CAS DATALOGGERS

Decentralized Acquisition Keeps Pumping Stations Running Smoothly

## Remote Monitoring Of A Municipal Wastewater Utility

Distributed data acquisition and autonomous monitoring of multiple systems and machines at separated locations is becoming increasingly important. These applications often require the ability to employ different connectivity options based on distance, infrastructure, and terrain to allow remote monitoring. Faced with a need to update their data collection equipment, the city of Ennepetal used the compact Loggito Loggers from Delphin Technology AG to monitor its wastewater pumping stations.

The municipal wastewater utility for the German town of Ennepetal operates 18 pumping stations located throughout the town. Sump pump levels and operating states are monitored at each station. Two pumps are alternately operated via a programmable logic controller (PLC), enabling optimum regulation of inflows and outflows in the overall system. To ensure the wastewater system operates reliably, it must be monitored around the clock to enable rapid response in the event of malfunctions, such as blockages or pump problems. In the past, the relevant data was transmitted to service technicians via the 3G mobile phone network. The impending 3G network sunset, and the switchover to LTE (4G), required upgrading of the data acquisition system. To provide a future-proof system, Delphin Loggito Data Loggers from were selected.

Autonomous, Decentralised DAQ At Each Station

To ensure autonomous data acquisition, Loggito Loggers were installed in each of the 18 pumping stations. By using high-precision, universal analog inputs, it was

possible to easily connect the sensors required to monitor sump liquid levels and power consumption, as well as collect operating data and identify fault conditions. The acquired process data, in combination with internal statistical and calculation channels, provides information about the current condition of the pumping stations. Operating-hour meters allow the calculation of accumulated run time to enable predictive maintenance for the pumping stations. The pumps can then undergo optimal and proactive maintenance while unscheduled downtimes can be minimized. Centralized monitoring is enabled by having each Loggito Logger measure, pre-process, and store the data locally and then forward it via a network or cellular connection to a data server at the main headquarters.
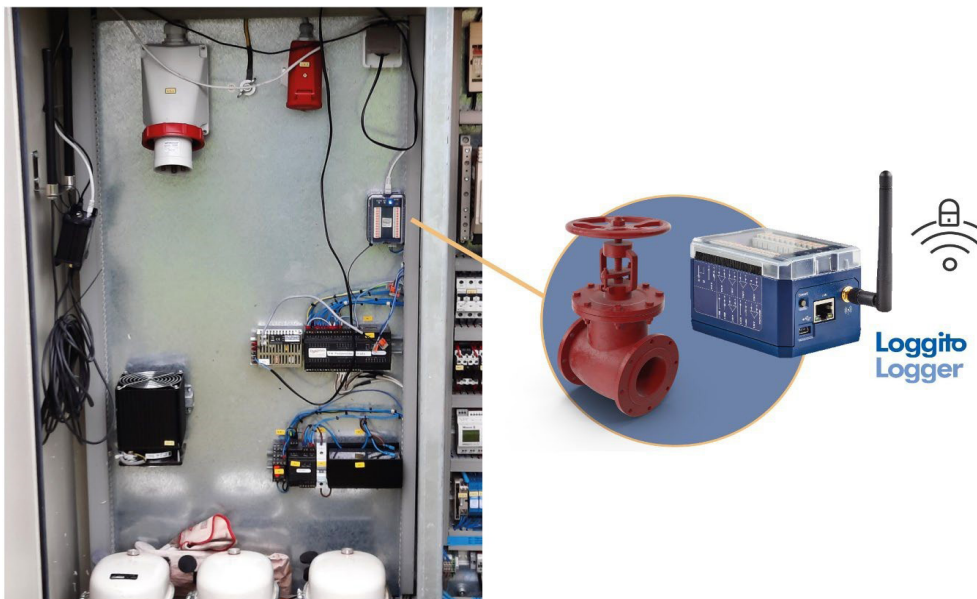
Loggito logger central integrated with an Ennepetal pumping station. From "Decentralised Acquisition" by Delphin Technology, 2022

Internal Data Storage For Extra Security

The Loggito Logger operates independently of a PC and its internal data storage capability ensures a high level of data security and reliability in remote data collection and transmission. In the event of network connection failure or a malfunction of the central server, all recorded data will be stored in the internal data memory.

Remote data transmission to the server then automatically resumes as soon as the network – either hardwired or cellular - and the server are available again, without requiring any intervention from the user. This means no data is lost and the measurement database on the server is updated without any gaps.

