INDUSTRY: TRANSPORTATION

Società Autostrada Ligure Toscana p.a. (S.A.L.T.)

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"Adopting an industry-grade automation solution was the first step to the successful implementation of a project characterized by a large number of controls, and mostly, by the need to guarantee uninterrupted operation."

Eraldo Benedetto, Automation Manager, Giordano & C. S.p.A.

S.A.L.T. Enhances A12 Motorway Maintenance and Driver Safety with Wonderware Industrial Software Applications

Goals

- Improve safety as well as reduce energy use and maintenance costs of Italy's A12 motorway
- Enable the automatic control and operation of tunnel lighting and ventilation systems to enhance driver safety

Challenges

- Manage a critical infrastructure that includes 24 tunnels and 45 miles of "B-class mountain" motorway
- Manage a large number of control units and ensure uninterrupted operation
- Immediately identify anomalies or malfunctions along the motorway, providing diversified information and access to each operator

Solutions and Products

- Wonderware® System Platform
- Wonderware InTouch®
- Wonderware Historian

Results

- A12 motorway safety has been enhanced
- Energy consumption has been reduced via the automated management of tunnel lighting and ventilation systems
- A preventive maintenance system has been established based on the centralized real-time monitoring of installed equipment, decreasing maintenance costs

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Viareggio, Italy – Running through one of the most picturesque regions in the world, Italy's A12 motorway takes drivers over more than 96 miles from Genoa through Tuscany and on to Rome. However, traveling this central road in Italy poses many challenges to drivers such as high speeds, hilly terrain, 24 tunnels that cut through the region's numerous mountain ranges, and more than 45 miles of "B-class mountain" roads. With such demanding, yet majestic driving conditions, motorists must be alert at all times for changing road conditions and possible hazards.

Understanding how important it is to ensure this stretch of heavily travelled roadway is maintained to ensure driver safety, the Italian government selected Società Autostrada Ligure Toscana p.a., or S.A.L.T., to manage all aspects of this stretch of road. With the help of Wonderware®, S.A.L.T. now uses automation software applications to effectively manage road maintenance practices and motorway condition, providing more than 50 million motorists that use the A12 each year with the safest driving experience.

Bearing the huge responsibility of managing this critical stretch of motorway, S.A.L.T. chose to invest in a remote monitoring and control system with the primary goals of improving safety, reducing energy use and lowering overall maintenance costs.

"These important requirements could be met only with solutions and expertise from a software provider with expertise in industrial systems. Industrial software applications characterized by high reliability and with the capacity to handle large-scale applications were required to successfully implement a remote monitoring and control solution," said Paolo Pierantoni, S.A.L.T. CEO.

To help the company successfully address these challenges, S.A.L.T. selected Giordano & C., a solution provider specializing in industrial automation, to effectively implement the Wonderware software applications.

"Adopting an industry-grade automation solution was the first step to the successful implementation of a project characterized by a large number of controls, and mostly, by the need to guarantee uninterrupted operation," said Eraldo Benedetto, automation manager of Giordano & C. "A motorway is always open and any failure of technology systems can endanger the lives of dozens of people. During the design stage, we focused on the reliability and redundancy of all installed systems to guarantee optimal control under any circumstance."

Light at the End of the Tunnel

On a motorway with 24 tunnels, lighting is one of the most critical elements to driver safety. The proper level of visibility must be assured in relation to current weather conditions as well as time of day. A driver's vision must adapt quickly to sudden changes in lighting, as a vehicle traveling at 65 miles per hour covers nearly 95 feet each second. Being blinded for even a couple of seconds can significantly impede driver safety, making proper adjustment of many tunnel lighting systems along the A12 essential. For example, the entrance to a tunnel must be lit to replicate current outside lighting conditions, whether day or night. While in the tunnel, lighting must be adjusted to provide proper visibility along the roadway, with lighting intensity decreasing as the driver gradually approaches the inner section of the tunnel. Lighting must them be readjusted to mimic the outside light conditions as a driver exits the tunnel.

In the past, these adjustments were entrusted to a worker who had to manually adjust the lighting each hour of every day and ensure that it was properly modified to represent current outside light conditions. This manual process had the potential of human error which threatened the safety of drivers.

In addition, delays in lighting adjustments may have had an economic impact from the inefficient use of electricity. A delay in adjusting the lighting by even a few minutes can result in significant additional energy cost. Now, these critical lighting processes are automated and controlled using Wonderware System Platform, giving S.A.L.T. a substantial technological advancement in how it manages its critical applications.

"Time scheduling is based on an astronomy calendar where sunrise and sunset timetables are stored, including possible corrections triggered by a network of twilight sensors and light meters, which detect real weather conditions," Benedetto said. "This process is important to the profitability of S.A.L.T. by ensuring that only the proper level of power consumption is used, avoiding all unnecessary powering of lights. Energy savings equate to cost savings, which has a significant impact on the company's balance sheet."

