SWARCO REFERENCES

SWARCO | The Better Way. Every Day.

SWARCO's leading idea is to improve quality of life by making the travel experience safer, quicker, more convenient and environmentally sound.

For this purpose, the Austrian traffic technology corporation produces and provides a large range of products, systems, services, and turnkey solutions in road marking, urban and interurban traffic control, parking, and public transport. Cooperative systems, infrastructure-to-vehicle communication, electromobility, and integrated software solutions for the Livable City are latest fields in the group's portfolio.

Our 5300 traffic experts are keen to shape together with you the transition from conventional traffic management to value-added services fit for the traveller in the digital age.

www.swarco.com







- 1 Urban Traffic Management
- 2 Highway & Tunnels
- Parking & Smart Charging 3

CONTENT

ONE BRAND ALL SYSTEMS

SWARCO Traffic Solutions.

SWARCO smart mobility solutions respond to the needs of society in the digital age and make the travel experience quicker, safer, more convenient and environmentally sound. With integrated and value added services derived from analytical methods based on high quality and trusted data sources. WE IMPROVE QUALITY OF LIFE....

SWARCO road marking solutions

...by showing the way worldwide and saving lives every day. With our high quality systems and services, we safely direct traffic from A to B, day and night. On all roads, in any weather. Today, SWARCO has grown into the world's largest system provider for road markings. Jump in and drive with us.

SWARCO smart charging solutions

...by providing fast and reliable charging solutions. With an easy-to-use charging infrastructure, convenient payment solutions, status information and route planning.

SWARCO urban traffic management solutions

• •

...by managing traffic as an integrated part of the city's transportation system to keep travelling convenient and hassle-free. With integrated systems for harmonizing traffic flows, prioritizing means of public transport, and with a special focus on bicycles and pedestrians.

SWARCO parking solutions

...by making parking a convenient and hasslefree experience. With integrated parking services, parking guidance systems, and an open platform to help people plan their travel, find alternative transport advice and inform them during the trip.

SWARCO highway and tunnel solutions

...by making highway traffic safer, more fluid, and more environmentally friendly. With integrated systems that quickly provide accurate, easy to understand and real-time information to travellers and operators.

.....



SWARCO is very much connected in the industry and cooperates with various partners and institutions to create the next generation of mobility management. New technologies, ranging from traffic light assistance systems to building more efficient and more reliable intersections, allow us to actively shape the future of mobility.

URBAN SOLUTIONS



SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

INTEGRATED TRAFFIC CONTROL CENTRE GET TO GRIPS WITH TRAFFIC WITH 24 LED CUBES

When the Hamburg police wanted to move the traffic control centre of the Hanseatic city from the 1990s into the new millennium, the project was officially put out to tender. With its innovative concept, SWARCO prevailed against seven competitors. What exactly was it about? Germany's port metropolis Hamburg was to be given a modern, intelligent traffic management system that would always provide a comprehensive overview of the traffic situation and an integrated operating system for all connected systems.

Put plainly: It must be possible to intervene in traffic at any time, to influence current developments and to guarantee maximum safety. Not least, the Hamburg system should continue to steer and control Hamburg safely in the future. This is also about a reliable power supply in order to avoid technical failures. It was also the customer's wish that the new traffic control centre should play all the parts ergonomically.

THE PARTICULAR CHALLENGE OF THE PROJECT

You guessed it: Just because Hamburg's traffic management is being adapted

to the state of the art, the traffic in the Hanseatic city will not stop! Quite the opposite: As a tourist magnet, the North German port city enjoys great popularity all year round, which is also evident on Hamburg's streets. Thus, the particular challenge of the project was to guarantee 100 percent availability of the traffic control center during the construction phase and to provide an interim solution for the operator workstations. SWARCO's solution: All workstations were moved to five compartments, the computers to a separate technical room. The control

and switching of the systems was guaranteed from beginning to end without interruption.

EYE-CATCHER LED VIDIWALL

As a long-standing partner of the City of Hamburg, SWARCO also impressed with its professionalism, innovation and reliability in this project, which was implemented by the general contractor SWARCO TRAFFIC SYSTEMS. Let's talk about some technical facts and figures: The eye-catcher of the new TCC is the 4 x 6 m LED wall, consisting

KEY FACTS

THE CHALLENGE

Modernize the traffic management system of the city of Hamburg while keeping up the operation of the traffic control center around the clock; Enable full integration of urban traffic, interurban and highway systems as well as Hamburg port

SERVICES

Design, supply, installation, system integration, TM subcenter integration, service & maintenance

TECHNOLOGY

INES for controlling 1,685 intersections, thereof around 300 running in Adaptive Network Control mode; Platform independent architecture; Multiconsoling technology enabling the integration of further systems as the police control center (HELS), the Federal Reporting Office (TIC) and the management program of the municipal traffic signal systems

PROJECT DURATION 2011 - 2013

of 24 LED cubes, for displaying and controlling the approx. 80 cameras installed in the entire city area. But all connected systems are also controlled via the integrated user interface: the traffic computer system with approx. 1,800 signal programs, the network and traffic control systems (NBA and VBA), a total of 16 LED display panels in the port area, and the tunnel systems in the city of Hamburg. Of course, all operator workstations are interconnected. This so-called multiconsoling means that any computer can intervene at any time: securely and quickly.



SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

INNOVATIVE TRAFFIC LIGHT SYSTEM DEPLOYED

On August 24, 2018, Kreis Kleve Bauverwaltungs-GmbH, together with the manufacturer SWARCO, put a novel traffic light control system into operation, setting new standards in terms of environmental friendliness. It is based on the intelligent SWARCO X-LINE platform.

The new traffic light control system regulates traffic at the intersection "Lindenallee / Merowingerstraße - Römerstraße". Compared to the predecessor system, the total energy consumption of the system can be significantly reduced.

When the modernization of the traffic light control system "Lindenallee / Merowingerstraße - Römerstraße" was due, the Kreis Kleve Bauverwaltungs-GmbH decided to take a big step. The aged bulbs in the signals were supposed to be replaced by LEDs. The choice fell on the latest generation of signals efficiently generating the necessary light: The former light bulbs were replaced by intelligent LED units that monitor themselves. This enables signal lights with a power consumption in the range of only 1 Watt.

The environmental friendliness results not only from the energy savings but also from the possibility of saving cables and copper. Both effects result from the concept of distributed intelligence that underlies SWARCO X-LINE. The control technology of a traffic light control system is no longer located exclusively in a control cabinet at the roadside, but distributed to control cabinet, pole and signal head.

The "SWARCO X-LINE" innovation therefore essentially comprises a completely new pole unit and low-energy

KEY FACTS

THE CHALLENGE

Installation of an environmentally friendly signalized intersection with lowest possible energy consumption while leveraging the existing cable network

SERVICES

Supply traffic light controller TLC, poles and traffic lights; Build and maintain entire traffic light controlled intersection

TECHNOLOGY

ACTROS traffic light controller based on SWARCO X-LINE technology platform; SWARCO FUTURIT traffic lights

PROJECT DURATION March - August 2018

signals specially designed for this technology. Both components can even be combined with existing traffic light controllers, allowing existing systems to be converted to "SWARCO X-LINE". Another advantage of this intelligent platform is the easy expandability of "SWARCO X-LINE" systems and the associated future-proofing.

THE CHALLENGE

Ensure that rescue services can pass intersections fast and safe with minimum impact on traffic

SERVICES

Integration of Roadside Unit (RSU) for each intersection and Onboard Unit (OBU) for each of the fire engines; Add a prioritization program to the intersection; Installation and maintenance service

> TECHNOLOGY ACTROS Traffic Light Controller with C-ITS/V2X extension

PROJECT DURATION September 2018 - April 2019



SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

GREEN WAVE FOR RESCUE SERVICES

FAST AND PROTECTED TRAVEL ACROSS INTERSECTIONS WITH C-ITS

In an emergency, every second counts: Firefighters and other rescue teams have to get to their place of work as quickly as possible. In a pilot project, the city of Ludwigsburg and SWARCO have successfully introduced the prioritization of fire engines at traffic lights. In contrast to previous systems, Ludwigsburg uses V2X communication (V2X = Vehicle to Everything). The fire engines communicate directly with the traffic lights by standardized short-range radio to provide free travel on the way to use. Overall, Ludwigsburg set the basis for intelligent traffic lights and digital traffic control technology to make traffic flow smoother and to reduce emissions.

Three firefighting vehicles are currently equipped with transmitters: the operations management vehicle, the firefighting vehicle and the environmental equipment vehicle. All three vehicles are usually involved a service case. The traffic lights along the B 27 were equipped from the junction "Markgröninger Straße" to the "Forum" building with the necessary antennas. They are able to receive the encrypted radio signals of the fire brigade.

Every second, the emergency vehicles send their position and speed directly to the traffic light controller. There, the signals are processed and compared with the scenarios stored in the programming. If the system detects an approaching emergency vehicle, the programmed signal sequence is started: The traffic light controller switches to the prioritization program. Once the firefighters have passed the intersection, the traffic light controller switches back to normal as quickly as possible to minimize traffic disturbance. As a result, the "green wave" for the firefighters is established fully autonomously, using the SWARCO C-ITS Emergency Pre-emption.

For many years, SWARCO has been

driving the roll-out of intelligent transport infrastructure for connected, cooperative and automated driving. The fire department prioritization is a first practical application of the underlying V2X technology.

SWARCO is a partner of the innovation network "Living LaB", in which the city as well as partners from business, industry and research institutions work together in a unique and cooperative manner. Innovative technologies can be tested and developed under real conditions. This benefits the city of Ludwigsburg, its citizens and its network partners.

