

AUTOMATION SOLUTIONS FOR THE OIL & GAS INDUSTRY

PROJECT REFERENCE BOOKLET



eXlerate[®]
SUPERVISORY SOFTWARE



Flow-X[®]
FLOW COMPUTERS

SPIRIT IT PROJECT REFERENCES

The references on the following pages highlight some of our fascinating projects. Although not covering our complete installed base, this booklet shows various system integrating partners worldwide, who have implemented our eXLerate and Flow-X technology.

Compilation date: August 2015

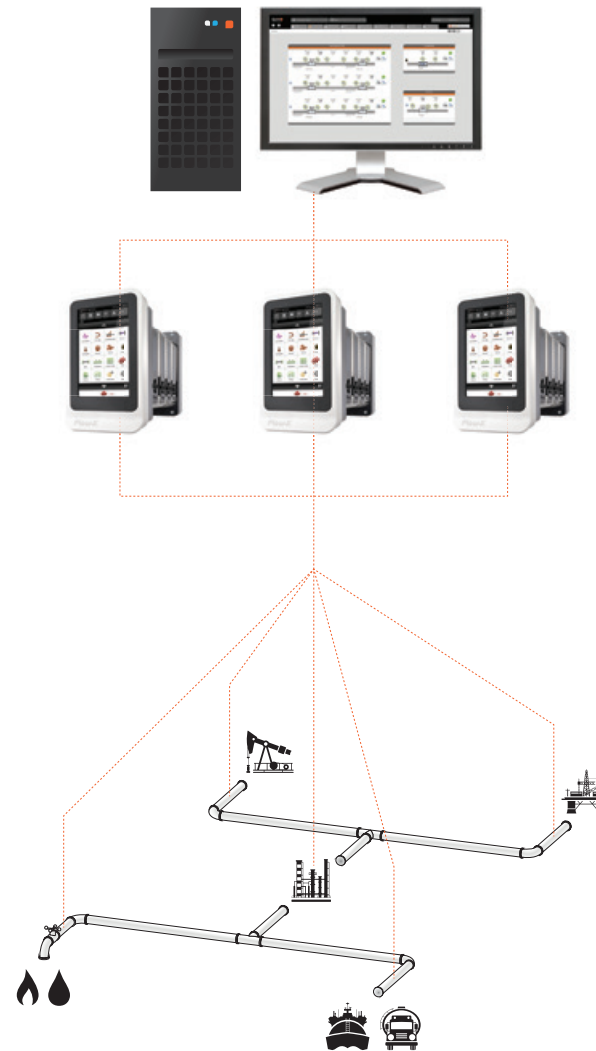


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eXLerate Projects



Flow-X Projects



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Flow Metering Systems



Terminal Automation



Flow Calibration Facility Management



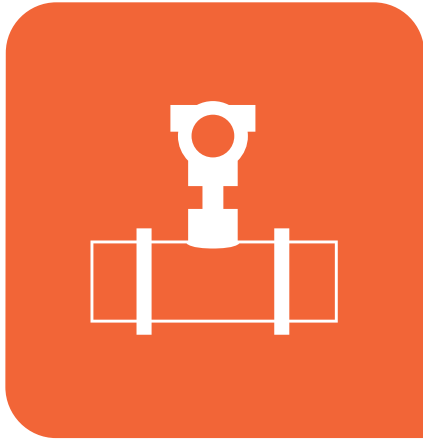
LACT Control



Virtual Flow Computing Systems



Pipeline Network Management



FLOW METERING SYSTEMS

Safe & sound operation and control from well to web

Spirit IT believes that the custody transfer of oil and gas can be significantly enhanced by smart metering control and management. Therefore, it offers eXLerate and Flow-X:

- ✓ Whereas solutions built with generic HMI / SCADA packages lack efficiency, eXLerate is developed specifically for the oil and gas industry. Solely complying with the world's most demanding specifications, our software is unique in the industry.
- ✓ Our Flow-X series flow computers offer a sophisticated concept that combines advanced measurement technology and fast digital signal processing.

The combination of our Flow-X hardware and eXLerate software enables a unique integral measurement management from well to web. Moreover, with automatic mismeasurement detection and correction, it sets a new standard in custody measurement.



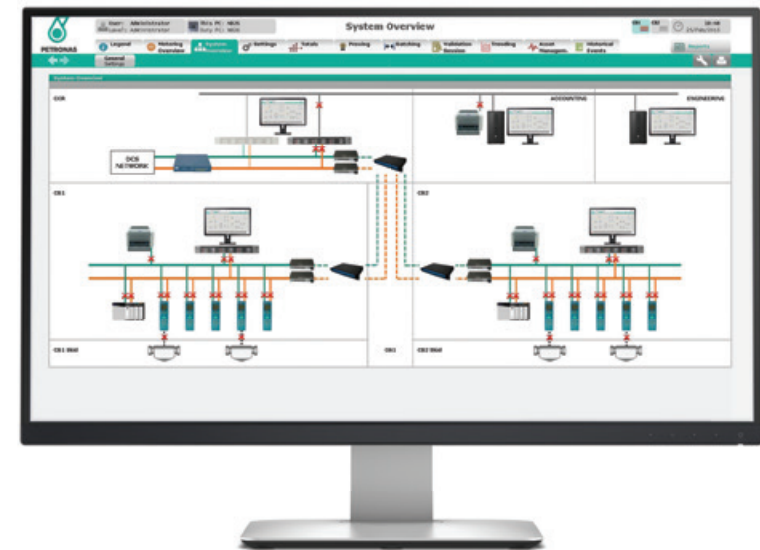
SUNGAI UDANG PORT

In Melaka, Malaysia, the Sungai Udang Port is facilitating a large local refinery. For the measurement of different refined products there, Spirit IT has launched one of its largest projects to date: the second version of SmartCen™.

