



Production, Gathering, Transmission & Distribution

SCADAventure™ for the Oil and Gas Industry

The advanced operations management system

Power and productivity
for a better world™



SCADAventure™ core systems offer full featured performance



ABB has been a global supplier of automation to the oil and gas industry for decades. ABB knows that the oil and gas markets are demanding, and we're dedicated to offering solutions that meet our customers' needs. Uniquely designed for challenging oil and gas operations, ABB's SCADAventure™ was conceived for a dynamic industry that requires safe and reliable control of distributed assets, as well as a bi-directional interface with corporate systems.

A Powerful Core

SCADAventure™ is built on a reliable, high performance, relational database that is unique in the market. Traditional SCADA systems depend upon memory linked lists. SCADAventure™ uses a real-time relational Database Management System, referential integrity and active queries to enhance data retrieval, data integrity and the speed of data updates. Nevertheless SCADAventure™ consumes less computer memory than traditional systems.

The Database Management System combines standard SQL technology with powerful features that improve memory efficiency, performance, data quality and connectivity to external corporate relational databases.

Data consistency is enforced through referential integrity. An easily configurable polling engine makes data acquisition smooth on low speed networks or over noisy communication lines. Data polled from remote devices is collected and stored in an embedded historian included in the base license package.

Redundancy and database updates by exception provide superior performance and reliability.

Performance is crucial in today's control room environment; SCADAventure™ 64bit operating system support removes the memory limitation of 32 bit operating systems. In addition, SCADAventure™ speeds up data interchange by lowering data transfer between servers and clients through a unique feature called active queries. The server updates the clients with changed values only, which significantly lowers network traffic. Last but not least SCADAventure™ is the most cost effective high end SCADA in the market, characterized by easy and low cost maintenance (30% less expensive than competitors' systems).

Features are always safe, robust and reliable, under SCADAverage™ control

Replication

Allocability is a SCADA system key requirement of oil and gas companies in order to cope with very large areas. SCADAverage™ supports distribution thoroughly through its replication engine.

Live data, databases and operator interface configuration are “replicated” to other servers in real time. Transfer is bidirectional and commands as well as set points can be issued at the local facility or remotely at the regional center, with appropriate interlocking if required (e.g. after hours). Supervision and consolidation of local and regional data provide extensive flexibility in system deployment and maintenance.

Replication occurs in two models:

- Hierarchical (local, regional and corporate levels)
- Peer-to-peer (offsite backup control center for immediate disaster recovery)

Replication allows automatic configuration to be:

- Centralized (remote non-intrusive)
- De-centralized (local to the server)
- Both

Online Disaster Recovery

SCADAverage™ supports an on-line Disaster Recovery server that allows backing up the system automatically in real-time. The Disaster Recovery server can be part of the system upgrade to offer seamless upgrades with no downtime for critical operations that require permanent control.

Disaster Recovery main features are:

- Complete binary copy of RTRDB and Log Files. Copy can be sent to up to 3 machines
- Up to triple redundancy available also for system upgrades with no downtime
- Scheduling of Replica.

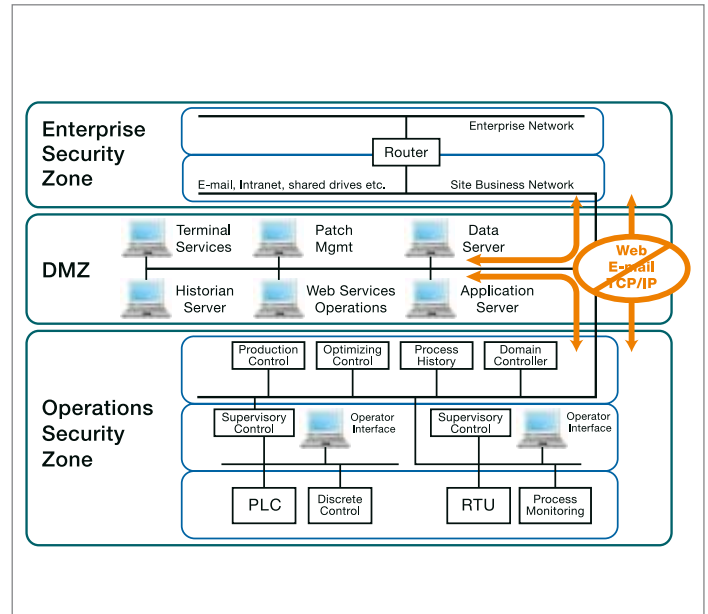
Business Object Templates

Pre-engineered templates allow the user to create multiple instances of objects in the system with the push of a button.

