Industry: Transportation

Tecnositaf S.p.A.

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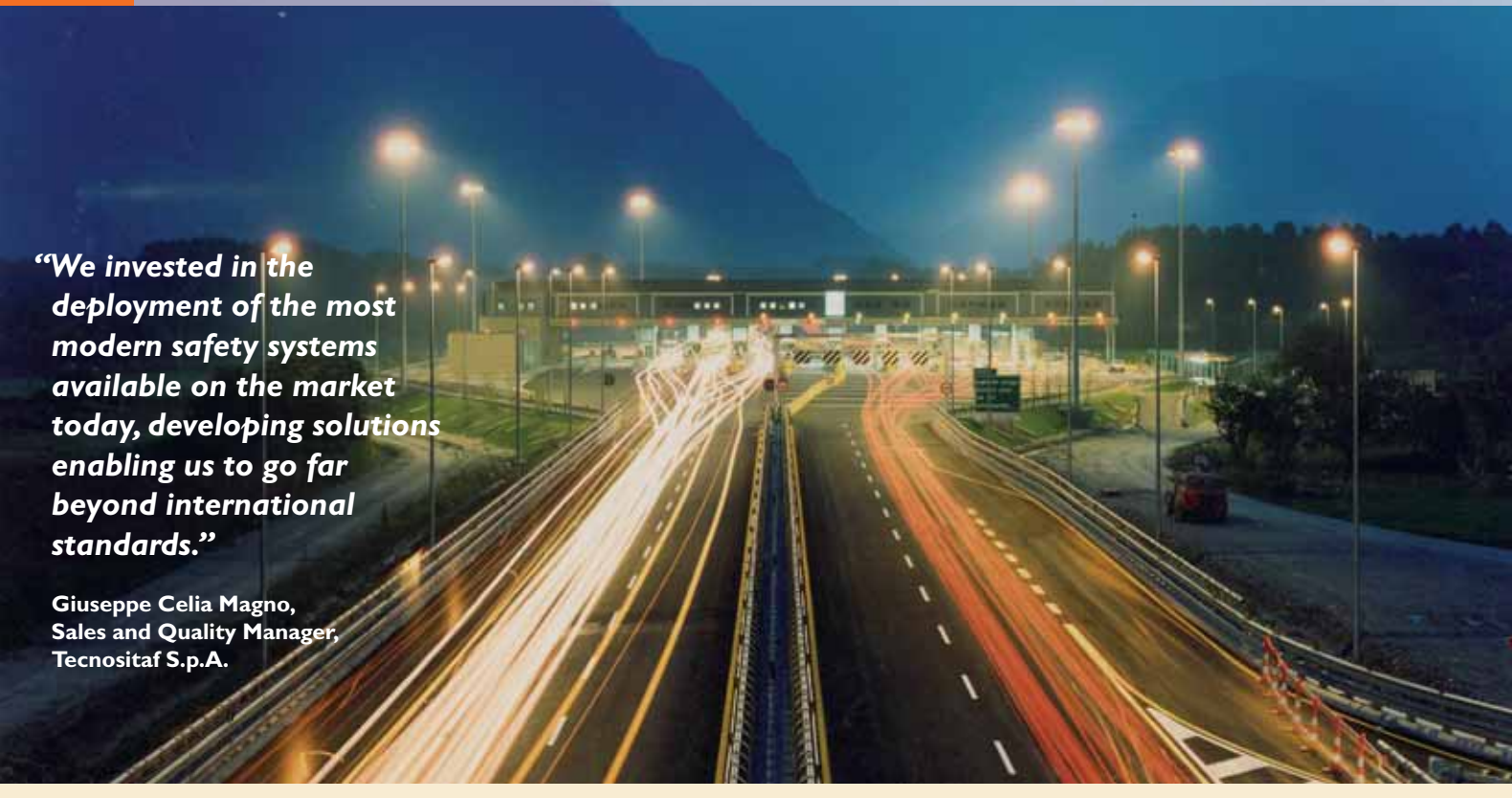

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Giuseppe Celia Magno,
Sales and Quality Manager,
Tecnositaf S.p.A.

SCADA: an Important Help for Managing the Road Infrastructure

by Wonderware Italy

Goals:

- Ensure the highest safety levels through the deployment of maintenance and infrastructure management systems.

