The system showed the council that adding dedicated turn lanes and advance green movements on side streets will ultimately reduce side street delays and improve overall corridor performance. The project highlighted that improved traffic signal efficiency provides cost savings to road users in terms of time and fuel consumption. Other benefits include increased corridor capacity and the reduction of CO2 emissions.

Miovision TrafficLink and Surtrac adaptive traffic signal control system improve traffic flow and safer roads on even the busiest, most congested corridors when deployed on a broader scale. Adaptive signal control systems continuously update to reflect current traffic conditions and generate optimized traffic signal timing plans for each intersection as they are needed. Overall, the use of the Surtrac adaptive system has improved eastbound and westbound performance along the Lansdowne Corridor throughout the study. The most significant impact occurred during the weekday afternoons in the westbound direction, where vehicle delay decreased by 41.3% and split failures decreased by 46.4%. Adaptive signal control technology also resulted in added cost savings for road users and a more significant reduction in fuel consumption and emissions. According to project results, fewer stops and acceleration reduce vehicle emissions by 20%, contributing to cities like the City of Peterborough reaching their Greenhouse Gas emissions reduction targets.

To learn more about pairing Miovision TrafficLink and Surtrac adaptive traffic signal control system solutions or to book a demo, visit https://miovision.com/contact-us to connect with a Miovision solutions expert.