

Sample Project Summaries



INTEGRA ENGINEERING LTD



River Water Booster Pump

Location: Argentina

→ DESCRIPTION

Project scope consisted of providing a booster pump to inject river water into an oil reservoir as a form of pressure maintenance.

The booster pump was required to have a suction pressure between 4 – 6 barg and is required a boost of 35 barg to ensure the water reached the battery storage tank. P&IDs and layout drawings prepared for a complete “Plug & Play” pump package. Pump packaged on a separate structural steel skid with all piping, controls and electrical included.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment shipped to site:

- 1 - Westinghouse 500 hp 460V/5011 A TETC Motor c/w bearing and winding RTDs and an oversized junction box
- 1 - iMech 862 Series HPS Pump Package c/w Horizontal Pump and AR Bearing Upgrade

→ CONTROL SYSTEM AND COMMUNICATIONS

The Control System consisted of the following:

- 1 - Electric Actuated Control Valve Assembly c/w 114mm 600 ANSI Fisher ET Control Valve and Electric Actuator
- 1 - Main Circuit Breaker 380V, 1000 Amp, 3 Pole
- 1 - Continuous Bus Bar Splitter, 600V, 1000 Amp, 4 Wire
- 1 - Allen Bradley PowerFlex VFD
- 1 - PolyPhase Control Panel c/w Allen Bradley Micrologix 1100 PLC
- 1 - Panelview + 600 Color Touch Screen
- 1 - 114mm 600 ANSI Rosemount Vortex Flowmeter
- Rosemount Gauge Pressure Transmitters
- 1 - 3” X 4” Farris Relief Valve



Battery Expansion

Location: Lloydminster, SK

→ DESCRIPTION

Project scope consisted of the expansion/rebuilding of an existing heavy oil battery to meet treating requirements of 1400m³/d (8,800 bbl/d) of heavy oil and the injection of 7500 m³/d of produced water back into the existing water flood. Included:

- Site preparation, access roads, surveying, piling, secondary containment, and concrete tank foundations.
- All electrical and instrumentation materials and labour required for process control of the listed equipment.
- All mechanical construction including welding and assembly of structural steel skids and piping, tank modifications, steel supports, platforms, stairs and final bolt up.

→ MAJOR PROCESSING EQUIPMENT

In addition to the existing equipment, the facility upgrade included the following:

- 1 – Pressurized Horizontal Treater c/w Auto Desand
- 4 - Overhead truck off-load stations
- 4 - Inlet Emulsion Surge Tanks
- 1 - Truck-in Sales Tank
- 3 - Sales Tanks
- 1 - Pop Tank
- 1 – Plate and Frame Heat Exchanger c/w Auto Flow Reversing
- 2 – 40 hp Progressive Cavity Treater Emulsion Charge Pumps c/w VFD
- 2 – 15 hp Progressive Cavity Emulsion/Recycle Pumps c/w VFD
- 1 – 50 hp Centrifugal Desand Supply Pump
- 1 – 40 hp Centrifugal Charge Pump
- 1 – 400 hp Multi-Stage Centrifugal Injection Pump
- 1 – 2000 Amp Motor Control Center c/w Skid and Building
- 1 – Truck Scale
- 1 – Scalehouse/Cut Shack c/w Centrifuge and Sample Heater

→ CONTROL SYSTEM AND COMMUNICATIONS

A new MCC and PLC that was capable of handling additional loads was installed.



Multiwell Pads & Battery

Location: Golden Lake, SK

→ DESCRIPTION

Project scope consisted of the design and construction of a 650 m³/day (4,000 bpd) emulsion oil battery with 12 API[®] heavy oil in Central West Saskatchewan. This development includes the tie-in of ten multi-well pad sites to a central battery.

