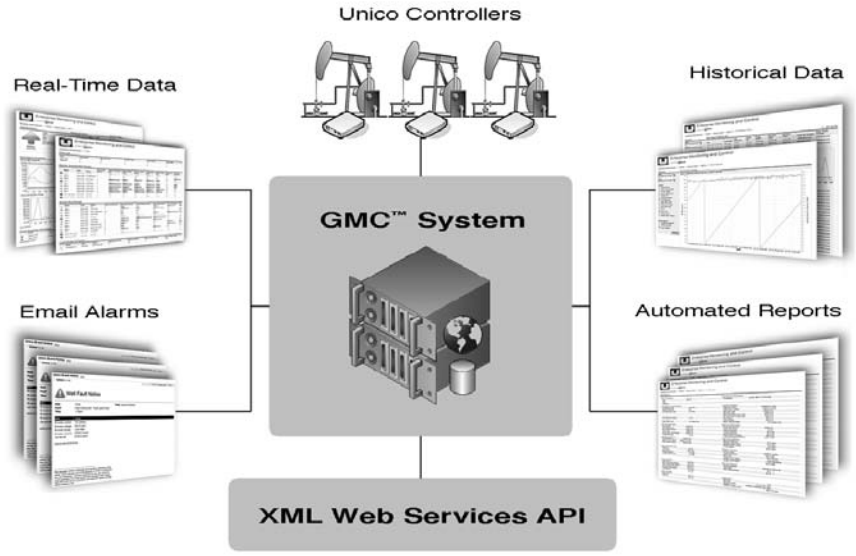
GMC™

Global Monitoring and Control System



Overview

The GMC™ system for enterprise monitoring and control is an efficient, cost-effective way for oil and gas producers to stay connected to the most critical aspects of daily operations. Using powerful hosted enterprise architecture, the GMC™ system reduces time spent manually collecting and analyzing data. Operators can monitor multiple fields simultaneously from a standard Web browser or Internet-enabled mobile device. Personnel can be notified of faults and conditions automatically, even while away from a computer. Collected data is stored securely in a central database and is available through the same intuitive Web interface or exportable for use in third-party software. Web cameras and other peripheral hardware can be integrated to provide a comprehensive monitoring and control solution.

Real-Time Dashboards

The GMC™ system continuously collects well data from an unlimited number of wells and fields and makes that data accessible from virtually anywhere at any time over the Web. Real-time dashboards provide hierarchical navigation through the data, allowing the user to view a summary of all fields, all wells within a specific field, a single well, or to probe even further into specific parameters or other details. At each level, data is presented clearly and prioritized so that crucial issues are brought to the user's attention without having to scan every well in search of problems. Since data is collected constantly, trends can be viewed over time, revealing behavior that might otherwise go unnoticed by periodic examination.

Automated Well Reports

Comprehensive well reports can be generated automatically or on demand. SRP reports include both surface and downhole dynamometer graphs. Users can simultaneously compare current and historical well performance. By collecting, tracking, and trending well reports and centralizing report management, the GMC™ system greatly simplifies field and well analysis.

Notification and Alarming

A sophisticated notification and alarming service alerts users when specific well conditions are detected. Alarms can be triggered, for example, whenever a fault occurs or when specific faults occur, when there is a communication failure, or when a value crosses a threshold, such as when production falls below a desired minimum. Alarms can be specified for individual wells or for an entire field. Users can customize alarm criteria and delivery options.

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Overview *(continued)*

Mobile Data Access

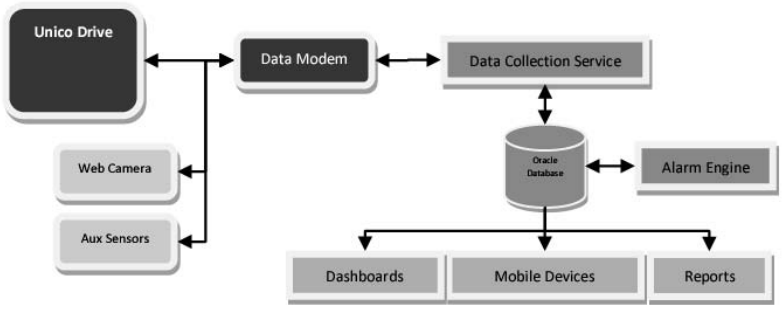
Mobile users can monitor the status of their wells and equipment from any location. Critical content from the producer, field, and well dashboards can be delivered to Web-enabled devices. Other devices can access select information via email or instant messaging services.