Monitoring At the Edge

Due to the Loggito Logger's autonomous capability to measure, pre-process, and analyze data at each pumping station, independent monitoring including automatic shutdown functions can be performed. Autonomous operation means such functions are always guaranteed, even when communications to a pumping station are temporarily interrupted. For example, when a motor temperature threshold value or power consumption of a pump is exceeded, the Loggito Logger's digital outputs can be used to shut down the system.

Transmitting Measurement Data To A Central Server

In addition to the installation of Loggito Loggers, LTE routers with high-gain antennas have also been installed at remote pumping stations to transmit the acquired measurement data to a central server via LTE. The routers are equipped with an automatic restart function which re-establishes connections and ensures remote data transmission in the event of a connection failure or the VPN gateway becoming unavailable. The Delphin Data Center (DDC) and the ProfiSignal 20 software are installed on the server and perform centralized measurement data management tasks as well as user administration. All data collected from the 18 pumping stations is linked together on the server, centrally stored, monitored, and analyzed.

Measurement data is securely and traceably archived and can be accessed within seconds, whether on a network using PCs, or mobile using smartphones or tablets. Data from all pumping stations can be easily combined to enable comparisons and a more detailed analysis of the individual pumping stations.

Transmission of the measurement data to end devices is realized within a secured network via a VPN tunnel. Connections to the individual Loggito Loggers as well as the status of each measuring site are also monitored centrally and automatic email alerts can be sent. The DataService runs on the server as a Windows service, so users can directly access the data, and alarms can be sent by email at any time. Staff can access the Data Center via the OpenVPN Client. Smartphones and tablets can also access the PS20 server and the Data Center via the OpenVPN app and PS20 client app and access visualization features. The required PS20 app can be downloaded free of charge from app stores for both iOS and Android devices.

Remote access to each pumping station has additional advantages allowing users to visualize measured data and configure the Loggito Loggers from any location. User management enables the definition of the user groups authorized to make changes to the basic system and device configurations, and which user groups have read-only access to the system. Service technicians can then, for example, modify limit values or the monitoring and storage of various parameters without having to spend time and effort traveling to a pumping station. This increases flexibility while also saving re-sources.
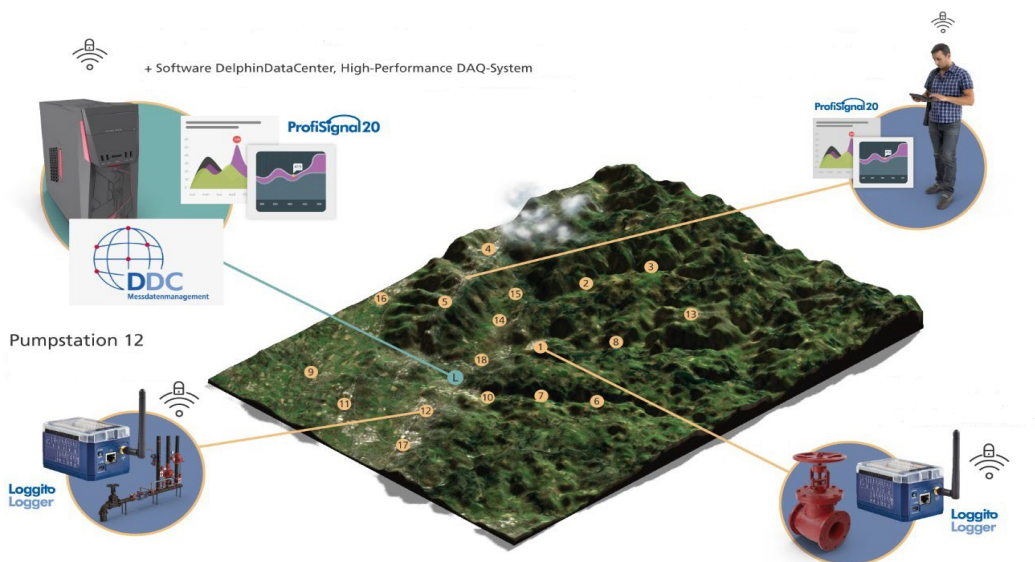

Demonstration of data transfer between devices. From "Decentralised Acquisition" by Delphin Technology, 2022.

Visualizing Measurement Data for Service Technicians

The [ProfiSignal 20 Basic software](#) provides the monitoring system's front end and acts as an interactive user interface. The platform-independent complete software package for visualizing and analyzing acquired measurement data can be installed in the control room as a desktop application or accessed at any time via the PS20 app on the mobile devices of service technicians. Measurement values and their trends over time are displayed on dashboards as measurement curves. These trend displays enable quick and easy viewing of historic measurement data. An overview diagram provides status readings based on combined alarms for all 18 monitored pumping stations.