→ MAJOR PROCESSING EQUIPMENT

- 1 - 10' dia. x 50' long Pressurized Horizontal Cold FWKO Package
- 2 - 393 m³ (2470 bbl) Heating Tanks
- 2 - 344 m³ (2161 bbl) Settling Tanks
- 2 - 320 m³ (2007 bbl) Sales Oil Tanks
- 2 - 320 m³ (2007 bbl) Water Skim/Surge Tanks
- 1 - 160 m³ (1000 bbl) Desand Tank
- 1 - 400 hp Water Injection Pump
- 1 - 6' dia. X 12' long Horizontal Inlet Separator Package
- 2 - 8 m³ (50 bbl) Dual High / Low Pressure Flare Knockout Drum (HP/ LP FKO)
- 1 - 6"/8" x 60' High dual air assist High/Low Pressure Flare Stack
- 2 - 25 hp Screw Air Compressors
- 1 - 2500 Amp Motor Control Center (MCC)
- 1 - Truck Unloading System
- 1 - 4.57m (15') x 13.7 m (45') Office

→ PIPELINES

- Produced Emulsion (PE) from individual wells designed to flow into the group emulsion header and down 10 kilometers through a six-inch (6") internally lined steel flowline from the wells pads to the central battery.
- Produced Water (PW) from the central battery designed to flow to the individual pads to aid in the flow of emulsion and for injection water.
- Casing gas is gathered off each wellhead into a common low pressure gathering line. Fuel gas is sent from the battery back out to each pad to run the engines.

→ CONTROL SYSTEM AND COMMUNICATIONS

The MCC Building houses a 2500 Amp Main Bus. A dividing wall separates the MCC and the Control Panel (CP) cabinet. Two PLCs installed in a common PLC cabinet. The PLC cabinet was designed with 25% spare capacity for future Inputs/Outputs (I/O) requirements. The MCC building is designed to be cooled and heated with an external HVAC system. A Hazard and Operability Study (HAZOP) and Layers of Protection Analysis (LOPA) was conducted to ensure risks were reasonably mitigated.



Well Pads and Tie In

Location: Aberfeldy, SK

→ DESCRIPTION

Project scope included the design, fabrication, and tie-in of a nine (9) well pads, 5 oil wells and 4 water injection wells.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- 5 - Horizontal Wells c/w Oil Lift G1500 PC pump drives and 40HP electric motors, and 40 HP ABB VFDs
- 5 - Casing Gas Utilidor Boxes c/w all necessary instrumentation and pressure protection
- 1 - 160m³ (1000 bbl) Test Tanks c/w with sample tray, blowcase and nozzle upgrades.
- 1 - Pump Building (housing 20 hp Tarby 3TL8 Progressive Cavity Pump c/w VFD)
- 2 - Three Head Chemical Pumps
- 1 - 1000-gallon Chemical Tank for emulsifier c/w secondary containment
- 1 - 500-gallon Chemical Tank for methanol c/w secondary containment
- 1 - 600 Amp MCC Building for 480V 3 phase service c/w with PLC

→ PIPELINES

The emulsion and casing gas collected from this well pad was flowlined to an existing well pad.

- 800m of 168.3mm (6"), 300 ANSI rated Flexsteel for a group emulsion flowline
- 800m of 114.3mm (4"), 600 ANSI rated Flexsteel for a produced water flowline
- 800m of 60.3mm (2"), 150 ANSI (1380kPag rated) HDPE 4710, SDR 11 poly pipe as a fuel gas buyback line
- 800 m of 114.3mm (4"), 150 ANSI (1380kPag rated) HDPE 4710, SDR 11 poly pipe as a common Casing Gas compressor suction line

→ CONTROL SYSTEM AND COMMUNICATIONS

- New injection wells were completed with a magnetic flow meter and are controlled by a manual choke valve
- New oil wells were completed with electric wellhead drives and were controlled by individual variable frequency drives (VFDs). Casing gas pressure control and measurement was done with instrumentation housed in a casing gas control cabinet
- 1 - Micro logix PLC with Wymax communications system to access the system remotely.
- VFDs on the wellheads.
- VFD on the transfer pump.



Water Storage and Processing Facility

Location: Lindbergh, AB

→ DESCRIPTION

Project scope included design and construction of a water storage and processing facility capable of handling approximately 2500 m³/day of trucked in produced water. A series of water storage tanks were designed to remove trace amounts of oil and solids before water is used in a salt cavern wash process. A pump building equipped with several process pumps is used to transfer clean water to cavern wash and disposal processes and to remove skim oil and solids that collect in the tanks. The facility forms part of a large multi-process treating facility.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- 1 - 2000 bbl cone bottom water inlet tank
- 2 - 2500 bbl water storage tank
- 1 - Process Pump Building
- 3 - 60 HP Water Transfer Pumps
- 2 - 75 HP De-Sand Jet Pumps
- 1 - 40 HP Oil Skim Pump
- 1 - 100 HP Boost Pump

→ PIPELINES

Process piping was installed to incorporate the tanks and pumps into the existing multi-process facility

→ CONTROL SYSTEM AND COMMUNICATIONS

The PLC Shut-Down Key was updated and an updated Process Control Narrative was prepared.