Specific templates permit the creation of:

- RTUs and PLCs
- Flow measurement devices (for liquids and gas)
- Pump-off controllers for rod pumps
- VSDs for PCP and ESP pumps
- Pumping and compressor stations
- Flow stations

The enhanced flexibility required by oil and gas SCADA in order to meet the changing needs of the field is a prime consideration and the result is a remarkable simplification of system maintenance.



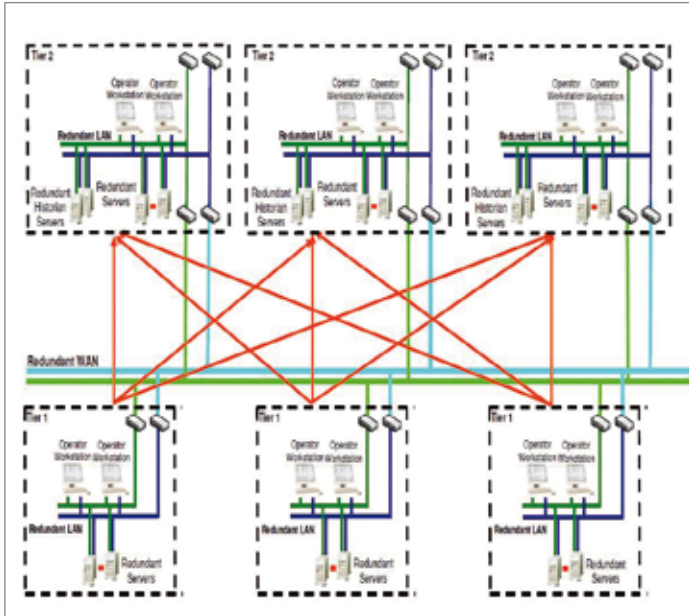
Security

Security is offered through a fully configurable authority system that prevents unauthorized persons from gaining access and activating commands. The multi-level security system conforms to any corporate standard criteria and maintains the history of each user's access to objects attributes, data, displays, production areas and controls. SCADAverage™ can be implemented on any security level. From the simple schema of firewall protection to the most sophisticated architecture in the market according to the customer's requirements:

- Re-routing of alarms for unattended areas
- Zones and zone groups access control
- Encryption and VPN support
- Inactivity logout
- Active directory support for centralized security with a password policy featuring:
 - Strong passwords
 - Automatic password expiry
 - Password re-use
 - Account lockout on repeat violations
 - Password length
 - Login auditing

“In active drilling areas, customers are drilling 20- 30 wells per month. SCADAverage™ automates and simplifies addition of wells to the system for significant lifecycle cost savings.”

SCADAverage™ adapts to industry demands



Redundancy

Up to triple real-time server redundancy allows the system to run with an active/standby configuration. Of course redundancy is also supported for communications (network, serial, satellite, radio, leased lines, GPRS, etc.) and through the levels of replication. Unlike many competitors' systems (which monitor hardware only), SCADAverage™ fully monitors both hardware and software operations to provide advanced protection against failure.

Business Systems Interface

SCADAverage™ supports open and real-time international standards of connectivity such as: ODBC, OLEDB, OPC DA, AE, HDA and UA. These same standards are supported by most of corporate databases and systems such as SAP, Pi, PVR, FieldView, Maximo, Silicon Graphics VRC and Slumberger Epinet. This commonality lets external relational databases communicate with SCADAverage™ real-time database, allowing remote procedure calls for easy bi-directional data transfer meeting any connectivity standard.

