Driven by a need to improve safety, efficiency, and reliability, America’s premier city turned to the cutting-edge automation technologies of Siemens Industry to renovate infrastructure and attractions.

New York City needs no introduction. Even before the events of September 11, 2001 put it in the annals of history, the city was a renowned hub of commerce, industry, and finance; a magnet for tourists; and home to literally millions.

That a city the size of New York must run like a well-oiled machine is a given. The bigger question, however, is how? New York is replete with an ever-growing number of new attractions and countless points of interest that must stay secure and current. Part of the city’s move to ensure safe, smooth operation of its sights and systems has been to modernize through automation and control, an effort that brought it into a trusted partnership with global automation leader Siemens Industry. Recent high visibility projects applying Siemens’ stable of innovative products and systems include the National September 11 Memorial, the NYC subway system, and the Statue of Liberty, which have improved personnel flow, optimized performance, and enhanced safety.
From the reflecting pools at the September 11 Memorial...

In memory of those who lost their lives, the World Trade Center Foundation, a non-profit corporation, was established to oversee construction of a National September 11 Memorial & Museum at the site. The Memorial, which opened in 2011 on the 10th anniversary of the tragedy, includes an eight-acre plaza and two enormous recessed reflecting pools. Each pool is almost an acre in size and covers the former physical footprint of one of the towers.

Completing the Memorial presented many challenges, among them the need to engineer, build, and operate the pools and keep the 600,000 gallons of water in them flowing and clear. Tapped for the task was Delta Fountains, a 22-year-old, Jacksonville, FL, firm specializing in architectural and floating fountains and one of the few U.S. fountain companies capable of handling a project of this size. “We were quite honored to have been selected to help with the design and construction of the pools,” says Delta Fountains President Joe Petry.

“We had to ensure that the reflective and acoustic properties of the pools stayed the same no matter what the weather or time of day or year,” adds Scott Johnston, who co-owns Delta Fountains with Petry. In each pool, water pours over smooth, stainless steel weirs that stretch horizontally atop the pool’s four walls, falls into a catch basin, and re-circulates. It is pumped at up to 30,000 gpm and filtered at a rate of 6,000 gpm. The complex system required technical solutions that would be cutting edge when installed and easily upgradable with the latest capabilities in the future. They were needs Delta Fountains knew could be met by Siemens Industry, the automation systems leader with whom it had partnered many times.

Together with distributor AWC and the Delta Fountains’ team, Siemens application engineers outlined system specifications. Among the requirements were a master control system with a distributed input/output architecture and local slave controls with onboard CPUs for redundancy. The resulting Siemens SIMATIC S7-300 programmable controller package also featured a G120/CU230P variable frequency drive (VFD) for distributed and remote control and redundancy.

Using a common engineering platform across its product family to minimize engineering time and lower costs, the SIMATIC S7-300 features fully integrated system diagnostics that require no additional programming. It communicates over a PROFIBUS fieldbus network to 16 SIMATIC ET 200S distributed I/O nodes with integrated CPUs that provide local control for the many motorized pumps that keep the water moving. With its onboard CPU, the ET 200S distributed I/O nodes can offload computing tasks from the S7-300 master controller to permit fast response to time-critical signals. VFDs on each pool’s pumps ensure precise water flow and pressure control to maintain pool water consistency.
At the core of the solution is the adaptability and flexibility of Siemens’ open architecture, which allowed changes to be easily incorporated without creating a negative financial impact. With the SIMATIC S7-300 controller, Delta Fountains can make real-time measurements from sensors just about anywhere in the pools and plumbing and use the data to automate controls and keep the systems in balance. Over time, the historical data will build baseline operating profiles that can be used to further automate pool operations.

For maximum configuration efficiency, Delta Fountains chose Siemens SIMATIC WinCC Flexible software for the main HMI operator station and each pump VFD panel. The software offers a wide range of operating functions and options for HMIs to provide easy operational visualization of the connected controllers, I/O nodes, and VFD devices. The software also allows the pools to be operated remotely over secure Internet connections.

The Siemens installation yielded numerous benefits. Petry and Johnston agree that without the Siemens products they could not have achieved the precision control they needed. The VFDs drive the pumps at optimum speed at all times, saving energy, curbing CO2 emissions, and reducing motor wear-and-tear and subsequently maintenance costs. “The system can test-sample the water every five seconds and adjust the bromine levels to keep a constant pH,” adds Petry. “The Siemens solution is so comprehensive that it saves the labor of two technicians, or about $150,000 to $200,000 a year including benefits. What’s more, because day-to-day operations can be controlled remotely from Jacksonville, New York’s high living costs can be avoided, too.”
...into the depths of NYC subway system...
Beneath the sidewalks of New York lies a subway network unlike any other. It is incredibly large and complex. Trains run 24/7 and cover more than 700 track miles. On any given weekday, more than 6.4 million commuters depend on it.

