White Paper

Ranger eRIGS™ Data Acquisition System is Transforming Completion and Production Operations at Oil & Gas Well Sites

Authored By

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Abstract

The oil and gas well service industry has not seen much innovation in decades, but data acquisition systems, such as Ranger eRIGS, developed by Ranger Energy Services, can deliver wellsite metrics to benchmark operational performance and improve efficiency.

Since the 1980's, digital monitoring systems have been developed for oil and gas drilling rigs to capture data from downhole sensors using wireline logging and measurement while drilling tools.

Today, these systems have evolved into advanced drilling, data acquisition, control, automation and monitoring systems. State-of-the-art automated rigs capture data and control the rotary system, pipe handling and makeup, top drive and hoisting system, fluids management and circulation systems, rotary steerable systems, well control systems, power systems and third party systems. Today's drillers manage the drilling process from an automated driller's cabin where they monitor and manage the integrated drilling systems with touch screen and joystick controls. Further, these automated rigs are monitored from anywhere in the world. Meanwhile, operators who are developing unconventional resources with long lateral well completions are requiring operational data to benchmark and optimize performance, but the well servicing segment has not adopted these drilling technology advancements.

Introduction

Digital Transformation

In 2018, Ranger Energy Services (Ranger), a premier provider of well completion and intervention solutions in the United States, began collecting the operational data and metrics to benchmark and improve performance. Initially, a worksheet based report was developed to capture completion and frac plug drillout data pertinent to the operation. The data from this spreadsheet was submitted via email to a central engineering team that could review it. The engineers would then evaluate operational performance, compare data with other internal benchmarks, identify opportunities for improvement, and prepare a post-job report. Finally, the team would warehouse the data for reference against future operations.

The next evolution was to automate the worksheet process and provide digital, real-time access to operational metrics and activities. Ranger personnel from Engineering, IT and Operations collaborated to define a system that would meet internal requirements. The company's Engineering and IT teams worked with an -- *Continued on next page*

Digital Transformation Continued

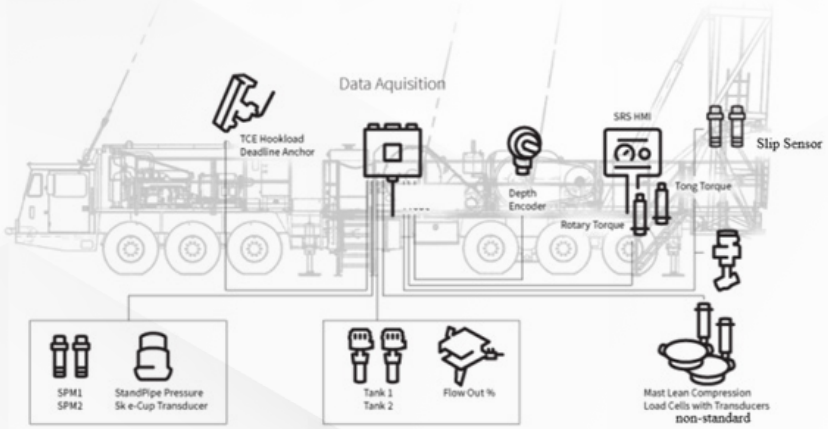
external resource to develop the initial system functionality to align with worksheet-based reporting. Engineering and Operations then conducted a field test phase of the software and hardware under live operating conditions. This phase enabled the team to refine the sensors, hardware, user interface, and software functionality.

eRIGS™ System Functionality

The result was Ranger eRIGS (Ranger Information Gathering System) data acquisition system. eRIGS consists of sensors on the rig and ancillary equipment that gather data metrics such as pump rates, pressures and volumes, weight, depth and torque. Operational alarms can also be set to notify personnel when parameters are nearing or exceed the desired operational range. The data is collected on location and is transmitted via the cloud to our engineers and managers as well as customers, wherever they are located. This data provides remote, real-time visibility to the operation that is taking place at a wellsite.

Specifically, eRIGS™ captures and calculates the following parameters:

- Total depth, bit position, hook load, block height, weight on bit, ROP
- Swivel speed, swivel torque, tong torque
- Pump pressure, pump rate, total pump volume into the well
- Standpipe pressure, wellhead pressure, flow out percentage, tank volume



Typical placement of eRIGS sensors on rig

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Ranger Live™

The eRIGS system is one component of the Ranger Live Mobile Platform, a customized suite of applications available to field crews at the job site via tablet or other mobile device. The suite includes a safety and quality system, a vehicle tracking and driver behavior management system, an electronic ticketing system, a preventive maintenance management system, and the eRIGS data acquisition system. Data for each system is captured on-site, transmitted via cloud-based internet, stored on Ranger's secure SQL servers, and is made available for access on any laptop, tablet or smartphone device.

