

Condition Monitoring of Final Storage for Radioactive Waste

Delphin TopMessage Modular Data Acquisition Systems

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CAS DataLoggers recently provided the data acquisition and control solution for a company with a government contract to plan, build, test and operate the final storage for radioactive waste material. The company had recently built a new final storage underground in salt-rich ground and first needed to perform condition monitoring prior to testing and running such an installation. Technicians needed to measure many different signals onsite including fluid pressure, air pressure, void pressure, temperatures, flow, and voltage. Naturally, this material needed to be stored at the most demanding standards, and according to the sensitive nature of this application, the measurement data had to be kept under a heightened security level, meaning that no data was allowed to go outside of the company, although alarming still needed to be set up on mobile phones. All these complications required a custom two-part solution: all measurement and data acquisition had to be done using standalone operation underground, while visualization and messaging would be setup aboveground. The contractor began searching for a modular data acquisition system capable of high-speed measurement, standalone operation for extended periods underground, and powerful software that could develop a means to view data recorded underground from a remote surface location.



The contractor installed **2 TopMessage data acquisition and control systems** in the final storage site as part of a complete condition monitoring solution. For this unique setup, management utilized a complete electrical cabinet housing both TopMessage devices underground. The connection between underground measurement and aboveground visualization was formed via an Ethernet connection. In case of an electrical power outage, the whole cabinet would be able to operate for more than 6 hours, and both above- and underground systems were secured with a reliable UPS. Data would be saved even when connection to the surface was lost, and in such a case, an alarm would be generated and sent to specified mobile phones.

A major issue for the contractor was the fact that in order to send SMS warnings, the message device needed a GSM modem, which was usually connected with a serial interface. However, since the distance between the subterranean site and the surface was over 300 meters, it was necessary to find another solution. Therefore a special router was developed that was able to convert email subject headings into SMS. This SMS router was then installed aboveground, giving personnel the ability to receive emails through Ethernet from four different senders and also to transfer the SMS message to four different

addressees. Through this workaround, alarms could be sent outside the company area without sending any sensitive measurement data.

The Delphin system architecture bridged the gap between the final storage site underground and technicians on the surface. Underground at the storage site, the TopMessage master was connected to sensors performing condition monitoring on the hazardous materials. This master was also connected to a slaved TopMessage which was connected to more sensors and to a signal amplifier. The master system was then connected to a switch which communicated with a switch on the surface. The aboveground switch was then interfaced with an SMS router to send the SMS messages, and also to an office PC to monitor and analyze the data. Aboveground this solution was developed using Delphin's ProfiSignal Klicks universal software for data acquisition, test automation and data acquisition applications. The software's applications ranged from simple data storage and visualization to forming a complete automation solution with reporting. From the surface, the customer could now view online collected data at any time without needing to travel underground, and personnel could always rely on an overview using alarms and sending SMS messages. Automatic ASCII export was working continuously so that if an export was interrupted or if the connection between PC and the TopMessage system was lost, then the application recognized when the last data was exported and simply started on the next export trigger event at the point of interruption, without any loss of data.

The customer benefited from several key features of their Delphin TopMessage systems, especially from eliminating the need for technicians to go underground, which saved a great deal of time and greatly improved safety conditions. Complete measurement and ASCII export were all automated by the master and slave devices. Additionally, the data was kept highly secure with these reliable systems communicating both on the surface and underground. Alarms were setup for measurements, the systems themselves and their connections, which were then generated and converted to SMS, and could be sent individually to an addressee. Finally, the powerful TopMessage/DataService Configurator software enabled the E-Mail to SMS converter for an advanced and efficient communications option.

For more information on the Delphin TopMessage data acquisition system, other real-time devices from Delphin, or to find the ideal solution for your application-specific needs, contact a CAS Data Logger Applications Specialist at (800) 956-4437 or visit the website at www.DataLoggerInc.com.

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