Sensor and Peripheral Support

Flexible GMC™ data modems offer a host of features for interacting with external devices, including LAN, USB, and RS-232 communications as well as analog and discrete I/O. These capabilities extend system functionality by allowing monitoring and tracking of auxiliary sensor input, interfacing with external controllers, and communicating with Web cameras for visually inspecting of well sites.

Architecture

The GMC™ system runs entirely on a host server. The server provides security, data collection, data storage, alarming, and notification services. The data modem provides a gateway between field equipment, such as drives and sensors, and the data collection service. Users access the real-time dashboard or mobile screens through the server's secure Web site.



Communication Options

A wide variety of communication hardware is supported, including cellular modem, Ethernet, Ethernet Advanced, local radio, and satellite.

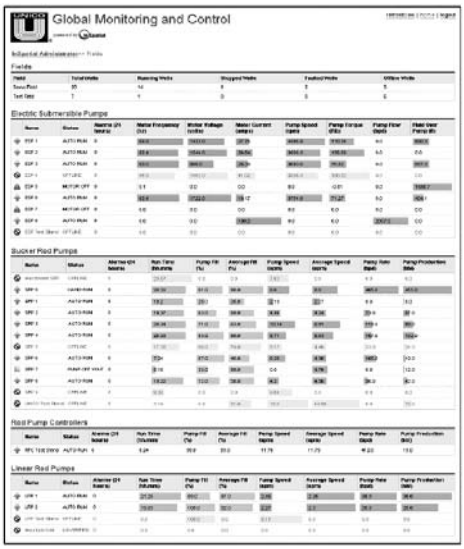
Deployment Scenarios

The GMC™ system can be deployed in a variety of configurations to meet both geographic and budgetary constraints. A clustered configuration, where multiple wells communicate via radio to a central cellular hub, maximizes use of cellular and satellite providers' unlimited data plans and allows operation outside of cellular coverage areas. A discrete configuration, using separate cellular modems on each well, simplifies field installation while allowing faster polling with asynchronous access.

SOA Integration

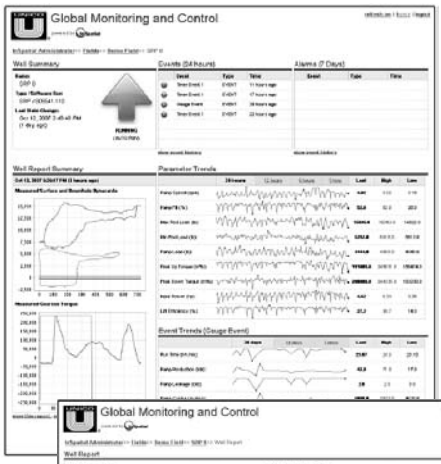
The GMC™ system provides an XML Web Service Layer to simplify integration of real-time monitoring and alarming functions with other enterprise systems. The system uses the PRODML and WITSML industry standards for a vendor-neutral solution. The system allows bidirectional XML, flexible data transformation and customization, streaming data, and data archiving.

Field Operation Summary

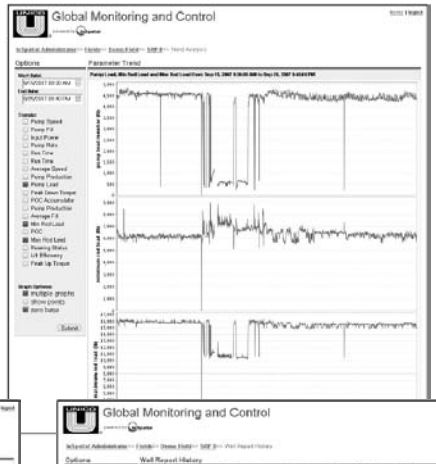


Sucker-Rod Pump (SRP)

