Control Systems for Interurban Traffic

Intelligent Traffic Systems

SIEMENS
Industrial Solutions and Services

Your Success is Our Goal
Interurban traffic on our freeways will continue to increase in the years ahead. One consequence of this trend will be that even minor obstructions in the flow of traffic are enough to cause accidents and major traffic jams. The prevention of such accidents and traffic congestion as well as the increase in road safety are therefore the central tasks of traffic control systems from Siemens.

An essential component of accident prevention is the ability to warn drivers as early as possible about potential sources of danger such as ice, accidents, fog banks, and so on. Taking the pressure off bottlenecks, for example, at tunnels, toll stations or sections of road with heavy traffic, is an essential way of improving traffic flow and road safety.

It is here that traffic management systems, tunnel control systems or electronic fee-charging equipment for toll stations play a valuable role. Modern traffic control systems help to

- considerably reduce the number of accidents
- decisively minimize traffic congestion
- harmonize the flow of traffic as a whole and
- make optimum use of traffic networks.

This is achieved by

- traffic monitoring
- traffic detection
- traffic information and
- traffic management.

The following pages provide an overview of how Siemens Intelligent Traffic Systems is already contributing towards improving traffic on our freeways today.

The SITRAFFIC system concept

With the SITRAFFIC system concept Siemens has developed a traffic instrument that is subject to continual improvement and which provides universal solutions for efficient, intermodal and environmental-friendly traffic management and traffic control. Products, systems and procedures are finely coordinated to ensure optimum system integration for data, communication and configuration. A large number of modules can be combined to create a highly functional overall system. SITRAFFIC offers all the advantages of a single system but remains open for combinations with other products and systems. Standardized interfaces (such as OCIT®, XML) link up distributed central and distributed components to form integral traffic management systems. On the basis of Internet technology they form a system-wide network covering roads and control centers.
1924 saw the beginnings of Siemens’ move towards becoming the most important and innovative supplier of intelligent traffic systems. Our products and systems are now being used in major conurbations around the world, over many kilometers of freeways, on secondary and country roads, in multi-storey car parks and in tunnels. The standards of quality are extremely high and the systems are tailored perfectly, reliably and consistently to meet the needs of our customers.

In addition to their integrated design features, our traffic control systems are distinguished by a strong customer orientation.

We install these systems for our customers on a turnkey basis and support them throughout the entire service life.

To meet the demands of interurban, local and urban traffic that is becoming more and more networked, our systems and products are designed for complete integration from the very beginning.

Appropriate interfaces permit the trouble-free expansion of existing installations and the combination of different systems, thus creating highly efficient, synergetic and all-inclusive methods of traffic management.

Numerous reference examples from all over the world prove just how successfully such systems and products can work together.
Parking Traffic telematics Services

Integrated traffic solutions for all requirements
Traffic management on freeways –
The bottom line

The underlying principle of freeway traffic management involves measurement, analysis and control. The levels of complexity and expenditure involved in these three concepts are considerable.

Installation of such a system is, of course, a costly affair. The question is: Does the result justify the costs?

One example: Several years ago, a traffic control system was installed by Siemens on the A9 freeway between Munich and Nuremberg. It comprised central computers, variable message signs, variable direction signs, sensors for measuring traffic density, as well as fog and ice detectors.

The result: Compared to previous figures, the number of rear-end collisions fell by 35%, the number of people injured by 31%, and the number of accidents with serious personal injury by 30%. The number and duration of traffic jams were also reduced correspondingly. Since then, the volume of traffic has increased even further. In order to cope with this increase, sections of this freeway are being widened to three, in some places, even four lanes. In addition, the traffic management system is being upgraded by Siemens.
Fast detection of traffic conditions

Measurement involves the automatic detection of all relevant traffic and weather conditions. Traffic detectors register not only the volume of traffic, but also any changes in its density. The number or proportion of heavy-cargo vehicles, trucks, cars and motorcycles is registered as well as the speeds in each individual lane. Fog sensors measure the visibility and ice sensors assess the danger of skidding.

Fast evaluation of ongoing situations

The data acquired in this manner is transmitted to the central traffic computer where it is analyzed and evaluated. Decisions then have to be made quickly on how to intervene. Such intervention can be carried out manually as well as fully automatically by means of control programs. Does traffic density warrant a diversion because traffic is threatening to jam up at the next construction site? Does a speed limit have to be imposed because of heavy rain?

Fast traffic management

The results of the analysis appear a little later as warnings and information on sign gantries and variable direction signs located ahead of the problem area in question. Traffic announcements are broadcast over the radio as well.
Traffic control on freeways has to deal with relatively long stretches of road. Warnings only make sense if they reach the road user in good time. In some situations, therefore, messages must be conveyed long before the danger zone is reached, for example, to enable the driver to choose an alternative route. Modern autonomous detection systems serve in this case as providers of data on traffic conditions. To be able to obtain the best picture of the current traffic situation it is necessary to install detectors at a number of key locations.

