

DRIVE ON

THE CORPORATE MAGAZINE OF THE **SWARCO GROUP**

01/18

WE IMPROVE QUALITY OF LIFE
BY MAKING THE TRAVEL EXPERIENCE
SAFER, QUICKER, MORE CONVENIENT
AND ENVIRONMENTALLY SOUND.

INTERVIEW WITH SWARCO'S COO'S

INTERSECTION OF THINGS

TRAFFIC SIGNAL CONTROLLED
INTERSECTIONS GET SMARTER
WITH SWARCO

SWARCO UV-LINE

A NOVEL FAST-CURING
MARKING SYSTEM FOR
INDOOR APPLICATIONS

SWARCO

AN ATTRACTIVE
PLACE TO WORK





TOMORROW'S TRAFFIC SOLUTIONS TODAY

Your traffic control systems need to communicate with one another to manage transport networks efficiently and intelligently. After all, you want to enhance safety for all road users over all modes of transport in a cost-effective way because you have to control your city's traffic like a conductor controls an orchestra. And you need this symphony of solutions now. So talk to us today.

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INTERSECTION OF THINGS

TRAFFIC SIGNAL CONTROLLED INTERSECTIONS GET SMARTER WITH SWARCO

At today's intersections, traffic lights are controlled by a traffic light controller via an electrical interface. This results in traffic lights with little maintenance efficiency. Additionally, value added functionalities cannot be implemented, and energy efficiency still has room for improvement. With the advent of cost-efficient and reliable field level communication networks, a next step is to introduce an electronic interface between traffic lights and the controller. The SWARCO LINE TECHNOLOGY is based on CAN (Control Area Network) and includes additional safety measures. Each traffic light and traffic controller are designed in such a way to meet the demanding safety requirements of the EN12675, EN 61508 and EN 50556 international standards.

Manuel Milli, SWARCO Solution Manager Smart Mobility and Urban Traffic Control, knows that at its core the new system required developments in three fields: signal heads as part of traffic lights, the traffic controllers, and the interface between both. Not to mention partnering activities with other actuators like signals for blind people or sensors (loops, video, radar). "The CAN protocol has mainly been used in the automotive industry for time critical and reliable applications", says Milli. "Consequently, it is a well-suited basis for controlling signal heads." The distributed architecture includes a main controller unit in charge of control and central power switching and the number of pole controllers for distribution of power and data communication to other components

of the platform. The 'intersection of things' offers a variety of new applications for different stakeholders, i.e. a system integrator of the equipment, an intersection operator, and a road user.

OPEN INTERFACES FOR SMOOTH INTEGRATION

The specification of the CAN-based interface is open for any integrator. The idea is to have a set of mandatory commands (e.g., switch on signal head) to guarantee interoperability among different vendors and system integrators. On the other hand, project-specific requirements can be met by introducing optional commands.

EFFICIENT MAINTENANCE

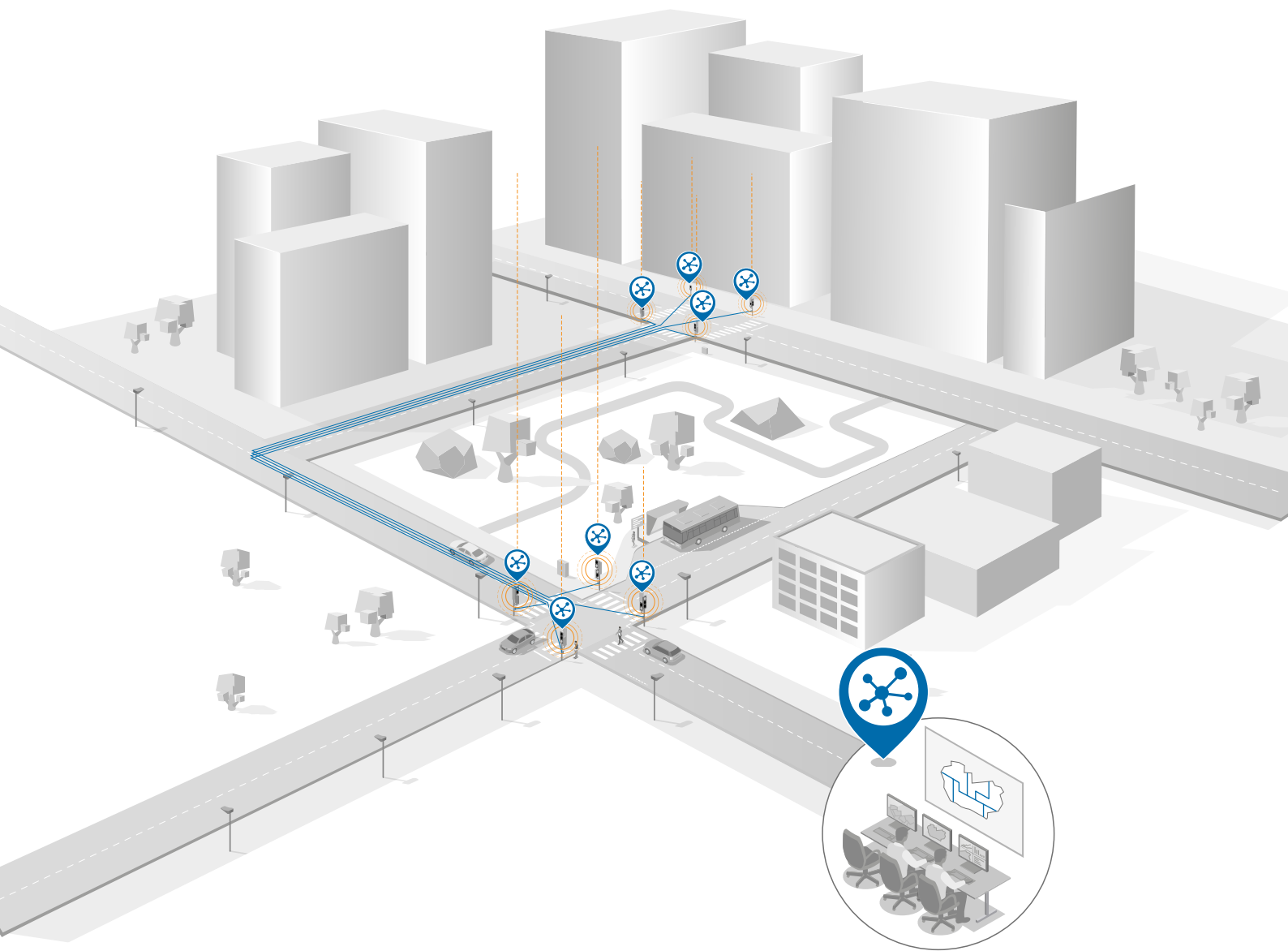
Traditional signal heads controlled via an electrical interface can only indicate if they are currently working or not. The new solution offers the possibility to retrieve detailed information on a critical failure in the signal head. Non-critical failures and minor incidents can also be reported. Consequently, instead of periodic maintenance, predictive and event-triggered activities are possible. Finally, the functionality can be enhanced, applying service patches remotely via a firmware update.

INCREASED ENERGY EFFICIENCY

In traditional systems, the electrical interface between the traffic light controller and signal head uses the consumed energy as an indicator of whether the signal head works or not. Even in the deactivated mode (i.e. signal off), the power loss is about 6 to 5W depending



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on the geographical region. The electronic interface enables a dramatic reduction in power loss to 1 or 2W, which results in increased energy efficiency. Moreover, due to minimal power consumption of LEDs, electrical disturbances on the line can be eliminated and the supervision is more robust.

