

StoneL[®]

Valve Communication Solutions

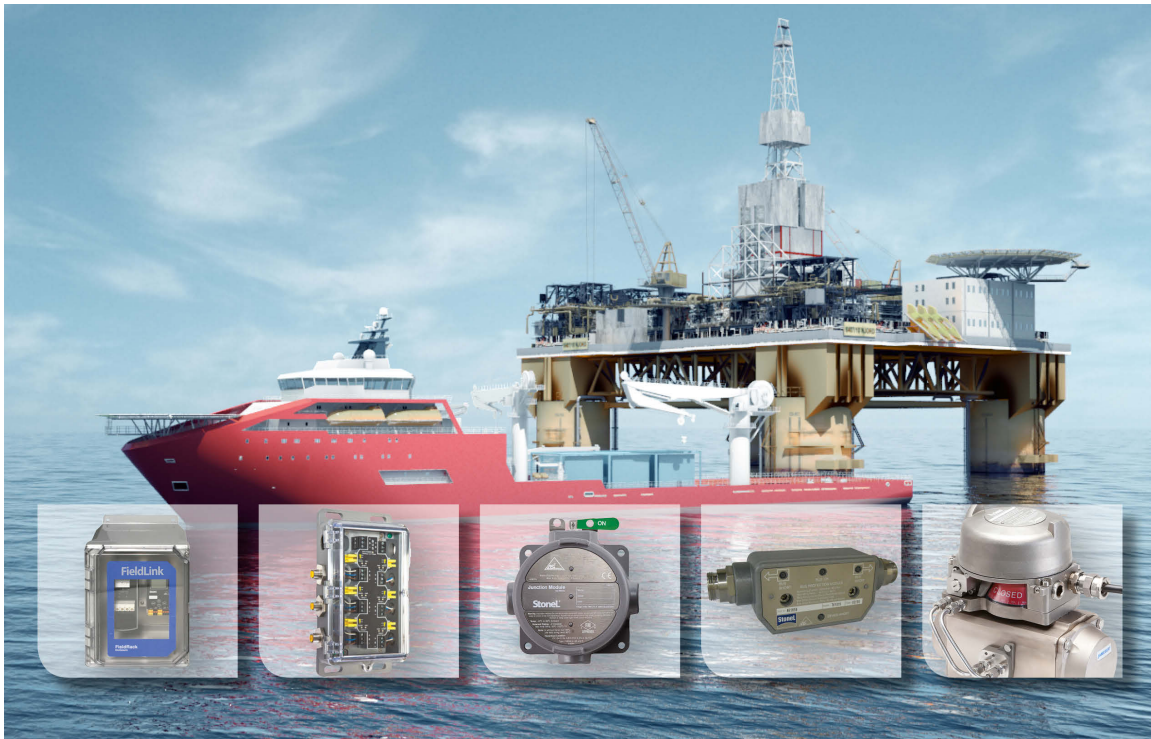
A white paper from StoneL

Easy on/off valve integration with AS-Interface for marine applications

By: Dale Ruckman, StoneL Field Sales Manager



Over the previous decade, new technologies, as well as an increasing demand for oil and gas, have spurred new investment in offshore drilling and production activities. With new regulations and a greater emphasis on safety, due to accidents such as Deepwater Horizon in the Gulf of Mexico, the need for marine support vessels is growing. They are being called on in greater numbers to supply platforms with necessary materials for drilling, production, and emergency support should a malfunction in operations occur.



*Figure 1:
StoneL's stainless steel explosionproof Axiom AX VCT has been installed as part of a valve communication network in ships worldwide above and below deck in a wide range of ship types and applications.*

With the increasing requirements for supply vessels and greater demands for each vessel, networking technologies are being explored to increase productivity and shipboard capabilities. Valve communication networking is becoming the preferred method for installing automated valves in process industries, including petrochemical, pharmaceutical and biofuels. The same reasons that make it desirable in industrial plants make it preferable for marine applications, including:

- Valve communication networks dramatically reduce wiring costs.
- Instruments and valves are easier to install.
- Time and manpower required for commissioning of smart instrument and valve installations are dramatically reduced.