SmartCen™ is our uniform and companywide metering supervisory solution, resulting from the joint development of PETRONAS and Spirit IT.

Having installed over 25 SmartCen™ solutions so far, much experience has been gained since the first implementation. Therefore, this new version has been vastly improved by new layouts and templates.

This project has been executed for PETRONAS' subsidiary Penapisan, which is the first to make use of our SmartCen™ for refinery products.



NAME

Sungai Udang Port

CLIENT

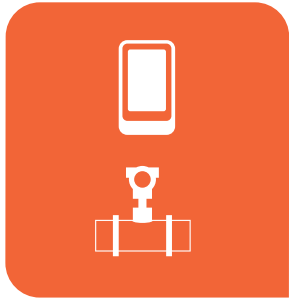
*PETRONAS
Penapisan*

COUNTRY

Malaysia

YEAR

2015

**NAME**

Enterprise Products
Texas

CLIENT

Enterprise Product
Partners, L.P.

COUNTRY

The United States of
America

YEAR

2015

ENTERPRISE PRODUCTS TEXAS

With assets in 81,000km of oil & gas pipelines, Enterprise Products is one of the largest providers of midstream energy services in the USA. Several new construction projects are in development in South Texas to extend the Enterprise's NGL and crude oil infrastructure.

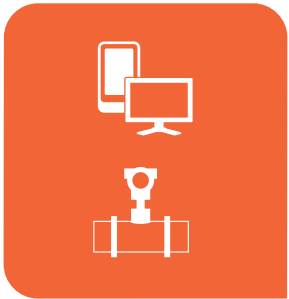
These projects include the construction of different facilities, such as natural gas processing, NGL fractionation and transportation in that area. For several of these locations, Spirit IT has been contracted to facilitate the project with a complete metering control system.

For example, for Enterprise's facility in Mont Belvieu, Spirit IT has installed in total:

- ✓ 7 Flow-X/R 19" flow metering rack enclosures;
- ✓ 2 Flow-X/S single stream flow computers;
- ✓ 45 flow-X/M flow metering stream modules.

These flow systems have been used for different ends, such as the metering of Mont Belvieu's LNG fractionation plant, rail cars to Conway and well storage.





NAME

Wheatstone - Onshore

CLIENT

Chevron Australia

COUNTRY

Australia

YEAR

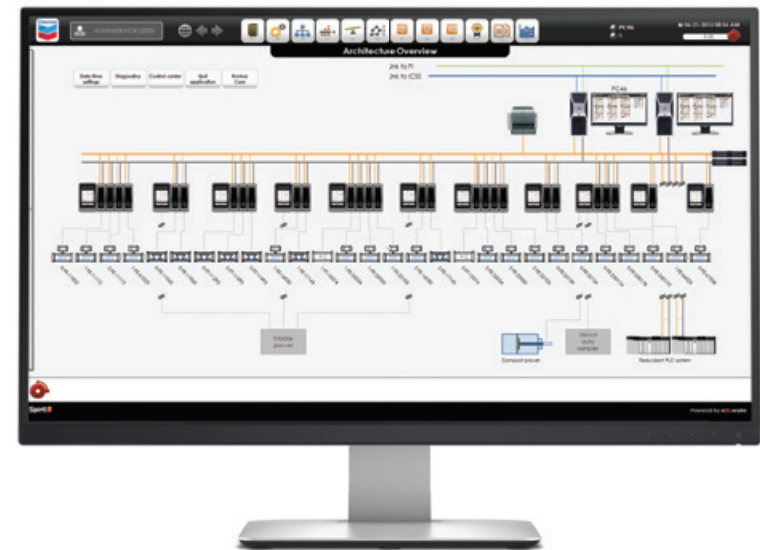
2014

WHEATSTONE - ONSHORE

Wheatstone is one of Australia's largest resource projects, providing greater security of gas supply and significant economic benefits. This Chevron-operated natural gas field is located about 200km north of Onslow in Western Australia.

From the offshore Wheatstone platform, a 225km trunk line is connected to the onshore facilities at Ashburton North Strategic Industrial Area (ANSIA). Here, the transported gas & condensate are further processed and stored for export.

For the provision of a metering system onshore, 22 multi-stream Flow-X/P flow computers with 58 Flow-X modules, connected with two redundant eXLerate-based supervisory systems, have been supplied. For allocation purposes, being both mass- and component based, all Flow-X flow computers are equipped with the latest GERG2008 calculation.





NAME

Wheatstone -
Offshore

CLIENT

Chevron Australia

COUNTRY

Australia

YEAR

2014

WHEATSTONE - OFFSHORE

The Wheatstone's offshore processing platform is located in 70 meters of water, about 220km from the Australian coast. Here, the produced gas, condensate and associated aquifer water are separated and cleaned.

As the incoming wells are fed into four separator facilities, each separator uses a specific meter; for outgoing gas an Ultrasonic meter and for condensate a Coriolis one. In total, Spirit IT has provided six meters, of which 1 Coriolis type and 5 Ultrasonic ones.

The whole system contains two redundant server computers with eXLerate supervisory software. It communicates with three Flow-X/R computer racks:

- ✓ One Flow-X/R8, for incoming streams;
- ✓ One Flow-X/R8, for flare signals, export metering, total fuel gas and one fuel gas meter run;
- ✓ One Flow-X/R5 with 4 fuel gas meter runs and one hot spare module.





NAME

Laggan Tormore

CLIENT

Total E&P UK Ltd.