INCREASED SAFETY LEVEL AND UP-TIME

Firstly, the solution is fully compliant with the requirements of EN61508, SIL 3, i.e. the system's residual failure probability rate is at least below 10^{-7} failures per hour. As a result, the platform contributes significantly to

ensuring that traffic safety at the intersection is inherently safe. Secondly, the platform not only mitigates the risk coming from dangerous failures (i.e. failures comprising the safety integrity of the equipment), but also handles non-dangerous failures with high occurrences resulting in very high reliability and availability with extremely limited downtimes.

The 'intersection of things,' with its CAN-based network and full compliance with product and safety standards, enables new services and supports the concept of Internet of Things (IoT). In addition to signal heads, any sensor (detectors, air quality sensors,

etc.) can be connected. Therefore, more data elements are collected, and services based upon these may be implemented. Moreover, connected intersections are a key element in making the infrastructure ready for connected and automated driving. Retrieving data elements from connected sensors with very low latency and bringing them to bypassing vehicles, may help to increase the situation awareness of the automated vehicles. For the time being, automated vehicles with state-of-the-art sensor technology are not able to recognize the current situation at an intersection and react to critical situations in a very short time frame.

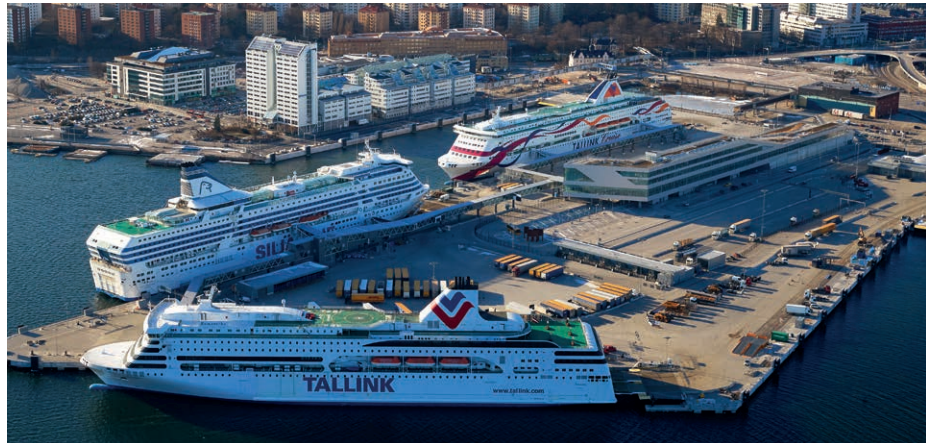
OPTIMIZING THE HANDLING OF TRAFFIC IN PORTS

SWARCO PORT CONTROL SYSTEM INCREASES EFFICIENCY IN STOCKHOLM HARBORS


Between 2013 and 2016, two of the ports in Stockholm were rebuilt, and SWARCO Port Control systems were installed to optimize the port area with improved traffic flows and convenient handling of trailers. “The port in Stockholm city center, Värtahamnen, is now a more efficient and environmentally friendly port with 5 quays and a modern passenger terminal”, says Anders Jonsson, manager of SWARCO’s traffic division in Sweden. Värtahamnen was moved further out into the water, and the city of Stockholm reclaimed large parts of the area that Ports of Stockholm previously managed. Now there is more space for the city to develop with new homes and workplaces, and the port can manage more vessels and traffic on a smaller area.



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The SWARCO Port Control System (SPCS) is a modern Intelligent Transport System that provides flexibility for a Roll-on-Roll-off terminal. The main concept is to create a good logistical flow while not compromising any of the strict security requirements. This is achieved by utilizing Automatic Number Plate Recognition (ANPR), barriers, length and height measurement, variable message signs (VMS) and automatic damage control of trailers. SPCS keeps track of where the vehicles and goods are at any given time. The system can also notify internal and external partners about the location. At the port entrance, the booking of the vehicle is checked, using ANPR and scanning to measure length and height. If the reservation is correct, the barrier opens and the vehicle is guided to the correct waiting area and lane by fully graphic VMS. Which lane the vehicle is guided to is based on configurable variables in the SPCS, such as vehicle type, departure, and distribution between check-in counters. Port personnel control traffic lights for traffic guidance within the port with a hand-held device, which also allows them to flexibly modify

the information on the VMS. In the waiting area, trailers are divided by a configurable set of rules depending on priorities set by the port operator to make loading and unloading easier, safer and more efficient. Those rules can, for instance, determine how and where to place different types of dangerous goods. By using SPCS the dock workers have access to and receive guidance about how to organize the trailers in the port area and onboard the vessels. Trailers are automatically scanned with cameras for damages before arrival to and departure from the port. This feature provides the port with a clear overview of whether any damages occurred during the stay in the port area and protects the port from any unjustified damage claims. “Ports have an important role in international logistics and trade. Requirements on capacity and expectations for more advanced services are continuously growing. The SWARCO Port Control System can play an important part in the ongoing digital transformation within harbors and provide a platform for new and more advanced services”, concludes Anders Jonsson. 




SWARCO INTRODUCES
NETWORK MANAGEMENT
IN THE OBERHAUSEN
METROPOLIS FOR BETTER
TRAFFIC FLOW AND
REDUCED EMISSIONS.

MANAGING TRAFFIC AROUND CENTRO

The 212,000-inhabitant city of Oberhausen in the Ruhrgebiet is a place of many attractions, among them Europe's largest shopping and leisure park CentrO. It is also a magnet of loads of traffic traveling the dense and frequently congested motorway network of A3, A42 and A40. Mühlheimer Straße in Oberhausen is the aorta to access the CentrO and often used as a by-pass for the congested motorway routes, transforming into a stop-and-go road with significantly increased impact of fine dust and other air pollutants. "To tackle this situation, SWARCO know-how and engineering is applied in a pilot project to improve traffic flows and reduce traffic-related emissions", reports Thomas Tillmann, traffic department head for SWARCO in Bochum. The introduction of the latest controller technology leads to converting individually controlled intersections into a higher-level traffic-actuated network management providing "green wave" flexibility.

How does this work? The superordinate control of the sub-network at Mühlheimer Straße is software-driven. The road network to be controlled is mirrored as a software model subdivided into individual route sections. Sensors and detectors measure various parameters such as duration of green phase, current traffic volumes and their speed. Based on these data it is then possible to obtain a short-term forecast of the expected maximum traffic load. The whole system is now able to set the optimum degree of utilization for the individually controlled road sections. In addition, SWARCO's Blue Data System with Bluetooth sensors measures speeds and waiting times at the respective subsections. Such data are directly incorporated into the traffic control strategy to minimize travel time and average waiting time. Up-to-date and valid data are the basis for efficient, optimal, systematic and superordinate control of the individual nodes in every traffic situation. The software tool allows for a comparison of theoretical

assumptions and the actual effects. Traffic jams, green phase reserves, and coordination problems due to synchronization can be determined quickly. The final quality analysis of the entire system and its components supports the permanent "self-assessment" of the network management. The winner is the city of Oberhausen, which benefits from reduced emissions and better traffic flows. 



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SUCCESSFUL TESTS AT
48 INTERSECTIONS IN
TRONDHEIM



VOLVO CARS TRAVEL BETTER WITH SWARCO TLA

SWARCO's Traffic Light Assistance (TLA) is a cooperative ITS development aiming at improving traffic flow in cities. The Norwegian city of Trondheim was one of the first Nordic cities to test the new TLA function deployed at 48 intersections. Thanks to a joint effort involving the Norwegian Road Authority, Volvo Cars and SWARCO, drivers receive an app-based service providing them with information when the traffic lights at an intersection turn to green or red. This technological approach helps optimize the traffic flow in urban areas.

