Connecting pieces of the PUZZLE

In pipeline construction work, there are several serial activities to be carried out, such as bending, bevelling, welding, coating and inspections, among others. Crucial pieces of data are collected during these processes, and it has become critical to establish a centralised means of bringing all data together to view and analyse on a single platform.

To achieve this, CRC-Evans has developed uLog, a cloud-based data logging system that focuses on bringing all of these pieces together. uLog collects, plots and analyses data, creating pertinent reports and completing data trend analysis. The data collection can be accomplished in real-time, as well as in historical mode by request. The collected data will be used to spot trends to improve the control system and minimise the variations of essential parameters, thereby predicting any impending issues and increasing quality. uLog attempts to close the gap in quality assurance to the end-user.

Shankar Rajagopalan, Chief Technology Officer, Advanced Technology Division, CRC-Evans Pipeline International, USA, introduces a new cloud-based data logging system.

System components

The uLog system components include a data server for each weld station, an access point that covers a 70 m radius and an Android mobile tablet. More than one WiFi access point may be needed for full coverage, depending on the number of weld stations. The data server, access point and mobile devices converge to form a closed WiFi network system. The secure cloud web application to create the job and enter job-specific characteristics can be done on most web interfaces. At this time, uLog data collection is limited to CRC-Evans' welding systems, but forthcoming developments will be focused to bring together pieces of data from other activities. The current system can perform real-time or historical acquisition of data, process, analyse and create PQR and WPS reports by applying API- and DNV-specific rules. This system is designed for both procedure qualification and production mode. Additionally, this application boasts a quality inspector mode for managing joint identification numbers and an inspector application to take quick snapshots of the current weld set to save and create end-of-day reports.

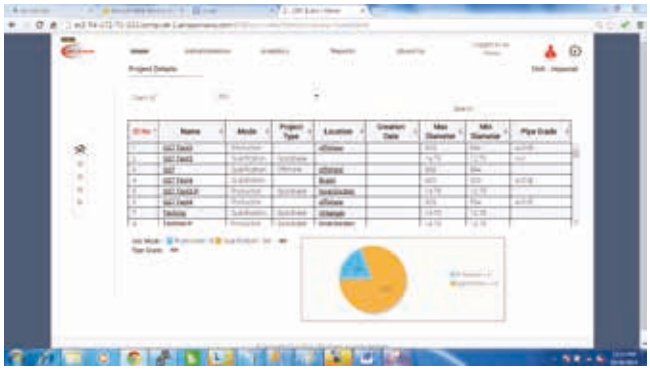

Figure 1. Cloud Dashboard.

Figure 2. Mobile application Dashboard.

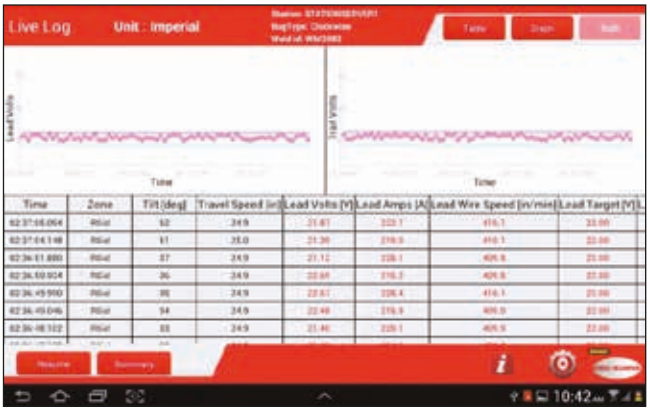

Figure 3. Data and graph view in Live log.

The uLog system process

The process begins with creating and entering job related parameters, such as job number, client information, pipe and material specifications on the uLog cloud server (Figure 1) by a cloud administrator. The uLog cloud server is a Security as a Service (SaaS) platform supporting multitenant architecture where multiple customers are served within same instance, yet customer-specific data remains segregated.

The job-specific parameter files for the number of welding stations are attached here and stored on the cloud by welding engineering personnel. This information is inherited by the field service personnel on his mobile device before the job begins and deployed to the machines on the job. This way, integrity is maintained; if there are any edits made on the parameters, they can only be uploaded back to the cloud by an authenticated user, so the current information is always available to the customer. A MySQL-based database is used on the cloud to maintain the data relative to a specific job. All log data and reports can be made available anytime and anywhere.