THE CHALLENGE

Interaction of different systems to represent and analyze the relationship between pollution and actual traffic volume

> SERVICES Planning, execution

TECHNOLOGY 3 Gecko2 Traffic traffic monitoring stations, SWARCO Cloud integration

> PROJECT DURATION 2017 - 2018



SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

TRAFFIC DATA COLLECTION WITHOUT DATA JAMS WITH GECKO2TRAFFIC

The Hessian State Agency for Nature Conservation, Environment and Geology (HLNUG) would like to analyze the relationship between pollution and the actual traffic volume. SWARCO offers the right networked technology for this: the Gecko2Traffic traffic monitoring station in conjunction with the SWARCO Cloud. Limburg an der Lahn is a city with one of the highest nitrogen dioxide concentrations in Germany. The objective was to measure the volume of traffic responsible for the high pollution levels both in and out of the city by quantity and type. For this purpose, three Gecko2Traffic traffic monitoring stations were set up in the immediate vicinity of an existing HLNUG environmental monitoring station. The collected traffic data (8+1 classification according to TLS BASt) will be compared with those of the environmental monitoring station.

The result: A direct relation between the measured values of the environmental measuring station (pollutant load) and the actual traffic volume (quantity & type) could be established and analyzed

FROM THE ROAD DIRECTLY INTO THE SYSTEM

However, for traffic data to be comparable with environmental data, the data must be provided at a certain aggregation and time interval. This is managed by our partner company A-I-P (Ambient Information Processing GmbH) from Vienna. The operators of the HLNUG's environmental data evaluation platform simply collect the

traffic data from the SWARCO Cloud and transfer it to the HLNUG's environmental measurement system.

GECK02TRAFFIC DOES EVERYTHING AGAINST DOWNTIMES

For example through automatic evaluation and analysis: Using web-based access via a browser, traffic data can be retrieved at any time from a PC/notebook or mobile device. In addition, Gecko2Traffic has an autonomous power supply (rechargeable battery, solar) and data transmission via mobile radio, eliminating the need for time-consuming cabling and connection work. Gecko2Traffic counters can also

be used very flexibly and can be moved to another location without great effort. And there is no need for time-consuming commissioning. The device is simply registered in the SWARCO Cloud using a mobile phone (QR code) and is immediately ready for operation. The result is low costs for maintenance and operation. With Gecko2Traffic, SWARCO was able to quickly offer its customers a concept meeting all requirements with regard to the connection and compatibility of data output to the HLNUG's environmental measurement system. After all, our customers, their work flow and their data should never be held up pointlessly.



THE CHALLENGE Optimize the cycling network, reduce travel times and increase the safety of cyclists

> SERVICES Plan and install a Green Wave for cyclists

TECHNOLOGY Automatic detection consisting of 8 thermal imaging cameras and 11 induction loops

> PROJECT DURATION 2017 - 2018



SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

BICYCLE WAVE FOR OBERHAUSEN

The city of Oberhausen in the Ruhr area already had a well-developed network of cycle paths, which has now been decisively optimized. With SWARCO's socalled "Radwelle Oberhausen", cyclists can now reach their destination even faster and safer. Well-marked cycle paths meander through the entire urban area of Oberhausen so that every corner can be easily reached on two wheels. Nevertheless, the people of Oberhausen preferred to get into their cars or use public transport. Why? The traffic lights were mainly optimized for public transport - so cyclists had to wait a long time. In order to make cycling more attractive and to increase the proportion of cyclists, waiting times had to be significantly reduced. As one of the most important customers of SWARCO Traffic Systems, Oberhausen also relied on the expertise of SWARCO in this case. As all the traffic light systems came from SWARCO anyway, they could be converted at low cost.

CYCLISTS SEE GREEN

The main cycling route network of the city of Oberhausen covers 67 km with a total of 191 traffic light systems. The aim now was to significantly improve the switching at the individual junctions for cyclists and thus increase comfort. The SWARCO solution: With the help of automatic detection - consisting of 8 thermal imaging cameras and 11 induction loops - cycle traffic is accelerated by cyclist pre-detection. Detectors enable intelligent control of signaling systems. This means that

as soon as the cyclist approaches the traffic light, it switches to green or - if it was already green - the green phase is extended. This keeps the cyclists in the flow, making them faster and bringing them more comfortably and safely to their destination. They don't have to press any buttons at the traffic lights and don't have to stop and start all the time.

PR FOR A WAVE OF ENTHUSIASM

The main advantage of the Green Wave is a significant increase in the attractiveness of the cycling network.



This results in a reduction of CO2 emissions, which in turn benefits the environment and quality of life. Not to forget: The shortened waiting times also led to a reduction of the number of red light violations and thus improved general road safety. In Oberhausen, SWARCO not only impressed with its extensive technical know-how, but also supplied the complete PR package: 80 posters, 10,000 flyers, 1,000 stickers, 3 PVC banners, 1,000 saddle covers, 2 displays, 2 beach flags and above all the name and logo of "Radwelle Oberhausen".