Maintaining efficiency and safety in this transportation lifeline is an ongoing effort, one that Siemens Rail Automation has been part of from the start. The automation leader has guided multiple projects for New York City Transit (NYCT). Most recent is a Public Address/Customer Information System (PA/CIS) involving the portion of the transit system known as Subdivision A, approximately a third of the total transit system.

The PA/CIS project has its beginnings in the mid-1990s when NYCT began planning the construction of a system-wide electronic communications network to serve as the backbone for future communications needs. The network would dramatically increase the amount of information that could be exchanged throughout the system and its many stations. Now complete, the vast infrastructure of more than a million feet of fiber optic cable offers maximum flexibility to accommodate countless anticipated subway system applications, of which PA/CIS is one.

To build a foundation for PA/CIS, Siemens Rail Automation first installed a train control system known as ATS (automatic train supervision). The project improved operating efficiency by automating train control functions previously performed manually and consolidating control into one location. PA/CIS continued the transit system upgrade, supplying riders with audio and visual train arrival/departure information. It displays all information in real time and operates over the system-wide electronic communications network.

Key to the success of PA/CIS is the incorporation of Siemens’ SIMATIC WinCC Open Architecture (OA), a platform independent system designed to reduce engineering time and implementation costs for installations with special application size, operating system, and complexity requirements. “WinCC OA is one of the only software platforms with the ability to handle a system of this size and complexity,” adds Siemens Mobility’s Paul Eliea, project director for the PA/CIS system and the ATS effort. “Its architecture supports large scale systems–up to 2054 systems can be combined. Because of that capability, WinCC OA is able to handle...
huge amounts of data—and PA/CIS is currently operating with 10 million datapoints and was tested successfully to handled the 20 million data points required to expand to Subdivision B. These data points need be configured only once, reducing the number of possible faults during configuration. And each system has its own stand-alone feature set,” he continues. “If a loss of connection occurs between systems, all functionality is not gone. Local systems can operate on their own. This combination of distributed systems and redundancy enables systems with high-performance, high scalability, and high availability.”

Prompted by customer service needs while also embracing safety concerns, PA/CIS delivers automatic and manual messages. Features include audio and visual live and pre-recorded messages, and visual displays that can provide special effects. Announcements are ADA-compliant; and should the need to evacuate an area arise, a safety announcement can be made quickly and efficiently. The system boasts some 10,000 speakers, 1,000 customer information signs, and 40 workstations.

Critical to the operation of PA/CIS is its link to the ATS. “We interfaced the two systems and started drawing data from the ATS for the PA/CIS,” says Eliea. “The two systems operate well together and we’ve had very few issues with the data exchange.

Data from the ATS provide the positions of the trains. That information, schedule information, and a set of algorithms together predict train arrival times.”

It is an extremely accurate system that is constantly updating, adds Eliea. “The PA/CIS system identifies the train and where it is in the sequence. It also shows which other trains are coming in, and scrolls constantly. It provides a lot of information, and helps control crowding. It lets passengers know where to go based on up-to-the-minute information. There is less running or rushing.”

Siemens has worked extensively with NYC Transit employees, training the maintenance team, operators, and software engineers. “We’ve ‘embedded’ the software and commissioning engineers with Siemens personnel so they can work together directly and learn the system first hand,” says Eliea. “The same process has been applied in the control center and field maintenance.”

At this point, Siemens Rail Automation has received certificates of substantial completion for the PA/CIS and Phase I of the ATM project and anticipates completing the transfer of all operations over to transit personnel by summer 2012.
...to the heights of the Statue of Liberty

Undeniably one of most revered symbols in America, the Statue of Liberty in New York Harbor has welcomed millions of immigrants to the shores of the United States...and millions of visitors into its interior. Recently, however, access to the beloved landmark was restricted as Lady Liberty undergoes a $27 million renovation. The "life safety upgrade program," a U.S. National Park Service initiative, will see the national landmark remodeled with new fire and safety features and modified to improve personnel flow. The work is expected to be complete by fall 2012.