The mobile device can be authenticated for engineers, lead technicians, QA/QC personnel and inspectors. Each role will have its own main Screen (Figure 2) and the functions that can be performed are role-authenticated.

Furthermore, once the data is collected, trend and moving average analysis can be performed on the mobile device.

During a live log session, data plots can be viewed in real-time and the data points (Figure 3) can be customised for variables on an X and Y axis. A quick summary average of real-time weld data is available on this page, and all data logs are saved via the weld ID or the joint number.

A typical scenario for an offshore spoolbase pipe production scenario is shown in Figure 4. A pre-assigned file with all the weld numbers can be pushed from this application to a single station or all stations at once.

Historical data can be captured and analysed using a date and time range. Logs will be obtained from the machine if the mobile local database does not have the data downloaded prior to the request.

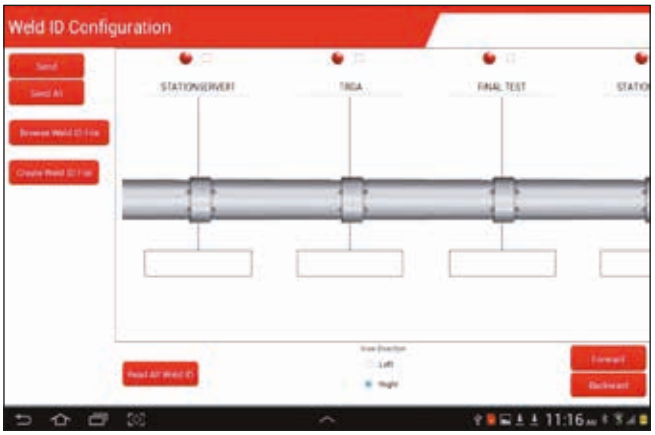

Figure 4. Weld ID deployment.

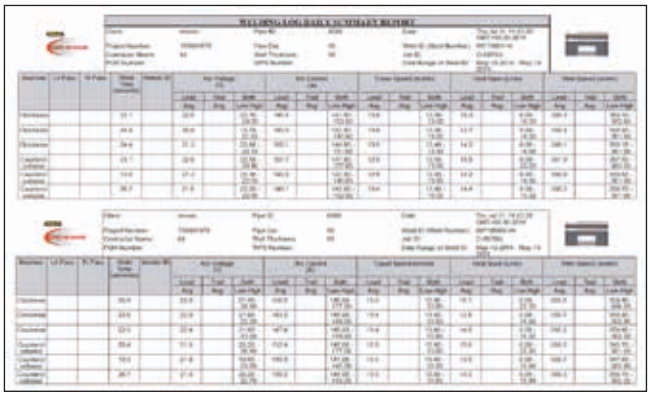

Figure 5. Daily report view.

The collected data can be used to create the appropriate reports. The PQR report will give the choice of selecting the appropriate weld number from a set of welds, and then a report will be generated. The WPS report allows customers the choice to select several PQRs, which are then used to create the report. The data for the reports is acquired from the information inherited from the cloud, weld parameter table and the log data. In instances where information is not available, user entry can capture data to be used in the report.

The WPS report also uses the formula selected for the specific job on hand. All user data presentation and reporting is available in imperial and metric units.

A sample of the daily report is shown in Figure 5. All data is logically organised by weld number to achieve a quick view for the full day. Electronic signatures are available on the reports to sign and send them to the right authorities for archival. A signature verification feature is currently in the development stages, and will be available on future versions of the system.

The process and machine control parameter set can be edited to suit the job and the logistics of the job itself. This system also keeps track of the machine software versions that were used, along with the parameter set so the process can be repeated anytime by keeping all the pertinent information for that job in one place on the cloud.

All data for the job can be synchronised to the cloud, if there is connectivity available. If a connection is not available, the local mobile device will hold that data to be uploaded to the cloud as soon as there is connectivity. The data for the job is stored in the data server connected to the machine, on the mobile device and on the cloud.

Summary

The power and value of this CRC-Evans cloud-based, universal logging system for the customer lies in its crucial ability to collect and analyse valuable data from a multitude of devices in a complex operational environment on a single interface. With uLog, end-users are able to process, organize, report, save and retrieve vital project data from a location on a mobile platform. WP

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