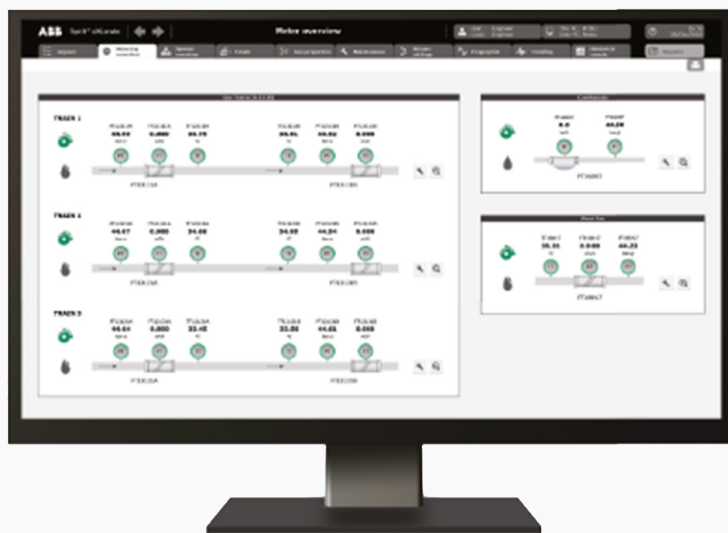




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ABB

abb.com/measurement



Project reference booklet

Global automation solutions for the oil & gas industry



- Spirit^{IT} eXlerate supervisory software
- Spirit^{IT} Flow-X flow computers

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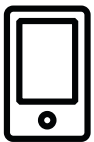
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Flow-X projects



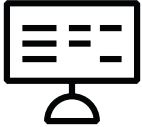
eXlerate projects



eXlerate & Flow-X



Sungai Udang Port



01 Client:
PETRONAS
Penapisan, Sungai
Udang Port,
Malaysia. 2015

In Melaka, Malaysia, the Sungai Udang Port is facilitating a large local refiner. For the measurement of different refined products there, ABB has launched one of its largest projects to date and with the SmartCentM application.

SmartCentM is the uniform and extensive metering supervisory solution, resulting from the joint development of PETRONAS and ABB.

The project has been executed for PETRONAS' subsidiary Penapisan, which is the first to make use of the metering template for refinery products.

The system consists of the following:

- eXlerate software platform in redundant configuration
- SmartCentM template including:
 - Live uncertainty,
 - semi-automated instrumentation validation for each instrument
 - Virtual Flow Computing
 - Mis-Measurement
 - Auto-billing
- Engineering & execution
- FAT, SAT and commissioning



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Enterprise Products



01 Client:
Enterprise Product
Partners, L.P
Texas, U.S.A.
Started in 2015- till today

With assets in 81,000kmn of oil and gas pipelines, Enterprise Products is one of the largest providers of midstream energy services in the USA.

Several construction projects were in development in South Texas to extend the Enterprise's NGL and crude infrastructure and till today it is still extending.

The projects included a complete metering control system including installation, commissioning and succesful start-up of the flow computing.

The systems consists of the following:

- 7 Flow-X/R racks enclosures
- 2 Flow-X/S single stream flow computers
- 45 Flow-X/M stream modules

These flow systems have been used for several locations such as metering of Mont Belvieu's LNG fractionation plant, rails cars to Conway and well storage.



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02

Wheatstone

Onshore & offshore



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01 Client:
Chevron Australia.
Wheatstone, Australia.
Started in 2014 & several
updates and extensions

Wheatstone is one of Australia's largest resources projects, providing greater security of gas supply and significant economic benefits.

This Chevron-operated projects consists of a processing platform, about 220km from the Australian coast and the onshore facilities at Ashburton North Strategic Industrial Area for gas and condensate processing and storage for export.

ABB has been awarded to execute for both sites (although via different channels) and to ensure optimum metering performance for the end-customer.