- Smart valves on a network can provide fast information about their condition, so that people don't have to travel to difficult areas of the ship to detect problems or troubleshoot them (diagnostics).

A valve communication solution for marine applications includes a valve communication terminal (VCT), with solenoid valve and limit switches integrated into one package, and networking components linking the ship's control system with the network communication protocol to the VCT. A great example of the VCT is the Axiom and an example of networking components is the FieldLink Bus Protection Module (BPM) and gateway— from StoneL.

Shipbuilders worldwide have begun adopting valve communication networking and are realizing the benefits. Hundreds of vessels are now equipped with shipboard valve communication networks above and below deck in a wide range of ship types and applications. (See figure 1)

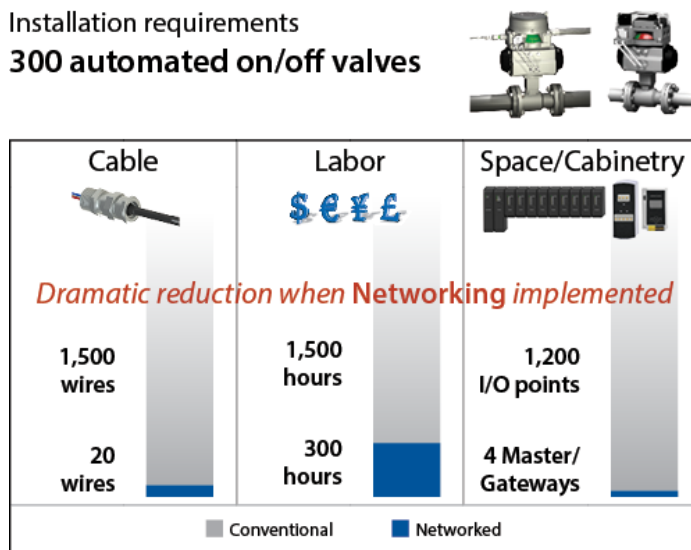


Figure 2: In a conventional installation, each process control device has to be individually wired with up to five or more connections. An installation of 300 automated on/off valves would typically require 1,500 wires, 1,200 I/O points, and considerable labor hours and staff. Installing networked process control valves would require only 20 (two-wire) cables and one person can be assigned to this task, dramatically reducing installation time and materials costs plus saving additional costs in other infrastructure.

Exceeding shipbuilders expectations

A complete valve communication solution addresses many shipbuilders' concerns and provides benefits including (See figure 2):

- **Wiring costs.** Conventional control systems require miles of cable and wires, and considerable I/O. Each process control device has to be individually

wired with up to five or more connections. In this model, a ship with 300 automated on/off valves would require 1,500 wires and 1,200 I/O points. An AS-Interface network of 300 automated on/off valves, however, requires only 20 (two-wire) cables, making it considerably less expensive. Furthermore, it dramatically reduces the need for I/O, cabinets and infrastructure.

- **Space and weight.** The labyrinth of wires on industrial ships severely limits available space on board. By reducing the number of wires required per valve the AS-Interface networking solution reduces the wiring space burden by over 80 percent.
- **Installation labor.** Instead of taking several hours to install and test a single valve, it takes less than an hour and one person can be assigned to this task instead of three or four.
- **Commissioning efficiency.** During a launch date crunch, hundreds of people can be working stem to stern sizing components, installing various systems, welding connections, and wiring valves. Bus communications makes it fast and efficient to isolate problems in valve networks without sending personnel into the frenzy to examine individual valves.