Communication

SCADAverage™ supports and monitors multiple paths of communications such as:

- LAN/WAN and leased lines
- Licensed and spread spectrum radios
- Microwave
- Satellite
- Cellular networks (GPRS and CDMA)

Communications analysis is available through real-time screen shots and trends; the system includes a protocol analyzer for radio and TCP/IP link.

Main protocols supported are:

- ROCTalk and ROC Talk plus
- BSAP (including RBE and immediate mode)
- Modbus (TCP/IP, RTU, ASCII)
- Allen Bradley DF1
- Totalflow
- HP 48000
- Kimray RTU, Galvanic, Eagle, Mercury
- Cameron Adept (ex Barton)
- Hex repeater (Amocams)
- Toshiba G2
- DNP3
- IEC-870-5-101/104

Reports

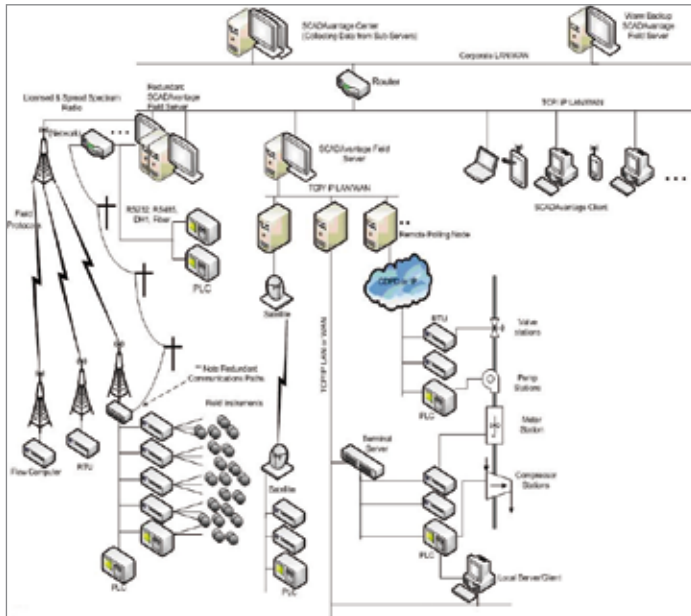
SCADAverage™ provides comprehensive data reporting to production, operations, maintenance, engineering, accounting and management.

Database system and communication function logs are available. Reports are provided through Active Reports™: an integrated up-to-the-minute package, one of the leading reporting systems in the market.

Historical Data

SCADAverage™ has two types of historians. The first historian is based on internal logs for polled real-time data and calculated points. As part of the core system, this historian does not require a separate license. The database consists of raw, hourly and daily values, limited only by the size of the disk. This data is used to supply trend values and also supports automatic archiving and de-archiving. The second historian, based on Microsoft SQL, is called Production Data History. This historian holds regulatory data, such as gas measurement data in compliance with API 21.1 and AEUB Directive 17th. With this historian, production data can be uploaded daily.

Flexible architecture handles current and future operations



In the current operational environment, it is essential to move operations from reactive to proactive. SCADA Advantage™ applications not only help operative staff with monitoring and control; they provide the right analysis for accurate and timely decisions. Simple configuration of useful applications provides a powerful tool for cutting downtime and optimizing production.

Upstream scalability

The system architecture was designed with flexibility in mind. SCADA Advantage™ can be deployed simply as a local HMI for a facility but also grow up to include new wells in the area and, further, take on more applications as needed.

The local system controls operations in the field. Multiple local systems can be connected to a consolidated central regional system. The regional system replicates information from all areas and handles daily optimization and coordination of activities.

Multiple regional systems can then be consolidated automatically to a corporate center linkable to upper level systems like Pi, SAP and Maximo.

