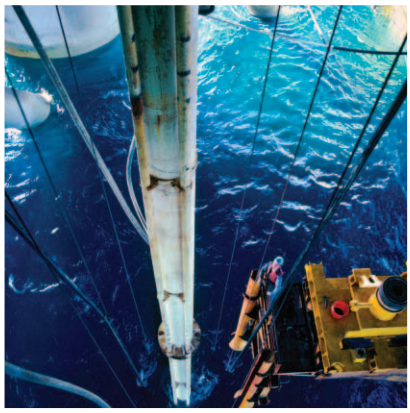



SAMPLE OF RRP PROJECTS

A snaphot overview of RRP's systems and processes



RRP
RAPID RESPONSE PROJECT LTD.




Project: Storage Gas Processing Facility
Location: Western Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consists of the design of the gas processing facility required to compress and inject market ready natural gas into underground storage caverns. This project consists of Injection storage and Recovery sales process. The Injection storage includes two (2) trains of 250 MMSCFD for a total of 500 MMSCFD. Gas for storage will be supplied by a third party transmission company.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.
The Injection Storage phase consists of two (2) trains. Each train includes the following Major Process Equipment:

- Metering Package
- 3000 kW Gas Turbine Driven Centrifugal Compressor Packages
- 11,000 kW Gas Turbine Driven Centrifugal Compressor Packages

The Recovery Sales phase consists of two (2) trains. Each train includes the following Major Process Equipment:

- The two (2) Gas Turbine Driven Centrifugal Compressor Packages from the Injection Storage phase will be reconfigured to have reversed flow direction for the Recovery Sales phase.
- Two (2) Phase Separator Package
- Propane Refrigeration Package

Major Process Equipments shared by both Injection Storage and Recovery Sales process include;

- Three (3) Insulated 160 m^3 Crude Oil Tanks
- Two (2) Insulated 160 m^3 Water / Oil Tanks
- Lease Automatic Custody Transfer (LACT) Unit
- Oil / Gas Fired Oil Treater
- Motor Control Center (MCC) Building
- Condensate Bullet (future provision for second bullet c/w LACT unit)
- Instrument Air Compressor Packages
- HP/LP Flare Knock Out Drums
- HP/LP Dual Flare Stack
- SCADA Communications Tower

→ CONTROL SYSTEM AND COMMUNICATIONS

A Distributed Control System (DCS) will be used as a Basic Process Control System (BPCS). The BPCS will be designed to use foundation fieldbus for all plant devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality. Power will be supplied by the utility grid with an Uninterrupted Power Supply (UPS) back-up system.

The design of the Safety Instrumented System (SIS) will use the following Safety Integrity Level (SIL);

- BPCS: SIL 0
- Fire & Gas Detection: SIL 1
- Emergency Shutdown: SIL 2
- High Integrity Protection System: SIL 3

Layers of Protection Analysis (LOPA) will be used to identify any new Safety Instrumented Functions (SIF) and for assignment of SIL. All ESD valves will be equipped with valve positioners to allow partial stroke testing to be completed to meet SIL diagnostic requirements which will be performed automatically by the SIS.

→ PROJECT COST AND SCHEDULE

Estimated value of the project is US $300 million. The Pre-FEED was completed on schedule.




Project: Shale Gas Development Pre-FEED

Location: Northern Canada

Services: Engineering

→ DESCRIPTION

This project consists of well parameter modeling and conceptual design for a 30 year 912 well (146,000 acres) shale gas development for the north eastern area of British Columbia, Canada. The study concentrated on the current understanding of shale gas completion technology and corresponding well performance. Realistic assumptions lead to a conceptual design for well pads, pipeline gathering system, booster compressor stations, central processing facility, sales gas pipeline and metering station.

The total raw gas capacity of the development is 900 MMSCFD with 912 wells and eight (8) Booster Compressor stations. The wellpad facility consist of fresh water retention pond for completion and each Booster Compressor station consist of five (5) 3200 KW Gas Turbine driven centrifugal compressor skid package, separation package, flare system complete with flare knock out drums and satellite communication system.

The Central Processing facility consists of three (3) trains with a capacity of 300 MMSCFD each. Each train consists of UCARSOL® Amine sweetening packages which is used to remove the CO_2, Glycol Dehydration package, Refrigeration system, Acid gas disposal system. A unique part of the shale gas development was to provide a fresh water transportation system to supply fresh water for frac fluid. The Fresh water for drilling and completion will be supplied from retention pond via four (4) 3000kW Turbine driven water pumps at the Central Processing Facility to each retention pond located at each Booster Compressor Station.
Delivery to potential sales gas markets was also investigated, including transport to a proposed LNG terminal with a capacity of 3.5 – 5 mmtpa.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Eight (8) Booster Compressor Stations includes;