THE CHALLENGE

Enlarge the automated traffic management system to more than 90 intersections including implementation of a CCTV and VMS system

SERVICES

Design, supply, installation and maintenance of a fully adaptive urban traffic management system

TECHNOLOGY OMNIA ITS integration platform featured with UTOPIA adaptive traffic control strategies; MISTIC infomobility platform & VMS management; ITC-2 traffic controllers

PROJECT DURATION 2012 - 2014



SWARCO TRAFFIC MANAGEMENT - URBAN SOLUTIONS

AUTOMATED TRAFFIC MANAGEMENT FOR THE CITY OF SKOPJE

The City of Skopje decided to extend and upgrade the overall traffic management system and applied for a loan from the EBRD. The funding enables to create a new Automated Traffic Management System (ATM) for more than 90 intersections in the city with the aims of optimizing individual trip times, improving traffic safety and reducing emissions and fuel consumption. To support this sustainable urban mobility plan, SWARCO implemented a fully adaptive system (OMNIA/UTOPIA) that monitors and manages traffic signals at 94 intersections across the city of Skopje.

PROJECT SCOPE

The SWARCO solution utilizes e.g. up to 80 ITC-2 traffic light controllers, 850 inductive loop vehicle detectors, a fiber optic cable network of approximately 50 km, a closed-circuit television (CCTV) traffic monitoring system with 51 cameras and five overhead variable message signs (VMS). The project was successfully implemented and the system harmonizes traffic conditions on real-time basis. The winner is the city of Skopje, benefitting from reduced emissions and better traffic flows.

HIGHWAY & TUNNELS



SWARCO's dynamic guidance systems help keep traffic in motion on highways and expressways, providing orientation and timely warnings, avoiding congestion, reducing emissions and informing about alternative routings and speed limits. Safety is particularly important when it comes to tunnels. SWARCO offers integrated systems that manage both the operation of tunnels and the traffic passing through them.

HIGHWAY & TUNNEL SOLUTIONS

Bavaria / Schleswig-Holstein Germany



SWARCO TRAFFIC MANAGEMENT - HIGHWAY & TUNNEL SOLUTIONS

GOODS TRANSPORT CHECKPOINTS: PILOT PROJECT FOR SAFE TRUCK CHECKS

The Federal Office for Goods Transport (German: BAG) is making an important contribution to traffic safety, environmental protection and tax collection by conducting road, tolling and operational inspections on German motorways and highways. In these inspections, individual trucks are prompted to leave the motorway by being flagged down manually by BAG employees on site to the parking lots used for this purpose. This not only requires a high number of staff, but also represents a serious safety risk. Automating the process can reduce personnel and, above all, ensure safer working conditions for those involved.

AUTOMATED SYSTEM WITH NUMBER PLATE RECOGNITION (ANPR), SOFTWARE AND PROGRAMMABLE VMS

The BAG pilot systems are being implemented in 5 lots at different times. With one check-point on each of the Federal motorways, the A1 (Schleswig-Holstein). A2 (North Rhine-Westphalia), A3 (Hesse), A9 (Bavaria) and A10 (Brandenburg). At four locations ahead of the checkpoints. ANPR cameras capture the license plate and country code of vehicles as they drive by. A

video camera shows the detected vehicles in their lane.

The data is transmitted to the intelligent outstation on the parking lot of the BAG checkpoints using wireless technology or fiber optic cables. This information is forwarded by W-LAN to the BAG employee's laptop and displayed in the browser-based software.

The software helps the BAG employee to select the vehicle that has to be diverted for inspection - in advance and at a safe distance. The

KEY FACTS

THE CHALLENGE

Implement a modern software solution for automated diversion of trucks, buses or cars (individually or groupwise)

> SERVICES Planning, execution

TECHNOLOGY

Development of a customized central controller software for the operation and visualization of a diversion system; controller & interface according to TLS 2012; LED matrix signs; prism technology signs; preparation to connect the outstations to the central system of the federal state (A1 & A9)

> PROJECT DURATION July 2017 - ongoing



corresponding license plate number will automatically be transmitted to the freely programmable LED sign, prompting the driver to exit to the checkpoint. As well as prompting individual vehicles, other vehicle types such as trucks, buses or cars with trailers can also be requested to exit. Another video camera at the LED sign monitors the procedure.

The whole system does not require powerful servers, but simply runs on an industrial PC with a touch panel and integrated browser and a standard communication & controller module.



SWARCO TRAFFIC MANAGEMENT - HIGHWAY & TUNNEL SOLUTIONS

TUNNEL MANAGEMENT SYSTEM TO RELIEVE DOWNTOWN

SWARCO equipped the Carmel Tunnels of Israel's 3rd largest city with new hardware and software – now travel times are reduced and better safety for road users is ensured.

The old part of Haifa with port and major business districts is located on a narrow strip beneath the 550 m high Mount Carmel. To relieve traffic-congested downtown Haifa and to provide an alternative to driving up and across Mount Carmel and so the Carmel Tunnels Project was started. SWARCO acted, together with Partner Menorah Izu Aharon in Israel, as system integrator and coordinator.

