Siemens XHQ Operations Intelligence aggregates, relates and presents operational and business data in real-time to improve enterprise performance. Siemens XHQ enables a variety of solutions for real-time performance management and right-time decision support.
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Whilst fluctuating prices are having a significant impact in the oil and gas industry, organizations are constantly looking to reduce costs, improve efficiency, and increase margins. Organizations are capturing information value by linking the entire operation to meet the challenges of production and operational programs. Organizations are aiming to improve their overall operational effectiveness through optimized collaboration and providing greater visibility of key, real-time, information to decision makers.

Significant investment is taking place to enhance and promote collaboration across department and organizational boundaries and with XHQ, organizations are able to see the ‘big-picture’ and anticipate when and where production and operational problems might occur, thus operating more pro-actively.

Improvements in the availability of data and information allow companies to move from monthly and quarterly stewardship to daily and weekly stewardship. The most sophisticated systems enable companies to see upstream data in real-time and compare actual results with planned results and business targets. The ultimate goal is for information to be presented vertically, from the HQ down to the subsidiary, site, equipment and well level, and horizontally, across the entire supply chain of the business.

XHQ provides both horizontal and vertically integrated solutions, Figure 2, thereby facilitating strategic and tactical decision making at all levels of the organization. Figure 2 demonstrates the logical flow of information drill-down and how information can be modeled by business function, spatial, and organizational hierarchy.

Many businesses have problems completing monthly planning cycles within four weeks leading to out-of-date forecasts. Prior to the implementation of XHQ, companies react slowly to production issues, and usually waited for a daily report to be compiled before any production variance or problem was realized, this latency of data most often resulted in additional losses that could have been prevented if immediate notification of abnormalities had been reported.

Information sharing is seen as a key enabler for optimal collaboration and major oil companies that have implemented XHQ Operations Intelligence systems list improved data quality and information visibility as some of the key drivers.
An Operations Intelligence platform such as XHQ, enables all business units to work together in a highly visible and collaborative environment, typically providing added value business levers such as,

- Alignment of Oilfield, reservoir, and operating branch objectives with corporate HQ objectives. Production Management and Operational data can easily be shared with other departments to verify that inter-dependencies are understood and overall efficiency is improved
- Optimize Well and Oilfield Production and Operational efficiency and reduce business risk - intelligently identify poorly performing functional blocks, oilfields, platforms and wells and provide supplementary, contextualized, information to support corrective business decisions.
- Reduce Costs – identify overspending cost centers and introduce controlling measures, reduce unit and FPSO / GOSP operating and capital cost
- Adapt and respond to unplanned market and operational events as they occur – provide real-time status information and automatically indicate the impact of the current and future Oilfield production, maintenance, and supply plans
- Leverage the value in existing systems – intelligently integrate and model business information from many disparate Oilfield and platform systems to provide a consolidated, real-time, view of the operational health of the business.
- Provide intelligent and intuitive real time dashboards that display the impact of Operational abnormalities on well production, injection, maintenance activity on production, and production disturbances on the bottom line etc...
- Provide a single source of the truth – improve the accuracy of decisions by providing consistent, centralized, and consolidated data. Replace volatile data sources such as spreadsheets and record historical data for strategic analysis. Promotion of standardization across different operational locations
- Foster continuous improvement. Provide real-time and historical Key Performance indicators and compare company and industry wide benchmarks and best practice. Derive areas of Lost Opportunity, Oil Loss, reduced oil gain, and provide management with relevant data to make pro-active decisions to reduce significant losses
- Highlight areas in need of HSE improvement and limit the exposure of people from operating safety risks by making historical data, decision-making and intervention knowledge readily available

Why XHQ?

XHQ is the ‘Best in class’ Operations intelligence platform used by Oil and Gas Majors all over the globe, XHQ is the platform of choice because of the following factors,

- Leverages the information value in existing systems to provide the end-users with the accurate information they need, at the right time
- Enables rapid deployment, reusable library and best practice content
- Ease-of-use. Intuitive and world class visualization techniques are used to ensure end users need minimal training and see immediate benefits
- Lower Total Cost of Ownership, configuration, not coding. Component, view and solution level reuse
- Mature, Proven references from global Oil and gas majors
- True data integration, intelligent integration of data that is contextualized and modeled
- Solutions are designed to help drive the business to achieve new benchmarks. Decision critical information is presented to the right people in a way that is easy to assimilate, without clouding the real meaning of the data

Why Operations Intelligence for Oil & Gas Upstream Operations?