COUNTRY

United Kingdom

YEAR

2014

LAGGAN TORMORE

Located 125km north-west on the Shetland Islands, the new Shetland Gas Plant (SGP) represents the future in the UK oil and gas industry. Covering an area of approximately 540,000m², it processes and exports isolated gas of the plant via two 18" pipelines.

As this plant is being owned and operated by Total, a leading company in the oil and gas industry, Spirit IT is proud to have been contracted here for the installation of 10 metering skids.

For complete custody measurement purposes, fully redundant Flow-X metering systems and eXlerate supervisory software have been provided, divided over two locations.





NAME

TAQA Bergermeer

CLIENT

TAQA Energy b.v.

COUNTRY

The Netherlands

YEAR

2013

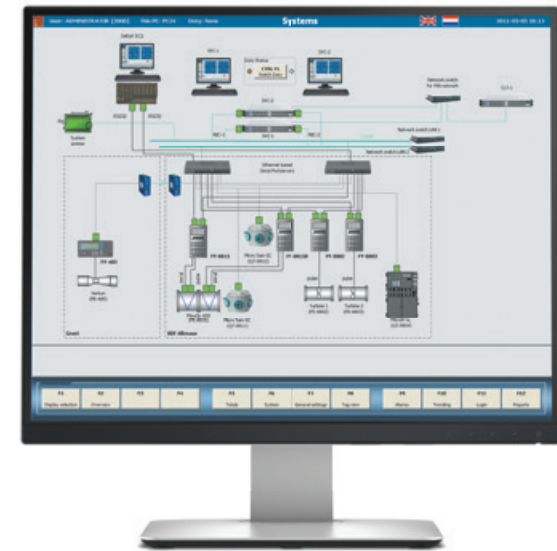
TAQA BERGERMEER

Bergermeer Gas Storage is a project of TAQA in the Netherlands. Being one of Europe's largest gas storage facilities, it comprises of a Bergermeer gas field near Bergen, and a gas drying site in Alkmaar. For both locations, Spirit IT has provided gas metering solutions.

For the Bergermeer gas field, a complete Fiscal Gas Metering Station is implemented, including the following metering sections:

- ✓ Fiscal gas metering station A-1210, Import/Export;
- ✓ Vent gas;
- ✓ Condensate Truck Loading.

For the Alkmaar drying facility, our supervisory software is implemented. Because this drying facility involves an area covering three sites, namely Bergen, Bergermeer and Groet, we were pleased to provide eXlerate platforms on all locations.





MAA REFINERY KUWAIT

Located in the Arabian Gulf, 45km from Kuwait City, the Mina Al-Ahmadi Refinery (MAA) was built in 1949. It covers a total area of 10,534,000m² and is nowadays operated by KNPC.

This refinery for gas & liquid has been provided with an eXLerate supervisory software platform. The complete metering system contains 42 flow computers for metering and 2 flow computers for proving, which eXLerate monitors and controls.

This project is significant, as Spirit IT has been examined thoroughly as potential supervisory software supplier by KNPC. However, as Saudi Aramco has given positive feedback about previous projects executed by us, KNPC was convinced as well. Because the MAA Refinery concerns a large metering system, it was of pivotal importance for our client to work with only the best software: eXLerate.

NAME

MAA Refinery
Kuwait

CLIENT

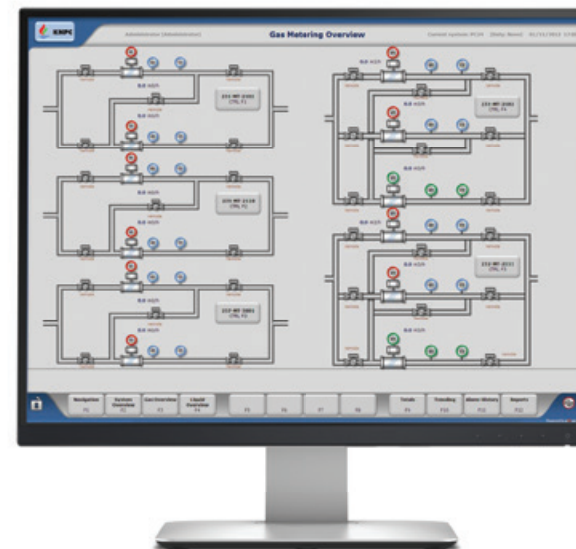
Kuwait National
Petroleum
Company (KNPC)

COUNTRY

Kuwait

YEAR

2012





LNGRV METERING

As an alternative to onshore LNG terminals, seven new Liquefied Natural Gas Regasification Vessels (LNGRVs) have been developed. This innovative design allows vessels to regasify LNG on-board and to discharge gas into pipeline systems.

For each vessel, our system integrating partner Global Gas Solutions supplied two eXLerate-based supervisory systems; one for custody transfer measurement and one for emission control.

This project has been our first to provide solutions for emission control. However, as the environment is of great concern for us, we are nowadays able to provide even more accurate NOx and CO emission calculations with our embedded GERG2008 analysis tools.

Significant for this LNGRV metering project is the connection with vessels to onshore units via satellite links. Thanks to this application, it is not necessary anymore to attend ships for short inspections or daily reports.

