APPLICATION NOTE - INDUSTRIAL

OIL BEAM PUMP AND ESP PUMP MONITORING

APPLICATION BACKGROUND

Oil companies often have very remote oil pumps which are difficult to monitor using traditional Remote Terminal Unit (RTU) equipment because there is no hard wired communication channel available to connect to a central Supervisory Control and Data Acquisition (SCADA) system.

For long oil pipelines, oil companies have strategically located pumping stations that boost internal pipeline pressure and flow. In order to avoid disruptions in production and transportation it is important to have a pump's condition status information available in real time. Since such sites are quite often very remote telemetry data collection system is required.

APPLICATION DETAIL

A typical remote oil beam pump installation would have a pump, a pump engine (diesel) and a pump controller. The pump controller typically would have a small RTU with a Modbus interface and measurement sensors attached, usually 4-20mA analog temperature and pressure sensors.

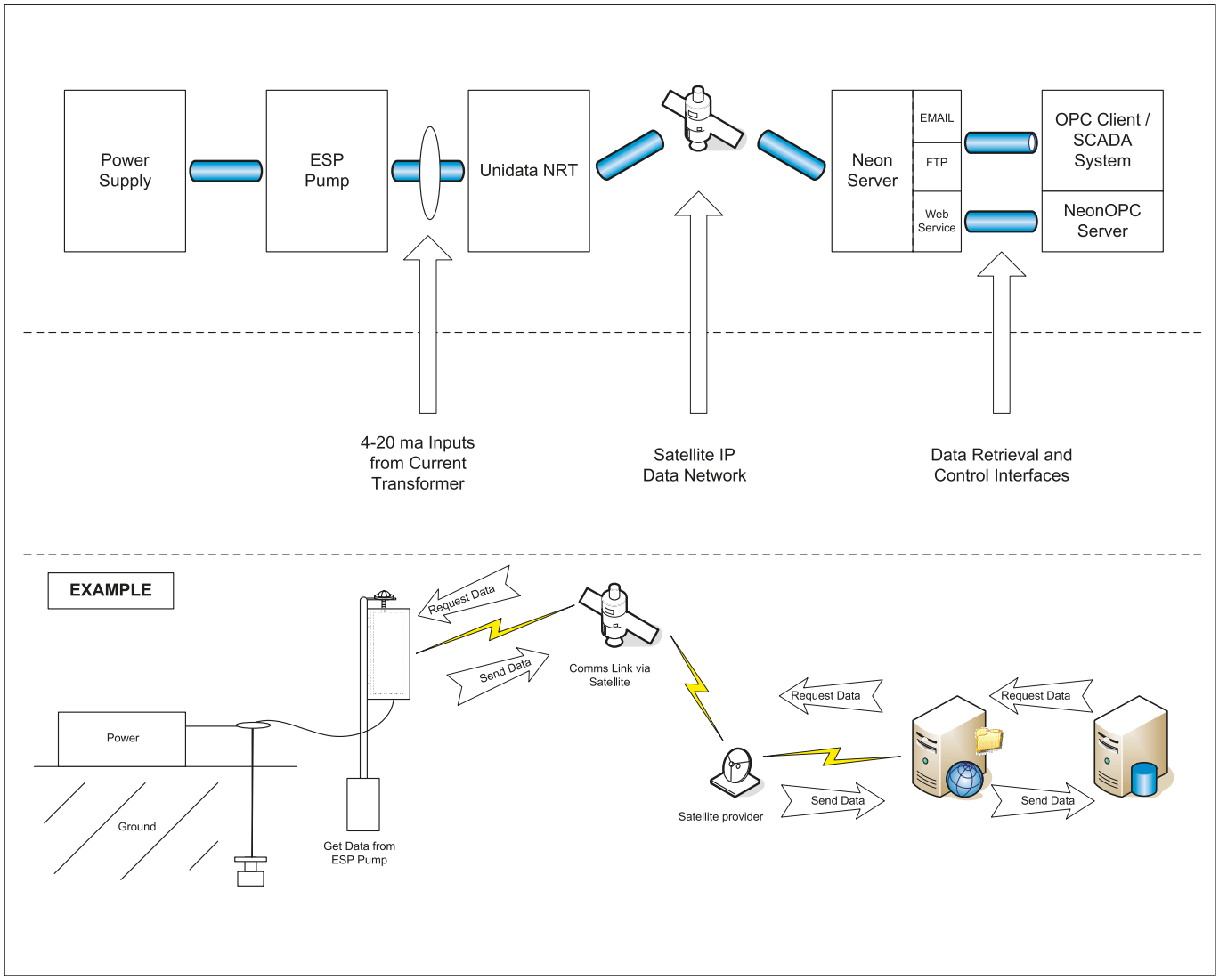
There are many different brands and types of oil pumps, for example there are beam pumps, jet pumps and electrically submersible pumps. All of these have some form of pump / engine controller. Some have individual sensors typically 4-20mA analog inputs and some have more complex Remote Terminal Unit (RTU) controllers with Modbus interfaces. Some also have control outputs, for example a control output to force a pump shutdown in an emergency.