PROJECT SCOPE, CHALLENGES AND GOALS

The project consists of two sets of twin tunnels, the 3.5 km long western and the 1.6 km long eastern set, with two lanes of traffic in each tunnel and four portals. The entire project is 6.5 km long and includes 5 conventional bridges, 6

segmental bridges and 11 km of roads. Using the tunnels, which require a paying toll, cuts the current travel time from the Haifa South interchange in the west to the check post interchange in the east from 30-50 minutes down to 6.

CENTRAL SYSTEM FOR CENTRAL MANAGEMENT

The project includes the complete tunnel management system with a central software and 27 outstations. The central

software allows control of all tunnel systems by means of a visualization screen. All information is available all the time in one overview. The tunnels are monitored from the tunnel control center in Krayot. Furthermore, the system is connected with the facility management system (FMS) including fire detection, electrical control, light control and ventilation control. This safety feature reacts in case of an alarm e.g. fire with predefined measures such as tunnel closure.

KEY FACTS

THE CHALLENGE

Reduce traffic congestion for downtown Haifa, optimize travel time for road users

SERVICES Project coordination, system integration

TECHNOLOGY

PRIMOS® central system software for common MMI; variable routing signs in prism technology; VMS / lane control signs in LED technology

PROJECT DURATION 2009 - 2010

PROJECT SCOPE: central control software; 27 outstations; 4 internal variable message signs (LED); 73 lane control signs; 4 prism openers for variable routing; 46 double induction loops; 84 traffic detection cameras; 8 PTZ cameras;18 corridor motion detection cameras; 9 routing and blocking barriers; 2 overheight controls; 144 emergency roadside telephones

Gotthard Tunnel Switzerland



SWARCO equipped the Gotthard road tunnel (motorway A2) with new hardware and software – efficiency increased with EffiGo integration into the operational management level and a new operating concept are included. The Gotthard Road Tunnel in the Swiss Alps is one of the narrowest arteries on the transit corridor between North and South Europe. 17km long, it is also among the world's longest road tunnels with bi-directional traffic. The tunnel traffic control had been completely renovated between 2003 and 2005 by SWARCO's former subsidiary Weiss-Electronic GmbH. In the course of several extension works the traffic control system was prepared for an integration into the operational management level (BLE TINWUR) of the cantons of Tessin (TI), Nidwalden (NW) and Uri (UR) with subsequent BLE network integration of all traffic computers.

OBJECTIVES. CHALLENGES AND TO-DOS

As the operators were very satisfied with the functionalities and reliability of the traffic management system, they chose SWARCO again in 2014 to increase the efficiency by integrating the Gotthard system into the superior BLE. This required the simplification and adaption of the software architecture to cope with

the other devices of the BLE. Further action points: Cancel the separation of the northern ramp so that the separate master computers are no longer needed. Their functionality is then handled by the tunnel master computers, creating a redundancy set-up. Moreover the outdated computer hardware had to be replaced and the entire group level of redundant servers reshaped to redundant KRI2B.

INNOVATIVE AND RELIABLE MMI SOLUTION

The heart of the traffic control system was not modified since it had been working fine. However, there was improvement potential for the user interface. The original one was developed with Java applets, which were no longer viable due to the number of possible different versions. Therefore



KEY FACTS

THE CHALLENGE Improve efficiency of 24-hour operated tunnel traffic management

SERVICES Planning and execution

TECHNOLOGY PRIMOS[®] central control system software with customized innovative features for future-ready tunnel traffic management

PROJECT DURATION 2014 - 2015

a completely new MMI (Man Machine Interface) was developed, exclusively based on HTML and Java Script and adapted to the "Look and Feel" of the other BLE components. Moreover the following hardware was installed within the project: 2 master computer systems incl. web server, 2 emergency computer systems incl. web server, 10 group computers with 20 servers, 83 substations to control some 500 traffic.

Munich



SWARCO TRAFFIC MANAGEMENT - HIGHWAY & TUNNEL SOLUTIONS A 99 MUNICH RINGROAD SMOOTHLY RUNNING MOTORWAY TRAFFIC

The A99 motorway, also known as the Munich motorway ring, is Bavaria's busiest motorway. To prevent traffic from coming to a standstill during the expansion, SWARCO was commissioned to carry out the adaption of the traffic control facilities. An average of 160,000 vehicles per day - with an upward trend: a good reason to expand the Aschheim/ Ismaning junction and, at the same time, to adapt signposts, sections with flexible release of the hard shoulder and the associated video components. The aim of the project was to prepare and re-use traffic system components wherever possible and to maintain the hard shoulder use during road construction and facility conversion works.