Different scenarios are possible such as:

- Local > Region > Corporate
- Field > Country > Headquarters (different countries)
- Operational > Optimization > Economic/Strategic

SCADA Advantage™ Benefits

Efficient use of communication bandwidth

- Deadbands
- Data compression
- Publishing and subscribing
- Update by exception

Simple and consistent configuration

- Consistent look and feel in SCADA Advantage™ explorer
- Dynamic, self-configuring maps
- 2 step full configuration of wells, metering and compressor stations

Low license cost

- Competitive server licenses
- No license required for workstations
- No license required for trending historian

Support for industry standards in real-time

- ANSI SQL
- ODBC
- OLEDB
- OPC DA, AE, HDA and UA

Powerful alarm Call-out and telephone Call-in



Alarm Call-out and Call-in Application Targeting reduced operating costs increasingly requires upstream oil and gas companies to implement unmanned remote facilities. To ensure safety, operators need a robust warning system: with the Call-out and Call-in application available and reliable SCADAverage™ provides alarm escalation (in addition to on-screen alarm display) in the control room, plant site, dial-up laptop or handheld device.

In addition to screen warnings, Alarm Call-out and Call-in of SCADAverage™ can force a PLC to sound an alarm horn if the site is experiencing a priority alarm condition. Similarly the caveat is routed to a list of escalating contacts and receiving devices is configured in the Call-out application.

Designated personnel receive audio or visual notification of operating problems through:

- Cellular or land phones
- Electronic mail text messaging
- Voice radio
- Communications-enabled PDAs

Authorized personnel can dial into the system and use the phone keypad to request meter pressures, flowrates or temperatures. Request of data for a single well or for a range of meters is obtainable by keying in a pre-defined report number. Basing on the report, operators can plan the appropriate intervention.

The Alarm Call-out and Call-in application is configured to escalate alarms. The system automatically calls out a series of telephones or other devices in an escalating pattern, if the alarm is not acknowledged within the configured response time. The application conforms to all levels of SCADAverage™ system security, so that an audit trail of the escalation is saved in the database. Blackout periods can be configured to temporarily disable alarm signals to specific users or groups. The blackout feature is useful if a person is on vacation or off shift as well as for locations where personnel are working onsite and can hear local alarm signals or where operators are monitoring alarm screens from a central control room.

On screen analysis tools, queries and messages complement alarms, realtime and historical graphic trends and reports for managing production facilities, injections sites, wells, metering stations, batteries, satellites, plants and pipelines.

SCADAventure™ is state-of-the-art in abnormal states handling

Enhanced Alarm Management Application (EAM)

Alarm Management is a key factor to improve operations at complex process plants. There are no general rules and guidelines: often all the required information is distributed among hundreds of different documents. That's where EAM proves its important advantage.

Enhanced Alarm Management (EAM) is a powerful application developed to replace alarm printing and enhance the alarm system. Additional functions are available for intelligent alarm monitoring and archiving as well as off-line alarm and event analysis. EAM also provides real-time alarm analysis and management for the SCADAventure™ system and furthermore can even cover the entire automation system if required.

Virtually every device capable of sending ASCII data through a communication port can be connected to EAM. ASCII strings may consist of alarms, messages, events and/or reports. EAM fully exploits the features of the OPC alarm and event protocol.

Various SCADA, PLC and emergency shutdown systems can be connected to EAM. Data (collected, filtered and parsed from EAM) is saved in an Open Database based on SQL server. This offers a new method for offline alarm analysis and improves process alarm handling by SCADA operators.

The ABB Enhanced Alarm Management comprises three software modules:

- Database Manager Server
- Event Viewer Client
- Analysis Toolkit Client

The modules are tightly and seamlessly connected together, to provide an integrated and scalable solution.

Abnormal Condition Management Application

SCADAventure™ uses a powerful feature called control sequences to track certain configured conditions. These conditions are defined by easily customized triggers using SQL, If-Then-Else-End values or even external programs called with parameters. These triggers return a true or false condition to initiate action.

If the evaluation of one or multiple triggers is true, the actions specified in the control sequence execute. These actions are very flexible. They range from setting a set point or sending a command forcing execution of complex logical steps in a pre-determined sequence to invoking the action of an external application/system.

The Abnormal Condition Management application adapts to the customer's environment by allowing the customer to define the conditions under which the action should be taken. In corporate implementations of SCADA systems, this application enables the automation of repetitive tasks that operators should otherwise handle manually.

"We've chosen ABB because they offer state-of-the-art technical solutions at competitive prices within short delivery times."