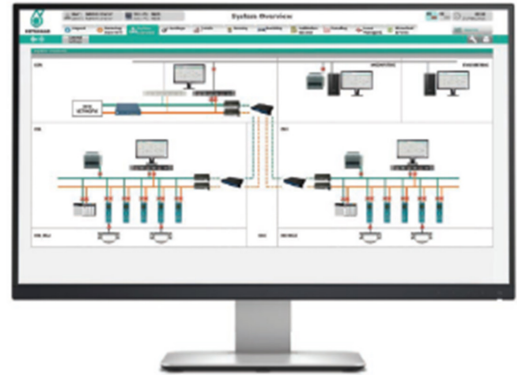
The offshore system consists of:

- 21 Flow-X computers for incoming streams, flares, export metering and fuel gas.
- ABB Spirit eXlerate supervisory software

The onshore system consists of:

- 58 Flow-X computers for mass- & component based on GERG2008
- ABB Spirit eXlerate supervisory software

Both the offshore as the onshore eXlerate supervisory software systems are executed with two redundant servers to ensure data any time.



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Laggan Tormore



01 Client:
Total E&P UK Ltd.
Laggan Tormore,
United Kingdom.
2014

Located 125km North-West of 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, ABB is proud to have been contracted for the flow measurement systems of 10 metering skids.

The system consists of:

- Flow-X computers in redundant execution
- ABB Spirit eXlerate supervisory software over two locations

Above project is the basis for a long co-operation between ABB and Total for both European as Africa locations.



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02

TAQA Bergermeer



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01 Client:
TAQA Energy b.v.
TAQA Bergermeer,
Netherlands. 2013

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, ABB 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, ABB is pleased to provide the eXlerate software on all locations.



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MAA Refinery Kuwait



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01 Client:
Kuwait National
Petroleum Company
(KNPC). MAA Refinery
Kuwait. 2012

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 is equipped 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 was significant, as ABB has been examined thoroughly as potential supervisory software supplier by KNPC. Because the MAA Refinery concerns a large metering system, it was of great importance for the client to select the best supervisory solution.



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LNGRV Metering



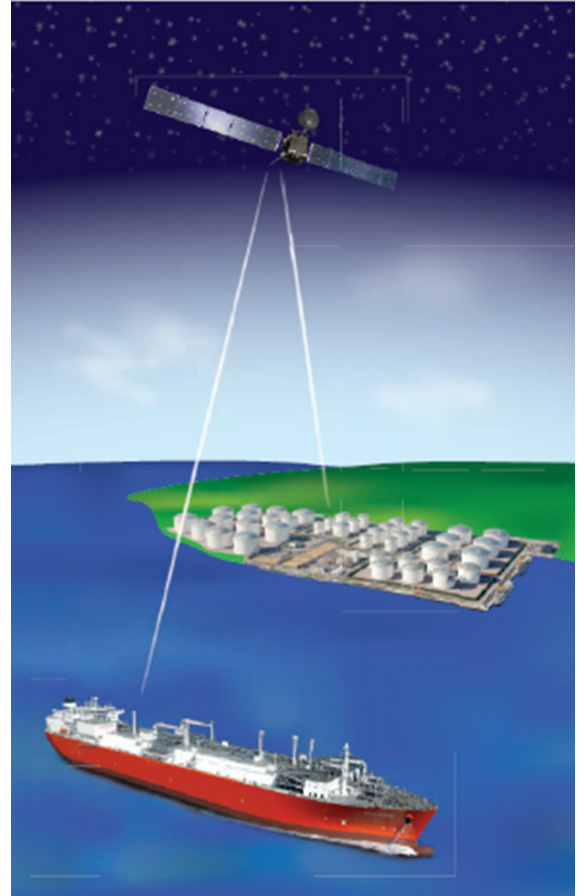
01 Client:
EXMAR
LNGRV Metering,
Belgium. 2007/2008

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 had been ABB's first to provide solution for emission control. However, as the environment is of great concern for ABB, ABB is 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 the vessel to onshore units via satellite links. Thanks to this application, it is not necessary anymore to attend ships for short inspections or daily reports.