NAME

LNGRV Metering

CLIENT

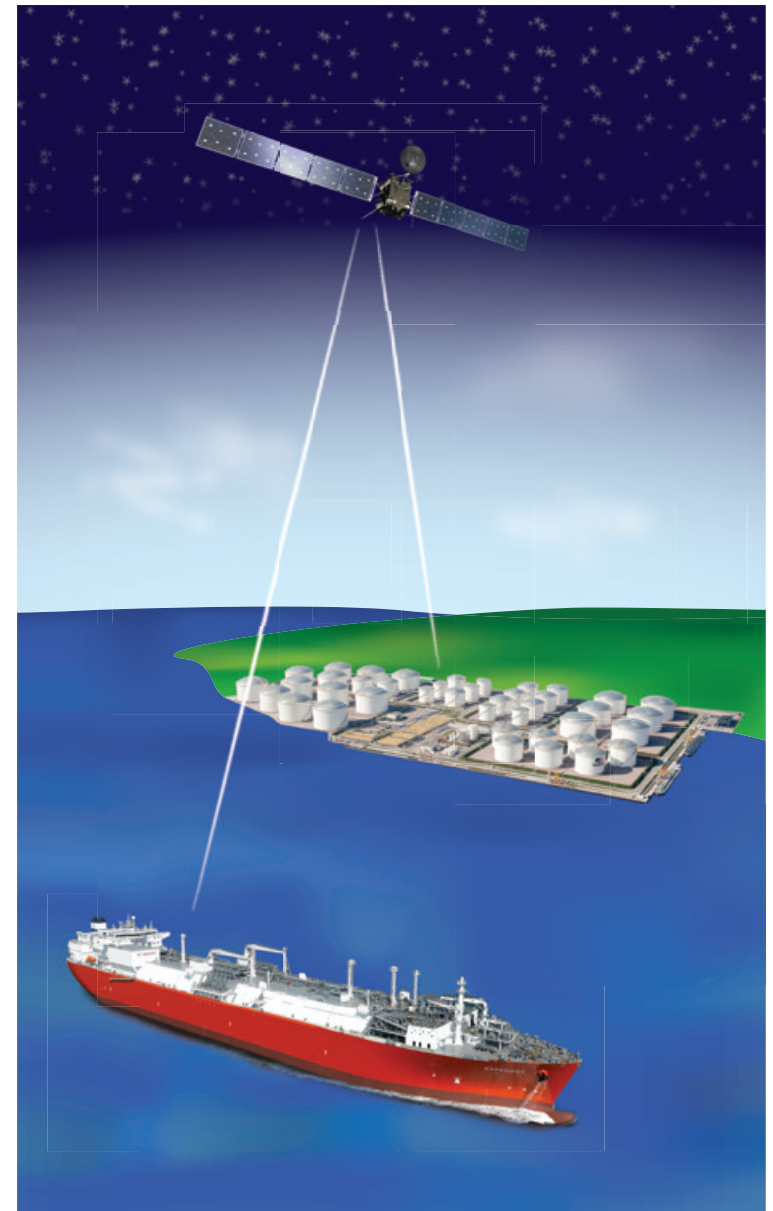
EXMAR

COUNTRY

Belgium

YEAR

2007/2008



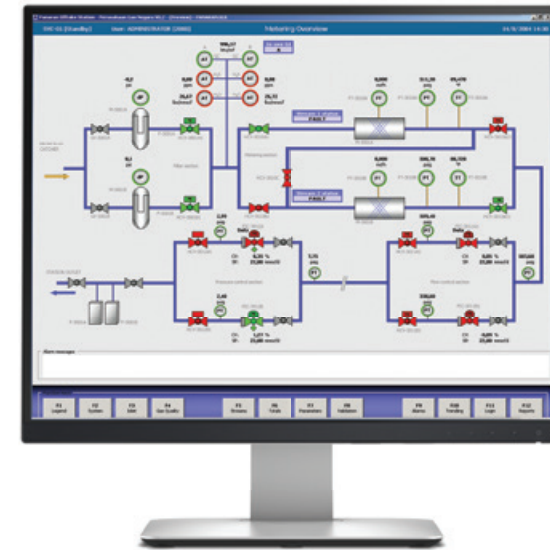


PANARAN STATION

Gas metering station Panaran has been Spirit IT's first large international project. Located in Batam Island, Indonesia, this station required a specific supervisory computer system, which only eXLerate could comply with.

As the metering station included complex calculations, only eXLerate was able to meet the high requirements. Rather than having an impressive installed base, our eXLerate-technology was considered to be more critical for PGN.

A significant aspect in this project is the integration of a globally-linked data, audio, and video communications cable network. It is the first project to have such a network laid simultaneously with a subsea pipeline.



NAME

Panaran Station

CLIENT

*Perusahaan Gas
Negara (PGN)*

COUNTRY

Indonesia

YEAR

2004



TERMINAL AUTOMATION

High degree of integration with field equipment and software

Terminal automation concerns the business control of receipt, storage and delivery of liquids in a tank farm.

As many manufacturers offer specific software solutions for tank inventory only, full functionality is lacking towards the whole automation process.

Our eXLerate software for terminal automation offers a wholly integrated platform for all metering and control equipment at your tank farm. This tailor-made single solution is independent of hardware suppliers, which makes it fully applicable to terminal systems.



NAME

Edmonton Terminal

CLIENT

Gibson Energy ULC

COUNTRY

Canada

YEAR

2015

EDMONTON TERMINAL

The Edmonton terminal is located in Alberta, Canada, and provides storage for crude rail loading. Being one of the North America's major storage hubs, this terminal contains a total of 35 tanks and has a storage capacity of approximately 8 million barrels (1.27 million m³). Due to recent terminal expansion, Spirit IT has been contracted to install a complete crude rail loading system.

In the terminal, railcars can be loaded from 22 different positions, located on an elevated platform. There, the loading arms contain a fill tube, metering equipment and instrumentation to prevent overfills.

This system consists of the following:

- ✓ 22 Flow-X/M flow computers, divided over 3 Flow-X/R racks;
- ✓ 5 eXLerate software platforms in a redundant configuration.

In any loading system, maintaining the totals or averages and controlling the valves are of pivotal importance. Therefore, our system is designed in such a way, that these two main processes are controlled effectively.