Liu Xiang Dong,
PetroChina
Project Manager



Upstream Applications

Bringing operational efficiency to well test



Automated Well Test Application

When well production is measured at a group meter rather than at the individual wells, such wells must be tested at intervals. This in order to meet government regulations, partnership agreements and joint ventures contract's reporting requirements or to determine the profitability of each well. The flow rate tests determine each well's gas, oil and water production rate.

Each well is flowed through a test separation facility for a specified period that typically includes a purge time plus up to 24 hours of stable test time. The test results are used to prorate monthly production from the group measurement point back to individual wells and to determine production from a formation or pool.

An Automatic Well Test algorithm, running in a Programmable Logic Controller (PLC) located at the satellite facility, automates well testing steps.

The PLC allows a choice of three well test methods that differ according to level of automation:

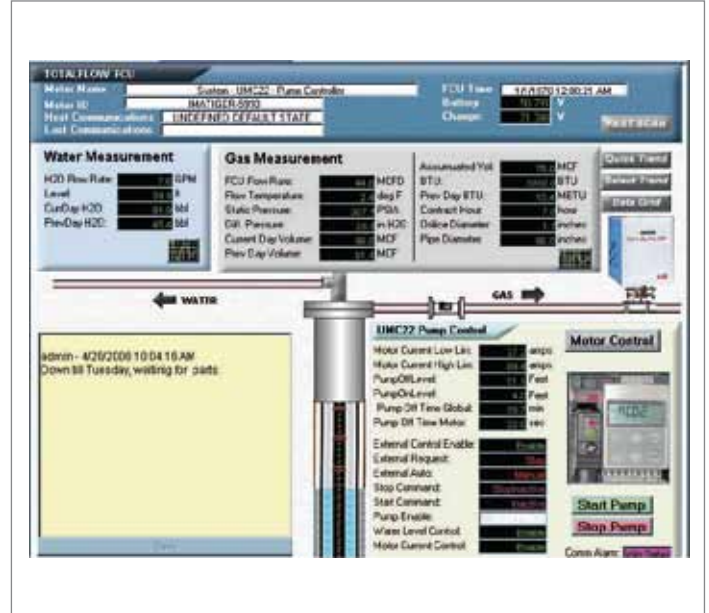
- Semi-automatic valve changes requiring manual intervention.
- Fully automatic valve changes put new wells on test using an ordered list configured in the PLC.
- Statistical well testing which controls valve changes based on a calculated appropriate purge time plus a designated stable flow time.

All test data is stored for viewing in the Production Data History database of SCADAventure™.

Any authorized user can accept or reject a completed well test. Both accepted and rejected values remain in the database. The application allows users to filter which well is currently being tested and to review results by specifying a device or a unique well identifier or a range of dates.

A user can view or edit automatic well test information for a specified time range and for one or more wells. The integral audit trail and security functions ensure any change to a well test value is accompanied with the reason for change. In some circumstances, certain test values are derived by calculation rather than measurement. In these cases, if an edit is performed, the well test history editor automatically recalculates the derived values.

Allocating daily production accurately



Production Allocation

Group metering is used at test facilities and plant inlets. While measurements may be combined, monthly production must still be reported on a well-by-well basis to meet government regulation, royalty regimes and sales contract requirements. With SCADA Advantage's™ Daily Volume Allocation, this process is fully automated.

SCADA Advantage's™ Volume Allocation application uses well test results to quickly and accurately allocate the volume measured at a group meter to the associated wells.

The inputs to allocation calculation include:

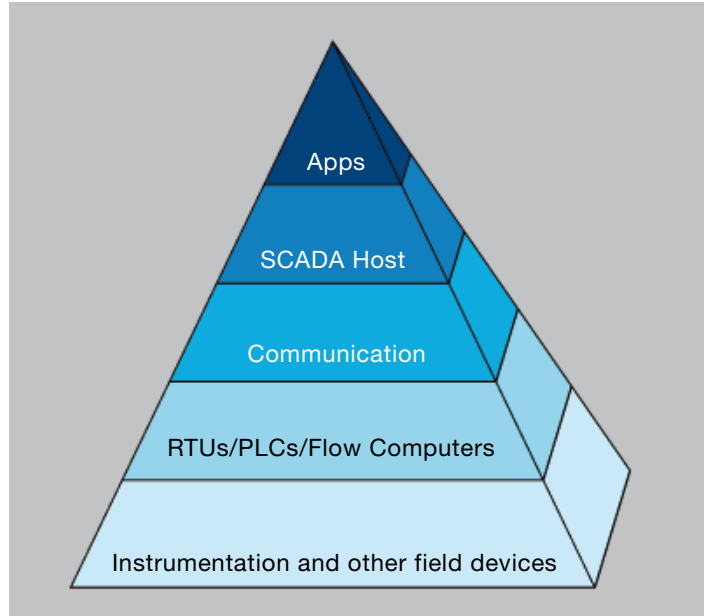
- Last valid test gas, oil and water volumes for each well in the group
- Total group metered gas, oil and water volumes for the day

A well's production hours can be entered manually by an operator or automatically by the system, if appropriate telemetry is installed at the well.

SCADA Advantage™ automatically monitors low flow or no flow sensors. It uses this piece of information to determine when a well has been shut in and thus calculates and stores total monthly production hours.

The allocation process also adjusts the reported well volumes for recovered fluids such as load oil or diluents used to flow heavy oil.

SCADAventure™ providing compressor optimization



Reciprocating Compressor Efficiency Application

Production and sales of upstream oil and gas depend greatly on available compressor capacity. Accurately monitored and optimized compressors are important in alleviating production bottlenecks.

The Compressor Efficiency application provides a diagrammatic view of reciprocating compressor efficiency. The diagram can be for a single compressor, or several parallel compressors. Various compressor characteristics are displayed including current net flow, maximum capacity and potential maximum capacity that might be expected from the compressor(s).

Engineers use these diagrams to quickly assess a compressor's production capacity and determine what pocket settings or speed changes could optimize production. Zooming to any diagram section reveals additional details. In the case of a parallel compressor efficiency diagram, a composite capacity curve is calculated and displayed.

Current operating conditions, maximum speed conditions and the ultimate maximum curves for all contributing compressors are displayed. If a compressor shuts down, the application automatically re-calculates a composite curve for the remaining compressors.

Pipeline Applications

A Solid Foundation for Pipeline Operations



Efficient pipeline management is the basis for improving throughput and information management. SCADAverage™ provides internal and external applications that are integrated with the real-time system to facilitate the collection, management, processing and (optionally) validation of gas flow measurements from a variety of data sources. SCADAverage™ meets the information needs of Gas Transmission, Distribution and Production systems.

In many cases the distance to pumping or compressor stations and to isolation valves requires local control and buffering of data to cope with possible communication interruption. With other systems interruptions may cause data corruption or data loss. SCADAverage™ uses configurable data integrity checks and local data storage to ensure data quality and prevent data loss.

Pipeline scalability

SCADAverage™ can be deployed as a local HMI, monitoring and controlling block valves as well as pumping or compressor stations.

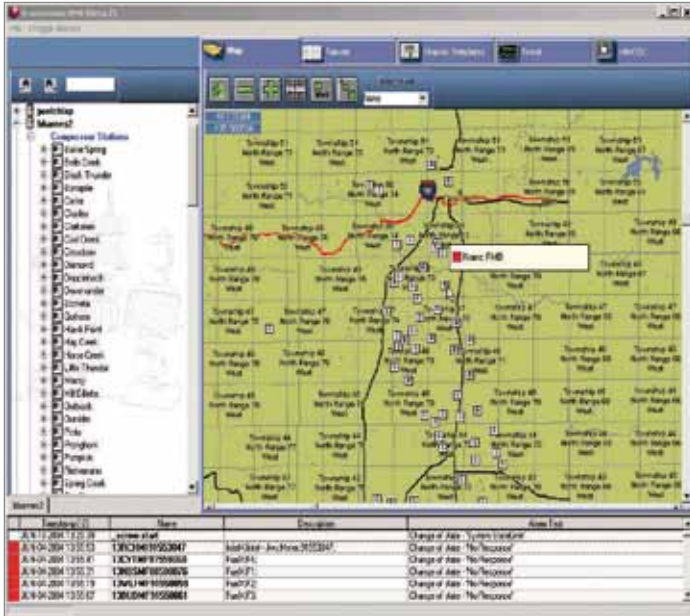
All stations and valves can be automatically consolidated into a control room system using replication. The control room typically runs the operational and commercial applications that result in efficient pipeline management. Back up control rooms are easily configured using peer-to-peer replication, which keeps them synchronized with the main control room.