The TLA system provides the motorist with a speed recommendation to experience

smooth traffic flow at the next intersection. When the vehicle approaches the intersection, the TLA obtains the status information of the traffic lights, whether they show red, amber or green, and the time left to the next phase change. This is visualized on the dashboard of the vehicle or in the app. Of course, the TLA will never recommend exceeding the speed limit.

During 2017, SWARCO tested the TLA system with the use of a specially developed app placed on board a selection of Volvo cars, provided by Volvo Nordic. This was all made possible with great support from Ørjan Tveit from the Norwegian Public Roads Administration. Soon, we will see Volvo cars equipped with the TLA service now ready to be launched. Thomas Rønslund, Sales Manager at SWARCO knows that Volvo and SWARCO are ideal partners in the driver's seat to push the TLA topic further. "SWARCO's mission is to improve quality of life by making the travel experience safer, quicker, more convenient, and environmentally sound. The development of new solutions like the TLA underpins this commitment and our leading position in ITS solutions", says Rønslund with conviction. The purpose of the success-

ful tests was to find out if the system positively influences the car's emissions by avoiding unnecessary stops. In addition, the driving experience also becomes more convenient and less stressful.

The adaptive traffic engine behind the traffic calculations is SWARCO's predictive algorithm, showing high performance in accuracy and traffic management. This prediction service developed by SWARCO is enabled by the OMNIA system. It is a great step forward for the use of driverless cars and towards increased safety and better service to drivers. To guarantee full coverage of the TLA service, it is necessary to combine the features of the local (and proprietary) systems with the open and centralized approach provided by SWARCO. The TLA system is already installed and being tested in other European cities, such as Berlin, Hamburg and Verona where SWARCO and Audi are testing a similar solution – Audi Connect. The unique thing about the project in Trondheim is the desire to make traffic signal data accessible via open source. In the light of successful tests, it will be much easier for developers to come up with new and innovative solutions for better traffic flow and environmentally friendly mobility. ◀



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SWARCO HELPS PROVINCE OF NORTH HOLLAND TO ACCELERATE MOBILITY INNOVATION

TRAFFIC MANAGEMENT, AUTONOMOUS DRIVING, MOBILITY AS A SERVICE, THE INTERNET OF THINGS. AS A FRONTRUNNER IN THE FIELD OF ITS AND TRAFFIC MANAGEMENT, THE PROVINCE OF NORTH HOLLAND INVESTS IN THESE NEW TECHNOLOGIES. ITS MAIN FOCUS: NEXT GENERATION ROAD INFRASTRUCTURE AND NEW MOBILITY SERVICES.



In 2012, the province opened its traffic management center from which 270 traffic lights, 150 cameras and 25 variable message signs are controlled. Jeannet van Arum, Program Director Smart Mobility explains: "With the rise of intelligent transportation systems and everyday connectivity of road users, we are now investigating new opportunities to enhance safety and traffic efficiency, and to reduce emissions. SWARCO is one of our main partners in investigating these new developments."

Private companies in the telecommunication and automotive industries invest heavily in R&D for ITS. "As a road authority, spatial developer, and provider of public transportation, the Province of North Holland plays an important role in the mobility chain. Therefore, they now choose a proactive attitude in learning and collaborat-

ing with private companies", says SWARCO NEDERLAND Manager Freek van der Valk. To do this, the province created a Smart Mobility Program that includes not only theoretical studies, but also practical pilots in co-creation with private companies. These practical trials are executed in daily traffic conditions on public roads within a testbed called 'Smart Mobility Schiphol', named after the nearby Amsterdam Airport Schiphol. Testbed Smart Mobility Schiphol contains regional roads and arteries with different characteristics including a bus rapid transit lane. In 2018, all 48 traffic lights within the testbed will be adjusted to ITS G5 functionality and will then also communicate with connected traffic through 4G LTE. We call these intelligent traffic light controllers iTLC's. A few of the important 'Day One' use cases, as specified by the European commission, have already been tested.

TALKING TRAFFIC PROGRAM OF THE MINISTRY OF INFRASTRUCTURE AND WATER MANAGEMENT

From a longer-term perspective, the Dutch Government has initiated the Talking Traffic Program to achieve an acceleration of the modernization of traffic light controllers. This implies that an open ECO system has been set up to facilitate autonomous driving up to the road user. SWARCO has done the Proof of Concept of the iTLC as partner in the Talking Traffic Program in close cooperation with the Province of North Holland on a secondary road, N205. This road is part of the Province of North Holland Smart Mobility Schiphol Testbed. In total, over 20 SWARCO iTC-2 controllers in this region will be updated this year in line with the Talking Traffic architecture.



ORGANIZING PARKING
IN CITIES AND ON
CORPORATE PREMISES IS
KEY TO ENVIRONMENTALLY
SOUND MOBILITY



PORSCHE COUNTS ON SWARCO PARKING GUIDANCE SYSTEM


SWARCO in Germany reports the successful implementation of more than 20 parking guidance systems during 2017. New installations, the maintenance of existing systems with signage and computer upgrades, and numerous extensions were the task of the experienced team based in Gaggenau near Karlsruhe. 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 park-

ing spaces. In a first phase, new car parks were built and equipped near the entrances with eleven dynamic parking guidance signs informing about the current occupancy degree. Meanwhile, a second construction phase has started, putting up signs already in the city area of Stuttgart to inform the Porsche employees at an early stage about which road to take to the next free parking house in Zuffenhausen. In Weissach, seven signposts 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 and commissioning. Data transmission occurs via GPRS.

Uwe Pertz, parking expert with SWARCO, knows that there are new, extended requirements for parking guidance systems. "We have the right answers to such trends by developing specific software tools. As examples, he names the following:

– Hosted parking guidance center ("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 fully graphic RGB LED information boards
- Control of bollards to bar parking spaces and sensitive city areas
- Connected mobility integrating public transport and park-&-ride facilities

Often, a parking guidance system is the first cornerstone for an integrated citywide traffic guidance and information system, as it will be installed soon by SWARCO in the Swiss town of Thun, considering particular traffic situations such as events, traffic incidents, or construction works. C-ITS-ready, modern parking guidance systems will be a great help for communities to tackle fine dust and emission impacts. 

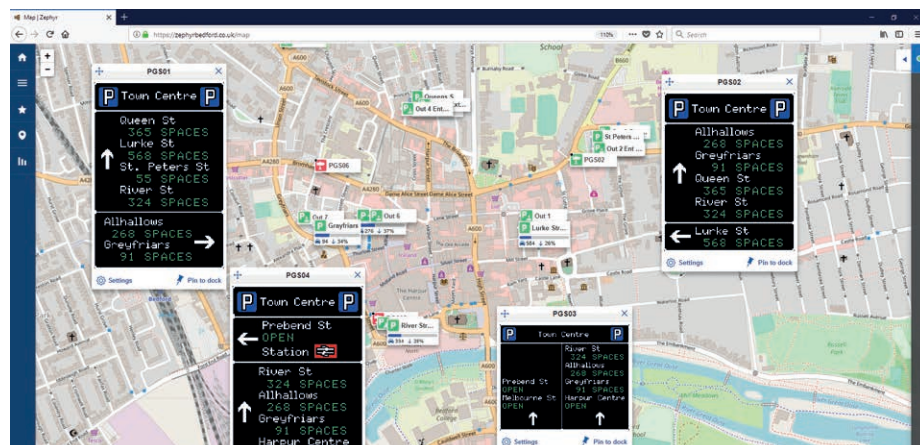


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SWARCO KEEPS THE TRAFFIC FLOWING IN BEDFORD

THE INCREASING URBANIZATION OF THE UK'S TOWNS AND CITIES CREATES A NUMBER OF CHALLENGES, NOT LEAST THE NEED TO ADAPT THE ROAD INFRASTRUCTURE TO ACCOMMODATE THE INCREASE IN VEHICLES THAT INVARIABLY RESULTS.