JOSEPHBURG TERMINAL

In response to the current growth in propane production, a new NGL rail terminal at Josephburg, Canada, has been constructed. Spirit IT's innovative rail terminal system here has been the first to include GERG2008 calculations for butane.

Josephburg's terminal consists of rail loading and storage facilities, as well as pipelines to Fort Saskatchewan for both propane and butane.

For propane loading and butane off-loading facilities, the following system has been developed:

- ✓ 32 Flow-X/M flow computers, divided over 7 Flow-X/R racks;
- ✓ 4 eXLerate supervisory software computers in a redundant configuration.

NAME

Josephburg
Terminal

CLIENT

Keyera

COUNTRY

Canada

YEAR

2015





JU'AYMAH SEA ISLAND

Located in the port of Ras Tanura, Saudi Arabia, Ju'aymah Sea Island is being owned and operated by Saudi Aramco. Our project here was the first to comply with this plant's full availability requirements. Consequently, the Ju'aymah Sea Island project has set the standard for eXLerate to be fully redundant.

The Sea Island LPG terminal is used for ship loading. It uses a system that measures the loaded quantities of four different products: propane, butane, diesel fuel and bunker fuel.

The required supervisory software for this system had to comply with high reliability and availability requirements, which were laid out in Saudi Aramco's standards for Royalty Metering of Hydrocarbon Liquids. Even though being convinced by Spirit IT's abilities, Saudi Aramco specified to only provide positive feedback on this project, if it had been operating longer than two years.

Nowadays, our software has been running smoothly for many years, which demonstrates the reliability that our client was sougning after.

Spirit IT has recently been contracted to execute a renovation project, by upgrading the software to our latest eXLerate 2010 edition.

NAME

Ju'aymah Sea Island

CLIENT

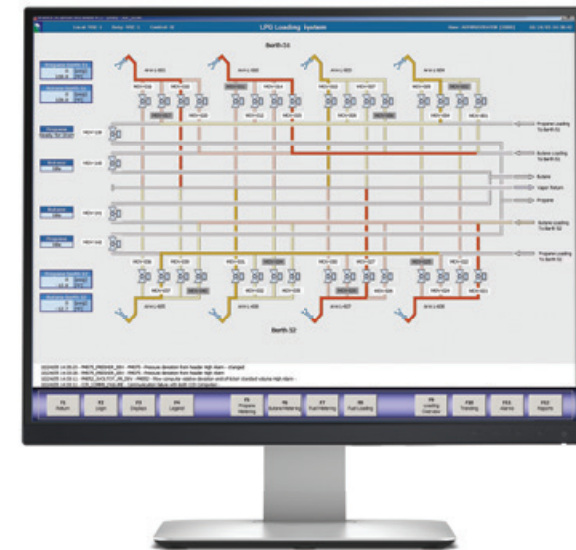
Saudi Aramco

COUNTRY

Saudi Arabia

YEAR

2005





FLOW CALIBRATION FACILITY MANAGEMENT

Control system for fully automatic flow meter calibrations

The purpose of calibration is to ensure the highest accuracy in flow metering. This is done by benchmarking flow meters to one or more master meters.

Spirit IT delivers complete calibration systems, consisting of both Flow-X control cabinets and eXLerate management software.

Our Calibration Management System (CMS) is able to:

- ✓ Safely control calibration procedures;
- ✓ Accurately measure the error curve of a Meter Under Test (MUT);
- ✓ Generate calibration results for an appertaining meter certificate;
- ✓ Provide a convenient and complete operator interface;
- ✓ Perform safe start-up and (emergency) shutdown of the system;
- ✓ Perform self-monitoring processes, such as testing overnight leakage.

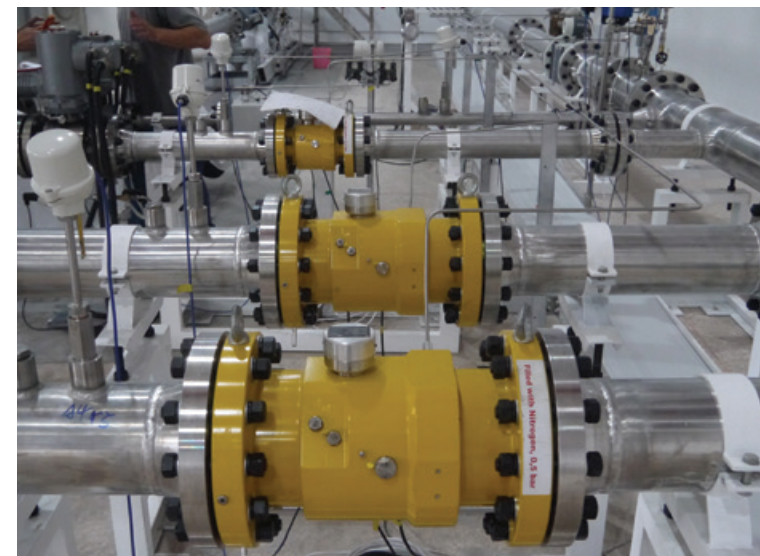


CANGNAN STATION

Tancy is a leading enterprise in the gas industry in China. Founded in 1995, its production site is currently located in Cangnan – Lingxi Town. This facility is used for production, R&D and calibration of gas flow meters.

Our calibration loop for Tancy consists of 4 master flow meters and two measurement sections, which can be tested simultaneously. The master meters all have different capacities (1 to 1600 m³/h), and an additional Ultrasonic check meter is included.

During normal operation, the Meters Under Test (MUTs) are calibrated using one or multiple master meters, depending on preference. Calibrations are done with air.



NAME

Cangnan Station

CLIENT

Tancy Instrument Group Co.

COUNTRY

China

YEAR

2014



NAME

Euroloop

CLIENT

NMi Certin b.v.

