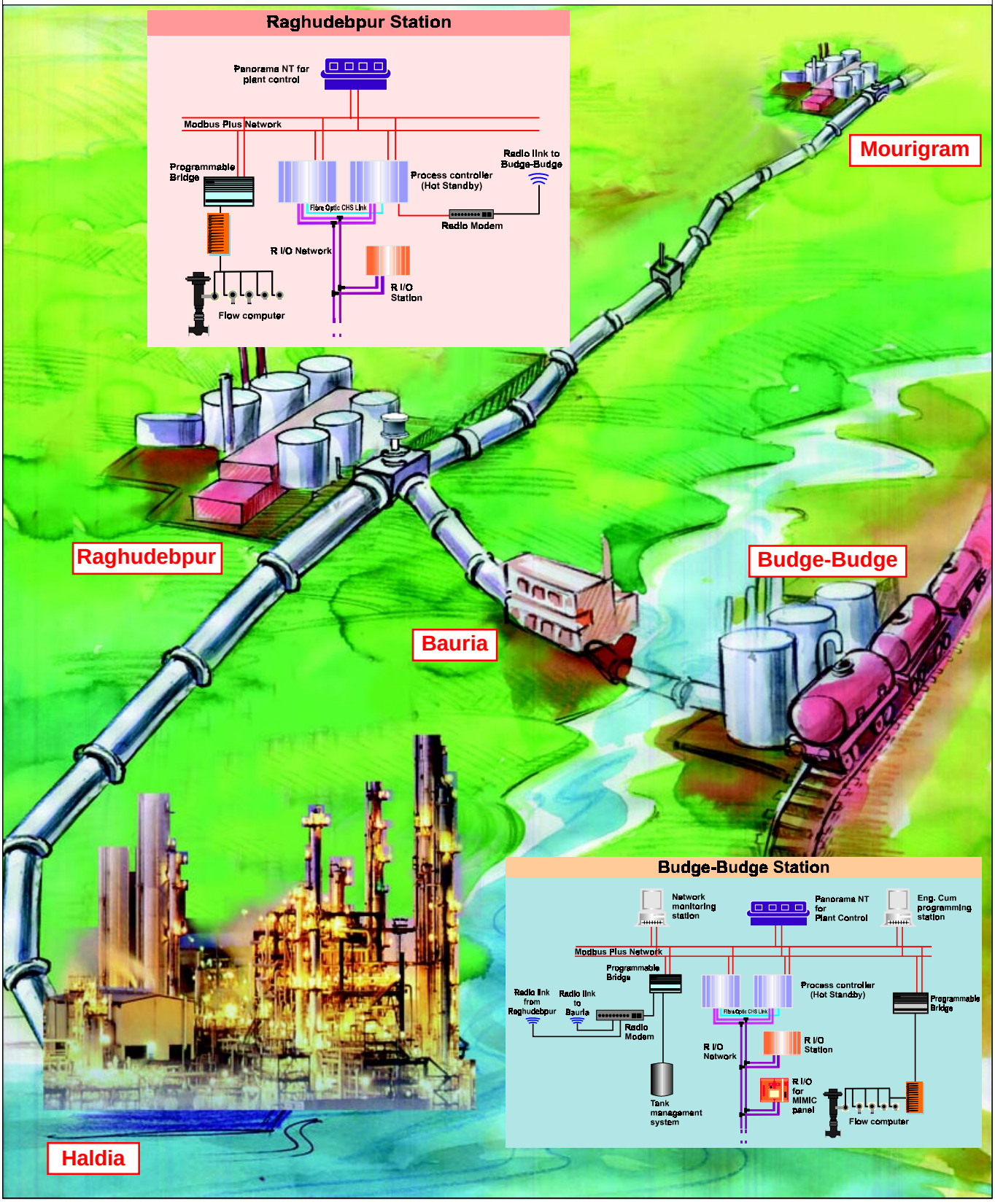
HMR-BB Pipeline Automation for IOCL



*The **7.3kms long pipeline from Raghudebpur to Budge-Budge** is an example of a totally reliable system that ensures the safe transport of hazardous petrochemicals over a long distance, and allows flexibility of operation. Designed to operate in five modes - local, remote, automatic, manual and master - the system facilitates easy, reliable, speedy single-point control and monitoring.*

System Overview

With a view to meet the requirements of petroleum products at Budge-Budge, IOCL has built a 7.3 kms long branch line from Raghudebpur to Budge-Budge on its already existing Haldia-Mourigram-Rajbandh pipeline.

System Automation

As per the operational requirements, the automation system has been divided into three subsystems:

a) The master control station (MCS) at Budge-Budge.

b) The station control station (SCS) at Raghudebpur.

c) Unmanned control station at Bauria.

To ensure total reliability, the MCS at Budge-Budge and the SCS at Raghudebpur are not only linked to each other, but also to the same I/O system over the same network. To achieve this, both stations were equipped with high-end process controllers operating in dual-redundant hot standby mode. Thus, even if one controller fails, the other takes over within one scan time. The system reliability is further enhanced by use of a dual communication network. The communication is based on a deterministic, peer-to-peer communication network with Modbus Plus protocol.