Provide simple and efficient access to critical Oilfield information – most expert systems require the end-users to become application experts in order to locate and extract pertinent information. This introduces a significant training and time burden. Adaptive and intuitive access to key data reduces the time taken to locate data, analyze data, and to make accurate decisions
The XHQ Oil and Gas Upstream Solution

XHQ has been deployed to provide both Onshore and offshore Operations intelligence. XHQ Solutions are driven by business benefits, needs, and requirements. The solutions typically provide general, company-wide, intelligence dashboards and specific operational functions as displayed in figure 3.

Each functional module provides valuable insight and analysis above and beyond the raw data handling provided by most OEMs and work process related management systems. Each functional module can be applied to different aspects of the upstream operation such as FPSO, GOSP, Producing Platforms, gathering stations, subsea producing skids etc...

Figure 4 Displays how information from different functional modules can be combined and merged into a real-time management dashboard, thereby enabling the end-user to see the relationships between different data sets without having to access multiple oilfield systems, compile spreadsheets, or wait for the data to be made available.

Another significant benefit of XHQ is that the end-user has the ability to intelligently drill down on any area of the dashboard to get more information. This greatly facilitates troubleshooting and root cause analysis.
Production Intelligence

XHQ solutions provide detailed analysis of the current and historical production effort. In addition to providing production trouble shooting and root cause analysis, production information for the total oilfield and combined oilfield operation is also aggregated and rolled up, Figure 5. The aggregation of multiple producing platforms or wells enables the Branch and Head quarter functions to see the “Bigger Picture” and analyze the overall impact of current and historical production on future reservoir and oilfield depletion.

Production Capacity Monitoring

XHQ is used to monitor the actual production and compare it to the maximum sustainable oil production capacity (MBOPD). Significant deviations from the optimal production rates are highlighted and alerted, Figure 5. Corresponding information, Figure 6, such as real-time parameters from the Well’s surface and subsurface process equipment, and shift log entries, is linked to the production alert, thereby supporting root-cause analysis for the production shortfall.

Production Analysis

For Offshore operations the production of Crude Oil, liquids and natural gas is analyzed over time and by well, platform, Operational block, Oilfield and by Branch. For Onshore operations the production data is aggregated and rolled-up by Production well, Metering Station, Central field manifold, Oilfield and for combined reservoir. Production rates are typically reported in Equivalent barrels of oil and are also correlated with water and/or gas injection rates and the associated improvement in oil recovery is also monitored. Oil loss is also reported and summarized together with the reasons for oil loss and oil gain. Oil Production enhancement (Oil Gain) is also analyzed with actual oil gain from re-injection, well workovers, new drilling activities etc... being compared to target oil gain.

Process Intelligence

The upstream operation consists of many processes such as separation, desulphurization, dewatering, gas treatment etc... XHQ solutions are used to monitor and analyze these processes in real-time. Real-time data is also available for most GOSP, FPSOs and well operations.
Since multiple producing wells are drilled for a given oilfield, it follows that the combined effect of the multiple wells must also be monitored whilst also considering the spatial relationship between the wells. Therefore, Production well, platform, FPSO and pipeline information is presented geographically using an Oilfield Map Figure 9.

Intelligent and contextualized data mining enables and facilitates troubleshooting of production and operational issues. From any of the nodes displayed in the Oilfield maps in figures 9 and 10, the end user can simply click and drill down to get more information on that particular node. For example, to access more detailed information on the FPSO, the user can select the FPSO node in figure 9 to navigate to the detailed FPSO dashboard Figure 11. The FPSO dashboard summarizes the decision critical and real-time information.

Frequently, the subsurface down-hole operation is monitored in order to provide valuable information on how to operate and modify the surface process operation. For example monitoring down-hole instrumentation such as PDHPG and temperature sensors to alert and indicate in real-time, unwanted water or gas production and knowledge of the point of influx to support remedial action. Further examples of real-time Operational Alerts featured in XHQ solutions include,

- Rate of Change (ROC) alert on the inner casing pressures of a production well, compare the current casing pressures for each well with the pressure from 2 days before and alert on significant changes in pressure. Such changes often act as a precursor for severe failure of the production well, leading to unplanned shut-ins and lost production
- ROC or limit exception on a PDHPG pressure drop to provide an early warning or information on the time and location of water fronts arriving at the well
• Limit alert on the Production wellhead choke valve positions, when the valve position is tending towards 0% this could mean the well has been shut-in by the operations team
• Pressure differential alert on a pipeline from the FPSO or from well to metering station to show a potential pipe leak
• Production variance monitoring and alert when the actual production for a day is below the planned production rate this can be the production delta for a well, platform, oilfield, metering station and for the whole oilfield
• Oil In Water (OIW) alert when the concentration of oil in the effluent water from the FPSO, Figure 11, becomes significantly high. In addition to environmental violations this usually indicates a broader issue with the crude oil treatment processing

Asset Intelligence
A wealth of information pertaining to assets and process equipment can be analyzed and displayed in XHQ solutions. Whilst the majority of Asset Management systems provide asset tracking and inventory listing, XHQ Asset Intelligence solutions provide valuable information and analysis of process plant related assets, facilitating timely business critical decisions, and driving the business to achieve new benchmarks in oilfield asset performance. Figure 12 displays a typical upstream asset performance dashboard. In addition to providing overall asset scorecard information, the worst bad acting equipment across the entire corporation are identified, listed and ranked.