Panaran Station

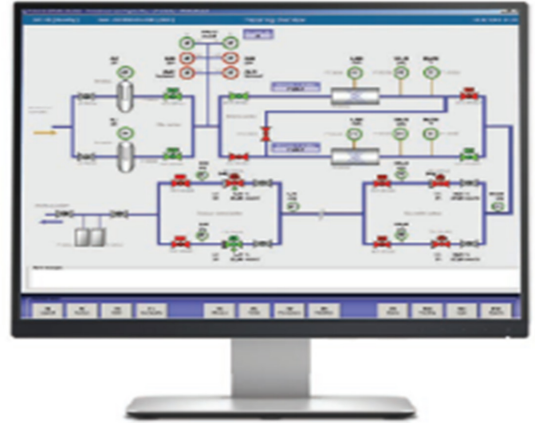


01 Client:
Perusahaan GAS Negara
(PGN). Panaran
Station, Indonesia. 2004

Gas metering station Panaran has been ABB'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 of this project is the integration of a globally-linked data, audio, and video communication cable network. It is the first project to have such a network simultaneously with a subsea pipeline.



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Sonda De Campeche Gulf Of Mexico



01 Client:
PEMEX. Test separation
off-shore, Mexico. 2020

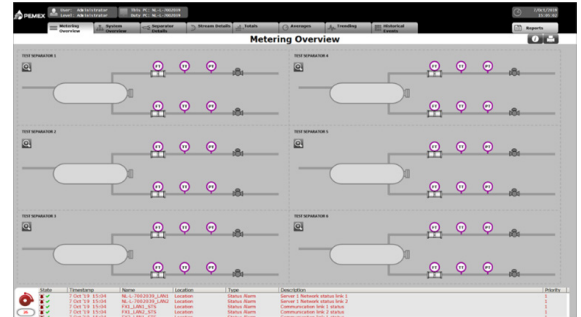
Located at the offshore PP-ESAH-A, ABB Spirit has executed the flow computer metering and supervisory for 6 offshore test separators.

The test separators are important for good operation of the platforms and frequently reporting, graphical-oriented operator interface together with real-time and historical trending gives vital information for optimum operations.

The required supervisory software for this software is designed and executed to handle the separators individually with 1 type of ABB hardware that support either gas or liquid (software determined).

The systems consists of the following:

- 12 Flow-X flow computers with backplanes & accessories
- eXlerate software platform in redundant configuration
- Engineering & execution
- (Remote) FAT



01



02

Edmonton Terminal



01 Client:
Gibson Energy ULC.
Edmonton Terminal,
Canada. First project
2015 / last project 2020

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

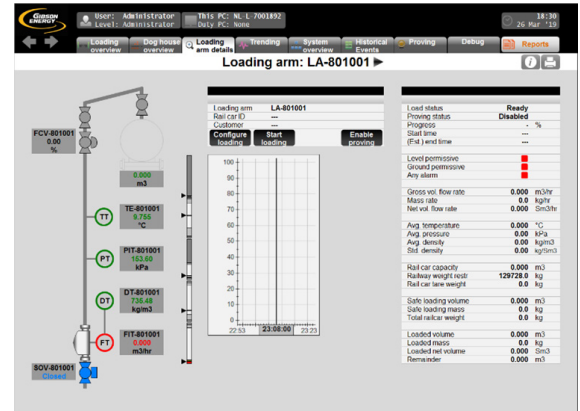
The initial systems consists of the following:

- 22 Flow-X/M flow computers, divided over 3 racks
- 5 eXlerate software platform in redundant configuration

The latest system/extension consists of the following:

- 24 Flow-X/M flowcomputers, with backplane
- Extension & upgrade eXlerate supervisory software
- 3 extra clients licenses for new dog house PC
- FAT & commissioning
- 2-years service contract

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



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02

Ju'aymah Sea Island



01 Client:
Saudi Aramco. Ju'aymah
Sea Island, Saudi Arabia.
First project 2005 /
update project 2019.

Located in the port of Ras Tanura, Saudi Arabia, Ju'aymah Sea Island is being owned and operated by Saudi Aramco. The project was the first to comply with this plant's full availability requirements. Consequentially, the Ju'aymah Sea Island project has set the standard within Saudi Aramco for 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.