This increase in traffic volumes, however, then presents a further set of challenges in how such vehicles are managed, to 'guide' drivers to certain areas, and steer them away from others, even if only on a temporary basis. One such town is Bedford, the county town of Bedfordshire, just to the north of London. It recently built and opened a new bypass to take traffic away from villages and rural areas, and created a new signposting strategy to direct and control traffic flow. As part of this strategy, it opted to install six new full matrix LED signs from SWARCO to provide parking



guidance, and five larger versions to provide traffic news and information. New count loops are also being installed at six of the town's major car parks to ensure the accuracy of information displayed. These are helping to further ease congestion, enhance the driver experience, and encourage further visitors to the town.

"What is different about this particular project is that the system will be managed for the first time using SWARCO's web-based central system", says Business Development Manager Andrew Walker. "Hosted remotely, the interface is more user-friendly than other

comparable systems, enabling Council staff to log into the system from practically anywhere. The system was operational before Christmas 2017, allowing the busy shopping period to be managed by staff from the comfort of their own homes", reports Walker proudly. As well as parking guidance and traffic information, the Council is also working with experts at SWARCO to steer drivers away from flooded roads. To this end, it has installed 12 new flood warning signs to keep vehicles away from trouble. Again, these are full color, full matrix signs but are installed in remote locations with no power supply. By fitting a low power router and sign controller, coupled with enhanced battery capacity, it is possible for a warning message to be displayed for seven days before further power is required.

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The replacement of the former signage with new LED VMS is a big gain in information quality.



HEATHROW AIRPORT IS NOW PROVIDING CHARGING POINTS AT ITS TAXI FEEDER PARK FOR ELECTRIC BLACK CABS WITH THE ADDITION OF RAPID CHARGING UNITS FROM SWARCO EVOLT, THE UK'S NATIONWIDE ELECTRIC VEHICLE (EV) CHARGE POINT SUPPLIER AND E-MOBILITY SPECIALIST.

SWARCO INSTALLS EVOLT RAPID CHARGING AT HEATHROW AIRPORT TO SUPPORT NEW ELECTRIC TAXIS

Heathrow Airport's taxi feeder park is a large facility that manages taxi services at the airport, dispatching taxis to the taxi ranks at each terminal to ensure that demand is met. SWARCO has installed seven EVOLT Raption 50 Rapid chargers, which can com-

plete an 80% charge in 30 minutes. These charging points will support the new electric taxis and address the Mayor of London's policy for all newly-licensed black taxis to be electric or plug-in hybrids from January 2018.

To improve air quality across the airport, Heathrow has pledged to make all of its cars and small vans under 2.4 tonnes electric or plug-in hybrid by 2020. Since pledging to 'Go Electric' in 2015, Heathrow has spent more than £4 million on charging infrastructure, with a total of more than £5 million committed to be spent by the end of this year. It has some 59 EV chargers offering 99 charging points across the airport serving drivers both Airside & Landside, and this includes 22 chargers from EVOLT.

Hayley Page, Project Manager for Electric

Vehicle Charging, commented: "In addition to this internal commitment we can also encourage other people passing through the airport to minimize their impact by making sure that the right infrastructure is in place."

Justin Meyer, General Manager of EVOLT, is pleased to be supporting the Taxis sector as it converts to electric: "We will see more and more EV Taxi charging facilities being installed in the UK over the coming years," he explains. "Heathrow's taxi feeder park is one of the first rapid charging hubs supported by the UK Government's Office for Low Emission Vehicles (OLEV) to have been installed. OLEV has awarded Transport for London and nine UK Local Authorities a combined total of almost £14 million to support EV Taxi charging infrastructure and EV Taxi rollout."



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NEW ITS FEATURES
MANAGE TRAFFIC IN
THE "ETERNAL CITY"

ROMA PRATI INNOVATION LAB

Roma Servizi per la Mobilità (RSM) has the mission of planning, supervising, coordinating and controlling the processes related to tackle the mobility management in Italy's beautiful capital with its 2.8 million inhabitants, 10 million tourists every year, and almost two million cars and more than 550,000 motorcycles circulating. SWARCO has been supporting this mission for many years as a provider of the OMNIA system, controlling already more than 400 intersections in the city. The area of the present initiative, aiming at modernizing the existing traffic system, concerns Roma Prati along the river Tiber, west of the city center. Via Flaminia was an ancient and famous Roman road leading from Rome to Rimini, across the Apennine Mountains. It is precisely in this area where the Rome Innovation Lab is growing, through the deployment of novel ITS features. "With the upgrade and renovation of the Bacino Prati traffic system, Rome's Mobility Agency wanted to create an 'innovation lab' where new technological solutions and ITS applications are implemented with the aim of improving the mobility of all the components involved", explain RSM engi-

neers Enrico Tuzi and Giacomo Tuffanelli. The SWARCO solution for the Lab includes two important innovations: the Strategy Manager and the installation of advanced Blue Data System sensors able to detect the vehicle transit by Bluetooth technology.

SWARCO's Turin-based technology manager Gianni Canepari guided the design of the Roma Prati integrated solution and explains the importance of the Strategy Manager. "It is a tool expressly designed to operate in the framework of Integrated Road Traffic Environments, where it provides the strategic level coordination among one or more ITS applications deployed to reach mobility management goals. The Strategy Manager reacts to the current traffic situation and traffic forecast in a structured and dynamic way to prevent traffic anomalies or recover from anomalies as fast as possible. It allows to create, update and delete co-operative operational scenarios (strategies) for all the contributing ITS applications and for all controlled equipment."


In addition to traditional data sources, fifteen Blue Data Systems installed at the intersections communicate directly with the central

system which processes travel times. They can detect vehicles up to a speed of 200 km/h and monitor travel times along the main travel routes. With all this information, it is possible to create a detailed picture of the current traffic situation in the entire area.

Roma Prati Innovation Lab represents a living "playground" bringing ITS excellence to the Italian capital. An evolution is already foreseen with the collaboration of SWARCO and RSM in the EU-funded project MyCorridor, where the Lab will grow towards interactive traffic management enhanced with C-ITS capabilities.



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WE IMPROVE QUALITY OF LIFE
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AND ENVIRONMENTALLY SOUND.

OUR LEADING IDEA

DRIVE ON (DO) INTERVIEWED SWARCO'S EXECUTIVES FOR ROAD MARKING SYSTEMS, PHILIPP SWAROVSKI (PS), AND INTELLIGENT TRANSPORT SYSTEMS, MICHAEL SCHUCH (MSCH,) ABOUT THE NEW KEY MESSAGE.

DO: Mr. Swarovski, what does the Leading Idea mean exactly?

