

INTERNET BASED MEASUREMENT MONITORING & CONTROL

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Bringing measurement and control to the Internet gives companies more cost effective systems for measuring, monitoring and controlling of oil and gas processes. These types of systems help companies with their current optimized resources by providing their employees data anywhere and anytime.

Outsourced Internet based Supervisory Control and Data Acquisition (SCADA) systems have proven to reduce the overall maintenance cost to companies. Instead of companies relying on proprietary based systems for upgrades and enhancements, the Internet based systems are thin client based and rely only on java and active X based add-ins to a standard browser, i.e. Internet Explorer 6.0. Increases in enterprise wide data has also proven to reduce costs due to employee efficiencies in gathering data for compiling reports for marketing and engineering departments.

SCADA HISTORY

Years ago monitoring and control of remote facilities meant crews spending hours driving from one remote facility to the next, often on a full-time basis. Once a problem at a facility was found, they fixed it, which often meant making an adjustment to a piece of equipment such as a pump or a valve. One of the first steps forward was equipping these crews with radios so as to call into headquarters when a problem was located, or to call for additional crews when needed.

Another step in automating this process was by simply adding a monitoring and alarm system. These were typically electro-mechanical devices at remote sites that would send a signal back to a control center via radio or leased telephone lines. While these systems were a step forward, the high cost of the computing technology often made them a tough sell to management on a purely cost/benefit basis. After all, once a problem was reported, a crew still needed to be dispatched to correct the deficiency.

SCADA AND CONTROL

Most of these systems evolved into SCADA systems with capabilities that enable remote control of facilities, not just monitoring. This added ability to control facilities (open/close, on/off, up/down, etc.) within specific parameters via an automated system is when SCADA made sense to corporate management and not just operations staff.

Over time the price and size of computing power continued to be driven lower, and as computing standards emerged, the market for SCADA systems grew significantly. Now, even small and medium sized oil and gas companies and utilities could afford these systems. Lower computing costs also opened the door to added functionality, such as modeling and analysis software, at a relatively small incremental cost. One key result of this phenomenon is that the price for SCADA solutions is bottoming out, but technical innovation continues at a fairly constant rate.

BENEFITS

Today the SCADA users are looking for dependability, scalability, and flexibility. One avenue for this powerful mix that has appeared on the horizon is the use of the Internet and Web-based technology. While delivering SCADA applications via the Internet can ultimately have the same effect as a traditional rollout, a number of advantages exist in considering Web-based SCADA applications, such as:

- **Scalability:** SCADA applications accessible on a corporate intranet make the information available to all in the organization that needs this data to do their job. By providing this data via the Internet to their desktop, the cost of personnel doing their job (i.e. time to perform tasks) is greatly reduced, opening the door to new business applications for this data.

Next generation Web-based applications will offer easy to use comprehensive configuration tools so as to allow users to design their own Web screen and applications. Assigned customer administrators have full access to these tools to address their needs without having to rely on an outside source.

- **Cost:** The cost of using standard Internet technologies (PPP, TCP/IP networks, browsers) greatly reduces the investment in proprietary hardware and software as typically supplied. Web-delivered SCADA can also turn a large capital investment in communication hardware and analytical software into an affordable monthly expense.
- **Cost Savings:** Some producer companies have experienced up to a 25% overall cost reduction

in operating costs compared to other conventional non-SCADA systems. Although they can not quantify the exact cost savings connected to each system benefit derived from automation, they do know that most of the savings come from these improvements in field operations:

- o Measurement data once made available across the Internet, offers producers marketing, production control, and instant access to volumes from their wells.
 - o Prevention of catastrophic equipment failure from improved alarm monitoring.
 - o Reduced fuel consumption from remote controlling of compressor speed to maintain desired suction pressure. Continuous remote control through Internet Web based systems prevents the machines from running at higher rates than intended.
 - o Reduced downtime at field compressor sites. Prompt notification of compressor shutdowns in the field allows for corrective action to the site of the problem.
 - o Many producers experience up to 99.9% run-time out of their compressors with real time monitoring systems provided by SCADA. Internet access allows more of the Enterprise to be involved with decisions pertaining to compressors, etc.
 - o Improved scheduling of preventative maintenance. For both compressors and metering systems offers continuous monitoring of compressor valve temperatures, engine cylinder temperatures, engine air/fuel ratios, fuel consumption rates and similar operating parameters permits graphic display of equipment operating trends. Potential problems are identified for scheduled maintenance before a breakdown occurs that requires emergency measures.
- **Faster deployment:** The use of industry standard networking technologies that are familiar to a broader group of engineer's means it is easier to make in-house modifications and deployments or find local expertise that can learn the system.
 - **Enhanced production:** The benefits of efficiency are nice in terms of cost. But most producers find that by far the greatest benefit of Internet based systems goes to the top line: increased revenue from rising production. For a gas producer, the greatest benefit of having a highly efficient gathering system is reduced downtime at the metering and compressor stations. When compressors stop, the backpressure shuts in the wells. With the quick response and widespread availability of the Internet, operators can respond to the compressors problems, thus reduce downtime.