Among the retrofits is the replacement of the Statue's existing rescue elevator with new state-of-the-art equipment. Directing the project is Tower Elevator Systems, Inc. (TESI), a firm specializing in permanently installed custom rack-and-pinion elevator systems. The work was prompted by the need to upgrade 30-year-old technology that had reached the end of its useful life. The new system is a special purpose personnel machine that uses cutting-edge technology to enhance safety and reliability and make unit operation more user friendly.

“We are extremely proud to be chosen to install the new rescue elevator,” says TESI president Todd Grovatt. The machine travels from the top of the pedestal through the Statue to just under the crown and is intended to give emergency personnel dedicated access to the statue. The custom-designed machine is unique, points out Grovatt. It had to be configured to fit in a very small space. And the project also marked TESI’s first application of Siemens Industry’s TIA Portal engineering software tool: a proven, intuitive engineering framework that allows automation processes to be designed optimally and efficiently from a single computer screen. The ground-breaking innovation shortens the engineering cycle, saves commissioning time, and reduces maintenance costs and TCO.

The standard core component of TESI’s elevator control system, the Siemens SIMATIC ET200S safety PLC, and other components in the project were all designed and commissioned using the TIA Portal. Easy to use, strong in its performance, and with one of the smallest I/O footprints, the SIMATIC ET200S safety PLC simplifies configuration and optimizes troubleshooting, with a short I/O reaction time to maximize throughput and system efficiency.

Brian Trapani, lead project engineer and developer of the PLC code and HMI screens for the application calls TIA Portal essential to the effective completion of the project. Critical features of the tool, he says, include the ability to drag-and-drop elements to and from any of the included libraries. “You can drag instructions directly onto the ladder network. HMI screens are all right there and available for editing. The cross-reference guide encompasses almost any input/output. Just a click or two gets you to the right place. You can organize function blocks more easily; you can add and remove hardware without ever losing your original place. That could not be done with earlier software versions.”

Trapani credits TIA Portal with reducing front-end engineering and programming time some 30 to 40% over previously used software. “And when something is already installed, when you are troubleshooting,” he adds, “TIA Portal’s cross-referencing features again really save time. You can find problems much faster. We are very happy with the TIA Portal engineering software. We understand and appreciate its integration benefits. Safety is a big focus of this company,” he continues. “The safety PLCs are a primary reason we partnered with Siemens in the first place. Now safety is part of TIA Portal [as of last November] and is easily programmable from within the tool.”

Safety features of the installation include redundant systems that track all aspects of the operation, notes Trapani, “including car speed, height, E-stop circuitry, open and closed doors on the landing side and the car side. TESI has also developed a rescue lowering system that is integrated into the safety mechanisms. Should the car lose power, if something goes wrong, the car can be lowered to the next safe landing so the personnel can get off. The safety PLCs also constantly monitor other components such as brakes and motors.”

The Statue of Liberty elevator was also TESI’s first application of Siemens’ SIMATIC HMI Comfort panels on an elevator. With integrated hardware and software, the SIMATIC HMI panels offer highly readable screens and longer backlight life to reduce TCO and meet complex visualization needs. “The Siemens SIMATIC Comfort HMI panels give us a full-color touchscreen user interface to monitor critical systems, perform diagnostics, and troubleshoot problems,” points out Grovatt. “None of those features had been available before. And we’re using variable speed drives for speed control now and have a very technically advanced laser positioning system which monitors the location of the machine within the hoistway to a very accurate level. The PLC takes feedback from the system, and using logic we developed directs the machine to a designated location.”
For the future, Grovatt looks forward to standardizing on the TIA Portal engineering software and integrating the product into its regular operations. “It will add efficiency to our engineering,” he says. “It is the next-step evolution in our partnership with Siemens.”

Keeping New York at the edge of tomorrow

New York City is unrivaled in reflecting the sights and sounds of American life. Superlatives apply so much so that a Google search turns up near-endless lists of “bests” and “mosts” in what is called by many the most celebrated city in the world.

Keeping a world leader like New York where it needs to be in terms of innovation and technology requires...and continues to require...the cutting-edge products and systems of another global leader: Siemens Industry. And the automation and technology giant remains there to help the city ensure the systems and services that make it number one operate with efficiency and safety. Together, Siemens and the city go on pursuing improvements that benefit all, from extending the PA/CIS system to the rest of the subway system to re-opening a refurbished Lady Liberty to ensuring the impeccable image of the September 11 Memorial...into the future and beyond.
For more information on the products and services discussed in this article, visit the Siemens Industry website at www.usa.siemens.com.