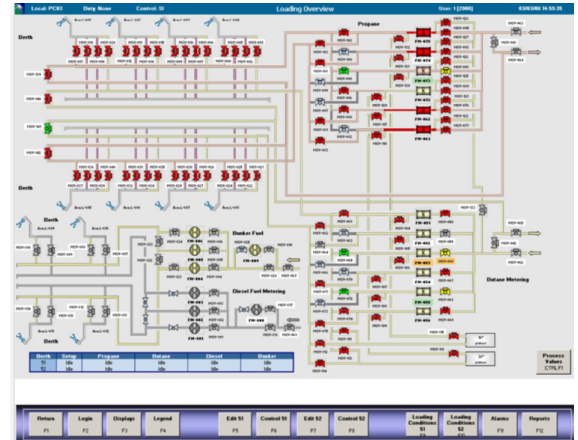
The required supervisory software for this software had to comply with high reliability and availability requirements, which were laid out in Saudi Aramco's standard for Royalty Metering of Hydrocarbon liquids. Even though being convinced by ABB Spirit abilities, Saudi Aramco specified to only provide positive feedback on this project, when it had been operating longer then two years. Nowadays, our eXlerate has been operating for almost 16years, demonstrating the reliability & rigidnes of the software.

The initial systems consists of the following:

- eXlerate software platform in redundant configuration
- Engineering & execution based on 3rd party control
- Measurement devices
- FAT & commissioning

The latest system/extension consists of the following:

- Extension & upgrade eXlerate supervisory software
- Add/incorporated additional functionality



01



02

Veracruz Rail Proving System



01 Client:
Valero. Veracruz Rail
Proving, Mexico. Project
started in 2020.

The new terminal of Valero is located in Veracruz for the receipt, storage and delivery of refined product. This terminal will have a capacity of approximately 1.4 barrels of storage capacity for gasoline, diesel, turbosine and MTBE.

ABB Spirit has been awarded the software and hardware solution for proving of the 26 loading bays, executed with Multiload batch controller.

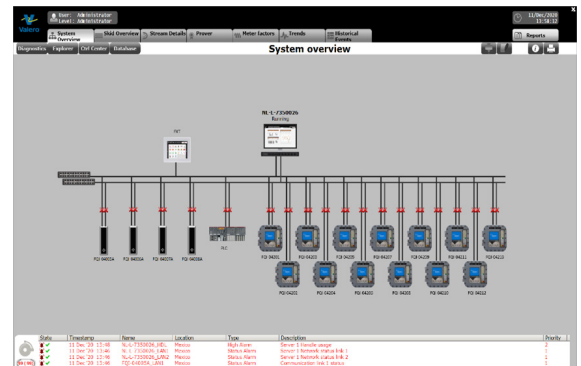
The required supervisory software for this software is designed and executed to handle 4 different products with 4 master meters on a regular bases with high or low flow.

The systems consists of the following:

- eXlerate software platform in redundant configuration
- Engineering & execution based on 3rd party control
- Measurement devices
- FAT & commissioning



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02

Ingleside Terminal Gateway Expansion



01 Client:
Flint Hill Resources. Texas
Terminal, U.S.A. 2019

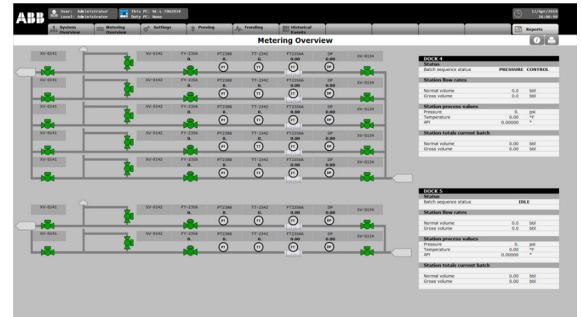
The Ingleside Terminal is a gateway to global markets providing Texas crude oil to flow around the world. Strategically located close to the Texas Gulf Coast and within close proximity to rich oil fields in the Eagle Ford and Permian Basin.

