



A Rockwell Automation Company

Pembina Pipelines - Buck Creek Pump Station Upgrade

The Client:

Pembina Pipeline is a subsidiary of the Pembina Corporation and operates 1500 kilometers of the gathering and trunk line pipelines in west-central Alberta. The Buck Creek pump station, located near Drayton Valley, is the hub of the system. From Buck Creek, oil is pumped through the 40

centimeter (16 inch) main line 100 kilometers (62 miles) to Edmonton. In 1994 throughput volumes averaged a total of 17,400 m³/day (120,000 barrels/day) of condensate and crude oil.

The Requirement:

The station was originally built in the 1950's and the pump control was still performed by relay logic. Recently a Modicon 984 PLC was added to perform station metering and relayed these values to the head office in Drayton Valley over a radio link.

Electrical protection was performed by multiple induction disk relays and other switching equipment that was over 40 years old and obsolete.

A general modernization of the electrical and control system

was needed to maintain the serviceability of the station. During estimation phases of the project decisions were made to replace all of the control and low voltage wiring; the medium voltage cables had been replaced once since the initial install and were in good condition. To economize on the quantity of new cables and motor control for valve actuators new 'smart' valve actuators were investigated. The age of the existing valve actuators added to the decision to replace them.

The Design Solution:

A Modicon Quantum PLC with a 213-04 CPU and 768KB of RAM was selected. Two 16 slot racks are mounted in a control panel placed in the main control room. Sequencing for three main pipeline pumps (650-1200hp) and three booster pumps are controlled by the PLC.

Station measurement is performed by smart signal conditioners and the PLC. Promac signal conditioners perform wedge meter density correction and integration and Solatron densitometer corrections. The PLC performs a temperature correction of the density signal as well a vendor supplied loadable function. Also, the PLC performs a temperature and pressure correction on the volume indicated from the inlet and discharge wedge meters using another vendor supplied loadable.

The fire detection/extinguishing and gas detection systems are tied into the new PLC for status information to be relayed to the head office.

A new valve control system from Rotork replaces the old motorized actuators. Fifteen valves with smart IQ actuators are wired to a Rotork Pakscan IIS smart controller via a 2-wire communication highway. The PLC communicates to the Pakscan via a BM-85 Modbus Bridge Mux and uses Modbus RTU protocol to control the valves and report the status of the smart valve actuators.

A Modicon PanelMate 2000 HMI handles all pump control

and alarming, indicates all Rotork valve actuator alarms, and displays station discharge and station metering back pressure control loops. It is also networked through the Bridge Mux.

Control of the station main breaker and two feeder breakers was accomplished using Multilin feeder protection relays. Neutral ground resistors were added to both the medium and low voltage power systems to limit the damage that will occur on a fault. Multilin motor protection relays were used for the six medium voltage motors and ground fault monitoring was added to these units. The six motor protection relays communicate over a Modbus multi-drop to the station PLC via the bridge mux.

Hinz performed the electrical coordination design and supervised the installation of the new protection relays.

A UPS salvaged from an adjacent site was installed to power the control system equipment and a new 48 volt charger was purchased to replace the old charger for the switchgear trip power system.

All control and low voltage wiring was replaced with teck cable on an above ground tray.

The entire modernization project was installed with only three - one day facility shutdowns; much of the work was performed with the facility in full operation.