A ROUND-UP OF THE SWARCO SOLUTION

The affected section of the motorway guidance system comprised of a bidirectional carriageway, each with three lanes, and the hard shoulder, which was also used during the construction work for temporary release during peak traffic hours. In the course of the work, the overhead signs of the Aschheim/Ismaning junction were dismantled and rebuilt in line with the relocated junction. The gantries were also adapted to the changed requirements. The release runs for use of

the hard shoulder also had to be adapted to the new location in cooperation with the traffic computer center. In addition, the video cross-sections were also adapted to the changed locations and visibility conditions.

OUR SCOPE OF WORK

1. Dismantling, building and if necessary interim storage, refurbishment and re-installation of: 10 new gantries, 2 refurbished cantilevers, 5 over-head routing signs (refurbished), 1 new overhead routing sign, 28 new

KEY FACTS

THE CHALLENGE

Keep traffic in motion during construction work, wide re-use and refurbishment of existing motorway guidance system components

SERVICES

Design, supply, installation, commissioning, maintenance

TECHNOLOGY

PRIMOS® road station TLS 2012. traffic guidance panels (prism and LED)

> PROJECT DURATION 2014 - 2016

variable message signs in LED technology, 4 traffic rerouting panels (rotating prism and LED technology), 8 video cameras (refurbished)

- 2. Delivery and installation of:
- 11 new outstation in line with TLS 2012.
- 11 control cabinets
- 3. Installation of all set-up devices

Thanks to SWARCO's solution traffic was largely running smoothly, taking away stress from the motorists and reducing costs for our customer.



SWARCO TRAFFIC MANAGEMENT - HIGHWAY & TUNNEL SOLUTIONS

TOP LEVEL TUNNEL CONTROL FOR BIELEFELD

Premiered in the "Ostwestfalentunnel" in Bielefeld, North-Rhine Westfalia, operations control and traffic control were combined on a redundant computer system. When developing the PRIMOS® TUNNEL CONTROL system, SWARCO took care of the following requirements: Browser-independent web visualization and international language selection; Tailor-made customized solutions with scalable modular system architecture and open interfaces and SPS solutions independent of the supplier; Easy integration of objects by text-based description of logical process chains, i.e. no binary content or cryptic abbreviations; High degree of availability by failover systems and redundancy (hot standby); No dependency on licenses from other

suppliers; Adaption of the look and feel of the visualization in line with customer wish. The system fulfils the highest data security standards. SWARCO replaced an existing SCADA system with its object-orientated system handling and controlling operations and traffic. This includes the traffic installations, emergency systems such as fire alarm, fire-fighing water supply, emergency call, escape route identification, communication equipment

such as tunnel radio, loudspeakers, videosystem as well as general operating devices such as lighting, ventilation, de-watering, energy supply, building technology, IT communication with network and router. The integration of the sub-systems was done by means of a central SPS. SWARCO's responsibility was to implement a data point server, an interface application with own data management to connect to external systems, such as SPS's,

cameras, and emergency telephones. The application can be easily expanded through plug-ins (clients), whereas each plug-in represents the connection of an interface. In Bielefeld the existing facility was replaced in several stages, still allowing the operation via the old system and the new SWARCO technology. This was very helpful when carrying out extensive functional testing and in making the operators getting used to the new situation.

KEY FACTS

THE CHALLENGE Need for a single system to manage traffic control and operations

SERVICES Planning, execution

TECHNOLOGY PRIMOS[®] Tunnel Control central software

PROJECT DURATION December 2016 - December 2017

The old operating technology was finally switched off in December 2017. when the new control computer of the firebrigade's coordination center was up and running. SWARCO PRIMOS® TUNNEL CONTROL is considered as an innovative milestone and important extension of the group's portfolio, allowing the complex management of traffic control and operational control in a single system.

PARKING & SMART CHARGING SOLUTIONS



We at SWARCO understand parking management as the implemen-

PARKING & SMART CHARGING SOLUTION

No matter how our vehicles will be powered in the future, the car will remain a form of personal transportation that offers its owner the freedom to travel when and where they want, in a way that public transport finds it almost impossible to rival. While in the future cars may be shared and able to carry out quite complex tasks autonomously, they will still need to be stored safely.

THE CHALLENGE

Create a modern parking guidance system for efficient use of existing parking spaces

SERVICES Planning and execution

TECHNOLOGY

29 dynamic LED parking guidance signs, VMS at 5 different locations for special announcements, data transmission via GPRS, no on-site computer necessary due to SWARCO solution with virtual parking guidance by software as a service

> PROJECT DURATION April - September 2014



SWARCO PARKING SOLUTIONS

THE EASE OF PARKING A CASE FOR SOFTWARE AS A SERVICE

Bergisch Gladbach - not only is the city itself is highly worth seeing, but also the new parking guidance system from SWARCO. Thanks to variable message signs, the search for a parking space is very clear and simple.

"Welcome to Bergisch Gladbach" is displayed in yellow text on the LED display as you drive into the pretty district town about 10km from Cologne. The variable message signage is part of SWARCO's modern parking guidance system - with the aim of making better and more efficient use of existing parking facilities.