Challenges:

- Limit maintenance costs while ensuring maximum safety.

Wonderware Solution:

- ActiveFactory software;
- InTouch HMI;
- InTouch HMI for Terminal Services;
- Wonderware System Platform.

Results:

- Reduced maintenance and energy consumption of the tunnel lighting and venting systems;
- Deployment of a fire-fighting system meeting highest safety standards.

Bussoleno (TO), Italy – Tecnositaf, an integrated engineering company founded in 2001, is a SITAF S.p.A. company (A32 motorway, Torino – Bardonecchia and Fréjus Tunnel operator) that designs, develops and manages systems and tools for the mobility control and road (urban and extra-urban, outdoors and in tunnels), rail and industrial safety.

An Experience Along A32 Torino – Bardonecchia Motorway

Wonderware and Tecnositaf experience and technologies have been put together to ensure maximum safety along the whole A32 Torino – Bardonecchia motorway infrastructure.
Everyone of us, when driving on a motorway, is especially concerned about traffic and road conditions. But actually our safety depends on almost invisible technological infrastructures, which need to be perfectly working.

Managers of big infrastructure networks are fully aware of this issue and, in recent years, have been investing in strengthening those systems, providing them with the most efficient management and control tools. Maintenance and management of the road infrastructure, in fact, are not only the main goals, but also the highest costs for the contractor. Highways must be always open and ensure constant safety levels; any maintenance intervention involves organizational challenges and the need to open building sites, causing dangerous road narrowings.
In order to improve service levels, ensure safety and limit maintenance costs through an exact scheduling,

Figure 1: Central control headquarters A32 motorway.

SITAF (Società Italiana Traforo Autostradale del Fréjus), as contractor of A32 Torino – Bardonecchia motorway, recently invested in the expansion of the technological infrastructure ensuring the safety of this major road connecting Italy to France. This choice has been also influenced by the fact that 18 of the total 73Km are tunnels, a potentially hazardous environment for vehicles and the place where rescue interventions are really difficult, as testified by recent dramatic news.

Tecnositaf (specialized in integrated systems for road safety) has been therefore involved in this project, due to the expertise of its collaborators and the experience with other companies managing street and motorway systems.

Air Quality Control

"In the light of this," as explained by Giuseppe Celia Magno, Sales and Quality Manager, Tecnositaf, *"we invested in the deployment of the most modern safety systems available on the market today, developing solutions enabling us to go far beyond international standards."*

In such a project, constant event monitoring and automatized management systems are key factors provided thanks to the collaboration with Wonderware System Platform, combined with InTouch HMI (Human Machine Interface), represented the ideal solution for supervising the whole road section. This solution is among the most innovative on a global scale, since it leaves the freedom of customizing the application in order to develop all necessary controls Sitaf aimed at, and to reach the integration level Tecnositaf expected, all the while providing a reliable solution.

The project, personally followed by Andrea Ballatore, Wonderware certified system designer, aimed at replacing the pre-existent and out-of-date SCADA system, using the most efficient control technologies, especially for tunnel ventilation.
Inside highway tunnels, under particular weather or traffic conditions, there could be a high concentration in exhaust gases, affecting visibility and, in the severest of cases, the health of passengers. These are the reasons why the venting