Since SCADAverage™ supports all standards of connectivity, customers have the freedom to choose ABB or any third-party application that supports such standards as OPC, OLEDB or ODBC in real-time. This becomes especially important for system replacement when a pipeline company already has working applications in place.

On major gas pipelines, customers are adding approximately 2-3 metering stations per week. ABB's competitors typically take 2-3 days to integrate a metering station into their system. Using SCADAverage™, this task can be completed in 2-3 hours, contributing to significant lifecycle cost savings. "ABB provided the efficient way to execute and complete our refined products pipeline SCADA project."

Liu Weiguo
Operations Manager
SINOPEC

Gas pipeline core applications



Linepack

Linepack calculations are performed by the system to maintain an estimated inventory quantity. The system also tracks current pack and change in pack at hourly and daily intervals. Linepack calculation results are processed by the system against customer-definable parameters, allowing operations personnel to define alert levels. Graphical interfaces show Linepack changes over time in the form of trends and colored pipeline segments.

Schedule tracking

Gas schedule tracking calculations are performed periodically to establish the forecast end-of-day (EOD) contract quantity and the required flow rate to meet the quantity required by each contract.

The forecast EOD contract quantity calculation uses real-time input analog points to specify the accumulated volume and current daily flow rate for the current gas day at a particular receipt or delivery point in a pipeline network. It then extrapolates the anticipated total volume or energy.

Worldwide Support and Integration Centres

We recognize that oil company's specific service requirements are based on the criticality of its assets to production and on the level of in-house expertise. ABB service contract agreements are adjusted to complement the in-house expertise and provide additional capabilities needed to maintain asset performance at the required level.

Agreements range from call-up support services to complement a self-maintenance strategy all the way to dedicated on-site resources.

Programs providing software management and version upgrades are also available.

Our experienced service professionals can help implement the right support services contract.

ABB offices are located in most oil producing countries to offer the first line of support. Major execution centers all over the world can be involved when the urgency or complexity of issues should demand further help.

The benefits of this arrangement are:

- Expanded maintenance capabilities
- Improved system and equipment utilization
- Effective maintenance planning

ABB service professionals also provide expert on-site assistance for installation and commissioning of ABB systems, devices and instrumentation, ranging from start-up to full project management.

The benefits are:

- Smoother installations
- Faster start-up at lower cost
- Improved efficiency

Training

A skilled and efficient workforce means full system utilization: a very valuable corporate asset.

Through its training program for SCADA[™], ABB helps to increase the skill level and knowledge of the workforce.

Consequently responses to system and process challenges are more productive and analytical skills get improved.

Training is available at our major centers and can be customized on client's request and held at customers' offices.

The available, standard courses are:

- SCADA[™] Operations
- SCADA[™] Administration Course
- SCADA[™] Advanced Configuration



Asset Information operational gains are:

- Compliance with Microsoft standards means fast, intuitive learning and lower support costs. Training can focus on optimizing production and efficiency.
- Integrated automation for SCADA and telecom user environment
- Centralized management and low cost maintenance
- Increased safety and environmental control
- Reduced cost of ownership
- More reliable production and more efficient operation

“ABB has supported us with SCADA technology for the last ten years, making a continuous expansion and upgrade of the system possible.”

Javier Pellón
Technical Manager
ENAGAS

Contact us

ABB SpA

Via L. Lama, 33

20099 Sesto San Giovanni (Milan), Italy

Phone +39-02-2414.1

Fax +39-02-2414.3520

www.abb.com/oilandgas

oilandgas.info@it.abb.com