With the expansion the total capacity increased from 2.5 million to 3.5million barrels. The two additional docks (#4 & #5) are executed with Flow-X flow computers and supervisory so that the capacity increased from 200 to 380 thousand barrels per day.

The required hardware and supervisory software for this terminal is designed and executed to handle Loading and discharging, automatic sampling, switch runs and proving of the new docks.

The systems consists of the following:

- 8 Flow-X/M flow computers, in racks
- Server for supervisory system
- eXlerate software platform
- Engineering & execution
- FAT & commissioning

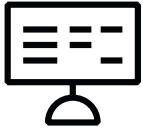


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02

Terrengganu Crude Oil Terminal



01 Client:
Petronas. TCOT Metering
System, Malaysia. 2015

Located near Kerteh on the east coast of Peninsular Malaysia, Petronas has a co-operation with ExxonMobile Exploration and Production for the storage, handling and off-loading of Crude oil from the near-by off-shore platform.

The scope of the metering package is a redundant supervisory system with additional features developed in close conjunction with Petronas, the so-called Smart-Cen. Smart-Cen is based on the eXlerate software platform which centralised data for remote monitoring, diagnostics, analysis and mis-measurement, which clearly surpasses the conventional metering systems.

The developed application has been awarded the Special Meritorious Awards for Engineering Innovation (SMEA) during the OTC 2015 in Houston, Texas USA.

www.petronas.com/innovation-petronas/sites/igap/files/pdf/petronas-technology-ses-brochure.pdf.

The systems consists of the following:

- Several eXlerate software platform in redundant configuration
- Hardware & control
- Engineering & execution
- FAT & SAT

FEATURES



- > Mis-measurement management, the Virtual Flow Computer, Integrated validation and online uncertainty calculation.
- > Real-time verification of flow computer computation.

BENEFITS



- > Reduces human intervention during metering activities.
- > Prevents late detection of abnormalities in flow measurement that occurs in conventional metering systems.
- > Enables proper analysis, trending and diagnostic on field instrumentation and devices, including flow metres through centralised data.
- > Standardises validation methods, reduces validation period, and improves system availability by facilitating metering system validations via integrated validation software which could standardise validation methods, reduce the validation period and improve system availability.
- > Enables quick detection of abnormalities, with remote accessibility enabling quick response to metering issues.
- > Ensuring mis-measurement caused by instrument failure/partial failure that leads to billing errors are acted upon.

TESTIMONIAL



- > Deployed at more than 28 metering sites including:
 - Onshore Gas Terminals
 - Onshore and Offshore Crude Oil Terminals
 - Pipeline Metering Installations
 - LNG Plants
 - Petrochemical Plants
 - Gas Processing Plants
 - Refinery and Offshore Platforms
- > Contributed to a substantial amount of cost saving at the Terrengganu Crude Oil Terminal (TCOT).
- > New installations in more than 30 sites including on-going projects such as PETRONAS Refinery and Petrochemical Integrated Complex Projects (RAPID) as well as the Pengerang Deep Water Terminal.

ACCOLADES



- > Won the 2015 Special Meritorious Awards for Engineering Innovation (SMEA) under the Intelligent Systems and Components category from Hart Energy E&P editor USA at the OTC 2015 in Houston, Texas USA.

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Photo from Petronas

02

Cangnan Station



01 Client:
Tancy Instruments
Group Co. Cangnan
Station, China. 2014

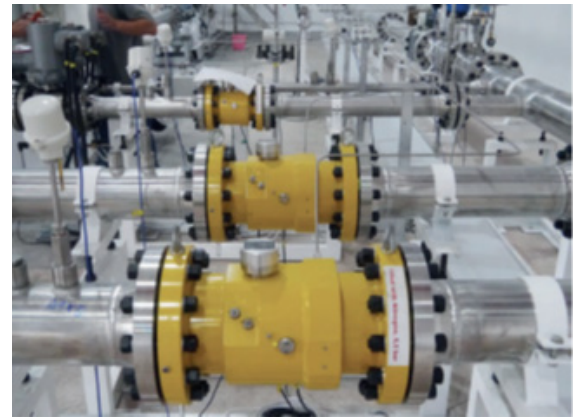
Tancy is a leading enterprise in the gas industry in China. Founded in 1995, its production is currently located in Cangnan – Lingxi Town. This facility is used for production, R&D and calibration of gas flow meters.

