Critical Control

Subsea Blow-out Prevention Control System

The Application

An offshore gas production facility requires surface control and monitoring of various safety-related subsea functions. The Subsea Multiplex Blow Out Preventer (BOP) control system provides remote control and monitoring of these functions for the Lower Marine Riser Package (LMRP) and the BOP Stack.

Blow out prevention functions for the LMRP consist of operating annular valves and isolation test valves. The system also controls choke and kill line stabs, hydraulic stabs, and riser connectors, and charges and isolates LMRP accumulator banks.

Blow out prevention functions for the BOP Stack consist of operating shear rams, upper, middle, and lower ram-type BOPs, and choke and kill line valves. The system also controls wellhead connectors and charges and isolates shear and acoustic accumulator banks.

The Need

Personnel operating the gas production facility's Driller and Toolpusher subsystems need safe and reliable monitoring and control of BOP and other subsea functions from their control panels on the surface. During maintenance, these functions must also be monitored from a Human Machine Interface located on the Central Control Unit (CCU) panel.

The Solution

The customer chose Silvertech Limited as systems integrator because of their extensive experience in safety systems design, and their proven ability to engineer GE Fanuc products for critical control applications. The GE Fanuc **Genius® Modular Redundancy** (GMR) system was chosen because of the reliability demonstrated by these systems in other critical control installations.

A triplex GMR system, consisting of three **Series 90™-70** programmable logic controllers (PLCs), was implemented. Each PLC individually monitors and controls the Genius distributed I/O subsystems for triple, dual, or simplex redundancy of input field devices and H-configuration output signals.

Signals from subsea sensors are transmitted from each of the dual redundant subsea electronic pods (Blue and Yellow) through triple redundant fiber optic communications links to the CCU, where they are processed, logged, displayed, and forwarded to the Driller's and Toolpusher's Control Panels for remote display. Subsea and surface hydraulic operating and pilot pressures are regulated from either control panel by simple pushbutton operation.

The subsea input subsystem, made up of duplex input Genius modules on separate Genius busses, provides redundant discrete inputs voted 2-out-of-2 (2oo2) and redundant analog inputs voted as the mean of the two inputs. The PLC logic, executed independently by all three PLCs, receives the same voted inputs. All inputs, both discrete and analog, will revert to 1oo1 voting under failure conditions.

The subsea output subsystem configuration and the surface Trip Riser Recoil System output, made up of a four-block *H* configuration of Genius modules on three separate Genius Busses, is configured to vote 2oo3, 2oo2, 1oo1 null (hold last state) on information from any of the three PLCs.

The surface output subsystem (other than for the Trip Riser Recoil System output) consists of duplex output Genius modules on separate busses with separate dual redundant bus systems for each of the Driller's and Toolpusher's control panels. Where used for analog instrumentation outputs, an output relay is driven by a single discrete output and wired for logical 1oo2 analog output operation.

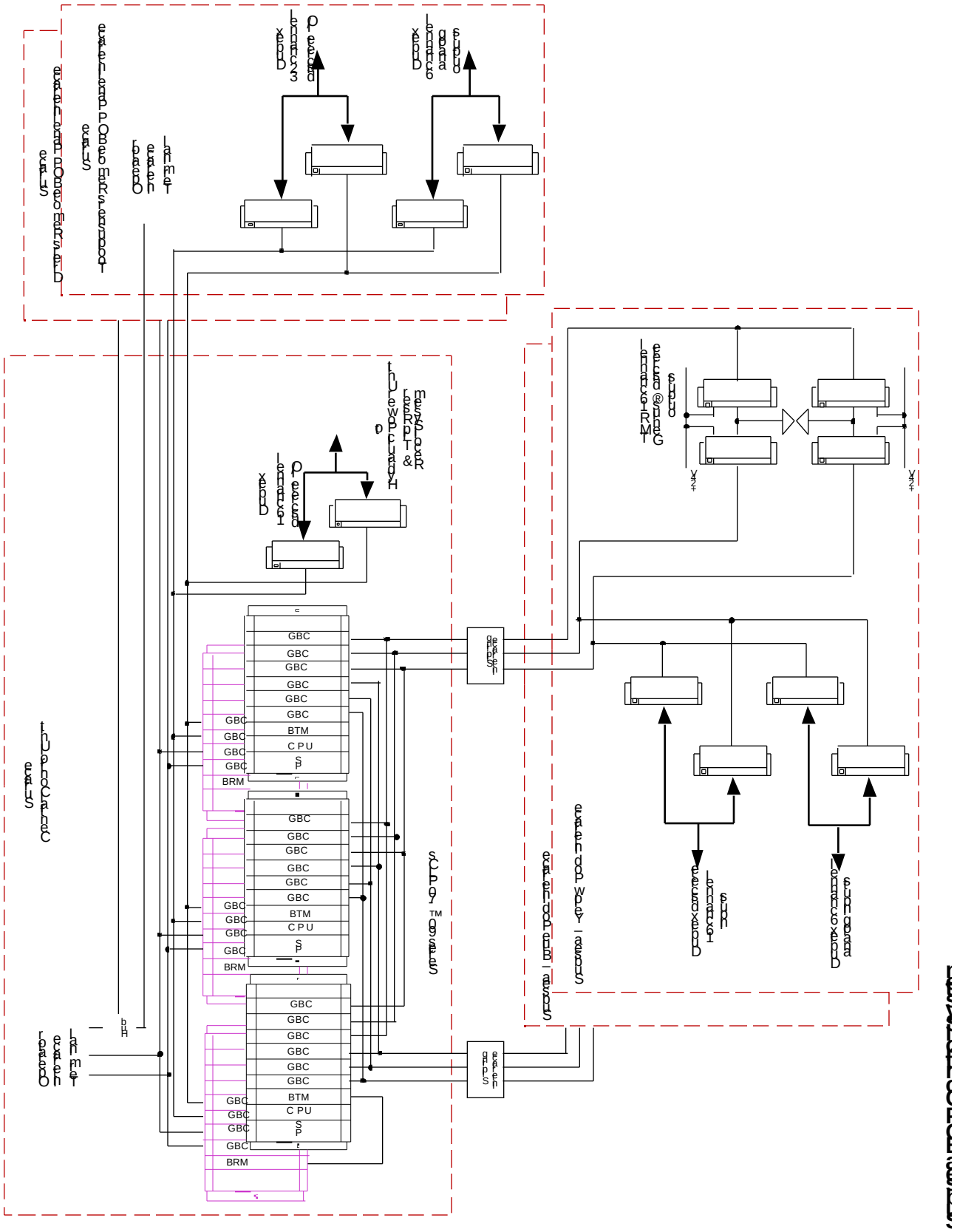
All Genius output blocks generate the output demand by voting 2oo3 the data provided by the three PLCs. Under PLC failure conditions, the voting will be adapted by using the Duplex Default State with the data from the two remaining PLCs. If communications to all PLCs is lost, all Genius output blocks go to the Default State.

The Benefits

The Genius Modular Redundant control system provides a reliable system that prevents nuisance shutdowns caused by spurious alarms as well as guarding against unsafe operating conditions

This Case History was written based on information supplied by the consultant and system integrator, Silvertech Limited, located in West Sussex, England.

For more information or a GE Fanuc sales representative in your area, call the GE Fanuc Information Center at 1-800-648-2001.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