Answering seagoing concerns

To make the transition to valve communication networking, shipbuilders and ship owners have had to overcome real and perceived problems that exist on land but are magnified for seagoing installations. Valve communication and control devices may be used individually or in combination to address:

- **Safety.** In a shipboard emergency, such as a collision or fire, it is essential to protect shipboard valve networks that rapidly actuate valves to predetermined safety positions. Using VCTs, such as the Axiom, you can remotely activate pneumatic override signals to drive the main pilot valve to a predetermined condition – regardless of coil or pilot status. This solution also gives operators the ability to manually reposition any or all valves to the safe position either locally or remotely.
- **Explosionproof requirements.** In above deck applications typical requirements are to have 316 stainless steel enclosures which meet explosionproof requirements. This ensures the solution is extremely durable and well suited for use in corrosive, heavy washdown, and high seas environments.
- **Network redundancy.** Without network redundancy, a cut cable or short circuit can result in immediate device loss on a shipboard field network. Using “loop topology” in conjunction with an AS-Interface network can

circumvent this problem. Loop topology enables field devices to communicate with the controller via a dual path. If the cable is cut anywhere in the loop, field devices continue to communicate and operate normally. This redundancy greatly increases safety while reducing loss of process control.

- **Short circuit protection.** Difficulties locating and repairing short circuits can be a thing of the past. By using StoneL's FieldLink BPM short circuits are identified and isolated in either the drop connection or on the main network "loop," allowing the process control network to continue to function normally.

Adapting proven technology

Most of the technology for device valve communication networking used in ships was transferred from land-based industrial applications where it has been used for over a decade. Once it was adapted to shipboard use, various enhancements were added to further improve redundancy, safety and installation productivity in very confined shipboard spaces.

There are many maritime applications, including military, in which shipboard bussing of valves and other devices can yield substantial cost benefits along with improved operational efficiencies, maintenance cost reductions, and safety.

Well stimulation vessels, as well as offshore service vessels, large offshore service vessels, and platform supply vessels are embracing shipboard valve communication solutions for its many benefits, including minimal space requirements, increased efficiency, and decreased downtime.

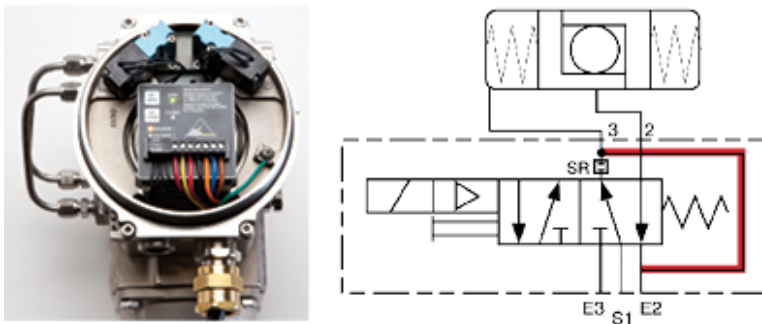


Figure 3: The Axiom AX's rebreather is suitable for both spring return (shown) and double-acting actuators. The unique design of the pneumatic valve in the Axiom provides a rebreather functionality, for spring return actuators. By tubing the Axiom manifold mounting plate to both sides of the actuator, ingestion of salt water or other contaminants into the actuator is eliminated.

Shipboard proven field devices

One of the first manufacturers of VCTs to utilize valve communication networks in the marine industry, Stone has been an innovator in creating robust networking components suitable for numerous shipboard applications. They have supplied thousands of conventional and valve communication networks for marine vessels operating all over the world. StoneL's shipboard proven valve communication network solutions for the marine industry include:

- **No actuator internal corrosion.** The unique design of StoneL's Axiom VCT includes a rebreather function (*see figure 3*). By tubing the Axiom manifold mounting plate to both sides of the actuator, ingestion of corrosives elements that may be present in the ambient air, such as salt or chemical fumes, can be eliminated.
- **Network protection.** StoneL's FieldLink BPM works with an AS-Interface network to identify and isolate a short circuit in the VCT or the main bus trunk (*see figure 4*). When a fault occurs in a field device or bus segment the device or segment is isolated, allowing the remaining devices and network to continue normal operation. Electronic "red flags" are displayed on the BPMs – directing maintenance staff to the faulted cable, and speeding repair or replacement. When used in conjunction with StoneL's Axiom VCT with dual coil shuttle piston solenoid, BPMs improve safety by helping to prevent loss of process control. This reduces downtime and increases productivity.