- Eight (8) Inlet Separator Packages
- 40 - 3200 kW Gas Turbine Centrifugal Compressor Packages
- Eight (8) Dual HP/LP Flare System including Knock Out Drums and 30 m Flare Stacks
- Eight (8) Fresh Water Retention Ponds
- Eight (8) 3000 kW Fresh Water Transfer Pumps
- Eight (8) Motor Control Center (MCC) Buildings
- Eight (8) SCADA Communication Towers

Major Process Equipment at the Central Processing Facility (3 trains) includes;

- Three (3) UCARSOL® Amine Sweetening Packages
- Three (3) Glycol Dehydration Packages
- Three (3) 3500 kW Acid Gas Disposal Compressors
- One (1) Refrigeration Package
- Two (2) Water Disposal Pumps

- Fresh Water Retention Pond
- Four (4) 3000 kW Fresh Water Transfer Pumps
- Motor Control Center (MCC) Building
- Three (3) Dual HP/LP Flare Systems including Knock Out Drums and 50 m Flare Stacks
- SCADA Communication Tower and Satellite Communication System
- Pig Sender/Receiver c/w Sequential Interlocking System
- Office and Accommodations

→ PIPELINES

The following pipelines are used to gather gas and produced water, and to distribute fuel gas, fresh water and acid gas;

- 272 km of eight inch (8") insulated pipeline for gas gathering
- 59 km of twenty-four inch (24") insulated pipeline for gas gathering
- 30 km of twenty-four inch (24") non-insulated pipeline for transportation to sales
- 59 km of four inch (4") insulated pipeline for produced water gathering
- 330 km of six inch (6") insulated pipeline for fresh water distribution
- 59 km of three inch (3") pipeline for fuel gas distribution
- 30 km of six inch (6") insulated pipeline for acid gas distribution

→ CONTROL SYSTEM AND COMMUNICATIONS

An Emerson Delta V Distributed Control System (DCS) will be used as a Basic Process Control System (BPCS). The BPCS was designed to use foundation fieldbus for all plant and field devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality.

The design of the Safety Instrumented System (SIS) will use the following Safety Integrity Level (SIL);

- BPCS: SIL 0
- Fire & Gas Detection: SIL 1
- Emergency Shutdown: SIL 2
- High Integrity Protection System: SIL 3

Layers of Protection Analysis (LOPA) will be used to identify any new Safety Instrumented Functions (SIF) and for assignment of SIL. All ESD valves will be equipped with valve positioners to allow partial stroke testing to be completed to meet SIL diagnostic requirements which will be performed automatically by the SIS.
The booster compressor stations will be remotely controlled and transmit data from the Delta V via a SCADA tower to the control room at the Central Processing Facility. Production metering will be sent to the Flowcal production accounting software through the Bristol RTU via satellite communications.

→ PROJECT COST AND SCHEDULE

The estimated project cost is US $2.02 billion. The pre-FEED was completed in 120 days.

Project: Gas Battery and Pipeline
Location: Northern Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consists of the design and construction of a 25 MMSCFD gas processing facility and pipeline. The gas is pre-heated before it flows into the separation vessel, where the gas and water are separated and measured. Production from the gas plant facility is transported into third party gas processing facility via 17 kilometres, six-inch (6") insulated pipeline c/w pig sender and pig receiver where the gas is further processed before flowing into the third party transmission line. All pig senders/receivers are designed with an interlocking system.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment includes;

- Line Heater Package
- 2 Phase Separator Package
- Produced Water Tank
- Frac Oil Tank
- Instrument Air Compressor Package
- Glycol Heat Tracing Pump Package
- Wellhead Heat String Pump Package
- Motor Control Center (MCC) Building
- Dual HP/LP Flare System, including Knock Out Drums and 43 m Flare Stacks
- Pig Sender/Receiver c/w Sequential Interlocking System
- Methanol and Corrosion Inhibition Injection System
- SCADA Communication Tower

→ CONTROL SYSTEM AND COMMUNICATIONS

An Emerson Delta V Distributed Control System (DCS) was used as a Basic Process Control System (BPCS). The BPCS was designed to use foundation fieldbus for all plant and field devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality.

The design of the Safety Instrumented System (SIS) used the following Safety Integrity Level (SIL);

- BPCS: SIL 0
- Fire & Gas Detection: SIL 1
- Emergency Shutdown: SIL 2
- High Integrity Protection System: SIL 3

Layers of Protection Analysis (LOPA) was used to identify any new Safety Instrumented Functions (SIF) and for assignment of SIL. All ESD valves have been equipped with valve positioners to allow partial stroke testing to be completed to meet SIL diagnostic requirements which are performed automatically by the SIS.

The gas battery is remotely controlled and transmits data from the Delta V via satellite to the control room at the Central Processing Facility located 200 km away from the Gas Plant Facility. Production metering is sent to the Flowcal production accounting software through the Bristol RTU via satellite communications.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $20 million. The engineering cost was 10.5% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up.

The project was completed in 110 days, on schedule and under budget.