DYNAMIC AND UP-TO-DATE INFORMATION

The new dynamic parking guidance system from SWARCO integrates 8 parking facilities. A special feature is the public car park "Schnabelsmühle", in which entering and exiting vehicles are recorded with video technology. A total of 29 VMS permanently show the current status of available parking spaces. These VMS also include 5 variants with two-line information on the display. Here you can also get information about local events, news and much more.



SWARCO PARKING SOLUTIONS

PARKING GUIDANCE SYSTEM FOR GERMANY'S FORMER CAPITAL

The federal city of Bonn is one of the twenty largest cities in Germany with a population of approximately 330,000. As the main center of the Rhineland metropolitan region and an important center of science, Bonn faces a high volume of commuters and visitors. The location of Bonn situated on both sides of the Rhine intensifies the traffic situation, especially on the three bridges crossing the Rhine. The city of Bonn was therefore looking for a guidance system that would not only educe parking search traffic, but also provide traffic information and guidance. REAL-TIME OVERVIEW

To be able to react flexibly to the traffic situation, SWARCO installed a system which includes 32 full-graphic, fullcolor LED matrix displays (dynamic parking guidance signs) to provide real time overview of the parking situation. In addition to displaying the current parking situation, these displays offer maximum flexibility and are i.e., also used to indicate traffic incidents, the environmental situation or rescue operations. The dynamic displays are complemented by 18 static parking guidance signs for route guidance in the city center area.

FLEXIBLE TRAFFIC CONTROL

The parking guidance computer is implemented as a virtual server in the data center of the city of Bonn and has interfaces to the traffic control computer, the Bonn fire department control computer as well as to the servers of the parking garage operators. The software is based on the proven ParkLine web software with a fully graphical, intuitive web interface. An additional module for flexible traffic management has been integrated in the form of a scenario manager. Adding to the information from the parking guidance system, the interface also

KEY FACTS

THE CHALLENGE

Providing a turnkey PGS that reduces parking search traffic and at the same time provides traffic information and guidance, data transfer from 14 parking facilities

SERVICES Complete project planning and execution, delivery of a turnkey system

TECHNOLOGY

Parking guidance software, scenario manager, LED RGB matrix displays, static directional signs

PROJECT DURATION 2020 – 2021

displays the traffic situation in real time. Using the interfaces to the servers of the parking garage operators in Bonn, the PGS additionally gathers the occupancy data from all parking garages in Bonn city center, district Beuel and the parking garages of World Conference Center Bonn.

THE CHALLENGE

Implement a powerful EV-charging system without the need to upgrade the grid or transformers. Mainly make use of the renewable energy available on site.

SERVICES

Installation and commissioning of a high-performance charger with battery booster. Remote monitoring, regular service, and maintenance of the equipment.

TECHNOLOGY

Charging station consisting of one battery booster pack of 140 kWh capacity and two dispensers for connecting electric vehicles via CCS-Plug. The battery booster is connected to the grid via 50 kW AC. The lithium-ion batteries and charging cables are liquid cooled to guarantee a consistent peak performance of the equipment for many years.

SWARCO MyCharge Control as a technical backend for monitoring the devices and offering a world class service in case of any problems concerning the charger.

PROJECT DURATION 2022 and ongoing services

SWARCO SMART CHARGING SOLUTIONS

CAR SERVICE AND GAS STATION

Bernd Goldhammer GmbH is a long-established car service provider and car dealer near Cuxhaven, at the North Sea coast of Germany. The company provides a gas station for fossil fuels and offers repairs and car servicing with partnering to the Ford motor company. In the upcoming years, more and more electric and hybrid vehicles will drive on our roads. Therefore, Goldhammer decided to invest in electric vehicle charging infrastructure to make the transition to clean energy and revitalize his business. On site, Goldhammer has some storage facilities and a workshop, both of which have been equipped with solar panels recently. In addition, due to the location at the North Sea, a lot of wind energy is available at the site. The customer needed a powerful EVcharging system to charge one or two cars at an output of about 270 kW DC, without the need to upgrade the grid or transformers. The system should use renewable energy from the solar panels on site and, if necessary, from a gaspowered generator.

SWARCO provided the customer with a high-performance charging system (hypercharger). The project included the installation and commissioning of a high-performance charger with up to 270 kW DC. SWARCO now provides regular service and maintenance of the equipment as well as a remote monitoring service via SWARCO MyCharge Control (CPO) to keep this sophisticated product up and running. A later upgrade to payment services is likely once the offering is established. The project was fostered by funding from the regional government of Lower Saxony.