COUNTRY

The Netherlands

YEAR

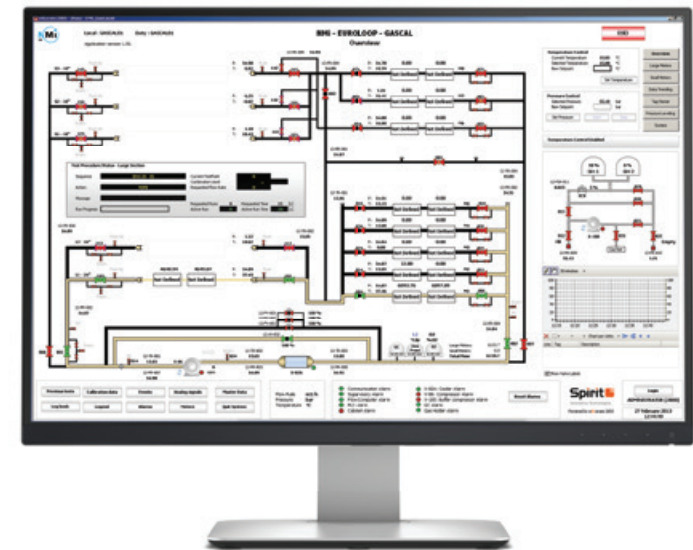
2008/2009

EUROLOOP

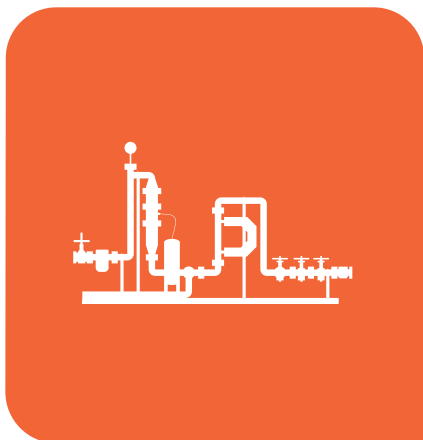
In the Botlek area near Rotterdam, the Netherlands, the largest test facility for gas meters is in operation: the NMi GasCal test system. As Spirit IT is a technology partner of NMi, we supplied a complete Calibration Management System here, which enables automated calibration and certification.

The GasCal calibration loop consists of two measurement sections for both small and large Meters Under Test (MUTs). Here, crosswise calibration is also possible.

For this facility, a total of 95 valves need to be controlled. Therefore, this system has 35(!) flow meters installed, of which each equipped with a Flow-X/M module. Furthermore, it consists of a fully synchronized redundant eXLerate supervisory platform.







LACT CONTROL

Web-based control and management of remote LACT facilities

LACT stands for Lease Automated Custody Transfer and concerns the measurement of crude oil when being transported from an oil well to a crude gathering facility.

Spirit IT has developed the effective eXSite platform, which concerns complete LACT control, consisting of Flow-X flow meters/LACT controllers, eXlerate supervisory software and the TYPO3 Content Management System (CMS).

For the management of one station, the eXSite Corporate Light Edition includes all functionalities necessary.

For the control of multiple local stations, the eXSite Corporate Edition offers:

- ✓ Central Data Repository for transactional and production data of all LACT sites;
- ✓ Maintenance of the driver databases of well operators and distribution;
- ✓ Connection to local LACT sites through internet;
- ✓ Web portal for well operators, who are able to update their driver database, retrieve production reports and query their database.

With our eXSite LACT control, crude gathering is made secure and smart.



AMERICAN MIDSTREAM WATFORD CITY

American Midstream is a diversified company, with its main assets in midstream energy. Currently, they are operating a network of more than 4,800km pipelines in the USA. For its crude gathering purposes, Spirit IT has developed the eXlent Platform.

eXlent, which controls and manages flow computers and data on a corporate level, has been implemented here in combination with our eXSite platform. This launch project includes a total of 82(!) LACT controllers, based on either eXlent or eXSite. All is installed in Watford City, North Dakota.

We are proud to specify that this project has been the first in cooperation with the ABB Group.

NAME

*American Midstream
Watford City*

CLIENT

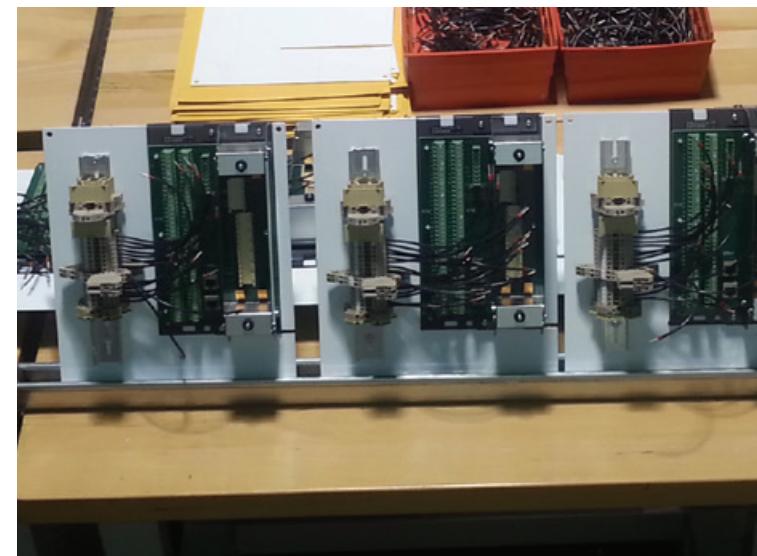
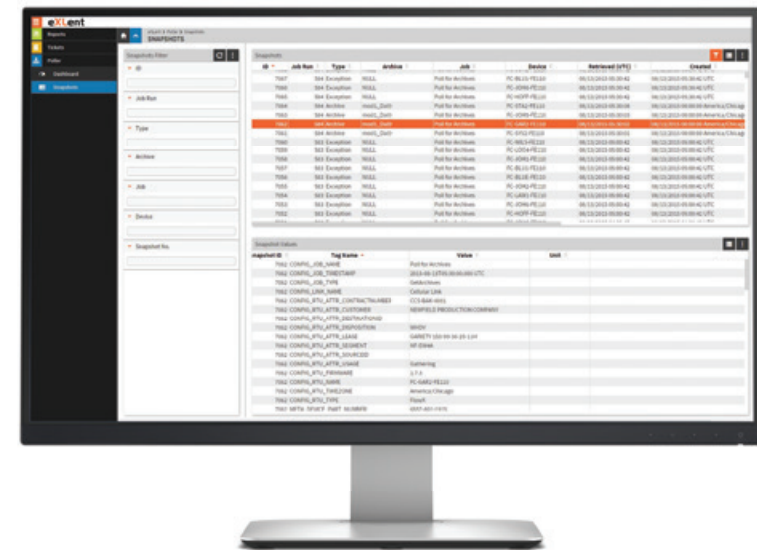
*American Midstream
Partners, L.P*

