



# A Synergy of Intelligent Street Lighting and Energy Conservation in Gothenburg, Sweden



The city of Gothenburg is located on the West coast of Sweden where the Göta Älv River meets the sea. As Sweden's gateway to the West, Gothenburg is a major trading centre for Sweden and has maintained its ties to the shipping and trade industries for centuries. With a population of nearly a half of a million people, Gothenburg is Sweden's second largest city.

Built according to Dutch architecture the city is orderly planned with rectangular districts surrounded by old canals. Preserving its history and the living environment in the area has always been a main goal for the city council and these efforts are reflected in the city's extensive public transportation system and initiatives to reduce traffic accidents.

As part of the city's long term goal to incorporate a highly efficient traffic system to improve connections between city districts as well as provide for the city's ever growing transportation needs, Gothenburg decided to implement an intelligent street lighting system. Capelon, a specialist in LON systems using power line communication, developed a system for the control and monitoring of street luminaries in two of the city's districts, Tuveleden and Högsboleden.

## Shedding light on energy conservation

The driving theme behind the project was an energy-saving streetlight scheme, where the system would continue to provide the most up-to-date technology and benefits for the city residents throughout its lifetime.

Together with the contractor, the Swedish National Road Administration (SNRA), the City of Gothenburg conducted rigorous tests to identify areas where Capelon's intelligent street lighting system would best benefit the city. In addition to reducing energy consumption and costs, decreasing carbon emissions was an important factor in choosing the street lighting system.

According to the European Lamp Companies Federation (ELC), one 500 W street lamp left burning for 7 hours during the night can produce up to 2 tonnes of CO<sub>2</sub> emissions per year – enough to fill 5 double-decker buses. At the same time, the street lighting scheme needed to provide safe driving conditions for traffic as well as offer lighting to prevent crime in the neighbourhoods.

## LON as the solution

To meet the high demands for energy conservation, pollution reduction, and safety, a street lighting management system based on LON technology was installed. The LON network allows devices from different manufactures to communicate with each other for optimal control of the street lamps as well as to enable low cost system expansion and upgrading.

"The benefits of using the LON protocol are in its proven reliability and widespread applicability," said Tomas Niklasson, Marketing Manager at Capelon. "The open technology allows us, as a supplier, to focus on developing improved functionality of the system for our customers."

With 550 lamp controllers, the system will be installed in two stages. As part of the first stage, which was finished in April 2007, 300 lamps and ballasts were installed in Tuveleden. The second phase includes installing 250 streetlights in the district of Högsboleden and is scheduled to be completed this December.

### Preventative monitoring

The City of Gothenburg wanted the ability to individually control and monitor each streetlight in order to detect lamp failures and allow lamp replacement and repairs to be completed in real-time, without affecting the safety of drivers and residents. To accomplish this, each street ballast is equipped with Capelon's LC-20D lamp controller, which monitors accumulated lamp burning hours, lamp and power voltage, total energy usage, and scheduling as well as produces alerts in case of lamp malfunction.

Reducing the need for emergency maintenance by replacing luminaries according to their lifetime and amount of hours burned as monitored by the LC-20D, this modern solution enables Gothenburg City to save on maintenance costs and prevent unsafe road conditions.

The streetlights can even be remotely controlled. A total of five MP-01 segment controllers from Capelon communicate with the LC-20Ds over a LON Power Line connection and are used to collect the data recorded by the lamp controllers and transfer the information via GPRS/Ethernet to a main computer.

From here, groups of lamps can be accessed and configured to different set-up modes for dimming and switching on or off, providing maximum ease of use for the system managers. In case of communication break down between the segment controller and lamp controllers, the LC-20D will automatically fall back on a pre-set mode providing a reliable street lighting scheme.

### The results are in

The system also offers the highest level of functionality. The MP-01s automatically control turning the luminaries on or off and can adjust the dimming level based on time of day, position of the sun, and amount of natural light. This provides optimal lighting for drivers and pedestrians while conserving energy and reducing carbon emissions produced by the lamps. After just six months, energy consumption was reduced by an astounding 74%. Lamp lifetimes will also be extended as a result of their dimming, further reducing maintenance costs for the city.

As demonstrated by the City of Gothenburg, integrated street lighting can lower energy consumption, reduce carbon emissions and preserve the environment. Projects to install intelligent lamps and ballasts are becoming a widespread trend in cities across Europe.

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