Cuxhaven Germany

SWARCO SMART CHARGING SOLUTIONS

PROGRESSIVE E-MOBILITY INFRASTRUCTURE FOR HAGEMEISTER GMBH & CO. KG

With around 200 employees, the brick-producer Hagemeister enables better living and working environments for all people. Hagemeister manufactures façade bricks, pavers and other clay building materials of outstanding quality. Every year more than 6000 living environments are designed with the durable and beautiful Hagemeister products. The main task in this project was to implement the ever-growing desire for clean mobility at Hagemeister. Not only customers and guests of the permanent exhibition, but also the employees and a local EV sharing company would like to use the Hagemeister charging stations. Different billing methods and means of payment are to be implemented. SWARCO provided Hagemeister with the SWARCO CPO backend "MyCharge Control" for the technical monitoring and control of the charging infrastructure on site. For easy billing and payment of charging services, SWARCO also provided the SWARCO EMP backend "MyCharge Pay". With the backend, billing can take place with or without a customer account and Hagemeister itself does not have to take care of the billing processes.

Hagemeister will further expand the solution at the Nottuln site after the positive experience with the first devices.

KEY FACTS

THE CHALLENGE

Establish a reliable and easy-to-use charging system for customers, commuters, the public, and an e-car sharing provider at the production site. The system must be able to map the various use cases and bill them accordingly.

SERVICES

Planning, installation, and operation of charging infrastructure, including billing of employees and external third parties.

TECHNOLOGY

AC charging stations with meters that comply with German calibration regulations, backend connection to SWARCO CPO backend "MyCharge Control" and SWARCO EMP backend "MyCharge Pay" via 4G modem.

PROJECT DURATION 2021 and ongoing services

THE CHALLENGE

Design and implementation of a modern parking guidance system for a large automobile manufacturer

SERVICES

Development, planning and execution including civil works and cabling

TECHNOLOGY

Parking guidance central computer, data collection at 6 parking facilities by means of energy-autonomous ParkHere sensors, data processing of single-space monitoring equipment, 7 dynamic parking guidance boards

> PROJECT DURATION 2017

SWARCO PARKING SOLUTIONS

DYNAMIC PARKING GUIDANCE BETTER ORIENTATION FOR PORSCHE EMPLOYEES

Dr.-Ing.h.c. F. Porsche AG operates its development centre in Weissach, 30 km west of Stuttgart, with around 6,500 employees. There is an ongoing search for parking spaces by employees in the company's own parking garages and parking lots, particularly at the start of the working day. Timely information about available parking spaces reduces search traffic and stress in the morning. SWARCO successfully implemented more than 20 parking guidance systems in Germany during 2017. New installations, maintenance of existing systems with signage and computer upgrades and numerous extensions fell to the experienced team based in Gaggenau near Karlsruhe.

BETTER ORIENTATION FOR THE EMPLOYEES

Sports car manufacturer, Porsche AG is a prominent customer who ordered dynamic parking guidance systems for their development center in Weissach and the headquarters in Zuffenhausen. The expansion of the main factory also led to an increased need for parking spaces. In a first phase, new car parks were built and equipped with eleven dynamic parking guidance signs at the entrances informing about the current occupancy. Meanwhile a second construction phase started, putting up signs in the city area of Stuttgart to inform Porsche employees at an early stage which road to take to the next free

parking house in Zuffenhausen.

A COMPLETE PACKAGE

In Weissach seven sign posts indicate the availability of free parking spaces. This is either assessed by counting the difference between cars entering and cars leaving or by a single space monitoring system. SWARCO was responsible for the entire parking system including civil engineering work, production of dynamic signs, installation, commissioning and data transmission via GPRS. There are new, extended requirements for parking guidance systems such as: - Hosted parking guidance centre (Software as a Service)

- Integration of parking spaces with charging stations for e-vehicles - Parking space reservation option before starting the trip - Personnel number related single space monitoring for employees - Integration of single space monitoring systems of car parks into citywide parking guidance systems - Communication of car park occupancy data on the internet and as smartphone app - Integration of full matrix LED information boards - Control of bollards to restrict parking spaces and sensitive city areas - Connected mobility integrating public

transport and park & ride facilities.

countries.

From Vienna to Oslo, from Dubai to Sydney, from Cape Town to São Paulo: SWARCO products, systems and services keep traffic in motion in over 80 countries around the world.

percent. LED light sources in SWARCO traffic lights

consume up to 95 percent less energy than conventional incandescent bulbs, thus reducing CO2 emissions and saving operating costs.

mobility Our 5300 employees around the world

experts.

are people on a mission: They support our customers in delivering safe, modern and environmentally sound mobility to the roads.

millicandela.

Our high-performance SWARCO SOLIDPLUS glass beads achieve stunning retro-reflective values of up to 1200 mcd/m2*lx. This is topping the values of standard products five to six times.

NUMBERS SPEAK LOUDER THAN WORDS. Facts and figures from the world of SWARCO.

1,000,000,000€

for a major leap in net sales. The group turnover is about to pass the 1bn \in threshold soon.

1,001,850 kilometers

Our annual road marking materials production suffices to equip over a million kilometers of roads, which is equivalent to a journey 25 times around the globe And this number keeps growing every year.

century. Our history began in 1969 with the production of reflective glass beads. Half a century later, SWARCO is among the world leaders in road marking and intelligent traffic management.