Maintenance Intelligence
An XHQ solution provides the broader end-user community with valuable maintenance information, fostering closer collaboration between the maintenance, operations, and management teams. Integrating maintenance information with operational information provides greater transparency and allows all parties to understand the impact of oilfield operations & production on the maintenance planning and strategy... and vice versa.
Summary Maintenance information for the entire upstream organization is consolidated and displayed, Figure 14, allowing management to track and manage the entire maintenance effort. Poor execution of the maintenance plan is reported together with maintenance costs and the maintenance status of critical process equipment. The maintenance information can be further analyzed by branch, by oilfield and by operational block and the user also has rapid access to individual Maintenance Work orders. Since delayed inspections and differed preventative maintenance can lead to unplanned breakdown of process equipment, the Maintenance work order execution is also summarized and aggregated by each location in the upstream organization.
Marine Terminal and SPM

Typical Marine Terminal Management operations cover chartering, vetting, Operations and Demurrages. Demurrage is an ancillary cost that represents liquidated damages for delays, and occurs when the oil tanker is prevented from the loading or discharging of cargo within the stipulated laytime. FPSOs and Marine terminal tank farms have a finite capacity and it is important to synchronize offloading and shipment dispatches with crude production to prevent demurrage costs being incurred. This is especially important with FPSOs that are only connected to SPMs since oil production would have to be reduced, if not, suspended if there is insufficient ullage in the FPSO.

XHQ upstream solutions provide the missing link between production and marine terminal schedules, enabling all parties to adjust forward plans, prevent demurrage situations, and prevent a reduction or suspension of production due to insufficient ullage.

The overall terminal schedule is frequently displayed, figure 15, summarizing current and forward month receipts and shipments. Related inventory data is also displayed. The shipment information typically covers the product or crude type, material quantity, vessel capacity, ETA, ETD and is allocated berth.

HSE and Management KPIs

Key Performance Indicators (KPIs) are a set of measurements that allow management to understand an organization’s overall health and to foster continuous improvement. KPIs are derived and calculated in XHQ based upon raw data from disparate systems. For all KPIs it is imperative and prudent to compare the current and historical results against a predefined target, set of targets, and/or limits. XHQ Upstream KPIs analysis enables management to:

- Understand the overall health of the business
- Focus upon areas of the business that need attention
- Conduct internal benchmarking. Track performance changes over time to indicate areas of the business that are improving and areas where performance is deteriorating, compare performance between operational blocks and oilfields
- Conduct external benchmarking i.e. drive the business to achieve new benchmarks, monitor company performance against industry benchmarks and global ‘best practice’ data

Example KPIs are displayed in Figure 17. The current results are compared against a predefined target and unwanted deviations are alerted. Spark lines are also used to demonstrate the change in KPI value over time and allow the management to see if the business is improving against each given metric.
Figure 17 XHQ KPI Dashboard

Oilfield Environmental Monitoring stations are used to report the concentrations of Sulfur Dioxide and Hydrogen sulfide together with ambient temperature and wind speed & direction, Figure 18. Significant changes in concentrations are alerted in real-time to warn of potentially hazardous situations in the field.

Figure 18 Environmental monitoring station summary

The Siemens Advantage

Domain Experience
Siemens has the experience in applying operations intelligence and delivering solutions that are relevant to the business needs of today and of the needs of the future. Siemens has many experienced consultants with deep knowledge of the industry and the Information technology skills to deliver solutions with proven added value.

Proven Track Record
The Siemens XHQ platform has been successfully implemented in many national and multi-national Oil & gas companies. We have a large number of successful references in implementing intelligence solutions throughout the Oil & Gas industry, including Intelligent Oilfield solutions for Saudi Aramco, CNOOC, Sinopec and TengizChevron.

Technology Partnerships
Microsoft and Siemens have a strong strategic relationship with the intent to drive innovative solutions in manufacturing.

Siemens is working closely with Microsoft to Leverage Microsoft client tools and software components and opportunities for performance improvements and to lower total cost of ownership.

Together with our network of certified solutions partners, we bring a complete solution from project design through architecture through development and deployment.

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