

# CC-Link

## NORTH AMERICA

### IN ACTION

## Compressed Gas Filling System

*CC-Link* provides the “open” network backbone for a high-pressure gas filling system at ILL-MO in their Jacksonville, Illinois facility. The compressed gases handled at this facility are Oxygen, Argon, Nitrogen, Carbon Dioxide and Helium. This system was designed and installed by Computer Integrated Automation, Inc. of Carol Stream, Illinois. The *CC-Link* network enables communication between PLCs, motion controllers, pneumatic valve manifolds, variable frequency drives (VFDs), digital I/O, and analog I/O devices. *CC-Link* handles remote device interfacing, integrating equipment from different manufacturers, data collection, information handling, and data exchange between PLC's and machine control elements.

The control system and *CC-Link* network assure gas purity, filling accuracy, and handles all operational functions of the gas filling controls. In this application, *CC-Link* enabled equipment from these different manufacturers to communicate over the same network:

- WAGO Corp. – I/O modules
- SMC Corp. – Pneumatic valve manifolds
- Mitsubishi Electric Co. – PLCs, HMIs, VFDs, I/O modules

### Additional Benefits

The use of the *CC-Link* network results in significant reductions in conduit and wiring expenses. Instead of long wire runs from each field device back to a central controller, now a simple commu-

nication cable interconnects all gas-filling devices on the network. Also, this approach eliminates the wiring mistakes so common with non-networked systems. Less skilled personnel can be utilized for the field-wiring task. Thus, field installation requires far less time and system start-up is considerably more efficient with less downtime for the end-user.

From the designer's perspective, a *CC-Link* networked system requires less engineering time, fewer CAD hours, less installation print production, and enables simplified panel layout and design, and the use of space saving components. *CC-Link* also allows easy future expansion of the system, which in today's rapidly changing environment is an important benefit.

### Description of the *CC-Link* Based System



*Gas Filling Island with 3 Filling Stations*

One *CC-Link* Master controls a single gas-filling island where a variety of I/O devices transmit thermocouple, digital, and analog information. An island consists of three sections, with each section called a filling station. The first station in this island handles the Mix Gas, the second handles the Inert Gas, and the third station handles the Oxygen Gas.



*Mix Gas Filling Station*

As the name implies, the Mix Station fills gas tanks with a mixture of different gases. An operator determines the portions and types of gases to be mixed through a touch panel HMI (Human Machine Interface) located on the front panel of the control enclosure. In this photo, the back of the HMI can be seen in the open panel door. The *CC-Link* Master is located in the back-plane of a Mitsubishi QnA series PLC. Information is transmitted via *CC-Link* to control the pumps and valves to provide the proper gas mixture requested by the operator.



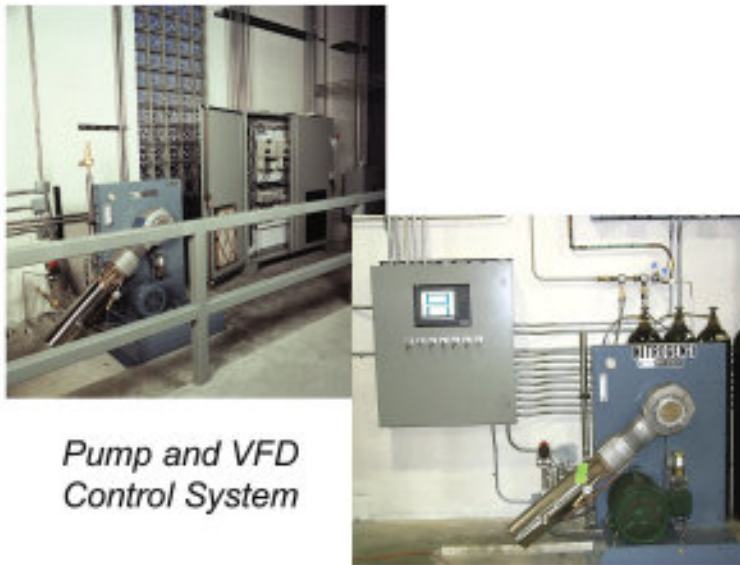
*Inert Gas Filling Station*

At this station gas tanks are filled with the selected Inert gas. The front of the Inert Gas Filling control panel contains numerous gauges and valves as well as another Human Machine Interface (HMI) device. Inside the control panel is a Mitsubishi Series FX, small PLC. This PLC integrates the numerous gauges, valves, push buttons, and HMI onto the *CC-Link* network of the entire Gas Filling Island through a *CC-Link* local station interface. A remote gas pumping station receives commands via the *CC-Link* network to provide the proper inert gas to this filling station as requested by the operator.



*Oxygen Gas Filling Station*

At this station gas tanks are filled with oxygen. The front of the Oxygen Filling control panel contains several gauges and valves as well as another Human Machine Interface (HMI) device. Inside the control panel is a Mitsubishi Series FX, small PLC. This PLC integrates the numerous gauges, valves, push buttons, and HMI onto the *CC-Link* network of the entire Gas Filling Island through a *CC-Link* local station interface. A remote gas pumping station receives commands via the *CC-Link* network to provide the supply of oxygen gas to this filling station as requested by the operator.



*Pump and VFD Control System*

The final part of the system is the Pump and VFD control system. The VFD Control cabinet houses three (3) Variable Frequency Drives (VFDs), each communicating on the *CC-Link* network. The VFDs control the pumps for filling the gas containers. A single pump may be used at several different gas-filling stations at different times, therefore the pump control needs to know which pump is operating at all times. This information is obtained through the use of the *CC-Link* network. Also in that cabinet is an I/O module for controlling the pump starters and various other I/O devices.

The Pump Control System queues the different gases for the different filling stations on the island. This system is the 'traffic cop', which controls when to start and stop the pump for the different filling stations. All gas filling stations use the same pumping station; therefore this pumping station controls which gas goes to which filling station based on the information and control signals it receives from the *CC-Link* master via the network. The pump control cabinet, which manages the pumping operation, contains a Mitsubishi Series QnA PLC and the *CC-Link* local station.

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