When a production well shuts in due to problems associated with the well, operators can be alerted to respond in a timely manner as to reinstate production.

SECURITY

Two types of security are used. First is user authentication utilizing an assigned user name and password. Second is data encryption for information transferred utilizing the web pages.

- **User Authentication:** Users of the web-based system will be assigned a username and password. Each user has specific rights assigned to view reports, view trends, view alarms and/or edit alarms. These can be specific to each well location viewed from the web site.
- **Data Encryption:** Data encryption has become very important these days as we continue to increase the uses and expose more confidential and valuable data to the Internet. Secure Sockets Layer (SSL) protocol has become the standard in the industry in providing secure information transfer through the Internet. SSL provides a range of security services including server authentication, client authentication, data integrity and confidentiality. Most data centers use 128-bit SSL encryption with a digital certificate registered through Verisign Inc.

OPERATIONAL ADVANTAGES

Given that delivering SCADA via the Internet is technologically and economically possible, what are the operational advantages? Consider for example, an interstate pipeline system. With facilities equipment and custody transfer points across literally hundreds of miles, the ability to access and manage real-time system operating data and customer data 24/7 is critical. Accomplishing all of this via the Web increases the availability of this data quickly and cost-effectively to the complete Enterprise.

A few examples demonstrate the practical application of these systems. Consider maintenance crews assigned to a section of pipeline. Having expedited access to any problems would save time and money, maintain product flow and ensure maximum revenue. A crew could access this information from a desktop at the office or via a hand-held device (such as a PDA) while out in the field. This data can also be managed to send a page or email to on-call workers when operating parameters are outside of predetermined levels.

Another example is tracking data at custody transfer points. Web-based SCADA would make this valuable business data available 'round the clock' to all requiring this information for a variety of reporting needs. This information could also be managed to send messages

to customers or pipeline marketing staff when usage patterns fall outside of predetermined levels. Additional services are available to the end user of the data. Businesses that quantify, scan, and adjust final billing numbers can replace the usual integration departments or outside services. Once the measurement data is available on the net, many third party services can be performed on this data in an expedient manner.

Web-based SCADA applications are a reality today. Vendors have developed a solution that is being deployed in the field across the nation on production locations. Operations and maintenance personnel are using the system to save time and money on operating and maintaining their remote pumping facilities and to keep the gas flowing at or near capacity, thus impacting the gas company's top and bottom line performance. Operation staff can access the report any time from virtually any location (see Monthly Total Report below).

The ability to view production data in graphic form and set operating parameters can also be executed via the Web (see Trend Display below).

DATA PRESENTATION

The data will be present via a standard web browser with HTML developed web pages. These types of pages are usually developed with standard software like Microsoft FrontPage or Adobe Page Mill. These software tools create web pages in a graphics environment and output HTML.

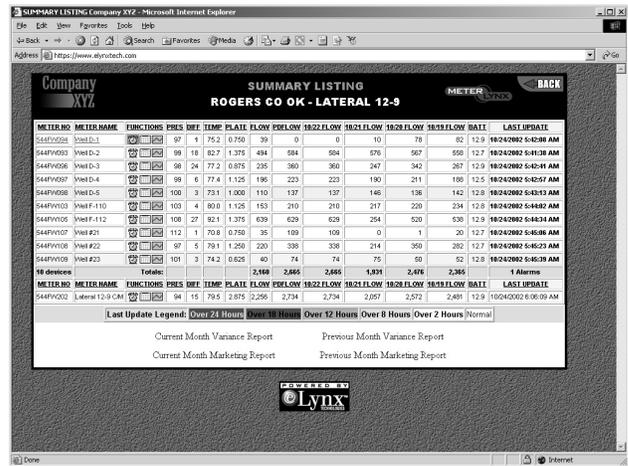
Java can also be used in the web environment to create applications that run over the Internet, i.e. historical trending application.

The following is a list of operational data that will be made available to the user through the user interface. Each of these values are available for display, trending and reporting.

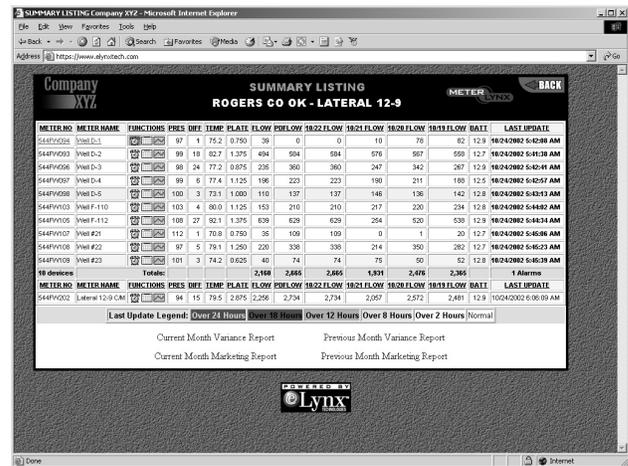
- Meter Name
- Date/Time stamp
- Instantaneous Flow Rate (MCFD)
- Previous Day Accumulated Volume (MSCF)
- BTU
- Differential Pressure
- Static Pressure
- Temperature
- Battery Voltage