Low-cost measuring station for acquiring traffic data

Up till now, the acquisition of traffic data on freeways and secondary roads has been associated with high costs on account of the length of the power and data cables leading to the measuring stations. Autonomous detection systems solve this problems by obtaining their power from solar cells and transmitting the data by radio to a traffic control center.

Major technology leap with video sensors

As leading systems integrator for digital video sensor technology, Siemens offers the traffic monitoring system of the future. The modular system detects both static and dynamic traffic processes which are measured and evaluated in real time and is thus able to adopt new approaches to solving the problems involved.

Traffic monitoring

The video systems from Siemens can monitor critical sections of the road on a permanent basis.

Traffic detection

As a lane detector, the system is able to recognize whether congestion is in the making at critical points on the road. A camera monitors the traffic of up to eight lanes. A precise picture of the current traffic situation can be obtained through the acquisition of all relevant data such as vehicle counting, occupancy, speed and the parameters derived for up to three categories of vehicles.

Emergency management – monitoring emergency roadside telephones

Monitoring of emergency roadside telephones is another strength of the system. Objects such as vehicles in breakdown areas and people making emergency calls are detected, registered and analyzed.

Shoulder lane conversion after visual examination

If certain stretches of a road are overloaded or individual lanes are blocked, the shoulder lane can be released for normal traffic if necessary. Any obstructions which may prevent conversion of the shoulder lane are registered by video detectors and cameras. If, after visually examining this section of road, the operator in the control center is satisfied there are no obstructions, he/she can release the shoulder lane. When the volume drops to normal levels again, the shoulder lane is closed to traffic.

A further advantage:

Installation of the monitoring systems involves no road surfacing or construction sites, so there is no disruption in the flow of traffic.
Modern roadway station units perform the task of traffic management on freeways. They record data relating to traffic and weather conditions and pass on instructions for display on the variable message signs. The signs made by Siemens employ different technologies (optical-fiber displays, LED displays, etc.) and possess an extensive repertoire of symbols and characters. Thanks to its modular design, the Siemens roadway station unit SST4 can easily be customized to perform different functions and meet national standards.

Apart from variable message signs, these roadway station units can also be used to control dynamic lane allocation by means of LED pavement inset lights.

These pavement inset lights have proven reliable in airport applications for many years and are now also being used successfully in freeway and tunnel projects.

Traffic management by ramp metering

Ramp metering on freeways has proven invaluable whenever traffic density on the on-ramps increases suddenly as a result of major events, trade fairs, etc. Depending on the current traffic situation (volume, density), ramp metering uses a traffic light installation to give one or more vehicles access to the freeway and ensure that traffic on the freeway flows without interruption.
Where it all comes together – at the control center

The integrating element in traffic control and information for interurban traffic is the control center.

Here the traffic, environment and operating data of all connected systems are collected, processed and archived. They are also analyzed and evaluated using the latest traffic technology procedures.

The knowledge gained from these data forms the basis of a detailed picture of the current traffic situation which can be used for the purposes of coordination, higher-level traffic management and the distribution of information. Siemens supplies complete traffic control centers including links to the peripheral equipment and extensions to existing systems as well as construction, maintenance and financing.

Advantageous complete solutions

The philosophy of complete solutions from Siemens covers the entire infrastructure that is needed to create and operate comprehensive traffic management systems on freeways.

This includes the development of power and telecommunications networks as well as all the work necessary for construction both above and below ground.

Information systems show the way

Comprehensive traffic detection performed, for example, by the "TRAFFIC EYE Universal" measurement and evaluation station provides the foundation for current traffic information systems – systems which are becoming increasingly more important. They keep drivers informed about the traffic situation on a suggested route before and during a journey and, consequently, keep them on the best route available at that time.
Tunnels are regarded as particularly critical areas. Monitoring traffic, dealing with accidents and rescuing accident victims are especially difficult in such surroundings. Breakdowns, traffic jams, fires or excessive CO levels must therefore be detected as quickly as possible.

Service personnel must also be protected when carrying out maintenance work in a tunnel. Road users must be warned of possible obstructions well in advance because congestion in tunnels has to be avoided under all circumstances. For the police and freeway authorities, regulating traffic in tunnels is much more difficult than controlling it on stretches of open road.

In order to comply with the highest safety requirements, tunnel systems must therefore be equipped with extensive control and management facilities. These are usually in the form of traffic signal installations, variable message signs, height control systems, detectors and CCTV monitoring equipment.

Professional traffic management Traffic control in tunnels must be prepared for all eventualities and calls for a comprehensive exchange of information with the technical equipment. Whether this involves the supply of lighting, ventilation and power or the installation of fire alarms and public-address systems, the equipment needed for tunnel operation complies with the internationally proven Siemens standard and leaves nothing to be desired.

Traffic control – automatic and by hand Automatic traffic control is carried out by means of predefined scenarios. For example, when a fire alarm responds, the variable message sign “Portal red” = “Block tunnel” is activated automatically. Other automatic scenarios are initiated in the case of accidents, traffic jams or breakdowns.