On this communication network HMI/SCADA, flow computers, mimic, tank management system and link to radio modem for inter-communication between the stations, are configured. This **gives the system a unique functionality.**

The unmanned control station at Bauria is monitored and controlled by the MCS at Budge-Budge. This is achieved with the help of micro-PLC at Bauria, communicating with the MCS at Budge-Budge over a **wireless communication system.**

This reliable configuration is a fast, user-friendly, cost-effective and an optimal solution for this process.

Key Features of the Automation System

- Pig tracking feature based on scrapper launcher signal.
- Product batch handling.
- Transferring of control from SCS to MCS and vice-versa.
- Authority assignment, so that each operator of the system is allowed to work on only those features for which they have authority.

System Features

The main benefit of the system is its easy monitoring of process. All important process variables of all stations are displayed at one mimic panel at Budge-Budge station.

The MCS at Budge-Budge is so configured that, apart from local control functions, it can also control and monitor the system parameters and processes at Raghudebpur and Bauria, located at a distance of 7.3kms and 1.5kms, respectively.

These stations communicate to each other over a wireless system. The data signals from the Raghudebpur SCS and Bauria unmanned station as well as control signals from MCS Budge-Budge (all with Modbus Plus protocol) are all routed through the gateway at the respective stations over wireless network. Thus control and data signals can travel to and from such long distance **without the need for expensive cabling.**

At Raghudebpur, the product coming from Haldia can follow three delivery routes:

- Full delivery to Budge-Budge,
- Full delivery to Mourigram, and
- Part delivery to Mourigram and part to Budge-Budge.

There are often changes in the product and batch sizes depending on the requirement. For this purpose, besides the process controllers and HMI/SCADA system, various field instruments have been provided, viz., turbine flow meters for flow measurement, control valves for flow control, density measuring system, smart/intelligent pressure and temperature transmitters and other instruments to monitor level, flow pressure, etc. This forms an integral part of the station control instrumentation.

Terminal (delivery) at Budge-Budge Station:

A PID loop is incorporated into the process controller, for the control of pressure control valves (PCVs). These PCVs control the flow of petroleum products from Budge-Budge terminal station. The PID loops are designed so as to have **the safest operation.** For this, each PID loop is made to depend on two parameters: station flow and manifold back-pressure (manifold at Budge-Budge). As long as the back-pressure resulting due to the discharge from Raghudebpur is not above the safe limits defined by the setpoint (set by the operator over the HMI/SCADA), the flow rate becomes the control input. If due to some reason, the back-pressure crosses the safe limit, the logic built into the system ensures that back-pressure becomes the controlling variable instead of flow rate so as to bring the former down to the desirable limits.

While all this is going on, the HMI/SCADA operator, depending upon the density signal received by the HMI/SCADA from the flow computer, actuates different MOVs feeding to different marketing tanks for different products. This density signal, as stated earlier, differentiates between products by making use of the density-product database built into the HMI/SCADA.

Besides all the above operations, a system for **emergency shutdown is built into the system** for emergencies.

Instrumentation

The general control sequence for individual components based on which the whole system is designed is outlined below:

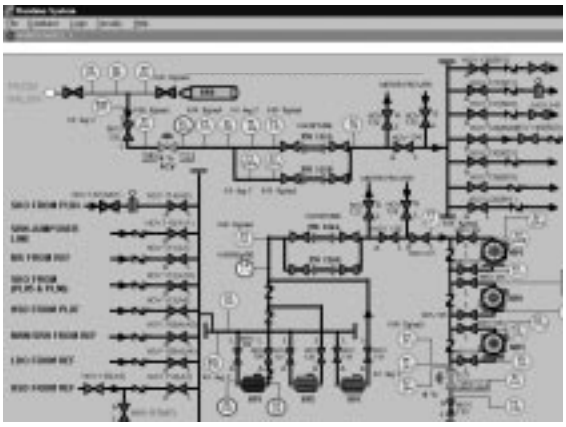
Valve System: The valves can be operated either manually or through an actuator circuit, as per the functional requirements. The sequences for operation are built into the process controller.

Sump Pump: The flow and level of sump pump and tank respectively are monitored by level and flow switches and, according to various conditions, control actions are taken by the process controllers, e.g., in case of low flow or low level, the pump motor is shutdown.

Flow Metering and Flow Controller: The flow computer accepts pulse signals from turbine flow meters and also inputs from density, pressure and temperature transducers for compensation purposes. Then the computer calculates the flow rate and cumulative quantity of product flowing through the pipeline.

These flow computers also provide facilities for batch size and density limit setting. Batch change is thus detected either based on batch size or density measurement.

HMI/SCADA: The software modules of Panorama-2000NxT provided offers tailor-made solution for this system.



Typical Panorama-2000 NxT Screen

All in all, automation system is all set to ensure reliable, safe transport of hazardous petroleum products on-time every-time from Raghudebpur to Budge-Budge.

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