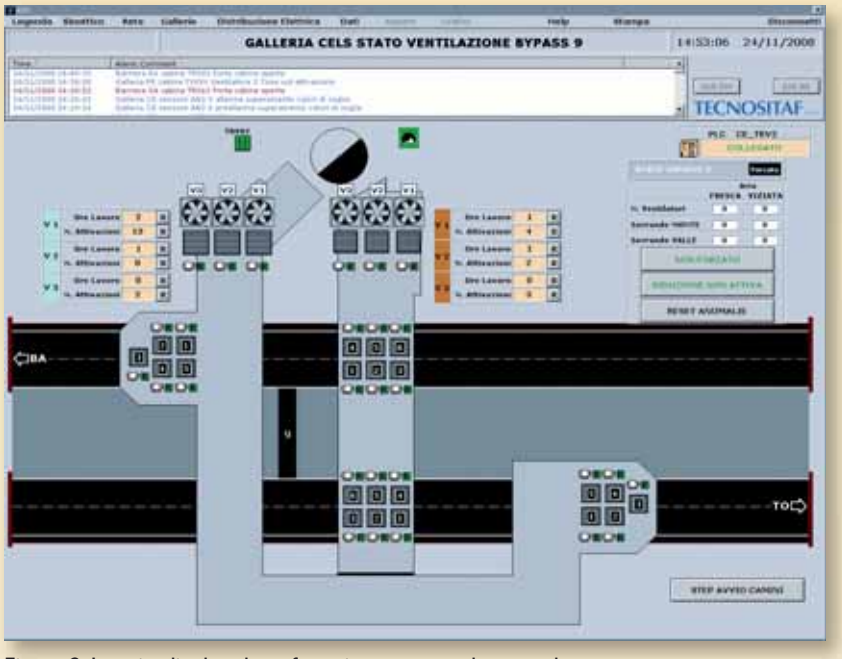

Figure 2: Longitudinal and roof venting system telecontrol.

system must ensure suitable air makeup. Non-stop ventilation implies high energy consumption, along with rapid deterioration of fans, and makes periodic and expensive maintenance necessary.

Manual management proved demanding and inefficient, mainly because personnell operating locally cannot have full visibility into the complete system. Gas concentration is not only influenced by traffic and passage of trucks or highly polluting vehicles, but also by external factors, such as weather conditions at the entrance end exit of the tunnel. It is possible to foresee almost exact traffic conditions in some timeframes, allowing to set the venting system up according to forecasts.

Wonderware solution has been customized to interact with 86 PLCs controlling the single local plants which are based on a master/slave logic and able to work autonomously, according to the information retrieved from field devices and historical archived data.

An optical fiber 1Gb/s network, 73Km long and suitably backed up, allows centralizing all the information in the central control room in Susa, where all emergency actions are coordinated. CO_2 concentration monitoring is ensured by sensors which start only the necessary fans in the longitudinal venting system, at the required speed, in case the concentration exceeds preset values.

Furthermore, according to the natural speed of the airflow detected by the anemometers installed at the entrance and inside the tunnels, the system sets the number of fans which would be enough to keep the air in tunnels always fresh.

This management system drastically reduced maintenance, extending the operating life of mechanical systems and, most of all, reducing electricity costs.

All the Light Needed

Tunnels are critical passages in every travel. In case of sudden lighting changes, human eyes require more then one second – the so-called *'adaption time'* – to focus images back. Considering that hen driving at 120Km/h, in one second you cover more than 30 meters, it is immediately clear that the driver's sight is temporarly and dangerously limited for quite a long distance. This is why lighting at the entrance and exit of tunnels must be particularly intense in the daylight and weak during the night.

For this reason, Tecnositaf engineers leveraged Wonderware solutions' capabilities to create an intelligent management system based both on seasonal timetables and on the brightness detected by twilight sensors. This smart management system allows limiting costs and extending the operating life of the installed lamps.

The same control system is able to constantly monitor the status of all switches and lamps, offering the operators in the control room real-time visibility into all the plants and enabling immediate remote or local intervention in case of need.

A Valuable Help in Event of Fire

However important, venting and lighting management does not always require real-time intervention and can tolerate partial delays. In event of fire, every second can make the difference for people trapped in the tunnel.
For this reason Tecnositaf, not least to comply with

severe international regulations, invested in the creation of a particularly robust and effective system.
The need to ensure highest quality standards contributed to the choice of a SCADA system based on Wonderware System Platform, combined with a proprietary system.

The SCADA system itself, in fact, constantly diagnoses the status of the fire-fighting system, notifying any disfunction and activation.
Perfect efficiency and timely activation of the plant represent two crucial factors engineers took into consideration upon development of the plant.
Perfectly working pumps and valves must also be automatically activated, with no room for error.
For this reason, the SCADA system analyzes CO_2 concentration levels and air opacity, constantly comparing them with historical data and values retrieved in tunnels. This way the plant can easily distinguish initial fires linked with sudden increases in values detected by sensors in a limited area, from the passage of particularly polluting vehicles, thanks to the integration with videosurveilance systems carrying out smoke detection functions, too.

In this case, afther the activation of fire-fighting systems, smoke extractions systems come into operation according to pre-set schedulations, in order to facilitate evacuation and rescue procedures to the rescuers called by the Centralized Control Room.

All these solutions allow ensuring the highest safety levels as today possible, improving safety of drivers on the A32 highway.

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