

Monitoring Flush Mechanisms Using Automated Data Collection

dataTaker DT800 Intelligent Data Acquisition System

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CAS DataLoggers supplied the datalogging solution for a large manufacturer of toilet flushing mechanisms which wanted to automate the data collection in their product development lab. They had been using a combination of simple digital gauges for water pressure and flow as well as a stopwatch to capture test data for new designs. Each test of a new design change required measurement of maximum flow rate, total flow volume, minimum pressure, and fill time at a number of different water inlet pressures. During the test, data was recorded manually on a clipboard and then input manually into an MS Excel spreadsheet. Management soon saw the need for an automated solution which would entirely replace the current time-intensive process which drew personnel away from more critical work. This solution would need to be cost-effective, flexible enough to monitor all the different parameters, and capable of stand-alone operation for real-time data acquisition.

A **dataTaker DT800 Intelligent Data Logger/Data Acquisition System** was selected to record the data. The flexibility of the dataTaker's universal analog inputs allowed operators to use the existing pressure and flow sensors, some of which had voltage outputs and some of which had 4-20mA current outputs. Robust and versatile, the DT800 offered high-speed datalogging with up to 42 analog inputs, comprising 42 separate single ended channels or 24 differential channels. These were isolated and over voltage protected, with measurement across 12 auto-scaling ranges from 10mV to 13V full scale. All common measurement types were supported, including DC and AC (RMS) voltage, current, resistance, temperature, bridges, strain gauges, 4-20mA loops and frequency. Adjustable excitation and triggering were provided on all channels. A serial sensor port was also included for sensors with RS232/485 or SDI-12 capability. Digital I/O consisted of 8 digital input channels and 8 digital I/O channels. Two of the digital inputs had adjustable threshold for the monitoring of low level signals. Digital state counts at up to 10kHz and triggering were supported on all digital channels.

Next, a program was written which used the triggering and totalizing of the data logger to capture the data of interest. A real-time schedule sampled the flow rate and pressure at a rate of 10 times/second. This data was shown on a dashboard for live data display. For the flow rate, an alarm was set to trigger when the flow went over .02GPM which indicated the start of the flush. This alarm then started a second flush schedule which ran during the flush/fill cycle.

This second flush schedule (which also ran at 10 Hz) performed the logic and calculations to capture the key data: for example, the water flow rate was totalized (integrated) to determine the flow volume. The flush schedule also monitored the instantaneous water flow rate to determine the peak volume,

monitored the instantaneous water pressure at the tank inlet to determine the minimum pressure, monitored the pressure at the tank outlet to determine the peak back pressure in the outlet, and recorded the time duration since the start of the cycle. This second schedule also had an alarm set on the water flow rate. In this case, the alarm was set to trigger when the flow rate had dropped below 0.01 GPM, indicating that the tank had filled completely and that the cycle was over. This alarm stopped the flush schedule and triggered a third report schedule which summarized the data and reset the internal calculation variables for the next cycle. The data from each cycle was captured in the data logger, both as the raw pressure and flow vs. time values and as the summarized data for each cycle. The DT800 could store up to 130,000,000 data points and utilized an ATA Flash PC Card slot for removable data storage.

Using the graphing capabilities of the user-friendly configurable dEX software, a chart page was created to display the pressure and flow data during the cycle. A dashboard page was also created to display the summary of the results from each flush cycle. The dEX software's intuitive graphical interface allowed users to configure the data logger, view real-time data in mimics, trend charts or tables, and retrieve live and historical data for analysis. dEX ran directly from a web browser and could be accessed either locally or remotely, anywhere that a TCP/IP connection was available including worldwide over the Internet. Operators could utilize any of the logger's built-in communications ports to view dEX including Ethernet, USB and RS-232.

Finally, to automate the data reporting, the DDE capabilities of the software were used to automatically send the summary data to an Excel spreadsheet. A form was created that received the new data form at the end of each flush cycle. An Excel macro monitored these cells, and when new data appeared, the macro simply copied it to a new row in the report and updated the statistics. This eliminated the need to manually enter the data and allowed the customer to easily process the data gathered from dozens of runs.

The manufacturer realized several advantages from installing the dataTaker DT800 in its product development lab, most important of which were the significant time and cost saved by entirely automating the lab's data collection, freeing up personnel for other necessary duties. Suited for applications requiring high-speed, multiple versatile channel inputs and large storage capacity, the DT800 also offered free software which generated the convenient dashboard page providing clear organization of the test results.

For more information on the dataTaker DT800 Intelligent Data Logger/Data Acquisition System, other dataloggers in the highly successful dataTaker product line, 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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