COUNTRY

*The United States of
America*

YEAR

2015





SUNOCO OKLAHOMA

Sunoco is a crude oil acquisition company, primarily located in the mid-United States. Their main assets involve 335 crude oil transport trucks as well as 135 crude oil truck unloading facilities.

This project has been executed in cooperation with CRT Services. Among many alternatives, Sunoco has chosen Spirit IT to provide its powerful eXSite solution for remote LACT control, which includes Flow-X hardware, eXLerate supervisory software and TYPO3 CMS.

Our solutions have been installed in several facilities of Sunoco, such as Cushing and Oklahoma City.

In order to ensure full functionality, Sunoco has also been provided with our eXSite training program.



NAME

Sunoco Oklahoma

CLIENT

Sunoco Logistics

COUNTRY

The United States of America

YEAR

2015





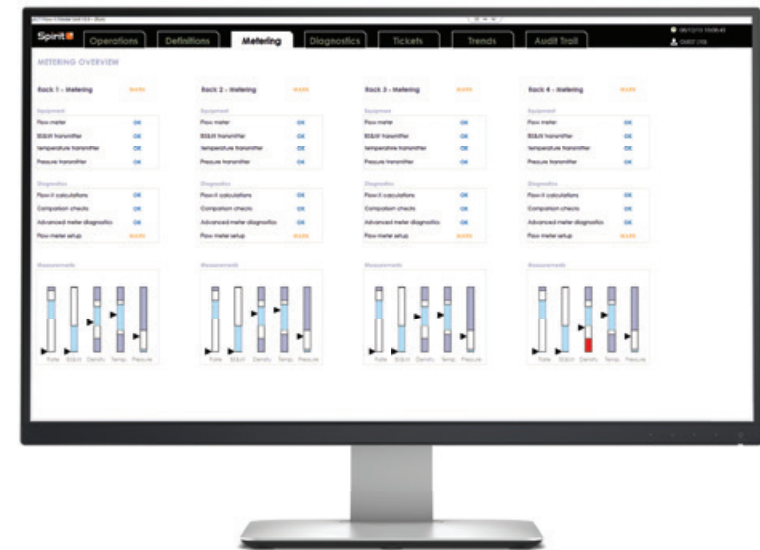
JAG ENERGY TEXAS

JAG Energy is a prominent company in the transfer of liquid hydrocarbons, located in the USA. For its LACT sites, Spirit IT has developed a complete system for operation, monitoring and control.

When operating with liquid hydrocarbons, transfers are completed when trucks offload crude oil into large storage tanks. As these tanks are located in remote LACT sites, it requires efficient management. This is accomplished by our powerful eXSite platform.

In partnership with CRT Services, this system is implemented in several LACT sites of JAG Energy.

Each system consists of Flow-X flow computers inside a NEMA 4X cabinet, our eXLerate-based supervisory platform and TYPO3 CMS.



NAME

JAG Energy Texas

CLIENT

JAG Energy, Inc.

COUNTRY

The United States of America

YEAR

2013



VIRTUAL FLOW COMPUTING SYSTEMS

Accurate and secure flow computations on a server platform

Spirit IT is a leading pioneer in the world of Virtual Flow Computing (VFC). A VFC can be considered as a flow computer that runs on a server computer, which supports an 'unlimited' number of streams.

Instead of providing physical connectivity to field signals like conventional flow computers, measurement values are acquired by data communication, e.g. with a PLC, DCS, data historian or I/O interfacing hardware.

A VFC solution is an attractive and cost-effective alternative to traditional flow computers, especially when there is no need to wire up the metering signals to the flow computer.



NAME

Halfdan

CLIENT

Maersk Oilt

COUNTRY

Denmark

YEAR

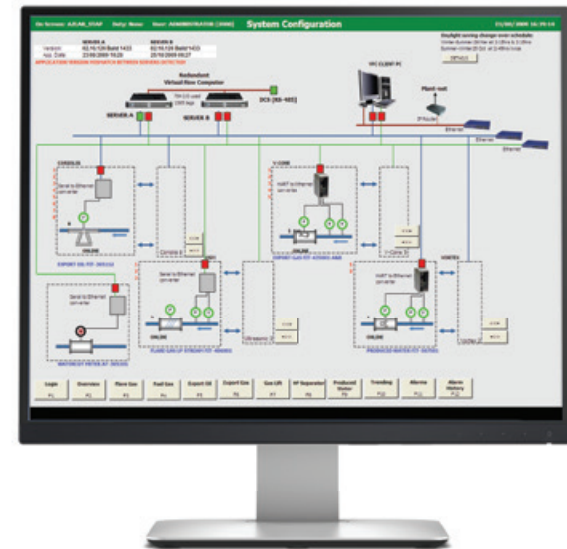
2008/2009

HALFDAN

The Halfdan field is located in the North Sea, approximately 225km from the Danish coast. Being an oil and gas field, its production started in 1999. This field is the first to implement our eXLerate-based Virtual Flow Computer (VFC) on a big scale.