Project: Gas Battery and Pipeline

Location: Northern Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consists of the design and construction of a 20 MMSCFD gas processing facility and pipeline. The gas is pre-heated before it flows into the separation vessel, where the gas and water are separated and measured. Production from the Gas Plant Facility is transported into Central Processing Facility via five (5) kilometres, six-inch (6") pipeline c/w pig sender where the gas is further processed before flowing into the transmission line. All pig senders/receivers are designed with an interlocking system.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment includes;

- Line Heater Package
- 2 Phase Separator Package
- Produced Water Tank
- Frac Oil Tank
- Instrument Air Compressor Package
- Glycol Heat Tracing Pump Package
- Wellhead Heat String Pump Package
- Motor Control Center (MCC) Building
- High Pressure Flare System, including Knock Out Drum and 30 m Flare Stack
- Pig Sender/Receiver c/w Sequential Interlocking System
- Methanol and Corrosion Inhibition Injection System
- SCADA Communication Tower

→ CONTROL SYSTEM AND COMMUNICATIONS

An Emerson Delta V Distributed Control System (DCS) was used as a Basic Process Control System (BPCS). The BPCS was designed to use foundation fieldbus for all plant and field devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality.

The design of the Safety Instrumented System (SIS) used the following Safety Integrity Level (SIL);

- BPCS: SIL 0
- Fire & Gas Detection: SIL 1
- Emergency Shutdown: SIL 2
- High Integrity Protection System: SIL 3

Layers of Protection Analysis (LOPA) was used to identify any new Safety Instrumented Functions (SIF) and for assignment of SIL. All ESD valves have been equipped with valve positioners to allow partial stroke testing to be completed to meet SIL diagnostic requirements which are performed automatically by the SIS.

The Gas Plant Facility is remotely controlled and transmits data from the Delta V via satellite to the control room at the Central Processing Facility. Production metering is sent to the Flowcal production accounting software through the Bristol RTU via satellite communications.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $8 million. The engineering cost was 11% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed in 75 days, on schedule and under budget.

Project: Sour Gas Well Tie-In

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

The project consisted of the design of an amine system for the tie-in of a sour gas well. The amine system was designed to handle 1.5 MMSCFD of sour gas. Sweet gas is transported to a sales pipeline and the water is sent to a storage tank and trucked out.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment installed at the Sour Gas Well Site includes;

- Amine Package
- Wellhead ESD Valve
- Chemical Injection Systems
- Dual HP/LP Flare System including Flare Knock Out Drums and 20 m Flare Stack

→ CONTROL SYSTEM AND COMMUNICATIONS

The Amine package is equipped with a Programmable Logic Controller (PLC). The PLC controls the amine package and all other well site equipment. Cell phone call out supplied for alarms and/or shut down.

→ PROJECT COST AND SCHEDULE

The cost for the project was estimated US $1.3 million. The engineering cost estimated was 10.5% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The preliminary design was completed on schedule.

Project: Sour Gas Well Tie-In

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the conceptual design for an acid gas injection system modification to an existing gas plant with a capacity of 150 MMSCFD. The dry acid gas will be transported from the gas plant to the acid gas disposal well through a 25 km six inch (6") insulated pipeline. Currently the plant produces 500 tonnes/d of sulphur through two (2) trains and the client is considering replacing the sulphur production with acid gas disposal. The project will utilize existing surplus 5000 kW compressor. Total acid gas disposal will be 12 MMSCFD.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Gas Plant includes;

- 1200 kW Electric Driven Reciprocating Compressor Package
- 2500 kW Gas Driven Reciprocating Compressor Package
- Refrigeration Package
- Upgrade of Existing Motor Control Center (MCC)

Major Process Equipment at the Acid Gas Disposal Well includes;

- Sub-surface Safety Valve
- Fire, H_2S and Gas Detection
- HP Flare System including Knock Out Drum c/w sweet gas purging system and Flare Stack
- RTU Communication Tower

→ PIPELINES

Two pipelines are required for this project. One (1) to transport the acid gas from the gas plant to the acid gas disposal well and one (1) to supply sweet gas for purging the acid gas transportation pipeline and disposal well equipment.

- 25 km of six inch (6") insulated pipeline for acid gas transportation
- 25 km of three inch (3") non-insulated pipeline for sweet gas purge supply

→ CONTROL SYSTEM AND COMMUNICATIONS

The existing Programmable Logic Controller (PLC) will be expanded to accommodate additional controls for the compressor packages and the refrigeration package. A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower into the main control room.

→ PROJECT COST AND SCHEUDLE

The total estimated value of the project is US $12 million. The Pre-FEED was completed in 70 days.

Project: Compressor Replacement
Location: Western Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of a replacement screw compressor to handle 1.5 MMSCFD of sour gas. The gas driven screw compressor at the oil battery had been damaged due to design problems. A new electric driven screw compressor was designed, requiring a power transformer upgrade.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook up and accessories.