PS: In our business, it is all about people being on the way to their individual destinations. Every day, travelers orient themselves with our road safety solutions, in many cases without knowing who is behind the road markings with brilliant nighttime visibility. Only when you drive on a road without any striping, will you notice the life-saving advantages that professional and well-maintained road markings offer. In this way, SWARCO improves the quality of life of everyone, because driving on roads with good road markings is more convenient, much safer, and lets the travelers arrive much quicker at their destinations. And it is a fact that well-guided and smoothly flowing traffic is much more environmentally sound. It is important to note

that we improve the travel experience not only on the roads of our planet. You will find SWARCO pavement marking solutions at pedestrian crossings, on airfields, in industrial shop floors, on Formula 1 racecourses, at roundabouts, in the car park, on the playground, on train station platforms and in many more places.

DO: Mr. Schuch, what are your thoughts behind the Leading Idea?

MSch: Traffic and transportation are on everyone's minds because we all want smoother traffic flow, less congestion, quicker travel, and reduced emissions. Whenever this doesn't happen, we see this as detrimental to our quality of life. That is why SWARCO is putting the focus on improving the travel experience. Our key principle is to deliver mobility management

and information solutions oriented towards the traveler. We know that increasingly people want to change their mode of travel when on their way from A to B and that nowadays, information about available travel alternatives often plays a really important role in our trips. Whether you walk, drive with your electric car, or ride on a bus or a bicycle: you want up to date, real-time information about things like schedules, the availability of parking spaces or electric vehicle charging stations and the coordination of the different modes of transport is crucial for a smooth, hassle-free, and convenient journey with as little delay as possible. SWARCO provides systems and solutions that consider the entire transportation system of a town or city in a holistic manner. We support the authorities by providing them with connect-



Philipp Swarovski, COO Road Marking Systems Division

ed mobility solutions that improve their citizens quality of life by delivering both higher levels of services and easily accessible trip information to meet their expectations of a seamless and simple-to-use travel experience.

DO: Mr. Swarovski, INTERTRAFFIC Amsterdam, the world's largest traffic technology exhibition, is a launch pad for innovations. What are SWARCO's novelties from the road-marking systems division perspective and how do they underpin the Leading Idea?

PS: In our Competence Center for Glass Technology and Road Marking Systems, we continue to develop new products and solutions not only in terms of better retroreflection, extended durability and increased environmental protection. Improving quality of life for us also means having a closer look at improving work processes for the applicators of road markings. SWARCO is at the cutting edge in offering hundreds of different customized glass bead blends, which are optimally designed to fit the individual striping purpose. Blends with our high-performance SOLIDPLUS beads ensure that road marking contractors produce road markings with excellent nighttime visibility that easily meets the standards and road authority demands for long-term performance. In Amsterdam, we premiered a novel marking system especially for indoor use in industrial halls and shop floors. SWARCO UV-LINE is a fast-curing marking system that is dry and

functional after just two seconds of treatment with UV light. This not only facilitates the job of the striping, but also drastically reduces the downtimes of production plants for marking work. SWARCO UV-LINE is protecting the environment, as it is a solvent-free system that can be used worry free in sectors where odor is also a critical factor, such as the food or pharmaceutical industries. (Read more on page 19 of this issue.)

DO: Mr. Schuch, what are SWARCO's innovations from the ITS division perspective and how do they underpin the Leading Idea?

MSch: Our future-proof solutions leverage the concept of the connected traveler - including autonomous vehicles - as enabling elements for the upcoming deployment of mobility as a service. All our actions are building blocks towards our vision for the future of mobility management: fully digitalized, integrated and interactive. For example, we invested in R&D to make our road infrastructure systems communicate with cars, buses, and trucks: In the Netherlands, we enable intersections to connect to vehicles for better traffic flow through the TALKING TRAFFIC initiative; while in Norway we have successfully demonstrated our Traffic Light Assistant and Traffic Light Forecast solutions together with Volvo. At Intertraffic in Amsterdam, we will premiere a full range of C-ITS ready solutions, including an 'App' for cyclists. Advanced management of Public Transport fleets, leads to improved service quality, which helps to encourage modal shift, leading to a safer and cleaner environment for everybody. On-board solutions for future Public Transport vehicles include safety and security applications such as eco-driving and passenger monitoring - which make services more cost-efficient, greener and provide higher care levels for vulnerable travelers. We are starting to use AI technology, along with data fusion and modeling, to help us process the huge quantities of data now coming from mobile devices and smart sensors. This gives

us enhanced situational awareness about what is likely to happen in the short, medium and long-term future at intersections enabling us to further evolve our adaptive Urban Traffic Control systems.

Our final goal is to empower cities to shift from traditional infrastructure-based transport management towards a data-driven, more accessible, reliable, effective and tailored 'as-a-service' approach built around the users.

DO: And what about the enabling technologies for which SWARCO is known globally?

MSch: Of course, we have innovations within these parts of our business as well! For example, SWARCO continues to be the world leader in the field of LED traffic lights, where we are integrating new features such as environmental data collection and pedestrian detection to improve safety. SWARCO LINE TECHNOLOGY is another innovative approach to reduce the amount of wiring and equipment needed on the street at intersections and pedestrian crossings, as well as opening the possibility for better communication between the traffic controller, traffic detectors, and the signal heads. As you see, we have lots of ideas for improving quality of life and creating better travel experiences.

DO: Thank you very much for these insights, gentlemen.



**Michael Schuch
COO ITS Division**

BRIGHTER ROAD MARKINGS: DRIVERS NOTICE THE DIFFERENCE



SOLIDPLUS HIGH
PERFORMANCE GLASS
BEADS FROM SWARCO
CLEARLY MAKE A
DIFFERENCE IN
THE VISIBILITY OF
ROAD MARKINGS.

Road marking systems reflectorized with SOLIDPLUS in field tests deliver RL of 1,000+ mcd/m²/lx and about 100 mcd/m²/lx under wet conditions (RW). On a road with a daily traffic load of about 8,000 standard vehicles, SWARCO compared the performance of a solventborne paint system reflectorized with standard glass beads with a premium system comprising waterborne high-performance paint Limboroute® W15 reflectorized with SOLIDPLUS drop-on glass beads. Measurement results speak a clear language in favour of the high-performance system:

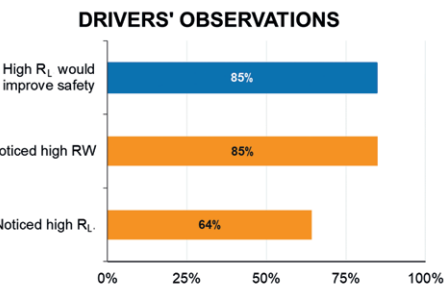
Retro-reflectivity [mcd/m²/lx] of the test area (average from all lines)

	Premium system W15 + SOLIDPLUS			Standard system		
Measurement period	Initial	3 months	Change	Initial	3 months	Change
Retro-reflectivity (R _L)	567	527	-7%	366	311	-15%
Wet night retro-reflectivity (RW)	128	114	-11%	73	34	-53%

But how do the drivers perceive such high-performance markings? This was assessed by means of a questionnaire answered by 156 persons. “64% of the drivers reported to have noticed the installation of road markings with increased RL and 85% of the drivers who travelled through the test stretch at night during rain observed that the markings provided high RW”, reports Tomasz Burghardt from SWARCO’s Road Marking Systems Division. Furthermore, 85% of the drivers considered the enhancement of retroreflectivity as one of the principal factors in improving road safety. The questionnaire results, visualized in the chart, confirm that drivers do notice and appreciate horizontal road markings with high retroreflectivity at both dry and wet conditions.