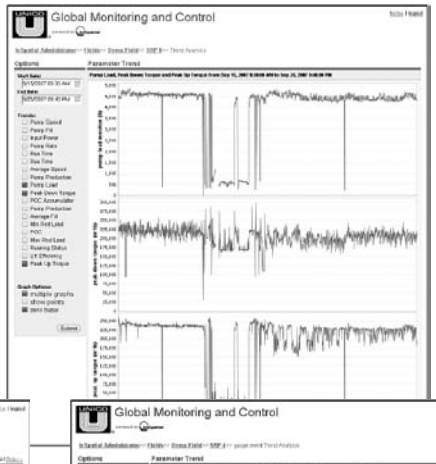
Well Operation Summary

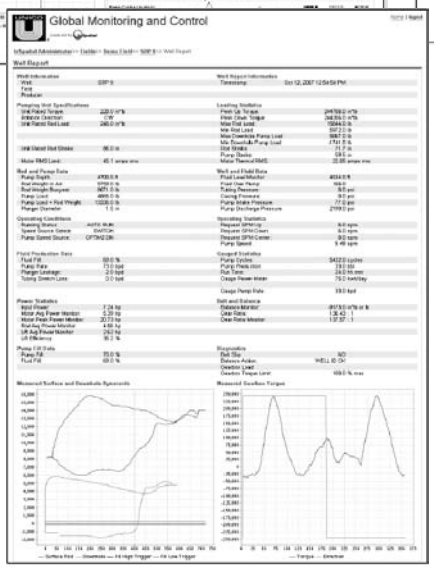


Rod Load

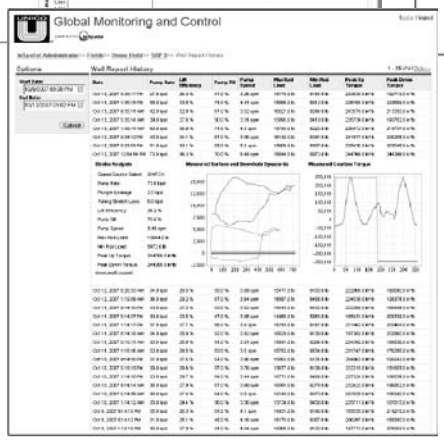


Gearbox Torque

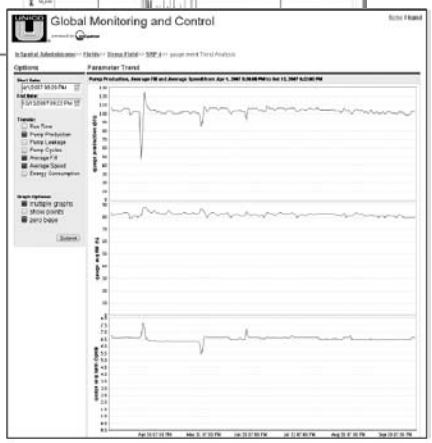




Well Report



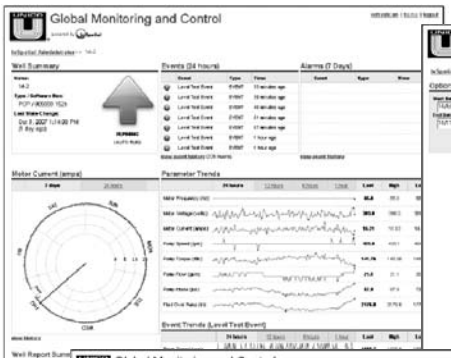
Well Report History



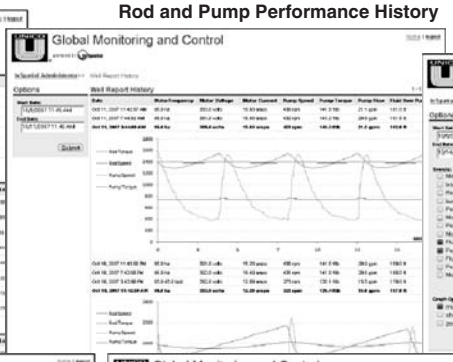
Gauge Production

Progressing Cavity Pump (PCP)