Central Processing Facility

Location: Soda Lake, SK

→ DESCRIPTION

Project scope included the design and construction of a central processing facility. This facility was built adjacent to one well pad and two well pads were flowlined in. The facility was designed to produce 465 m³/day of oil and 3250 m³/day of water with a single injection pump. All the production in the field is sour.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- 1 - 10' x 40' cold FWKO
- 2 - 2000 bbl Heating Tanks
- 2 - 2000 bbl Water Tanks
- 1 - Water filter building
- 1 - 200 HP Water Injection Pump
- 1 - Glycol bath heater
- 1 - Glycol x emulsion plate and frame heat exchanger
- 1 - High pressure/ Low pressure flare knockout drum
- 1 - High Pressure/ low pressure flare stack.

→ PIPELINES

- HDPE lined steel flowlines were installed from the well pads to the facility for both water and emulsion.
- HDPE fuel gas and casing gas lines were installed between the well pads and the facility.

→ CONTROL SYSTEM AND COMMUNICATIONS

The facility was equipped with two PLCs for controls and shutdowns. The facility was automated with control valves, flow meters, pressure transmitters, level transmitters, level switches and Drexelbrook probes.

A Hazard and Operability Study (HAZOP) and Layers of Protection Analysis (LOPA) was conducted to ensure risks were reasonably mitigated.



SAGD Processing Facility

Location: Plover Lake, SK

→ DESCRIPTION

Project scope included services to re-commission and expand an existing heavy oil battery to treat produced emulsion from a new SAGD project in the Plover Lake area.

The facility had a 10' x 40' FWKO that was re-commissioned, and a surplus 12' x 50' Treater was relocated from the nearby facility. The two vessels were utilized to treat the emulsion from the SAGD project. New heat exchangers were installed to cool the sales oil and produced water streams before the streams entered the existing sales oil tank and water plant. The gas entrained in the emulsion was directed to the existing flare system, which was re-commissioned.

The project also included new source water wells and infrastructure to supply fresh water to the steam facility. The new source water wells were tied into the SAGD treating facility where the fresh water was used as the cooling medium for the sales oil and produced water coolers. New pumps were installed to pump the water from the treating facility to the steam facility.

→ MAJOR PROCESSING EQUIPMENT

The expansion of the 10-05 facility included the items and activities listed below:

- Re-commission 1 10' x 40' Horizontal Heated FWKO
- Relocate and install 1 12' x 50' Horizontal Treater
- 4 - B149.3 Compliant Burner Systems
- 4 - Plate and Frame Heat Exchangers
- 2 - Centrifugal Source Water Pumps
- 1 - 1500 bbl Desand Tank
- Re-commission and Convert 1 1500 bbl Source Water Tank
- 1 - FKOD Vessel
- Re-commission 1 6" x 40' Flare Stack
- Re-commission 1 15 HP Recycle Pump
- Re-commission 1 30 HP Desand Pump

→ CONTROL SYSTEM AND COMMUNICATIONS

The PLC equipment at the existing heavy oil battery was at the end of its product life and was replaced with new equipment. In conjunction with the PLC upgrades, the existing HMI's were also replaced. A new operator interface program was developed as part of the upgrades.

A PLC was installed at each of the source water wells to provide local monitoring and control. Each wellsite PLC was equipped with an ethernet radio to communicate with the main PLC at the SAGD treating facility.

A new callout system was installed to report callouts for all existing and new process equipment at the facility.



Water Storage and Processing Facility

Location: Lindbergh, AB

→ DESCRIPTION

Project scope included the design and construction of a water storage and processing facility capable of handling approximately 2500 m³/day of trucked-in produced water. A series of water storage tanks were designed to remove trace amounts of oil and solids before water is used in a salt cavern wash process. A pump building equipped with several process pumps transfers clean water to a cavern wash and disposal processes remove skim oil and solids that collect in tanks. The facility forms part of a large multi-process treating facility.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment includes:

- 1 – 2000 bbl cone bottom Water Inlet Tank
- 2 – 2500 bbl Water Storage Tanks
- 1 – Process Pump Building
- 3 – 60 hp Water Transfer Pumps
- 2 – 75 hp De-Sand Jet Pumps
- 1 – 40 hp Oil Skim Pump
- 1 – 100 hp Boost Pump

Process piping was installed to incorporate the tanks and pumps into the existing multi-process facility.