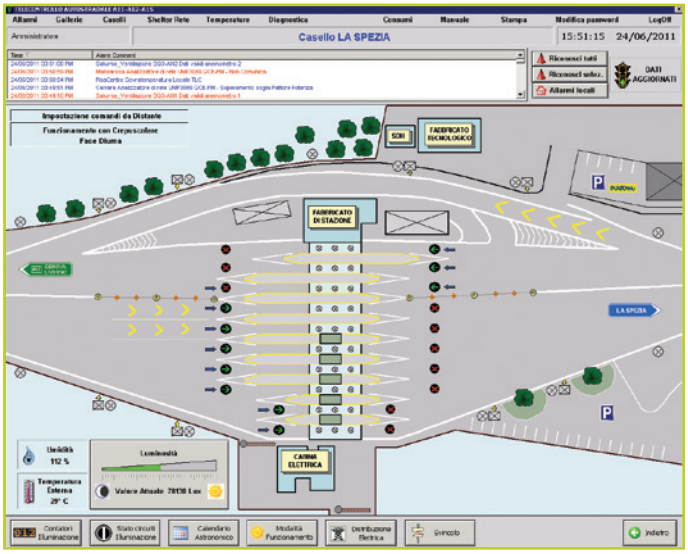
Dissipating Harmful Emissions in Tunnels via Wonderware Software

Inside a motorway tunnel that is used by thousands of vehicles every hour, concentrations of exhaust gas can quickly arise, reducing visibility and making air unbreathable. These conditions can have devastating effects on motorists in the event of long stops due to traffic or mechanical trouble with their cars. Therefore, proper ventilation is essential and requires specific methods for extracting harmful emissions. Using the Wonderware applications, operators can determine the proper air extraction direction according to environmental conditions outside the tunnel, enabling the efficient extraction of noxious fumes.

In case of fire, the air ventilation system features fans whose rotation speeds and direction must be adjusted to support the extraction of smoke without further feeding the flames. It's a delicate balance, especially in tunnels such as Saturnia which is equipped with 14 fans. For this tunnel, a complex measurement system has been installed to perform smart calculations based on exhaust gas concentration, smoke opacity, wind and atmospheric pressure, in order to optimize the operation of each fan.

Streamlined Maintenance Eases Driver Inconvenience

While energy consumption is the most apparent cost factor, the financial impact of maintenance was also evaluated to ensure cost savings. Most drivers have experienced the inconvenience of being stuck in traffic due to road work. Not only is this annoying for drivers, it also is expensive for the management company in terms of staffing, equipment and overall organization. Such conditions can be further worsened by the fact that, in the case of extensive work or an emergency situation, it may be necessary to close down the motorway which results in lost revenue.



In view of these potential situations, A12 maintenance practices required special attention. All technology equipment, from lamps to fans, is monitored remotely from a control room in Viareggio, where two redundant servers are installed to store data collected via the Wonderware Historian. Using a dedicated optical fiber link, information is collected by 40 PLCs that supervise the operation of each system locally. This provides the control room staff with critical information on the condition of any piece of equipment in real time, including power switch cabinets, as well as detailed information about the operating hours of each element. Wonderware Historian combines advanced data storage and compression techniques with an industry-standard query interface to ensure open and easy access to information, enabling process and production decisions to be evaluated and made by the

right people at the right time. Data stored in the Wonderware Historian is easily accessible with a range of reporting and data analysis clients that deliver Historian data to a desktop, or via the Web, as well as to a smart phone or tablet. Advanced data retrieval modes built into Wonderware Historian simplifies report generation, saving valuable IT resources.

Safety is No. 1 along the A12

Of course, safety is a factor that a motorway management company cannot neglect. For this reason even before analyzing the cost effectiveness of a system, the adoption of all the necessary solutions to safeguard travelers is necessary. On a complex motorway such as the A12, S.A.L.T. managers must be informed immediately about any anomalies. Because such requirements are not always compatible with the detailed analysis of each technology component, which is mostly relevant for ordinary management operations, the flexibility of Wonderware System Platform was an important factor. The software provides diversified information and access to each person, including the ability to retrieve information via the Internet.

The control room operator, who is in charge for launching rescue operations in case of emergencies, is informed about current events through a highly intuitive alarm system. The high resolution graphics provided by Wonderware InTouch HMI deliver clear visualization of any system failure on the operator panel, as well as issues on the roadway such as a car crash. This enables the operator to immediately summon rescue squads or skilled workers.

Detailed data analysis is performed in the Viareggio control room, where all aspects of any situation can be examined to identify the required technical action, or to modify remotely specific parameter settings. To comply with the strictest safety standards, any change is automatically recorded and stored in Wonderware Historian. This procedure makes each operator aware of their specific responsibilities and enables them to analyze the effects of any action at a later time. Such capacity, supported by explanatory charts and the ability to compare highly heterogeneous parameters, is a success factor for a motorway controlled by more than 40,000 I/Os.

“The openness of the Wonderware Historian database and the virtually unlimited capabilities of Wonderware System Platform where all industrial automation applications converge, have proved to be very useful during programming,” said Pettiti. “We have also been able to create data exchange tables with other systems tailored to our needs and to meet all customer demands during development.”

The ability of the S.A.L.T. team to remotely control the entire system using industrial automation technology from Wonderware has been key to successfully managing this complex motorway system. Wonderware industrial applications have enabled the real-time management of intricate activities, especially under emergency conditions in which delays could potentially put many lives at stake as well as have a negative impact on profitability.

Invensys • 10900 Equity Drive, Houston, TX 77041 • Tel: (713) 329-1600 • Fax: (713) 329-1700 • software.invensys.com

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