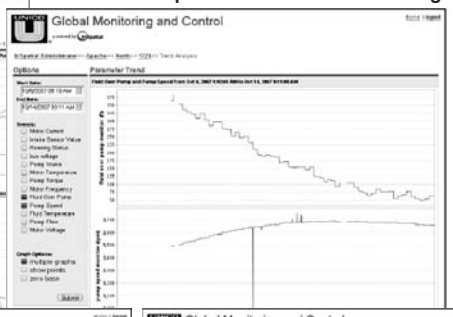
Well Operation Summary

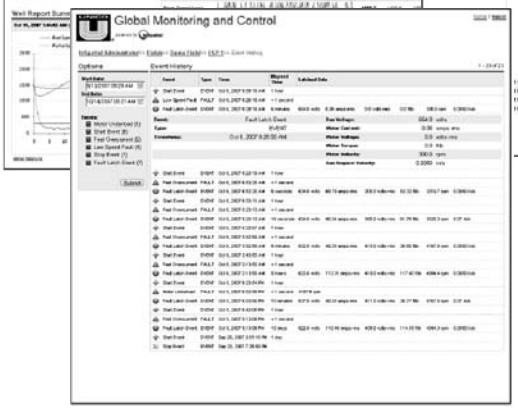


Rod and Pump Performance History



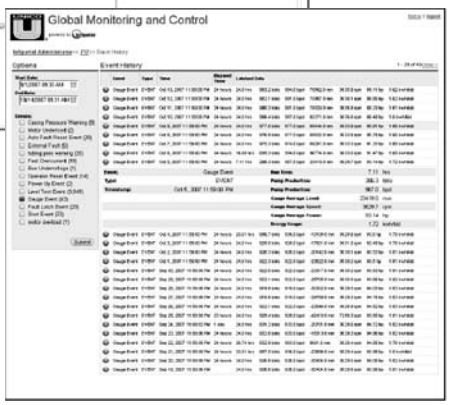
Speed and Fluid Level Charting





Fault and Event History

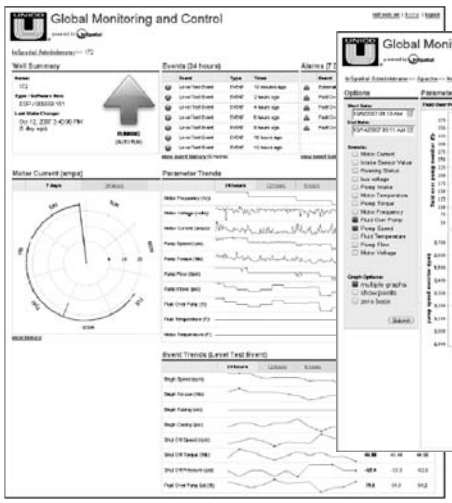
Level Test History



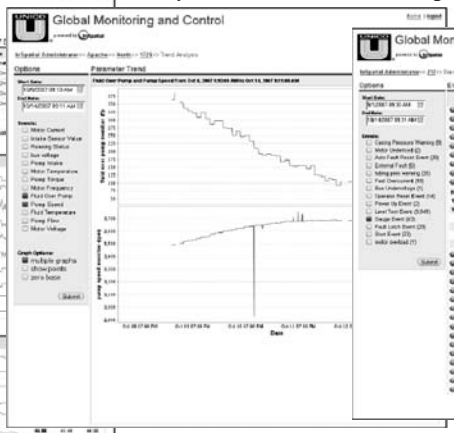
Gauge Production History

Electric Submersible Pump (ESP)

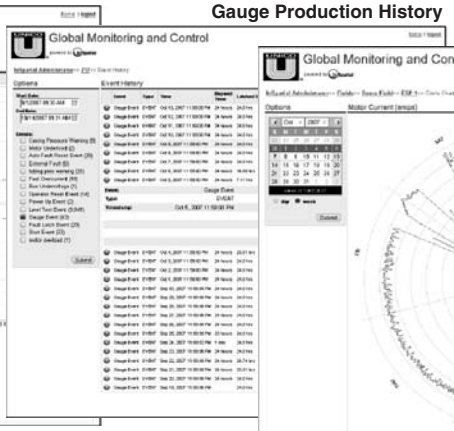
Well Operation Summary



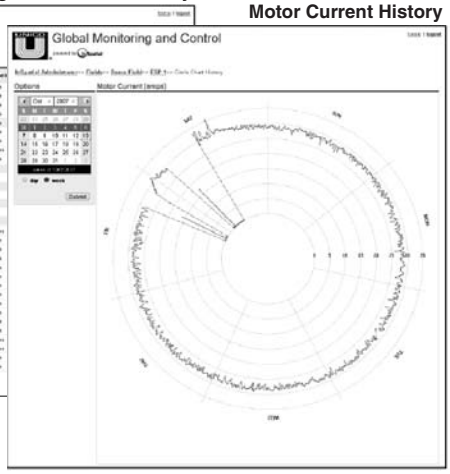
Speed and Fluid Level Charting



Gauge Production History



Motor Current History



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