Major Process Equipment at the Compressor Station includes;

- 300 kW Electric Driven Screw Compressor Package
- 480V Transformer
- New Motor Control Center (MCC) Package

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Control (PLC) was used as a Basic Process Control System (BPCS) and shut down, isolation and blow down. The BPCS was designed to use foundation fieldbus for all plant devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality. Power supply came from the utility grid system with Uninterrupted Power Supply (UPS) back-up supplied.

→ PROJECT COST AND SCHEUDLE

The total value of the project was US $1.0 million. The engineering cost was 8.6 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed in 90 days, on schedule and under budget.

Project: Gas Battery and Pipeline
Location: Northern Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consists of the design and construction of one (1) 30 MMSCFD gas processing facility and associated pipeline required to separate free water and saturated water and deliver dry gas to a third party gas processing plant. One (1) ten inch (10") 20 km pipeline from the gas battery transported into an existing pipeline.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Gas Battery includes;

- Line Heater Package
- 2 Phase Separator Package
- Produced Water Tank and Flash Drum
- Instrument Air Compressor Package
- Dessicant Gas Dehydrator Package
- Wellhead Heat String Pump Package
- Motor Control Center (MCC) Building
- Dual HP/LP Flare System, including Knock Out Drums and Flare Stacks
- Pig Sender/Receiver c/w Sequential Interlocking System
- Methanol and Corrosion Inhibition Injection System
- Sales Gas Meter Package
- SCADA Communication Tower

→ PIPELINE SCOPE OF WORK

One (1) 10" 20 km pipeline was constructed to transport the dehydrated gas to a gathering pipeline for further processing.

→ CONTROL SYSTEM AND COMMUNICATIONS

A Distributed Control System (DCS) is used as a Basic Process Control System (BPCS). The BPCS was designed to use foundation fieldbus for all plant and field devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality. A safety Programmable Logic Controller (PLC) is used for plant shut down, isolation and blow down. All communication is transmitted via communication tower and satellite into the main control room and accounting software.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $25 million. The engineering cost was 7% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule and under budget.

Project: Gas Plant

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of a 25 MMSCFD gas plant. The gas flows into a three phase separator where the water, condensate and gas is separated and measured. Raw gas enters the plant at both high pressure and low pressure. The low pressure stream is boosted and comingled with the high pressure stream prior to the suction of the high pressure compressor. NGLs are temporarily stored on site until they are trucked out. Sales quality natural gas is transported to a sales transmission pipeline through a 24 km six inch (6") pipeline. 10 rich gas wells feed the gas plant.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the gas plant includes;

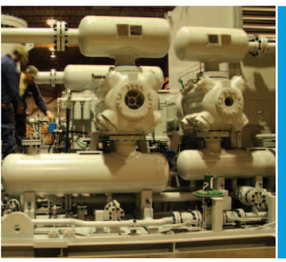
- HP & LP Inlet Separator Packages
- 1300 kW HP Compressor Package
- 1000 kW LP Screw Compressor Package
- Refrigeration Package
- C_3 Cooler and Accumulator Package
- De-Ethanizer Package
- Stabilized Condensate Separator Package
- Ethylene Glycol Regeneration Package
- Produced Water Tanks and Truck Out Facility
- NGL Bullet, Truck Loading Facility and Lease Automatic Custody Transfer (LACT) Unit
- Dual HP/LP Flare System including Knock Out Drums and Flare Stack
- Motor Control Center (MCC) Building c/w PLC and RTU

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Controller (PLC) is used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower and satellite into the main control room for accounting software use.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $25 million. The engineering cost was 9 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed in 60 days, on schedule and under budget.



Project: Compressor Installation

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and installation of a 7500 kW gas turbine driven centrifugal compressor package to handle 55 MMSCFD of raw gas. The compressor package control system had to be integrated into the existing plant control system.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Gas Plant includes;

- 7500 kW Gas Turbine Driven Centrifugal Compressor Package

→ CONTROL SYSTEM AND COMMUNICATIONS

The compressor package control system was integrated with the existing plant Programmable Logic Controller (PLC). The existing Safety Instrumented System (SIS) was modified to include the new inlet compressor package as part of the plant shut down, isolation and blow down.

→ PROJECT COST AND SCHEDULE

The total estimated value of the project is US $10 million. The engineering cost was 8.5 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule and on budget.