Manual traffic control is mainly carried out when maintenance work is to be performed in the tunnel, making part of the road unavailable for a certain length of time. A traffic-dependent lane control system now guides drivers around such an obstacle on one or more remaining sections of the road.

Efficiency through compatibility Thanks to compatible interfaces, the system can be integrated into higher-level control systems. Extremely simple graphic user interfaces ensure a high level of convenience and user-friendliness. Data are displayed and visualized on the screen quickly and in an easily comprehensible manner, thus allowing pinpoint intervention in any traffic situation.

Siemens tunnel control systems include:

- Central monitoring and control system (SCADA)
- Power supply
- Lighting
- Ventilation
- CO, NOx and visibility measurements
- Fire alarms
- Public-address facilities
- Emergency telephones
- Tunnel radio
- Height control
- Traffic detection
- Video monitoring
- Traffic lane control
- Traffic control, and much more
In emergencies, messages must be sent to the rescue control centers quickly and reliably. Where seconds count, there is simply no room for compromise.

The Siemens emergency call system permits fast and reliable communication between road users and the personnel in the control center. It conveys reports of accidents, breakdowns or other problems on freeways. The system consists of the outdoor stations (emergency telephones) and the control center.

**The emergency telephone – independent and dependable**

The emergency telephone unit is independent of the power supply system. It comprises a telephone system installed in a weatherproof housing. The device can be fitted on a post or into a call box and equipped with a telephone receiver or integral intercom unit.

These telephone units are located on both sides of the road at intervals of one kilometer. A telecommunications cable is used for both the telecommunications link and the power supply. When the call button is pressed, the station switches to service mode and signals an emergency call to the control center.

**The control center – professional safety management**

The control center consists of a computer and a telecommunications system. A printer registers and documents all pertinent data such as the time, fault indications or voice recordings. The computer provides the operator with an easily comprehensible menu and visualizes all the important information. This ensures that the operator has reliable and transparent control of the exchange of communications between the control center and the emergency telephone.

**Full compatibility with existing systems**

Another advantage of the Siemens emergency telephone system is that it can operate as an autonomous system or can be integrated into existing freeway management systems. It is compatible with other systems and can pass on emergency calls to higher-level control centers.

Optional features are an automatic announcement service (for road users when the operator is not able to answer immediately) and voice recording (manual or automatic recorders).
Traffic projects are increasingly being financed on a private basis. Appropriate systems are therefore needed for refinancing investments by means of tolls. Tolls are also a suitable means of financing public roadwork according to the principle of paying for use. However, to keep traffic flowing smoothly and to eliminate bottlenecks, new toll solutions must be created which are specially tailored to the needs of customers. Today, freeway operators can choose from among the following means of toll collection.

**Classic method of toll collection**
A ticket is issued at a tollbooth in each lane when a vehicle enters the freeway and a fee has to be paid when the vehicle exits the freeway. The complete toll ticketing system, including all the equipment such as barriers, signaling and payment systems, is installed by Siemens.

**Combined toll collection**
Classic toll systems are supplemented with automatic toll lanes. Motorists possessing a special pass are processed automatically as they drive through these lanes.

**Automatic fee collection**
The toll can be collected from passing vehicles over several lanes automatically, without barriers and without ticket handling. State-of-the-art technology identifies and classifies the motor vehicle according to the distance traveled and charges the appropriate fee.

Whichever of these solutions you choose we can supply you with fast, correct and easy-to-understand fee charging systems with user-friendly software.

Siemens can satisfy all your requirements, irrespective of the method of payment you decide on (credit cards, smartcards, cash payments in different currencies, prepay, postpay, etc.). The equipment is appropriately secured against misuse as regards both operation by personnel and use by the customer.

Siemens is your competent partner when it comes to planning, implementation, operation, service and retention of value.
Expertise in the provision of services is one of the reasons why Siemens enjoys the position it now occupies on the market. Siemens offers more than technology as far as intelligent traffic systems are concerned. From planning to financing, turnkey installations through to service, Siemens provides a cost-effective overall solution.

**Everything from a single source**

Our particular strength lies in the ability to provide comprehensive services at all levels of intelligent traffic systems. A partnership with Siemens gives you an option which no other competitor can offer on this scale: turnkey system solutions.

Planning, manufacture, installation, above-ground and below-ground construction work, warranty and spare parts guarantees, as well as HR management, financing and preparation of individual financing solutions are all part of the package of services provided by Siemens. And all this comes from a single source enabling you to meet whatever requirements you may have.

**The Siemens range of services includes:**

- Planning and engineering
- Financing and advice
- Modern products and systems
- Above-ground/below-ground construction work
- Service, maintenance and repair
- Training

**Siemens also offers:**

- Reliability backed by its comprehensive responsibility for complete systems
- Compatibility and system uniformity
- International expertise