December 8, 2021

ENG CASE STUDY

Success Story - Load Reacceleration Project

Challenge

A power distribution study at a major Gulf Coast refinery revealed that the outdated Distributed Control System motor start-up and shut-down control scheme required better planning and prioritization of the start-up process. The existing communication links between the substations and host were starting to fail. Another key issue were that replacement hardware was not available for the existing Distributed Control System.

Knowing that substations in various parts of the plant could go down simultaneously during a major power outage, an automated solution was needed that would enable configuration of the exact sequence of start-up for each motor group and individual motors within the group. This capability would allow the refining processes to be restarted safely, quickly, and effectively.

ENG Solution

The Load Reacceleration System is used to automatically stop and systematically restart motors after a disturbance on the refinery power system. Each Substation will use a Load Reacceleration System to monitor and control medium and low voltage motors. Each Substation will be designed to accommodate up to 192 motors. The user assigns each motor with a name, horsepower, bus, a starting group, and a starting block, all of which are configurable without modifying the logic. The Host Control System can orchestrate the simultaneous reacceleration of at least 10 substations.

Called the "Load Reacceleration Project", ENG was commissioned to design and build the PLC-based Load Reacceleration System (LRS) to replace 10 existing LRS. The fully automated LRS oversees power to the substations and motor control centers scattered throughout the refinery through a single master control station called the "Host". Each power substation and motor control center are fed by 3 dual bus leads and the LRS detects which bus is on-line and available, automatically reaccelerating motors through the available bus. The control system for each substation can operate autonomously if the Host is down. Alternately, the Host will continue orchestrating a plant wide reacceleration even when one or more substations fail to respond. Fiber optics was selected for the communication link between the host and substations.

The configurable control software allows flexible configuration of the start-up and shutdown sequence through a graphical Human-Machine Interface provided as part of the LRS. Substations, electrical busses, and groups of motors are logically grouped, and priorities set for their respective place in the start-up sequence. Specific priorities for individual motors within each block can also be easily configured and securely modified, as may be needed. The system includes configurability for load shedding and tie breaker operation (placing a conductor between two electrical bus bars, allowing 1 phase to power both).

Business Impact

The system was fully tested at ENG's staging facility, allowing an immediate startup with no loss of productivity. The LRS has been operating now for over two months without any downtime, despite several large thunderstorms that have caused dips and power outages in the area. This new system allowed each substation to be configured for up to 192 motors and could detect a voltage dip as short as 16 milliseconds. The control software and graphics are easily replicated for each modernized substation.

An aging proprietary control system was replaced with typical PLC/HMI components, giving the customer more process insight, fine tuning capabilities and "off the shelf" hardware /software.