How to improve test accuracy with the latest sampling technology

Liquistation CSF48 automatic sampler

Sampling and laboratory testing are major responsibilities for water professionals. Test results are used for process control, and ultimately to determine that water is safe for drinking, reuse, or discharge to the environment. Regulatory agencies rely on reported results for proof of permit compliance. So, obtaining representative, properly collected and preserved samples is the first critical step to ensure accurate test results.

Endress+Hauser is a global leader in instrumentation and process automation. It is also one of the largest instrument manufacturers in the United States. Water Online spoke with Alan Vance, environmental industry manager, and Steven Smith, senior product marketing manager–liquid analysis, about the latest in water sampling technology.

Proper sampling is critical to ensure water testing results are accurate. What are some of the most important features to look for in an automatic sampler to ensure representative samples are collected?

Stationary samplers like the Endress+Hauser series CSF34 play an important role within a municipality as both operators and lab personnel want assurance that the representative sample is collected and preserved so it can be properly analyzed and recorded. The enclosure needs to be rated for outdoor use and in addition be vandalism proof.

The pumping technology must be reliable and accurate. Keeping the sample properly preserved is critical. So, having a fail-safe cooling system that is truly capable of cooling down the sample in a timely manner is integral to the sample. Finally, having a sampler with a simple menu for guided setup is an important feature.

What type of sampling control do automatic samplers provide (time, fixed-volume, or flow-proportional)?

All three sampling methods are available, plus a fourth, which we will discuss in the next question. Time-proportional sampling applies constant-time, constantvolume (CTCV) samples at regular time intervals, sampling the same volume each time. Flow-proportional sampling applies a variable-time, constant-volume (VTCV) approach where the timing of samples is based on flow. This method relies on an input from a flowmeter to the sampler. A flow measurement can also be used for flow-proportional sampling that pulls variable volumes over fixed time intervals (CTVV; constant-time, variable-volume). The sampling volume is calculated from the flow rate, where more volume is sampled when flow is high compared to when flow is low.

How can automatic samplers be used to sample only during events, such as when the pH reaches a certain level, during periods of low dissolved oxygen, or other specific criteria?

The Endress+Hauser CSF34 sampler can also draw a sample based upon an event. The sampler electronics (controller) can communicate with up to four individual externally mounted sensors. For example, with a pH sensor connected to the sampler, the sampler can be programmed to draw a sample and place it in separate bottles if the pH is too high or low. This approach is referred to as event-based sampling.

What determines whether a vacuum pump or peristaltic pump should be used in an automatic sampler?

A vacuum pump provides precise repeatable volume with high transport velocity, has no consumable parts, can be used with variable sampling line sizes, and is not affected by changing the vertical lift. Vacuum pumping also does not macerate the sample. Peristaltic pumps are relatively easy to set up, have fewer parts, and are rugged. But, peristaltic pumps have lift limitations. One major difference is that sample volume is

easy to change with a peristaltic pump by simply running the pump longer. Vacuum pumps always draw the same volume. To summarize, vacuum pump systems provide accurate, as well as repeatable, sample volumes for a higher level of performance in more demanding applications, while peristaltic pumps are convenient for short intake and suction heights and variable sample volumes.

What sampling options are available to sample from pressurized pipes or tanks?

There are two methods that can be used to sample from a pressurized pipe or tank. A retraction device can be inserted in the process to automatically withdraw a sample and then deliver it to the sampler. While these retractors do an excellent job of extracting a sample, they generally must be installed above the sampler so that the sample can flow from the retractor to the sampler. Another method is a flowthrough assembly that is plumbed to the pressurized pipe or tank. When sampling is desired, flow through the assembly is delivered to the sampler under pressure.

How should sampling data, such as time and amount collected, be documented?

Samplers can have log books that will record many pieces of sampling data. For example, a data log may contain sampling time, bottle number, number of samples per bottle, number of times a sample was not taken, number of times sampling was canceled, etc.

Is it possible to program automatic samplers and check sampler status remotely, and can data be viewed on the web?

Automatic sampling status can be remotely monitored, while the programming of the device is typically done directly on the sampler. Data can be viewed several diverse ways, including on the device or remotely using digital communications or web-based interfaces.

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How do automatic samplers ensure samples are kept at the proper temperature for preservation?

One of the most key features of a sampler is the cooling system, which preserves samples properly. Endress+Hauser's unique sampler design uses a fan-forced cooling system that blows refrigerated air into the bottle chamber. This continuous circulation of cold air ensures the sample is cooled to preservation temperature as quickly and efficiently as possible. Other samplers use cooling coils that rely on inefficient convection cooling. Additionally, the Endress+Hauser sampler refrigeration system is mounted in the upper half of the sampler and is selfcontained for ease of service. In addition, any exposed copper tubing in the system is coated to prevent any corrosion from gases like hydrogen sulfide (H2S). The unit can be programmed to the correct temperature (36° to 68°F), and this temperature is recorded in the unit's internal data logger. Optional temperature sensors are also available for individual samples and outside temperature.

How are software upgrades accomplished with these automated samplers?

Software upgrades are easily accomplished using an industrial SD card for firmware transfer to the sampler. By loading the updated firmware on an industrial SD card, the firmware can be transferred to the sampler through an SD card drive on the sampler electronics. Software upgrades are only a few button-presses away and do not require reprogramming of the sampler.

What are typical maintenance requirements for automatic samplers?

The primary maintenance in an automatic sampler is routine maintenance of the sampling pump. Peristaltic pumps require routine tubing replacement and periodic roller servicing. Vacuum pump systems may require periodic cleaning to ensure the level sensors are operating properly, the vessel is clean, and vacuum tubing is maintained. Small maintenance requirements will also include filter changes for air intake for the refrigeration system.

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