The 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 1600m³/h), and an additional ultrasonic check meter is included.

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



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Euroloop

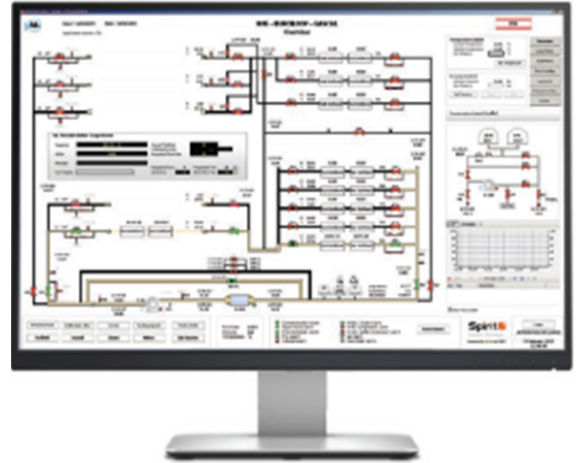


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01 Client:
Nmi Certin B.V. Euroloop,
Netherlands. 2008/2009
and extensions 2018.

In the Botlek area near Rotterdam, the Netherlands, the largest test facility for gas meters is in operation: Nmi GasCal test system. TesAas ABB is a technology partner of Nmi, ABB 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(1) flow meters installed, of which each equipped with a Flow-X/M module. Furthermore, it consists of a fully synchronized redundant eXlerate supervisory platform.



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American Midstream Watford City



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01 Client:
American Midstream
Partners, L.P.
American Midstream
Watford City, U.S.A. 2015

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

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

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



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Sunoco Oklahoma



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01 Client:
Sunoco Logistics,
Sunoco Oklahoma,
U.S.A. 2015

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 integrating partner CRT Services. Among many alternatives, Sunoco has chosen ABB to provide its powerful eXlerate solution for remote LACT control, which includes Flow-X hardware, eXlerate supervisory software and web-based Management System.

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 provided with our eXlerate program.



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Halfdan

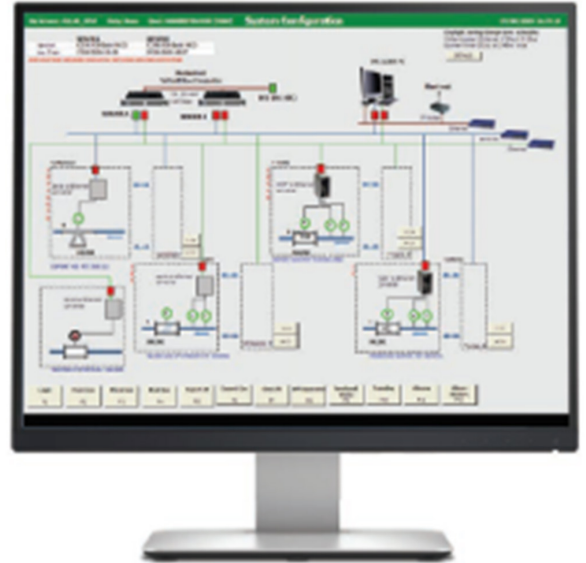


01 Client:
Maersk Oil. Halfdan,
Denmark. 2008/2009

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 ABB's eXlerate-based Virtual Flow Computer (VFC) on a big scale.

ABB's 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.



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02

Kittiwake



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01 Client:
Petrofac. Kittiwake,
United Kingdom. 2007

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 57,000boepd. 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 ABB's 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.



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Sakra Station



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01 Client:
PowerGas.
Sakra Station,
Singapore. 2006/2007

Spread all over Singapore, six gas stations are owned by PowerGas. Before ABB had been contracted, a meter engineer had to go to all of these station 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 Sakara 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.

Additional information

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