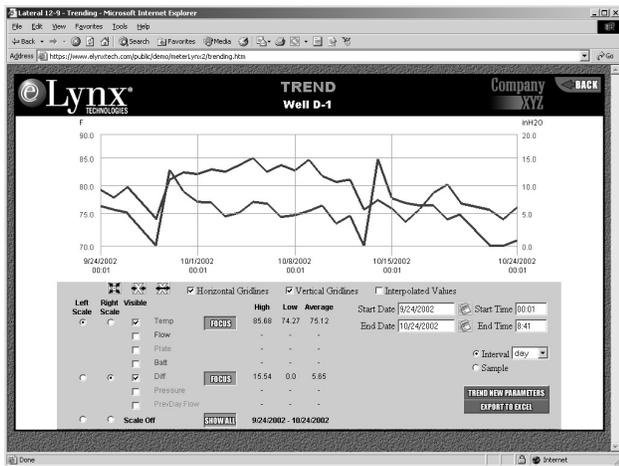
The following is a list of types of web pages available to the user through the user interface:

- Overview Display (Groups)
- Group Summary Display (tabular overview)
- Graphic Well Display
- Trending Display (per location)
- Alarm Display (per location)
- Monthly Total Report (per location)



Overview Display (Groups)





Trend Display

ALARM SETPOINTS
WELL D-1

Company XYZ

DEVICE ALARM LOG

Tag Name	Alarm On/Off	HE	HI	LO	LI	Status	Date of Alarm	Ack / Clear	Notify	Edit
DXWELL-ICM_BATT	On	14.7	-	11.7	-	-	10/22/2002 2:40:59 PM	10/22/2002 4:41:05 PM	[Icon]	[Icon]
DXWELL-ICM_DIFF	On	200	-	2	-	-	10/4/2002 10:40:46 AM	10/4/2002 2:40:48 PM	[Icon]	[Icon]
DXWELL-ICM_FLOW	On	-	-	-	-	-	-	-	[Icon]	[Icon]
DXWELL-ICM_FLOWLOW	On	-	-	-	-	-	-	-	[Icon]	[Icon]
DXWELL-ICM_PLATE	On	-	-	-	-	-	-	-	[Icon]	[Icon]
DXWELL-ICM_PRES	On	350	-	50	-	-	8/27/2002 8:40:32 PM	8/28/2002 12:40:32 AM	[Icon]	[Icon]
DXWELL-ICM_TEMP	On	-	-	-	-	-	-	-	[Icon]	[Icon]

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Alarm Display

MONTHLY VALUES REPORT
LATERAL 12-9 C/M

Company XYZ

Excel Format Contract Hour: 07:00:00 AM Meter: 718FW004

DATE	PRES	DIFF	TEMP	PLATE	FLOW	PDPFLOW	BATT
10/24/2002	97.2	1.2	75.2	0.8	38.8	0.0	12.9
10/23/2002	76.9	0.0	87.1	0.8	0.0	0.0	9.8
10/22/2002	85.2	0.0	71.7	0.8	0.0	0.0	78.0
10/21/2002	94.3	5.2	78.1	0.8	79.7	82.0	12.9
10/20/2002	86.2	5.7	77.9	0.8	80.2	83.1	12.9
10/19/2002	97.3	5.3	80.0	0.8	81.4	88.7	12.9
10/18/2002	81.5	7.0	78.1	0.8	86.3	93.5	12.9
10/17/2002	90.3	6.7	73.6	0.8	89.2	101.8	12.9
10/16/2002	95.7	7.5	72.1	0.8	97.1	115.4	12.9
10/15/2002	101.8	9.2	76.1	0.8	110.6	119.7	12.9
10/14/2002	95.7	13.0	76.5	0.8	127.4	10.2	12.9
10/13/2002	97.4	0.0	69.9	0.8	0.0	77.4	12.9
10/12/2002	89.5	5.3	81.1	0.8	78.5	76.3	12.9
10/11/2002	101.6	4.2	80.5	0.8	74.6	80.8	12.9
10/10/2002	82.9	6.7	83.0	0.8	64.7	82.4	12.9
10/9/2002	85.4	6.4	82.6	0.8	83.7	84.3	13.0
10/8/2002	94.6	5.7	82.7	0.8	83.4	87.9	13.0
10/7/2002	100.2	5.9	83.2	0.8	87.4	95.9	12.9
10/6/2002	91.7	7.2	82.0	0.8	92.1	80.9	12.9
10/5/2002	101.6	8.0	83.0	0.8	102.3	84.6	13.0
10/4/2002	92.7	6.0	81.6	0.8	85.1	87.3	13.0
10/3/2002	101.8	5.5	82.1	0.8	84.8	94.1	12.9
10/2/2002	86.3	7.5	82.2	0.8	91.5	101.8	12.9
10/1/2002	93.8	8.0	81.5	0.8	98.4	114.9	12.9

Monthly Total Report

CONCLUSION

Internet based measurement and control systems have proven to provide a solution for more cost sensitive companies with personnel operating in multiple locations.



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