→ CONTROL SYSTEM AND COMMUNICATIONS

The PLC Shut-Down Key was updated and a process control narrative was prepared for the client.



Well Pad FWKO Installation

Location: Aberfeldy, SK

→ DESCRIPTION

The Project consisted of the design and installation of a cold FWKO. The facility was operating at maximum water capacity. Several wells in the field had to be shut-in due to lack of capacity. The installation of the FWKO increased the water handling capacity from 1600 m³/day to 3500 m³/day.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment includes:

- 12' x 80' cold FWKO

→ CONTROL SYSTEM AND COMMUNICATIONS

Added FWKO instrumentation to the existing PLC. Instrumentation included:

- Drexelbrook level probes
- Pressure Transmitter
- Flow meters
- control valves for the water and emulsion outlets



Salt Water Disposal Facility

Location: Edam, SK

→ DESCRIPTION

Project scope consisted of the design and construction of a salt water disposal facility and tie-in of three wells via water transfer flowlines. The facility was designed to handle up to 800 m³/day of water, of which approximately 500 m³/day was to be trucked in and the remaining transferred to the facility through flowline.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- 3 - 1000 BBL Tanks
- 1 - 125 HP multistage centrifugal pump
- 1 - 8' x 30' pump skid and enclosure
- 3 - hydraulic driven centrifugal pumps
- Flexpipe FP301 Line Pipe

→ PIPELINES

Water transfer flowlines were installed from three locations to the saltwater disposal facility.

- 1600m 3" Flexpipe for water transfer

→ CONTROL SYSTEM AND COMMUNICATIONS

All end devices were tied into a PLC for process control, alarms, and shutdowns. A PLC and touch screen HMI was installed in the control panel, and all I/O was wired to it. All process control, alarms, and trending were done through the HMI. The PLC was connected to a SCADA system for remote process monitoring and callouts.



Water Tank Installation

Location: Western Saskatchewan

→ DESCRIPTION

Project Scope consisted of the removal and replacement of an existing 1590 m³ water tank at a Sour Oil Facility. The tank needed to be removed from service due to integrity issues in the shell and floor that would not allow a VRU system to be tied into the tanks to capture H₂S vapors.

Process piping modifications and tie-ins for the new tanks were completed during a scheduled turnaround prior to the installation of the new tanks. This allowed the tanks to be tied into the facility and brought online without any unscheduled downtime.

In addition to the water tank, an out of service de-sand tank was also removed to allow space for the new tanks. A secondary containment was installed to house the tanks. The tanks were set on steel skids welded to piles for support inside the containment.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- 2 - internally coated 588 m³ Water Tanks.
- Lightning protection system for each tank.

→ CONTROL SYSTEM AND COMMUNICATIONS

A full HAZOP was completed for the revisions to the facility. The facility is controlled by an Allen-Bradley Programmable Logic Controller (PLC). The site programming was updated with new equipment, shutdowns, and process controls.



Salt Water Disposal Facility and Water Transfer System

Location: Saskatchewan

→ DESCRIPTION

Project scope consisted of lower lifting costs of producing wells in the area by flowlining producing pad sites to a central salt water disposal facility, eliminating the need to truck out produced water from the area. A three (3) tank facility designed for 1000 m³/day was installed on the same site as a recently drilled disposal well. The system was designed for gravity feed as the disposal well is currently on vacuum. Provisions were left in place to allow for the installation of a boost/injection pump in the event the well begins to pressure up. The tanks were designed to allow for skimming via vac truck at scheduled intervals.

Three producing pads were connected to the facility via flowline. Casing gas flowlines were also installed from each pad to provide fuel gas for the genset on location. A water transfer pump package was installed at each pad to transfer water to the facility.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included

- 3 - 200 m³/day Hydraulic Water Transfer Skids.
- 3 - 160 m³ internally coated tanks water tanks.
- Bag filter skid c/w utilidor. 10' x 40' cold FWKO

→ PIPELINES

The following pipelines were installed to gather casing gas and produced water:

- 1300 meters 4" Flexpipe for water transfer.
- 1300 meters 3" HDPE for casing gas gathering

Both water transfer and casing gas lines were bored from producing pad locations. Dense tree vegetation, low wetlands and a creek crossing favored the use boring versus trenching.

