Bay Associates

Designed for Success

Results

- Critical control for life safety and equipment protection
- Better risk management
- 66% reduction in labor requirements
- Higher efficiency

"With GE Fanuc PLCs monitoring and controlling pump activities, we're able to maximize fuel dispensing rates and, more importantly, protect operators and equipment from dangerous surge conditions."
Robert Boseman
President
Bay Associates

Under Pressure

GE Fanuc Controllers Help Satisfy Variable Demands of Aviation Fueling Systems

Supplying aircraft fueling systems to premier U.S. military operations like McGuire Air Force Base, Edwards Air Force Base, and the Presidential Air Force One Aircraft, Bay Associates of Virginia Beach, VA, performs under an enormous amount of pressure—literally.

The largest aviation fueling system supplier in the world, Bay's Fueling Division operates as a manufacturer's representative and original equipment manufacturer (OEM) of valves, controls, and equipment used in storage, transfer, and dispensing of fossil fuels for military and commercial aircraft. Using GE Fanuc Series 90™ programmable logic controllers (PLCs) manufactured by GE Fanuc Automation, Bay designs unique, high-performance systems that instantaneously respond to the infinitely variable demands and pressure conditions associated with aircraft fueling. Confirms Bay President Robert Boseman, "With GE Fanuc PLCs monitoring and controlling pump activities, we're able to maximize fuel dispensing rates and, more importantly, protect operators and equipment from dangerous surge conditions."

"Auto" Fuel for Aircraft
Over the past several years, many major airports and military bases have changed their methods of fueling aircraft from tank-type vehicles loaded at storage facilities away from the apron or ramp, to automated or "hydrant" fueling systems. Hydrant systems, like those designed and manufactured by Bay, include off-apron/ramp storage tanks with pump houses that provide fuel through piping beneath the apron. Fuel is dispensed to pits or dispensing stations located at parking positions, fueling lanes, or passenger loading gates. Fuel is then loaded onto the aircraft via hydrant service vehicles, hose carts, or pantograph assemblies, eliminating the need for vehicular storage and transport to the aircraft.

Hydrant fueling systems typically feature a minimum of two tanks, one dedicated to receiving fuel and the other dedicated to dispensing fuel. Both tanks incorporate pump houses with two to ten identical fueling pumps handling

imagination at work

individual capacities from 600 gallons per minute (gpm) to 1,200 gpm. Corresponding capacity filter separators, control valves, and instrumentation for starting and stopping the pumps as determined by flow rate demands.

Bay's control systems vary from highly sophisticated systems that include tank inventory management and report capabilities, to simpler systems that include operating logic, alarm functions, and annunciation. Depending on I/O specifications, a GE Fanuc Series 90-30 or Series 90-70 PLC hardwired to field devices, I/O modules, and, for "hot standby" applications, a Genius® bus, provides communication from the I/O racks to the CPU.

Bay's latest hydrant control systems, the Type III – Revised system, uses the GE Fanuc Series 90-30 PLC to monitor and control 500 I/O points, comprising 90 percent digital I/O and 10 percent analog I/O. "Each PLC is programmed to react to pressure conditions within a loop system by communicating to the lead pump," explains Boseman. "When the pressure drops, the PLC brings on the lead pump to adjust the pressure according to demand." The PLC then follows a logical sequence to bring on additional pumps. If the system is issuing 600 gallons of fuel and only getting 50 gallons on return, additional pumps come online to satisfy the demand, or go offline in the case of over supply.

Due to military security, most of Bay's hydrant fueling systems are designed as standalone stations. Though automatic and predominantly unmanned, all are capable of providing audible and, in some cases, visual alarms. Some Bay customers request a desktop computer interface in a maintenance shop setting to run diagnostics or check field devices like pressure and flow transmitters. Currently, 75 percent of Bay's visual alarming is supplied by GE Fanuc's CIMPLICITY®* monitoring and control software. When incorporated, the Windows®-based CIMPLICITY software displays system conditions via user-friendly, graphical representations of specific system components.

* Part of Proficy Intelligent Production Solutions from GE Fanuc.

Bay has also designed a number of hot backup redundancy systems using GE Fanuc's Series 90-30 PLCs, the Genius bus, and HBR-30™ software provided by Trimation® of Charlottesville, VA, a GE Fanuc Accompany Program Partner. Hot backup redundancy uses a parallel CPU operation in which the HBR-30 software allows one CPU to operate as the primary and the other CPU to operate as the backup.

Peak Performance

For many of Bay's customers, the decision to use a hydrant fueling system depends on several factors, including cost, aircraft turnaround time, personnel requirements, and risk management—all of which affect system design. Servicing different types of aircraft, from helicopters to large cargo planes, adds yet another variable, as each tank accepts fuel at a different flow rate based on its size and the amount of fuel already present. Nozzle connection pressures range from a maximum 55 psig in operation to 120 psig maximum surge pressure, requiring the system to perform within those parameters while supplying peak fueling rates. Meanwhile, within a split second, the system's dispensing control valves must close upon release of the aircraft valves and the systems must avoid surge pressure shocks.

Constantly changing fuel demands create the continuous challenge of maintaining safe, yet efficient pressures for optimum fuel distribution. "If an aircraft valve closes before an operator stops fueling, that sudden change in pressure can cause problematic surge conditions that can lead pumps to fail or, even worse, equipment to rupture," warns Boseman. "With the help of GE Fanuc PLCs, our fueling systems can safely manage surge conditions, preventing fuel spills, damage to the aircraft, and, most important, operator injuries and loss of life."

Though fuel spills and aircraft damage run a distant second behind the safety of personnel, they are still a major concern as they can be quite costly. "Fuel spill liabilities can cost up to $8 per pound of earth for soil rehabilitation," notes Boseman. "And, if the fuel cell of a B2 Stealth Bomber ruptures, no one is anxious to pick up the tab for one of those $1.5 billion marvels."

Recently, Boseman has noticed a growing demand for Bay's automated fueling systems, which he predominantly attributes to military budget reductions and the push for fewer personnel. "Most military bases are designed to react to specific missions and, therefore, typically function well below capacity," says Boseman. "A nonautomated pump requires approximately three operators per pump house, where as an automated system can be safely managed by one operator. Based on this 66 percent reduction in required personnel, we expect military operations will continue evolving from hardwired I/O and LEDs to more advanced, automated systems with computer interfaces."

Supplying the bases that served the Gulf War and Kosovo missions, Bay has obviously earned an incredible amount of trust from the nation's most vital military facilities, a responsibility Boseman says the company takes very seriously. "Our fueling systems perform under incredibly demanding and largely unpredictable circumstances. We have to have confidence in every component, from the PLCs, valves, and hoses, right down to the smallest screw. After all, lives may be at stake."

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Additional Resources

For more information, please visit the GE Fanuc web site at:
www.gefanuc.com