Project: Gas Plant Modification

Location: Northern Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of modifications to an existing three (3) train sour gas plant to handle an additional rich sour gas feed. Total capacity for the gas plant is 250 MMSCFD. A Propanizer Package was added and some equipments were added to three (3) existing sulphur trains. Most of the propane is stored on site for use in company passenger vehicles, and surplus is transported to other storage facilities for sales. The plant is located in a remote location, requiring air transport of personnel.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Gas Plant includes;

- 1500 kW Gas Driven Reciprocating Compressor Package
- Separator Package
- Propanizer Package
- Upgrade of Existing Motor Control Center (MCC)
- Modification of Satellite
- Several Wells were Modified for Acid Gas Injection
- For Four (4) Years RRP tied all ZAMA Wells into Satellites & Plants
- RRP Installed Various Pipelines from 3” - 10” for Gas & Oil Wells
- All Regulatory Work was Completed by RRP
- Start-Up and Pre-Commissioning of All Projects were Completed by RRP

→ CONTROL SYSTEM AND COMMUNICATIONS

The existing Programmable Logic Controller (PLC) was expanded to accommodate all controls for the compressor package and propanizer package. A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communications are transmitted via radio tower between the plant, control room and camp, and via satellite to the regional branch office and world corporate headquarters.

→ PROJECT COST AND SCHEDULE

Yearly budget varied from $3-$5 million. All projects were completed by RRP, on time and on budget.

Project: Gas Plant Upgrade
Location: Western Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of debottlenecking of an existing Flare system and installation of Propane bullet and CO_2 Plant. Carbon dioxide (CO_2) plant installed is complete with skid packages and a control system for handling the CO_2 stream from Rimby Gas plant. CO_2 stream is separated from the acid gas stream from the Amine Plant and transported into the CO_2 plant where it is further refined from other components. The CO_2 plant produces hospital grade CO_2 product which is stored in the bullet and transported to the distribution center.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Gas Plant includes;

- Dual HP/LP Flare System including Knock Out Drums and Upgrading Flare Stacks
- Two (2) Propane Storage Bullets
- CO_2 Purification Package
- Upgrade of Existing Motor Control Center (MCC) and Control System

→ CONTROL SYSTEM AND COMMUNICATIONS

The existing Programmable Logic Controller (PLC) was expanded to accommodate all control systems for both propane bullets and the CO_2 purification. A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down.

→ PROJECT COST AND SCHEDULE

The total estimated value of the project is US $11 million. The engineering cost was 11.5 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed, on schedule and on budget.

Project: Compressor Station
Location: Western Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

The project consisted of the design and construction of a compressor station to gather and boost low pressure gas into the main gathering and processing system. The compressor station was designed to handle 8.5 MMSCFD of raw gas. The high pressure gas is transported via pipeline to a gas plant for processing and the water is sent to a storage tank and trucked out.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment installed at the Compressor Station includes;

- Inlet Separator Package
- 750 kW Gas Driven Compressor
- Chemical Injection Systems
- 20 m Vent Stack c/w Integral Knock Out Drum

→ CONTROL SYSTEM AND COMMUNICATIONS

The compressor package is equipped with a Programmable Logic Controller (PLC). The PLC controls the compressor and separator packages. Cell phone call out supplied for alarms and/or shut down.

→ PROJECT COST AND SCHEDULE

The cost for the project was US $1.8 million. The engineering cost was 7.5% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule and on budget.

Project: Sour Oil Battery Expansion

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the expansion of a sour oil battery, including the design and construction of components to increase the liquid capacity by 1200 m^3/d and the gas capacity by 20 MMSCFD. Water, oil and gas are separated from an emulsion stream delivering dehydrated clean crude oil to a sales pipeline at a BS&W less than 0.5%. The sour gas is compressed, dehydrated and sent to a nearby third party for additional processing. The produced water is trucked out.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Sour Oil Battery included;

- Group Separator Package (internally coated with Devoe 253®)
- Oil Treater Package
- Oil Degasser Package
- Sour Gas Glycol Dehydration Package
- 1500 kW Gas Driven Reciprocating Compressor Package
- Two (2) 160m^3 Sales Oil Tanks
- Two (2) 160m^3 Produced Water Tanks (internally coated with Devoe 253®)
- Vapour Recovery Unit Package
- Expand Motor Control Center (MCC) Package

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Controller (PLC) is used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower and satellite into the main control room and accounting software.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $7.5 million. The project was completed on schedule.

Project: Sour Oil Battery

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of a 3400 m^3/d sour oil battery required for the separation of free water and gas from an emulsion stream to deliver dehydrated clean crude oil to a sales pipeline at a BS&W less than 0.5%. The sour gas is compressed, dehydrated and sent to a nearby third party for additional processing. The produced water is trucked out.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Sour Oil Battery included;

- Common Group Inlet and Test Separator Package (internally coated with Devoe® 253)
- Glycol Boiler and Exchanger Package
- Oil Treater Package
- Oil Degasser Package
- Sour Gas Dehydration Package
- Two (2) 2000 kW Gas Driven Reciprocating Compressor Package
- Ten (10) 160m^3 Sales Oil Tanks
- Three (3) 160m^3 Produced Water Tanks (internally coated with Devoe® 253)
- Two (2) Vapour Recovery Unit Package
- LACT Unit Package
- Dual HP/LP Flare System, including Knock Out Drums and 30 m Flare Stack
- Motor Control Center (MCC) Package
- SCADA Communications Tower

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Controller (PLC) is used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower and satellite to the main control room and accounting software.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $22 million. The engineering cost was 9.5 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed over a period of 6 months, on schedule and under budget.