Horizontal road markings with high RL were proven, via multi-year statistical analyses, to be associated with a reduced number of accidents. Therefore, road administrators should demand high RL to improve safety, to assure comfort of drivers, and to improve road safety. Since elderly drivers tend to focus on line markings during their nighttime driving, their quality of life can be significantly improved by introducing systems with high RL. Even though road marking systems with high RL can be initially more costly than standard systems, the expenditures will become insignificant when accidents are prevented, and quality of life is improved. Highly durable systems allow for overall long-term savings when compared to initially cheaper low-end solutions. Furthermore, they should be selected because they are more environmentally friendly.

SOLIDPLUS glass beads are a very versatile solution, indeed. They are suitable for reflectorizing all types of road marking materials applied either as thick- or thin-layer. High RL can be achieved with SOLIDPLUS glass beads not only in white, but also in yellow and orange markings. The possibility of intermixing SOLIDPLUS with standard glass beads is a crucial advantage for striping companies who seek high quality products to minimize claims in performance-based contracts.



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EUROTHERM® – SIGNS FOR LIVABLE CITIES

WHAT MAKES OUR CITIES AND COMMUNITIES UNIQUE? IT IS THE PEOPLE LIVING THERE. WHAT MAKES OUR CITIES AND COMMUNITIES LIVABLE? IT IS THE PLACES FOR LEISURE AND RECREATION AND THE WAY HOW WE ORGANIZE TRAFFIC.

Livable cities offer green spaces for recreation, and the infrastructure for the different traffic modes is designed in a way that all inhabitants can travel individually from A to B as safely, quickly and conveniently as possible. Towns and cities with such features are attractive and enjoy a significant competitive advantage on an international level when it comes to finding well-educated and trained people for the qualified jobs they offer.

EUROTHERM® supports communities in getting closer to such competitive character traits. The large portfolio of SWARCO's preformed thermoplastic pavement marking materials is perfect for the creative design of schoolyards, playgrounds, parking spaces or cycle paths, to name just a few examples. "The versatility of EUROTHERM® preformed marking products can be best explained

when looking into the pavement design of schoolyards", says Bianca Schönheit, SWARCO's product manager for preformed marking solutions in Europe. Such spaces can be individually designed with a very flexible concept. Pupils, teachers and parents can be involved right from the beginning to jointly achieve the best results. "The teaching staff and the pupils will spend more time outside, learning becomes more interactive and fun, and the pupils will be more serene and more motivated and eager to learn", is Bianca Schönheit convinced.

Human beings will be much more satisfied when communities invest sustainably and in a future-oriented manner in their safety and health. EUROTHERM® is a cost-effective and helpful tool to support this to make towns and cities more livable. 



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TREMENDOUS TEXAS TEST DECK RESULTS

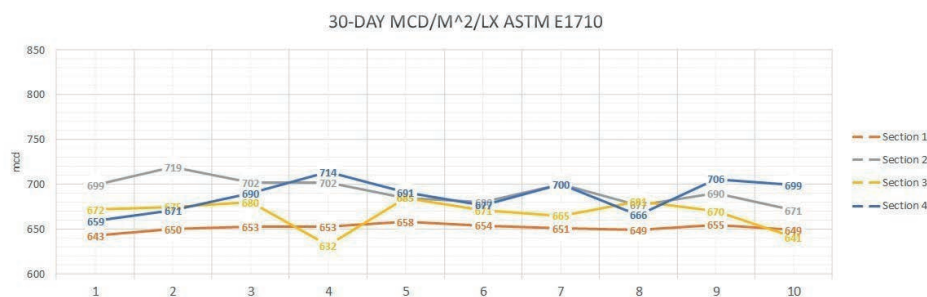
HIGH PERFORMANCE STRUCTURED MARKINGS WITH DURALUX

You want to make sure that DOT requirements for road markings are easily met in an economical way? You want to ensure that road markings stay perfectly visible in times of increasing numbers of ageing drivers and the advent of smart driving and autonomous vehicles?

Then SWARCO offers you the right system solution. To provide an economically responsible solution to Texas DOT spec SS8999 "High Performance Pavement Markings with Retroreflective Requirements", SWARCO has come up with a structured marking system consisting of SWARCOTHERM Profile and DURALUX Glass Beads™. "In cooperation with a key customer partner, the test deck for this system solution was installed on Highway 59 outside of Marshall, Texas, USA (4.70 miles south of Interstate 20), and consists

of approximately 6000 linear feet of "6 inch, Yellow, Dot'n Line" on the North-bound edge line", explains SWARCO REFLEX product manager Erik Maki. The AADT for this location is 861, a relatively low traffic area (estimated 25,830 to 34,440 vehicle passes for the 30 to 40-day observation period). The test deck was evaluated for initial retroreflectivity as well as 30-day performance after which the TX-DOT SS8999 spec requires retro-reflectivity values (ASTM E1710) to exceed 250 mcd for yellow markings and 400 mcd for white markings. Initial average measurements resulted in 829 mcd/m²/lx, after 30 days retroreflectivity readings were still at 674 mcd/m²/lx.

The use of SWARCO's DURALUX Glass Beads™ in this application provides a more economical and durable solution when compared to 1.90+ high index or cluster type beads typically employed to achieve performance requirements. DURALUX Glass Beads™ can withstand more mechanical impact while maintaining superior retro-reflectivity for a longer period. Properly installed high performance markings from SWARCO not only provide drivers with well defined lanes of travel and more safety, but also allow contractors to adjust desired results when used in a double drop system (cost control).



SWARCO UV-LINE

A NOVEL FAST-CURING MARKING SYSTEM FOR INDOOR APPLICATIONS

Indoor markings for industrial shop-floors are a great help in providing good orientation, organizing better workflows and improving safety at work. The application of such indoor floor markings mostly causes off-time for companies because you have to calculate with curing times of 12 to 24 hours before returning to normal production conditions.

The team at the Center of Competence of our ROAD MARKING SYSTEMS DIVISION looked into this challenge and came up with a novel solution. "SWARCO knows how this problem can be tackled and now launches the novel concept of SWARCO UV-LINE, an indoor marking system with curing times of just a few seconds", explains Tim Kreckel, R&D project manager with the RMS Division in Germany.

SWARCO UV-LINE is a solvent-free system that can be unscrupulously used also in sectors where odor is a critical factor, such as the food or pharmaceutical industries. The SWARCO UV-LINE portfolio is comprised of various colored markings and a shiny, transparent topcoat.

"The curing process by means of UV-radiation just takes 1 or 2 seconds. No more stress in respecting drying times or potlife", knows Kreckel. Thanks to the optimization process of the marking system and its layer thickness of 600 µm, it is also possible to totally waive the application of the topcoat. The curing by UV-radiation is independent of temperature. That is why SWARCO UV-LINE is perfectly suitable to be applied in cold storage areas.



Following a thorough cleaning of the floor – concrete floors must be shot-peened – the UV-paint is applied with a common airless sprayer. The maximum layer thickness should not exceed 600 µm. Sufficient covering is already reached with layer thicknesses of 150+ µm. The paint is then cured – without any waiting time – with a special UV-light device and immediately ready to be released to traffic. This means that traffic must be banned from the shop-floor only for a very short time, saving up to 24 hours of off-time compared to conventional indoor marking systems.

The marking companies are thus able to execute all work steps (cleaning, priming if needed, application of the marking, sealing with clear varnish) in just one working day. This saves time and resources. Solvent-free and odorless SWARCO UV-LINE in addition

constitutes a significant improvement from an environmental protection point of view. Furthermore, the transparent, UV-curing clear topcoat can also be applied to the proven and tested 2-component epoxy paint 2-K K809 Indoor Paint.