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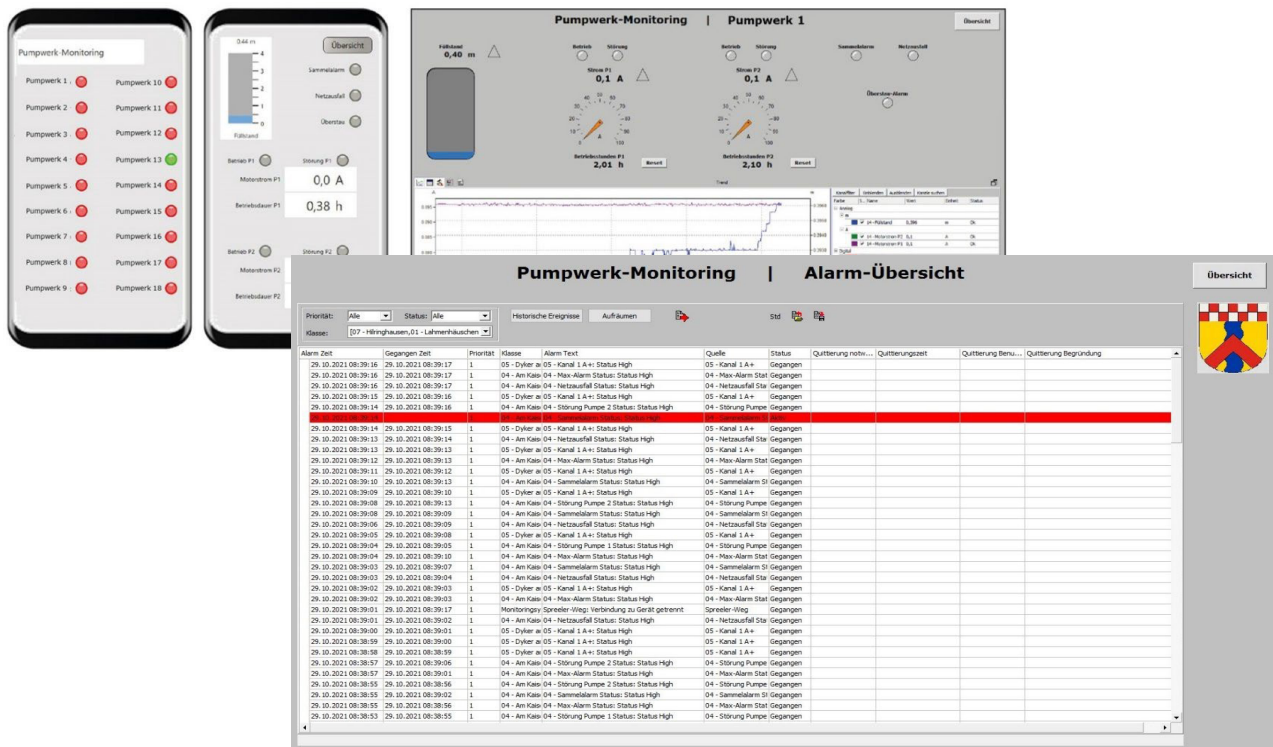
Measurement Data Visual for Service Technicians. From "Decentralised Acquisition" by Delphin Technology, 2022

rate diagram. This means that mobile service technicians as well as office staff have access to all measurement data at all times.

Future Outlook

The monitoring system can be further expanded by the DDC pooling the data of all 18 Loggito loggers on a central server. For example, pumping stations could conceivably communicate with each other, i.e. Loggito Loggers sharing data via the DataService. In this way, levels within a downstream sump could be checked before issuing an upstream pumping command, thereby preventing overflows. Other peripherals, such as variable frequency drives, power meters, and weather stations at the pumping stations can also be integrated into the Delphin monitoring system using versatile interfaces such as Modbus TCP and OPC UA. The flexible architecture of the Delphin hardware and software allows for future enhancements such as the ability to add new features, control the pumps, or even replace existing control systems. Plenty of options for the system's future expansion are therefore available.

Conclusion

"Since we have been using Delphin's monitoring system, we always have at hand all the key pumping station data, both in the office and when we are mobile. We can therefore respond in the best possible way at any time and do not need to actually go out to the pumping station. This saves working time and money!"

About The Author

This Application Note has been adapted from an article written by Delphin Technology. Delphin Technology is the manufacturer of the Loggito series of data loggers.

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For more information on Delphin Loggito Loggers, 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.