Ranger Live suite of mobile applications

Data Transmission and Visualization

All sensor data and calculated channels are transmitted from the onsite server to the web-based portal via LTE. Each well has a job file that updates in real time and is stored in the portal for future reference. The well files are accessible to on-site company representatives, superintendents, engineers or any personnel who have been approved for access. The files can be accessed anywhere through the established website or mobile phone app. Users will be able to see a list of all rigs they have been granted access to. The user can then select a specific rig to view eRIGS data in real-time.

The viewer displays the real time data in strip charts plotted by time or depth. There is a second condensed view that displays the current values for specific channels. Also, activity notes are captured and displayed on a third view. Up to 25 channels can be displayed on the viewer simultaneously. The display can be customized with user preferences for settings, color, and units. The custom displays can be saved, distributed to other users and standard views can be created for various operations.

Customizable Real Time Data Website & Mobile Views

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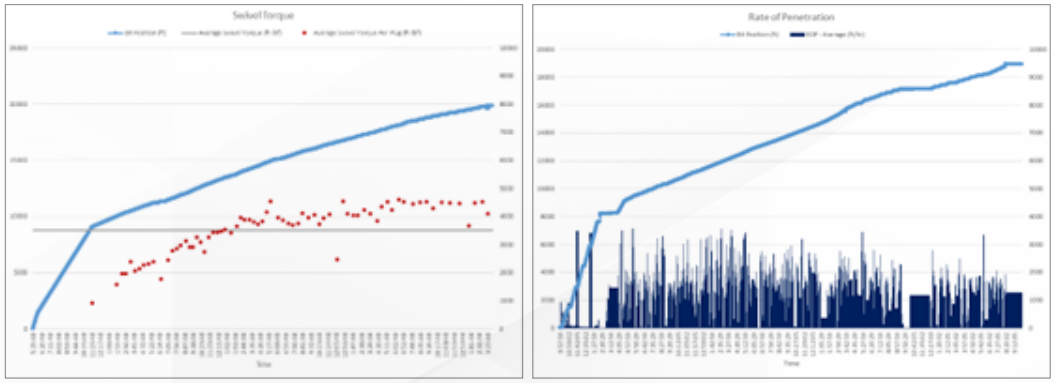
Technical Support and Data Analysis

Ranger's Engineering and Technology group offers technical, engineering, and operational support. Ranger engineers can monitor performance across multiple rigs to provide data quality assurance and aid in real time recommendations. Further, engineers can perform data analytics, benchmark operational performance, identify continuous improvement opportunities, prepare post-job reports, and compare post-job performance to pre-job plans.



Sample Data Analysis and Post Job Report Charts

Further System Development

The next version (v3) of the eRIGS data acquisition system has been developed and is currently being field tested. This version will utilize established instrumentation and will direct the sensor outputs into a modified software and visualization platform.

The upgraded version will provide a more customized visualization portal and post job reports that can be generated by any user at any time during or after the operation for historical records, comparisons or additional data analytics.

Ranger eRIGS Wellsite Display (v3)

Ranger eRIGS Portal Display (v3)

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› Conclusion

Enhancing Operational Performance

Ranger eRIGS data acquisition system can deliver live, digital wellsite metrics to benchmark operational performance, identify opportunities for improvement, and implement plans to optimize performance. Engineers, operations managers and customers can view live eRIGS dashboards via a cloud portal to monitor progress and performance across multiple operations and to provide technical support.

Monitoring real-time data from completion and production service operations can offer many potential benefits. These benefits include the ability to improve quality and safety performance, provide technical support, provide troubleshooting and coaching, reduce non-productive time, identify best practices, conduct analytics and trend analysis to benchmark operational performance, identify and implement operational efficiency improvements, and reduce operating costs. Ultimately, eRIGS will deliver consistent and repeatable performance that is scalable across multiple locations and regions on a platform that is capable of driving further efficiency gains. Finally, custom post-job reports can be compared to pre-job plans for future well optimization.

This latest data acquisition system for the well servicing segment is a transformative technology for augmenting operational performance in the oil and gas industry, providing real-time access to active operations, while enhancing management's ability to more effectively arrive at decisions that support operational performance and safety.

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› Company Info

About Ranger Energy Services

Ranger Energy Services (NYSE: RNGR) is one of the largest providers of high specification mobile rig well services, cased hole wireline services, and ancillary services in the U.S. oil and gas industry. Our services facilitate operations throughout the lifecycle of a well including the completion, production, maintenance, intervention, workover, and abandonment phases. Ranger Well Services offers high specification rigs, rig-assist snubbing, coiled tubing, rental and fishing, and plug and abandonment services. Ranger Wireline offers plug and perf completion wireline services, production and well intervention wireline services, and pressure pumping services for pump down perforating and stimulation treatments.