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Sydney Airport and SWARCO are proud of this superlative

THUMBS UP DOWN UNDER FOR SWARCO VMS

SYDNEY AIRPORT INFORMS WITH BRILLIANT LED SIGNS MADE IN AUSTRIA

The foundations for the success story were laid during the ITS World Congress in Melbourne in October 2016. In March 2017 SWARCO's Australian partner company BRAUMS finally got the order from Sydney Airport Corporation Ltd. (SACL). Eleven months later visitors approaching Sydney Airport are now

impressed by the largest VMS in the southern hemisphere. Up to 22 m wide and just under 4 m high, the signs use more than 750,000 LEDs at a 16 mm pixel pitch to display pin sharp high-resolution graphics. "Four out of a total order of 13 information boards were put into operation in January. The remaining nine VMS are currently being shipped to



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750,000 LEDs providing brilliant full-color messages at minimized power consumption



The installation took only a few minutes with little downtime for traffic

Australia", reports SWARCO VMS product manager Wolfgang Ernst who just returned from Sydney.


The devices set new standards in LED technology for large information signs with high luminous intensity, brilliant colors through best contrast values and uniformity of luminous intensity, and low power consumption at more than 60° beam width. Providing a display area of 65 m² with an average power consumption of only 2,000 W with the described performance was previously unthinkable. Such huge LED signs consume just a little more power than a standard hair-dryer and can be easily connected to a 230 V power outlet! It is no problem to even emergency-operate the signs with full functionality via a battery-powered UPS. The LEDs are always driven far below 10% of their nominal capacity, which greatly reduces the failure rate and further increases the system availability with significant savings on maintenance and spare-parts. At Sydney Airport's Traffic Control Center, all displays are controlled and monitored

via the newly introduced SWARCO software user interface. Up to 20 VMS can be operated via a central server. Each VMS is directly connected via NTCIP (IP) with the control center, without relay or outstation. The self-explanatory graphical user interface (GUI) allows intuitive operation of the system without extensive training. With a suitable browser (MS Internet Explorer, Google Chrome or Mozilla Firefox), a web-based user interface is displayed for monitoring and changing the status at any time. "SWARCO's



Practical sign content monitoring

control software is a cost-effective solution for driving a limited number of LED devices in "island mode" applications at, for instance, customs or toll stations, ports, airports, car parks or emergency vehicle exits", explains Wolfgang Ernst.

Customer SACL is highly satisfied with the SWARCO solution, which can be considered a quantum leap in the performance of LED displays with an unmatched total cost of ownership level. 



Challenge mastered: Ready for shipment, the VMS require special logistics in the factory



WHEN STREET LIGHTING GETS SMART

WHAT MAKES A LIGHTING SOLUTION SMART AND WHAT ARE THE BENEFITS FOR THE END USERS?

These two questions are key to city infrastructure projects which not only address the replacement of bulbs or mercury vapor lamps with LED technology but also aim to interlink municipal departments and services like lighting and traffic management under the smart city



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umbrella. SWARCO, well known in the urban traffic management domain for traffic light controllers, signals and signs, introduces new features by integrating luminaires and intelligent lighting management into the portfolio.

“CITYLIGHT, SWARCO’s light management system, offers a stepwise and highly integrated approach to a centrally controlled and maintained lighting solution for public space, e.g. on streets, squares, parks or parking lots”, says SWARCO LED lighting specialist Ernst Luckner. “Connected lighting” does not only mean “centrally controlled”, but also features the active interaction with other systems. CITYLIGHT is vertically integrated into SWARCO’s smart city platform OMNIA and provides local control of brightness in a city-wide lighting solution and makes local sensor data available for other applications.

The “Emergency Corridor”, for instance, is a typical requirement for a traffic management system which includes the need to turn street lighting to full brightness in a specific traffic situation. This provides higher active

and passive safety for drivers of emergency vehicles, private car drivers, cyclists or pedestrians.

Innovative and high performing luminaires like AREDO, CITERA or POLIFINA from SWARCO’s FUTURLUX product family, equipped with CITYLIGHT C-Nodes, are the smart field devices connected through CITYLIGHT C-Box gateways via private or public networks to the cloud. Local sensors for ambient brightness or presence detectors enable single street lights or groups of luminaires to be controlled individually. The city-wide lighting system is permanently monitored under operational and maintenance aspects.

SWARCO’s smart and connected lighting solution – as part of modern traffic management – combines low ownership and communication costs with the benefits of convenience and safety for all road users. CITYLIGHT has already been implemented very successfully in Danish cities like Ballerup and Kolding, with new project rollouts ongoing in Austria and Germany. 

TOP LEVEL TUNNEL CONTROL

PRIMOS® CONTROL AS FULL-FLEDGED TUNNEL CONTROL CENTER MANAGES BOTH TRAFFIC TECHNOLOGY AND OPERATIONS CONTROL TECHNOLOGY

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;
- Tailormade 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;
- System fulfils highest data security standards.

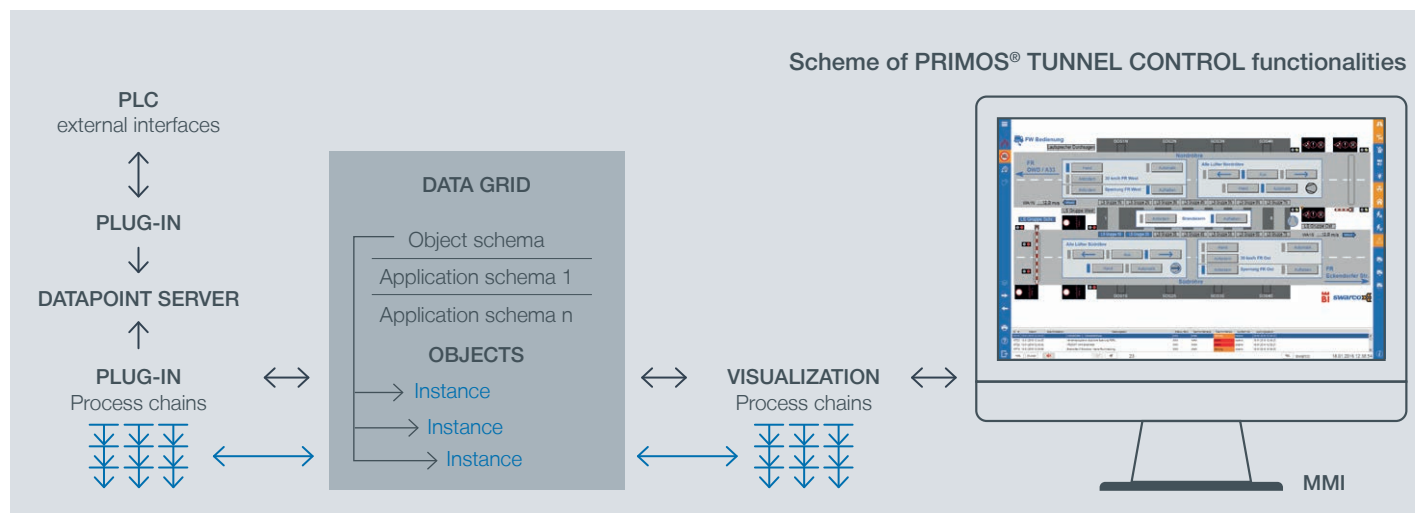
SWARCO replaced an existing SCADA system with its object-oriented system handling and controlling operations and traffic. This includes the traffic installations, emergency systems such as fire alarm, fire-fighting water supply, emergency call, escape route identification, communication equipment like 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. Jörg Gelz, Senior Project Manager with SWARCO in Trier, says the integration of the sub-systems was done by means of a central SPS. „The SWARCO part 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). Each plug-in represents the connection of an interface“. In Bielefeld the existing facility was replaced in



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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. 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. Frank Maier, SWARCO Solution Manager for Highway and Tunnel, considers PRIMOS® TUNNEL CONTROL an innovative milestone and important extension of the group's portfolio, allowing the complex management of traffic control and operations control in a single system. 