Project: Water Flood Project

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of several smaller portions, completed over a period of approximately nine (9) months, resulting in four (4) water source wells, two (2) water injection wells and the expansion of an oil satellite. Installation of 3000 m of four inch (4") diameter and 1500 m of six inch (6") diameter internally coated pipeline was required to transport the water from the source wells to the injection well. The individual portions of the total project were driven by the client's improved understanding of their reservoir model as water injection was increased to improve the production of gas and condensate. Total injection capacity was increased by 2400 m^3/d to 6000 m^3/d. The source water was highly corrosive, containing 112,900 ppm chlorides, 2.2% gas entrained in water with 49.9% H_2S and 11.43% CO_2.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the water source wells included;

- Motor Control Center (MCC) Building c/w RTU
- Internally Coated Valves (Impreglon® 410M)
- Internally Coated Pipe (Devoe® 253)
- Wellhead ESD, Control Valve and Metering Equipment

Major Process Equipment for the oil satellite expansion included;

- Oil / Water Separator
- 200 kW Water Injection Pump
- 100 kW Sour Gas Screw Compressor

→ PIPELINES

Several small lengths of pipelines were installed totalling 4500 m in length. Key technical achievements include;

- Internally Coated (TK-69)
- Zap-Lok® Connections
- Directionally Drilled

→ PROJECT COST AND SCHEDULE

The total value of the project was US $6 million. The engineering cost was 10.5 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The projects were completed on schedule and under budget.

Project: Oil Battery Expansion

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction for the expansion of an existing oil battery. A new water disposal pump was added to increase the water disposal capacity from 10,000 m^3/d to 15,000 m^3/d.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook up and accessories.

Major Process Equipment at the Oil battery includes;

- 12 Stage Horizontal Bingham Centrifugal Pump
- 1000 kW Electric Motor
- 30 kW Mabre Vertical In-Line Booster Pump
- New Motor Control Center (MCC) Package

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Control (PLC) in the new MCC was used as a Basic Process Control System (BPCS), shut down and isolation. The new MCC was coupled to the existing MCC.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $2.0 million. The engineering cost was 7.9 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule.

Project: Sour Oil Test Satellite and Water Handling Expansion

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of a 3000 m^3/d sour oil test satellite, including the addition of process equipment to handle an increase of water production of 2500 m^3/d. Ten (10) pipelines transport oil well effluent from the oil wells to the test separator. Each well has a designated test separator equipped with a custody transfer liquid mass flow meter and an orifice plate gas meter. The oil, gas and water from each well is separated and measured. From the satellite, the oil well effluent is comingled and sent via pipeline to an oil battery for processing. Provisions were made for eight (8) future oil wells. A group separator was added to handle any increase in water production. Gas from the group separator is vented to a vapour recovery unit, where it is compressed and diverted into the sales gas stream.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment at the Sour Oil Test Satellite included;

- Group Separator Package (internally coated with Devoe® 253)
- 1500 kW Water Disposal Pump Package
- Ten (10) 3 Phase Separator Packages (internally coated with Devoe® 253)
- Glycol Saskatoon Boiler Package
- Vapour Recovery Unit (VRU) Package
- HP Flare System, including Knock Out Drum and 30 m Flare Stack
- Two (2) 2.5 m^3 Double Wall Chemical Injection Systems
- Instrument Air Compressor Package
- Motor Control Center (MCC) Package
- SCADA Communications Tower

→ PIPELINE SCOPE OF WORK

One eight inch (8") 10 km pipeline was constructed to transport the oil well effluent from the sour oil test satellite to the sour oil battery for processing.

- Line-O-Log Pig Sender/Receiver c/w Sequential Interlocking System
- Major River Crossing
- Two inch (2") Insulation

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Controller (PLC) is used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower and satellite into the main control room and accounting software.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $16.5 million. The engineering cost was 9% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule.

Project: Sour Oil Well Tie-Ins

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of ten (10) sour oil well tie-ins. Each well produces approximately 100 m^3/d of effluent. To prevent freezing and ensure continuous flow, well bore heat strings, line heaters and insulated pipelines are used.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment at the Sour Oil Wells (10 well sites) included;

- Line Heater Package
- Heat String Pump Package
- Corrosion and Methanol Chemical Injection Systems
- Wellhead ESD
- RTU Communication

→ PIPELINE SCOPE OF WORK (10 PIPELINES)

- Four inch (4") and/or six inch (6") Diameter c/w two inch (2") Insulation
- 12 – 18 km in length
- Pipeline Crossings
- Road Crossings
- Power Line Crossings
- Creek Crossing

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Controller (PLC) is used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower and satellite to the main control room and accounting software.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $15 million. The engineering cost was 5% of the total project cost including Field Engineering, Pre-Commissioning and Start-up. The project was completed on schedule.



