Data Acquisition System Cuts Costs on Oil Well Stimulation Services

Delphin Logger Automates Data Collection & Pump Shutdown

CAS DataLoggers provided the data acquisition solution for **MTS Solutions**, an oil field service company headquartered in Bakersfield, California. MTS has been providing well stimulation services in California for over 30 years, maximizing production for clients using both traditional and green products. Data Acquisition Operations Engineer Kevin England explains, "We're a small business 25-man crew, as opposed to a multi-national company, so we needed a cost-effective monitoring solution for our jobs that still had the advanced functionality our customers require."

After sourcing Delphin data acquisition systems, Kevin developed a program using ProfiSignal software for MTS's oil well stimulation services and operations. His program auto-transmits job data over WiFi in real-time to well owners, documents the entire job, remotely shuts off pumps if necessary, and calculates productivity. In this way, Delphin performs Data Acquisition, Monitoring, and Automation—all in a single system at each job.

Multi-Parameter Monitoring in Real-Time

In late 2016, MTS Solutions sourced three [Delphin Expert Loggers](#) from CAS DataLoggers. These Model 100 loggers have a 4GB internal memory to store data along with a WiFi interface. MTS also opted for the Klicks software option enabling automation capability along with runtime monitoring.

In this application, the Expert Loggers are installed on different service trucks which travel to job sites, each monitoring multiple measurement values including Pump Pressure, Flow, Volume (in gallons), Runtime, and Productivity.

To collect the data, users have connected the loggers' universal analog inputs (mV mA, TC, RTD) with different sensor types such as 4-20mA pressure sensors and New-Flow™ flow meters. The Expert Loggers have been set up to sample data from each connected sensor once per second. Currently, the application involves 40 inputs.

Mr. England explains, "Essentially, I was looking for a data system I could program to take data from pressure sensors and flow meters and then trend that data over time. Earlier we had tried using another device, but Delphin is easy to use for everything we need. I developed this automated application myself using just the ProfiSignal Klicks software. Now our rig operators only have to push a few buttons on a laptop to start the job."

Trending the Data

The monitoring program for well stimulation services includes a trend chart of Pump pressure vs. time using data from 2 pressure sensors mounted on the pump on the truck and a third sensor located at the wellhead.

A separate flow meter on the truck is used to record the flow rate and the number of gallons of fluid pumped vs. time. All of this data is displayed on a single, operator configurable graph page providing a comprehensive view of the operation in an easy to understand format.

Wireless Data Transfer

Data collection is performed automatically over Wireless Ethernet (WiFi). MTS uses WiFi hotspots for wireless connectivity and fast data transfer so that well Engineers, Field Operators and MTS management can all view data in real-time, using their PCs or mobile devices. The Expert Logger provides the data every second which provides a clear picture of operations on well stimulation services.

With their old data recorder, the pump operator would need to remember to bring a flash drive, save the local data to it, and turn it in at the end of the day. Now data collection is performed in a single event, automatically saved, then sent to a one-time "Cloud" account, and in 15 seconds it's available for Mr. England to view from any location.

He explains, "I have the program set up for three different ways to talk to the rig's PLC. It looks for the IP address of one of three communication types: USB, Ethernet or WiFi connectivity. If it can't find an IP address, the program won't start, so this way we ensure that the rig won't operate unless it's first able to transmit the data. This feature also prevents data tampering.

"Our customers love this: they can see all the data in real-time. This wireless viewing technology blows one of our customer's minds: he can even monitor us from any location while we're working on his job."

Electronic Documentation

Operators start and end their job with a button press that creates a datafile in CSV format containing an In/Out timestamp along with location name, well name, and operator name. During the shift, the ProfiSignal program automatically documents all operator actions taken, including pumping time and chemical switch-outs. This datafile is then exported as an ASCII2 file and timestamped.

Operators also have an option to open TeamViewer software (available free online) where they can receive a temporary passkey. This is then given to customers and allows a temporary one-time viewing of the job. In this way, customers can view data remotely in real-time instead of needing the Tool Pusher or Engineer in the 'danger zone' during the job.

Mr. England explains, "By adding Delphin, our data collection routine went from a 1 3-step training program to a simple 4-step process with minimal effort. This way, the customer can correlate and filter the data so the Delphin program is a documentation solution for us too. The simplicity of ProfiSignal is definitely there. The CAS inside Engineering Dept. has been nothing but helpful. Once I got the hang of the software, it was all cut-and-dry, very easy to maneuver in."

Alarm Capability

The program also has multiple two-tier alarms set. Four alarms provide over-watch on pump pressure and wellhead pressure. England explains, "We have a preset maximum value set for well pressure, given to us by the customer and then set in the program on our side by the Operator. Operators also have a digital alarm set with their rig PLCs."

The 2nd alarm tier causes an automatic truck shutdown, which is achieved by the software sending a command to the PLC, activating a relay which causes the truck to shut off. If the pressure exceeds this user-set max value, it only takes a second and a half to shut down the truck's valves and relieve all pump pressure. This guarantees that throughout operation, pressure never exceeds a few PSI over the set shutdown pressure.

Kevin England again: "This is definitely one of the biggest features that our customers request. We also have a way to automatically shut off the PLC via timer, which is nice because it prevents it from being accidentally left on indefinitely."

Productivity Monitoring

"There's a future application I plan to use with the Delphin loggers: a Volume calculator based on the well that the operator is at. We routinely get specs on the wells like casing diameter, displacement, etc. from engineers. I want to input this into ProfiSignal so that the operator can look at these numbers and match them up to the gallons pumped. This way, the customer can look at productivity and see that it's acceptable."

Benefits

Summing up the benefits of the new solution for monitoring well stimulation services, Mr. England comments, "At MTS, our biggest buying point for Delphin was its cost-effectiveness given the large feature set which combined everything we wanted to do. Before this, we used to use hand-programmed PLCs, but the technicians were $240/hr to hire and weren't available for weeks. If operations shut down, we had a BIG problem! Now we handle everything 100% in-house, without needing to wait or pay for support.

"As an example, one of our main customers in Long Beach recently required that all their contractors implement auto-shutdown capability during their jobs. Using our program, we were able to provide that requirement for them overnight. If we still had our old system, we'd have been out of luck and lost the work opportunity!

"Part of the ROI also comes from our new data collection method: because we now we have immediate, reliable data collection since job data is all auto-transmitted via wireless. Our operators are using HP laptops running Windows 7. ProfiSignal comes out crisp and clear on Win10; I would recommend it."

Following the development of this program, MTS Solutions purchased two more Expert Loggers in early January of this year, putting the total number of units purchased at six.

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For more information on Delphin Data Loggers, oil well stimulation services or to find the ideal solution for your application-specific needs, contact a CAS DataLogger Application Specialist at **(800) 956-4437** or www.DataLoggerInc.com.