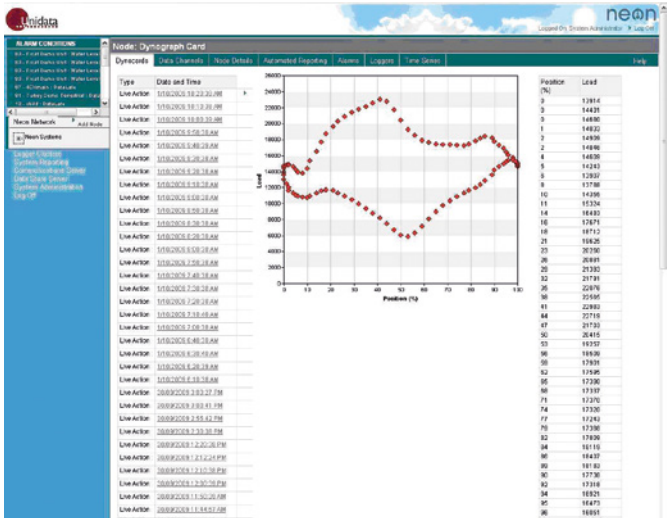
Unidata has worked with Weatherford EPIC, Lufkin SAM and smaller providers of such systems. All of these pump monitoring systems have Modbus parameters which can be collected and monitored remotely.

There may also be requirements to monitor older pumps without sophisticated controller systems. In these circumstances, the individual sensors would need to be installed and monitored. Instruments measuring pressure, temperature, fuel levels, voltages may be attached to analog and digital inputs of a Neon Remote Logger which will routinely collect data and report on it.

Perhaps there is an electrically submersible pump that needs to be monitored. This could be accomplished by adding a clamp on the current transformer of the pump power supply, so the pump power input can be monitored, across three phases. The measured data can indicate the pump load and working condition.

The Neon Remote Loggers can be set up to monitor the analog and digital sensors and store readings and operating parameters locally. In most cases, the data is sent on a regular (5,10 or 15 minutes) basis to a central Neon Server to be viewed on a web browser, and sent to associated systems within an organization responsible for managing the oil pumps.





Typically such organization would have an immediate need to display the data on their SCADA systems and they would have a longer term need to analyse the performance data to determine the long term efficiency of the well.

Dynacard graphs are very valuable indicator of beam pump operation and well condition. The Dynacard can be extracted from the Oil Pump controller, passed through the Neon Remote Logger and displayed on the neon Applications Software Web browser.

The data could also be scanned for any out of limit condition. The Neon Remote Logger will scan data for any out of limits conditions and, in an instance that any occur, the NRL will activate an alarm and send an email or a text message to the allocated people to take appropriate action.

It is important to consider the power requirements of the site. If primary power is available, only a small battery would be added to the system to act as a backup, in case the primary power is disrupted. If primary power is not easily accessible, the system can be powered by a lithium battery pack or a rechargeable solar power system.

Depending on the instruments chosen, the lithium battery pack (non-rechargeable) can provide independent power source for up to 2 years.

The Solar power system consists of a rechargeable lead acid sealed battery, a solar panel and a solar controller. Solar power systems should be properly rated for the instruments used and as such will provide long-term power solutions.

There needs to be some consideration on requirements for intrinsic safe instruments in this application. Any direct sensors connected to an oil pump would, most likely, need to be intrinsic safe. Furthermore, the wiring from them will need intrinsic safe barriers fitted as well. The specific requirements for each installation needs consideration, but generally, it is likely that the Neon Remote Logger system would be located just outside the zone for intrinsic safe equipment.

TYPICAL CONFIGURATION

APPLICATION SPECIFIC INSTRUMENTS / INPUTS

Options	Unidata Part Number	Description
Customised Pressure Sensors	Custom Part	Custom Pressure inc Vacuum Sensors, Custom Output V, 4-20mA
Modbus RTU	Modbus RTU	

NEON TELEMETRY - NRL / RTU / FIELD UNITS

Options	Unidata Part Number	Description
Ethernet	3016A-000 / 3008A-000	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G / 4G	3016A-C00 / 3008A-C00	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G / 4G and LoRa	3016A-CL0 / 3008A-CL0	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite - Inmarsat	3016A-00I / 3008A-00I	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite - Inmarsat & 3G / 4G	3016A-C0I / 3008A-C0I	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Low Earth Orbit Satellite - Globalstar	3016A-00G / 3008A-00G	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Satellite - Iridium Short Burst Data	3016A-00R / 3008A-00R	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Standalone RTU / NRL - Industrial	3004A-00 / 3004A-0L	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
Cellular RTU / NRL 3G / 4G - Industrial	3004AC0 / 3004A-CL	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
M – Series Standalone RTU / NRL	3004B-M000 / 3004B-M0B0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Cellular RTU / NRL 3G / 4G	3004B-MC00 / 3004B-MCB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series LoRa RTU / NRL	3004B-ML00 / 3004B-MLB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Ethernet RTU / NRL	3004B-MEBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Microsatellite RTU / NRL	3004B-MHBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Iridium Short Burst Data RTU / NRL	3004B-MIBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional

NEON APPLICATION SOFTWARE - CUSTOMER SERVER

Options	Unidata Part Number	Description
Neon Applications Software	2302A	Neon Server Software Licence Incl 5 NAL
Neon Applications Software	2302A-10	Additional 10 NRT Access Licence
Neon Applications Software	2302A-20	Additional 20 NRT Access Licence
Neon Applications Software	2302A-50	Additional 50 NRT Access Licence

NEON HOSTING SERVICE - UNIDATA SERVER

Options	Unidata Part Number	Description
Neon Hosting Service	2301A	Neon Data Initial Subscription Setup Fee
Neon Hosting Service	2301A-01	Neon Data Service Fee for 1-50 NRT
Neon Hosting Service	2301A-02	Neon Data Service Fee for 51-100 NRT
Neon Hosting Service	2301A-10	Neon Data Service Fee Metering

DATALOGGER MANAGEMENT SOFTWARE

Options	Unidata Part Number	Description
Starlog V4 Management Software	6308A-AUE	STARLOG V4 Full Licence Key