Project: Sweet Oil Battery
Location: Western Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of an oil battery required for the separation of free water, oil and gas from an emulsion stream to produce dehydrated clean crude oil at a BS&W less than 0.5%. The oil battery was designed to handle 1000 m^3/d of oil and 2.5 MMSCFD of gas. Nine (9) wells flow into the battery. The clean oil is sent to storage tanks for truck out to a nearby terminal, the gas is sent via pipeline to sales and the water is sent via pipeline for disposal.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook up and accessories.

Major Process Equipment at the Sweet Oil Battery includes;

- Oil Treater Package
- Glycol Dehydration Package
- 500 kW Gas Driven Reciprocating Compressor Package
- Two (2) 160m^3 Sales Oil Tanks
- 160m^3 Produced Water Tank
- Dual HP/LP Flare System, including Knock Out Drums and 30 m Flare Stack
- Motor Control Center (MCC) Package
- Control Room
- Refridge Package
- Vapour Recovery Unit (VRU) Package
- Water Disposal Pump Package

→ CONTROL SYSTEM AND COMMUNICATIONS

A Distributed Control System (DCS) was used as a Basic Process Control System (BPCS). A safety Programmable Logic Controller (PLC) was used for shut down and isolation. The BPCS was designed to use foundation fieldbus for all plant devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality. The power supply came from the utility grid system with an Uninterrupted Power Supply (UPS) back-up installed.

→ PROJECT COST AND SCHEDULE

The total value of the project was US $4.5 million. The engineering cost was 7% of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule and under budget.

Project: Refinery and LNG Plant FEED
Location: Northern Canada
Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the detailed design of a 500 m^3/d refinery producing gasoline, diesel fuel, asphalt base, heating oil, kerosene and 0.4 mmtpa of LNG. Prior to cooling, H_2S and CO_2 are removed from the 50 MMSCFD raw gas stream in two phases. In the first phase an amine tower is used to remove the H_2S and some of the CO_2. In the second phase, a UCARSOL® amine tower is used to remove the remaining CO_2. This project is located in a remote area, requiring airlift of manpower and equipment and the construction of a 10 km of permanent road to gain year round ground access to the site.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment installed at the Refinery/Plant includes;

- Three (3) Phase Inlet Separator
- 4500 kW Gas Turbine Driven Centrifugal Compressor Package
- 160 m^3 Condensate Tanks
- 160 m^3 Internally Coated Water Tanks
- Two Phase Coalescing Separator
- UCARSOL® Amine Package
- Lean Oil Package
- De-Ethanizer Package
- Fractionation Tower
- Desiccant Dehydration Package
- Cryogenic Cascade Refrigerant Package
- 17,000 kW Propane Refrigerant Compressor Package
- 3700 kW Cryogenic Compressor Package
- 1900 kW Cryogenic Expander Package
- 150 kW Vapour Recovery Unit (VRU)
- Two (2) Gas Driven Power Generation Packages
- Two (2) Instrument Air Compressor Packages
- Dual HP/LP Flare System, including HP & LP Knock Out Drums and Dual Flare Stacks
- Motor Control Center (MCC) Building
- SCADA Communication Tower and Satellite Communication

→ CONTROL SYSTEM AND COMMUNICATIONS

A Distributed Control System (DCS) will be used as a Basic Process Control System (BPCS). The BPCS will be designed to use foundation fieldbus for all plant devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality. Power supply will come from two (2) (one stand-by) power generation packages with Uninterrupted Power Supply (UPS) back-up.

The design of the Safety Instrumented System (SIS) will use the following Safety Integrity Level (SIL);

- BPCS: SIL 0
- Fire & Gas Detection: SIL 1
- Emergency Shutdown: SIL 2

Layers of Protection Analysis (LOPA) will be used to identify any new Safety Instrumented Functions (SIF) and for assignment of SIL. All ESD valves will be equipped with valve positioners to allow partial stroke testing to be completed to meet SIL diagnostic requirements which will be performed automatically by the SIS.
The refinery and LNG plant will be manned 24 hours a day and will be remotely monitored, and production metering will be sent to the client's accounting software via satellite communications.

→ PROJECT COST AND SCHEDULE

The FEED was completed in 120 days.

Project: Power Generation - FEED

Location: Northern Canada

Services: Engineering and Procurement

→ DESCRIPTION

This project consisted of the detailed design of a 112 MW power station, including heat recovery system, to supply power to the regional mining industry. LNG will be used as fuel gas for the power generators.

→ MAJOR PROCESSING EQUIPMENT

All packages are skid mounted and housed within a building, complete with controls, utility hook ups and accessories.