Our VFC system in this field consists of 18 flow streams for flare & fuel gas, export gas & oil and water measurement. Our application processes each stream with meter-specific flow computations and presents the measured and calculated data on customized worksheets.

The system consists of two redundant VFC servers, which are connected to two Ethernet networks.



**NAME***Kittiwake***CLIENT***Petrofac***COUNTRY***United Kingdom***YEAR***2007*

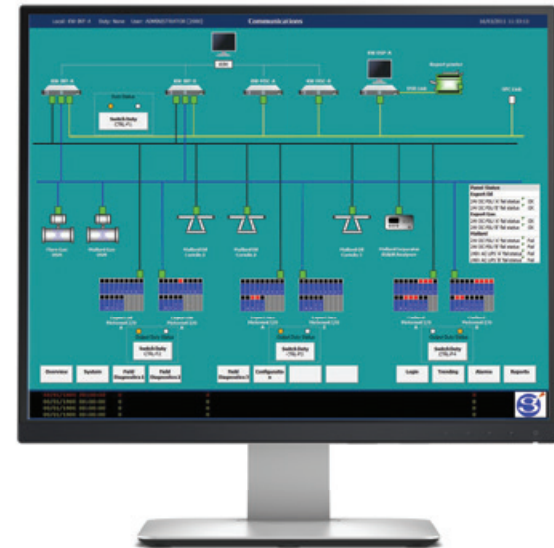
KITTIWAKE

The Kittiwake platform is located in the North Sea, around 160km from Aberdeen, and has a water depth of 85-90m. Processing oil and gas from four fields, this platform has an oil capacity of 29,000 boepd and a water injection capacity of 57,000 boepd. As this Petrofac-operated field required a major metering system upgrade in 2007, the eXLerate-based Virtual Flow Computer (VFC) was installed

For this platform, about 25 metering streams were realized with our eXLerate-based VFC solution, including export oil & gas, oil & gas test separators and water injections.

This system consists of metering controllers for the measurement of field signals, which are processed by a redundant VFC system. Additionally, eXLerate supervisory systems, as well as client computers, were installed for remote operation and control.

This system was successfully implemented, tested, installed on-platform and commissioned in August 2007. Later, in 2013, it has been fully upgraded and renovated, making it fully coherent with our latest technology.







PIPELINE NETWORK MANAGEMENT

Flow computer management on a corporate level

With widespread pipeline networks, it is of great use to monitor all in one central control room. Therefore, eXLent (eXLerate Enterprise edition) provides all functionalities necessary for flow computer management on a corporate level.

eXLent uses an n-tier architecture in which presentation, processing and data functions are logically separated. This allows for flexible and reusable applications, which run on only one server computer and may be distributed over multiple servers.

Our eXLent software allows for redundancy on multiple levels and can run in a Virtual Machine environment.



NAME

Sakra Station

CLIENT

PowerGas

COUNTRY

Singapore

YEAR

2006/2007

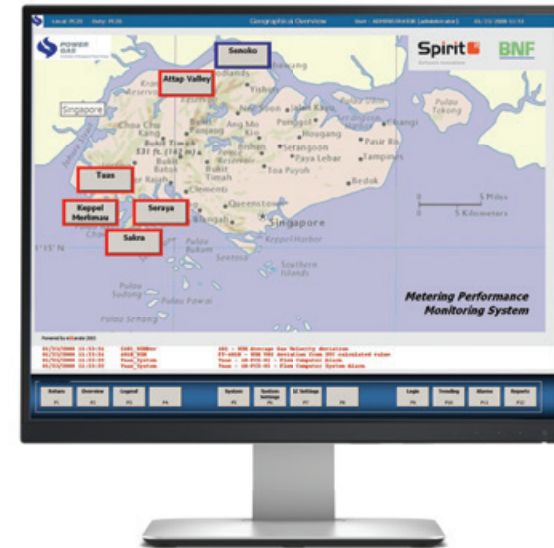
SAKRA STATION

Spread all over Singapore, six gas metering stations are owned by PowerGas. Before Spirit IT has been contracted, one metering engineer had to go to all of these stations personally for monitoring and control. As this was not efficient for our client, it sought after the most reliable supervisory system for remote control: eXLerate.

Our system continuously monitors the six different metering stations, by utilizing a variety of software technologies, including CUSUM-based drift monitoring and advanced historical trending technology.

When all metering equipment is working correctly within its performance bandwidth, our system at the central Sakra station supports metering engineers with graphical data overviews of the remote locations. However, if a problem is detected, a detailed diagnosis report is automatically generated, showing the identified problem.

eXLerate provides efficient and timesaving supervisory solutions, wherefore only few metering personnel is necessary.



NOTES

ABOUT SPIRIT IT

We make flow measuring systems **better, smarter and more accurate.**



A MEMBER OF THE ABB GROUP



Power and productivity
for a better world™

Since November 2014, Spirit IT has become a member of the ABB Group. The acquisition adds a new line of high-performance custody transfer solutions to ABB's measurement business unit.

ABB is leading in power and automation technologies that improve performance while lowering environmental impact. With thousands of experts around the world and high-performance innovations, ABB's team is dedicated to making measurement easy for its customers.

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