→ CONTROL SYSTEM AND COMMUNICATIONS

Each producing pad had a standalone SCADA system installed for remote monitoring and shut down from the main disposal facility.



Butane Capacity Increase

Location: Lloydminster, SK

→ DESCRIPTION

Project scope consisted of increasing butane production in a Gas Recovery Unit. This was done by twinning the butane production rundown line from the Gas Recovery Unit to the Butane Storage Sphere. A third Butane product pump was also added to allow for increased butane injection rates from the Butane Storage Sphere into the HSB Pipeline.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment includes:

- Butane Product Pump
- 1500 m of Butane Piping
- Control Valves and Instrumentation
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→ PIPELINES

Completed a 2" Hot Tap on the existing 10" HSB Line.

→ CONTROL SYSTEM AND COMMUNICATIONS

A HAZOP was completed for both the twinning of the line and addition of the third pump.

Updates were made to the Upgrader Distributed Control System (DCS) for the addition of the third pump. The operation of the new pump was programmed to be identical to the existing pumps with the exception of splitting the butane flow control set point when two pumps are running.

Valve position switches were added to the manual discharge valve on the common discharge line for the pumps. Pump interlocks were updated accordingly based on the switches.



Oil Field Sludge Truck Pump-Off System

Location: Lloydminster, SK

→ DESCRIPTION

This project consisted of the design and construction of a pump off-load system skid capable of handling trucked-in oilfield sludge to a Sand Cavern Facility for disposal. The off-load system consisted of a truck off-load box a strainer to remove large foreign objects and a transfer pump capable of handling a wide range of difficult to pump fluids containing solids. Included complete process piping design to incorporate the new equipment and to enable an operator to commingle oilfield sludge into an existing sand slurry disposal stream. Design was intended to mitigate risks associated with sludge disposal operators working in close proximity to the truck off-loading area and an adjacent sand disposal process.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- Truck Off-Load Box c/w Strainer Device.
- Sludge Off-Load Pump Skid.
- Process piping was installed to incorporate the pump skid into an existing sand disposal process.

→ CONTROL SYSTEM AND COMMUNICATIONS

A hazardous operations assessment was conducted during the final design phase to ensure the process met design and operating objectives. The PLC Shut-Down key was updated and an updated process control narrative was prepared and reviewed with the client prior to PLC programming.



Well Pad Polymer Injection

Location: Aberfeldy, SK

→ DESCRIPTION

Project scope consisted of the installation of a trailer mounted Mobile Polymer Injection Unit. This unit is to be conveniently installed and can be easily moved to trial polymer injections in other fields. It is designed to receive dry polymer powder and produced water and to output a high quality, high pressure polymer “field blend” solution.

→ MAJOR PROCESSING EQUIPMENT

Major Process Equipment included:

- Stand-alone polymer mobile injection unit designed and supplied by SNF to receive water and dry polymer powder and to output a high-quality field blend polymer solution.
- The unit is housed in a mobile trailer unit so that it is easily moved.
- 3 - Passive Coil Choke Boxes for each polymer injector.

→ CONTROL SYSTEM AND COMMUNICATIONS

The mobile injection unit is equipped with Motor Control Center (MCC), Programmable Logic Controller (PLC) and Human Machine Interface (HMI). Cell phone call out supplied for alarms and/or shut down.

Hazard and Operability Study (HAZOP) and Layers of Protection Analysis (LOPA) was used to identify any risk and designed proper mitigation plans.



As-builts of Natural Gas Pipeline and Compression Facilities

Location: Various locations in Saskatchewan

→ DESCRIPTION

Contract scope includes the generation of as-built key mechanical drawings for natural gas pipeline and compression facilities. The facilities include, but are not limited to, compressor stations, storage and gathering facilities, transmission pipelines, blockvalves, custody transfer measurement facilities and distribution utility infrastructure.

Most of the key mechanical drawings are generated for compressor stations. The compressor station key mechanical drawings include a 3D CAD model of the entire facility, a Process Flow Diagram(s) (PFD), a detailed site plan, a pressure piping line list and a valve list.

Final drawing deliverables are compatible with CADWorx, AutoCAD and Navisworks Freedom software packages.