Major Process Equipment installed at the Power Generation Plant includes;

- Five (5) Titan 250 Solar Gas Turbine Driven Power Generators
- Heat Recovery System

→ CONTROL SYSTEM AND COMMUNICATIONS

A Programmable Logic Controller (PLC) will be used for control systems on all five (5) packages. The plant control system is designed to use foundation fieldbus for all plant devices including transmitters and control valve positioners in order to provide full Asset Management System (AMS) functionality. A safety PLC will be used for the Safety Instrumented System (SIS) for plant shut down and isolation. All communication is transmitted via satellite to the corporate headquarters.

→ PROJECT COST AND SCHEDULE

The estimated cost for the project is US $240 million and estimated completion is 24 – 30 months. The FEED was completed on schedule.

Project: Dual Gas Pipeline System

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of a dual pipeline system. Two (2) 30 km eight inch (8") pipelines were installed in the same ditch. One (1) pipeline is used to transport 35 MMSCFD of sales gas back to the main transmission pipeline. One (1) pipeline is used to transport 25 MMSCFD of raw gas and condensate to a third party Gas Plant where it is further processed to remove the H_2S and CO_2. The pipeline is designed with ESD valve stations to limit the amount of sour gas released in the event of a failure. The gas consists of 2 % H_2S.

→ PIPELINE SCOPE OF WORK

The pipelines transverse 30 km of varying terrain and includes 4 ESD Riser Valve Stations.

- 30 km of forested land
- Proximity to High Density Population Centers
- 100 Pipeline Crossings
- 6 Road Crossings
- 10 Power Line Crossings
- 1 Cased Dual Highway Crossing
- Designed and Built to Support Line-a-log Inspection Tools
- Pig Sender and Receiver c/w Sequential Interlocking System
- Testing and Commissioning with Dry Air

The line pipe is 219 mm OD x 9.27 mm WT (2.0 mm corrosion allowance), Grade 359, Category II, externally coated with YJ2K®HT (high temperature polyethylene). It is buried to a minimum depth of 1.5 meters.

→ VALVE STATION EQUIPMENT

Equipment at the Valve Stations includes;

- Full Port ESD Valve
- S Bend Risers, Anchors and Expansion Loops
- Fire, H_2S and Gas Detection (LEL)
- RTU Communication Tower c/w several Repeater Stations

→ CONTROL SYSTEM AND COMMUNICATIONS

The existing Programmable Logic Controller (PLC) was used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower, satellite and repeater stations to the main control room.

→ PROJECT COST AND SCHEDULE

The total estimated value of the project is US $8 million. The engineering cost was 5.0 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed on schedule.

Project: Sour Gas Pipeline

Location: Western Canada

Services: Engineering, Procurement and Construction Management

→ DESCRIPTION

This project consisted of the design and construction of 100 km eight inch (8") sour gas pipeline to transport 35 MMSCFD. The pipeline is used to gather and transport third party dehydrated sour gas to the Gas Plant where it is further processed to remove the H_2S and CO_2. The sweet gas is processed through a refrigeration plant in order to meet the dew point requirement for the transmission line. The acid gas from the sweetening plant is dried via refrigeration plant in order to remove all the water from the acid gas before it is further compressed for injection into the wellhead. The pipeline is designed with ESD valve stations to limit the amount of sour gas released in the event of a failure. The pipeline is designed to handle 25 % H_2S.

→ PIPELINE SCOPE OF WORK

The pipeline transverses 100 km of varying terrain and includes 12 ESD Riser Valve Stations and six (6) Third Party Inlet Riser Stations.

- 70 km of forested land
- 30 km of muskeg (requiring swamp weights)
- Proximity to High Density Population Centers
- 200 Pipeline Crossings
- 15 Road Crossings
- 10 Power Line Crossings
- 1 Cased Highway Crossing
- 1 River Crossing (2 directionally drilled pipe strings, 1000 m)
- Designed and Built to support Line-O-Log Inspection Tools
- Pig Sender and Receiver for Smart Pig Inspection c/w Sequential Interlocking System

The line pipe is 219 mm OD x 9.27 mm WT (2.0 mm corrosion allowance), Grade 386, Category II, externally coated with YJ2K®HT (high temperature polyethylene coating). It is buried to a minimum depth of 1.5 meters.

→ CONTROL SYSTEM AND COMMUNICATIONS

Equipment at the Valve Stations includes;

- Full Port ESD Valve
- S Bend Risers, Anchors and Expansion Loops
- Fire, H_2S and Gas Detection (LEL)
- RTU Communication Tower c/w 10 Repeater Stations

→ CONTROL SYSTEM AND COMMUNICATIONS

The existing Programmable Logic Controller (PLC) was used as a Basic Process Control System (BPCS). A Safety Instrumented System (SIS) is used for plant shut down, isolation and blow down. All communication is transmitted via radio tower, satellite and 10 Repeater Stations into the main control room.

→ PROJECT COST AND SCHEDULE

The total estimated value of the project is US $24 million. The engineering cost was 5.2 % of the total project cost including Field Engineering, Pre-Commissioning and Start-Up. The project was completed in 150 days.

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