Figure 4: StoneL's FieldLink Bus Protection Module (BPM) works with AS-Interface to identify and isolate a short circuit in either the drop connection or on the main network "loop" allowing the rest of the devices to function normally. Used in conjunction with StoneL's Axiom valve communication and control monitor, BPMs improve safety by helping to prevent loss of process control. This reduces downtime and increases productivity.

Diagnostics. The Axiom diagnostics unit is a VCT that includes additional capabilities for monitoring the primary air supply, integral solenoid (see figure 5), high flow spool valve, and process control valve operations. These conditions may be monitored both locally and remotely through the ship's HMI control system software.

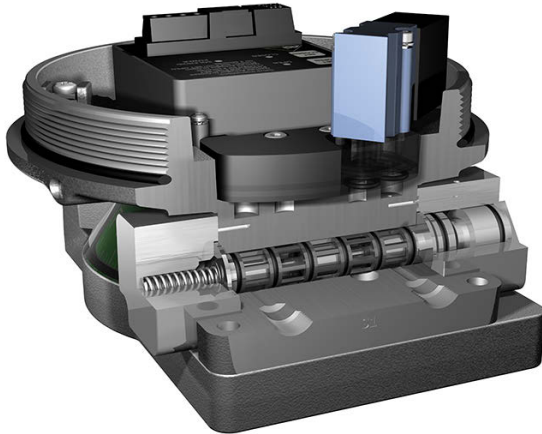


Figure 5: The Axiom's integral solenoid system operates on less than 0.6 watts of power, and the integral pneumatic valve system operates on standard plant air, with 0.7 or 1.2 Cv to operate valves rapidly.

- **Valve communications.** The Axiom VCT utilizes any of the four primary network protocols: AS-Interface, DeviceNet, Foundation Fieldbus, or Modbus. In addition, it greatly reduces installation time and cost; requires considerably less I/O; has basic diagnostic capabilities; and allows multiple devices, depending on the protocol, to be connected to the network with a single cable topology.
- **“Fail safe” pneumatic control.** The Axiom, with its integral pneumatic solenoid, offers “fail safe” pneumatic control options, which automatically position the valve to a predetermined position on loss of electrical power or communication. Options include fail open, fail closed, or fail-in-last position.
- **Meeting major class society requirements.** The FieldLink BPM and Axiom VCT are designed and inspected to meet all US Coast Guard and ABS requirements, as well as those for emergency shutdown and local valve indication and control.

StoneL's application support group is able to combine both valve communication and networking capabilities to provide a complete shipboard system. FieldLink solutions focus on economically and reliably connecting field devices with the computer control architecture regardless of the communication protocol employed. VCTs enable quarter-turn and linear discrete automated valves to think and communicate. Modular products and support services based on a broad range of experience allow StoneL supply channels and integrators to respond to each customer's shipboard networking challenges.

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About the author

Dale Ruckman is a Field Sales Manager for StoneL. Dale graduated from University of Texas with a BS in Mathematics. He is a Vietnam veteran with 10,000 plus flying hours (active duty and Air National Guard) and was Commander of an electrical engineering squadron with the Air National Guard for 10 years, retiring as a Lieutenant Colonel. Dale has spent nearly 40 years in process automation, instrumentation, and control systems in oil and gas, petrochemical and marine applications. He formerly owned his own instrument sales company. Dale has been with StoneL for more than 10 years. He can be reached at druckman@stonel.com

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