Scheme of PRIMOS® TUNNEL CONTROL functionalities



MULTIFUNCTIONAL TRAFFIC SIGNALS

SWARCO DEMONSTRATES THAT TRAFFIC LIGHTS CAN DO MUCH MORE THAN JUST RED-AMBER-GREEN

For more than a century, traffic signals have been known as indicators of red for STOP and green for GO. But in a rapidly changing world with new technologies a signal head will have much more functionalities. Therefore, SWARCO started a project to re-invent and re-shape the tasks a signal can fulfil on the street. At the Intertraffic exhibition in Amsterdam SWARCO will already show three different “smart” applications of such innovative traffic signals:



COMBIA "SAFELIGHT"

More and more accidents occur on pedestrian crossings because people are distracted by looking at their smartphones instead of paying attention to what the traffic light indicates. Complementing the conventional pedestrian signal function, the new “Safe-Light” application directs a red light beam to the pavement, alerting the “head-down generation”.

COMBIA "AIRDEC"

Dieselgate and tendencies to ban individual traffic from city centers based on levels of emissions increased the demand for measuring NO_x, CO₂ and other traffic-generated greenhouse gases. SWARCO’s “AirDec” is the solution for monitoring air quality by means of sensors integrated into the signal head.

COMBIA "PEDCOM"

Additional features of detection can be integrated as a safety element into the signal head. SWARCO’s “PedCom” solution is such an integrated feature that detects the presence of pedestrians who intend to cross the street or road.

COME AND SEE US AT OUR INTERTRAFFIC STAND 10.103 AND TALK TO OUR EXPERTS ABOUT THE FUTURE OF SIGNALLING.



SWARCO ROADSIDE TRAILERS C-ITS READY

TIMELY AND UP-TO-DATE INFORMATION FOR THE ROAD USERS

SWARCO's LED variable message signs have been known worldwide for their optical top performance at minimized energy consumption.

They are used for stationary installations in the urban and interurban area but can also be mounted to warning trailers for mobile use on motorways.

Such trailers have now become more intelligent and were further developed to communicate the sign content directly into the vehicles. SWARCO calls it MiTra, which stands for "mobile intelligent trailer" for use in the

infrastructure-to-vehicle communication (co-operative ITS) on motorways. It consists of the following main components:

- full-color LED matrix display with highest performance and lowest energy consumption ;
- ITS-5G interface transmitting the sign content into the vehicles;
- Bluetooth sensors for travel time assessment, permitting to indicate delays to be expected in road construction zones;
- radar sensor as collision protection against heavy goods vehicles;
- communication and control of the trailer on site or via a traffic control center.

The "talking" trailer is equipped with sensors and connected to a traffic control center to react on the latest traffic conditions on a motorway. The operator sends traffic information directly into the vehicles via an I2V radio mod-

ule. Parallely the information is displayed as text or pictures on the energy-efficient RGB VMS mounted on the roadside trailer. A typical use case is temporary roadwork zones where the motorists are informed via symbols and graphics about altered speed limits, the course of lanes, and expected delays.

Motorway operator ASFINAG meanwhile introduced this technology for their road network so that users of the Austrian highways will meet MiTra more frequently soon. The novel and future-oriented approach by SWARCO has already been recognized by public institutions. MiTra was conferred the Burgenland Innovation Award 2017 and also nominated for the Austrian National Award for Innovation.

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SWARCO INTENSIFIES EMPLOYER BRANDING ACTIVITIES



AN ATTRACTIVE PLACE TO WORK

The traffic technology industry is subject to significant transformations in the age of digitalization. This represents also a challenge for employers who need to find the right people able to understand technological challenges, support future growth and guarantee continuous competitiveness.

"We are well aware of this situation and already notice that it is not so easy anymore to find people with the specific qualifications for the various open positions in our group",

comments Julia Mairhofer from SWARCO AG's Human Resources department. "The SWARCO ACADEMY is one cornerstone in our talent management and succession planning strategy. But we also know that we can do more to inform the public about SWARCO's attractiveness as a place to work", she adds.

Various measures were taken to present SWARCO as an employer with interesting job profiles and a lot of creative leeway in designing the work.


Firstly, SWARCO started to participate in career fairs in Austria and Germany to present its business domain and the manifold types of jobs. The direct contact with potential applicants is much appreciated and triggers interesting discussions. The CAREER & COMPETENCE fair in Innsbruck is one opportunity during 2018 to meet Julia Mairhofer. Secondly, social media channels are used more frequently to advertise with pictures, short stories and off-the-work content that SWARCO employees are happy and proud of being part of the family. Meanwhile

the group employs 3600 mobility experts in over 70 companies worldwide. Just visit our Facebook page and discover our stories under www.facebook.com/SWARCO.Group.

"As a third measure we published a brochure with people working at SWARCO to give a better insight in what they do in their jobs", explains Mairhofer. This brochure will be available at Intertraffic Amsterdam and other future SWARCO exhibitions.

Software developers, IT infrastructure specialists, controllers, sales and marketing people, chemists, project managers, glass specialists, service technicians, R&D engineers, people with know-how in legal affairs – the job opportunities at SWARCO are countless. Therefore, it is worthwhile to have a regular look at the list of open positions on www.swarco.com.

Maybe it is you who wants to take a new direction.

SWARCO is growing – grow with us! 



jobs@swarco.com

EVENT CALENDAR

GET IN TOUCH WITH SWARCO AT THE FORTHCOMING EVENTS:

20 - 23 March 2018	INTERTRAFFIC AMSTERDAM	Amsterdam / NL
16 - 19 April 2018	TRANSPORT RESEARCH ARENA (TRA)	Vienna / A
04 - 07 June 2018	27th ITS AMERICA ANNUAL MEETING & EXPO	Detroit / USA
13 - 14 June 2018	mobil.TUM Scientific Conference	Munich / D
17 - 21 September 2018	25th ITS WORLD CONGRESS	Copenhagen / DK
22 - 24 October 2018	EUROPEAN ROAD CONFERENCE	Dubrovnik / HR

SWARCO RAIDERS TIROL HOME GAME BOARD



COMPETITION	DATE	START	GUEST TEAM	STADIUM
AFL - W2	24-03-2018	14.30 h	Bratislava Monarchs	Innsbruck Tivoli
AFL - W4	07-04-2018	14.30 h	Graz Giants	Innsbruck Tivoli
CEFL - W2	28-04-2018	18.30 h	Wroclaw Panthers	Innsbruck Tivoli
AFL - W7	13-05-2018	14.30 h	Vienna Vikings	Innsbruck Tivoli
B4T	25-05-2018	18.30 h	Central College Iowa	Wattens
AFL - W8	27-05-2018	14.30 h	Mödling Rangers	Wattens
CEFL-Bowl*	09-06-2018*	18.30 h*	TBD*	Innsbruck Tivoli*
AFL - W10	16-06-2018	17.30 h	Danube Dragons Vienna	Innsbruck Tivoli

*subject to qualification

GUIDING YOU SAFELY

Every day our cost-effective marking systems help to save lives on roads all around our planet. They offer safe guidance by day and night under all kinds of weather conditions. On your travels from A to B and into the future with Smart Driving you are always on track with SWARCO. Talk to us today about the road marking systems of tomorrow.

