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Tech Note 171108-1: Early Rinse Command and more Aggressive Sensor cleaning with Bleach

New feature

Background: Cycle uses a wet chemical method that causes blue staining of materials. The staining is thought to grow worse as a material soaks in the solution. Over time, less light is available for the Cycle measurement, and eventually service is needed to clean surfaces and regain optical transmission. In current Cycle operation, after chemicals are mixed with sample water, enough time (10 min) is given for the chemical reaction to reach completion even at very low temperatures.

A new feature enables Cycle to rinse after the reaction is complete and the analytical signal has been selected, rather than waiting the full time. More specifically, the feature starts rinsing a specified number of pump counts after the signal has been selected. Preliminary lab testing suggests this feature can minimize window staining. A side effect of this feature is that not all runs will take the same amount of time (times may be less).

New feature instructions: The new feature can be implemented in the Cycle Host Software's monitor tab, or using any terminal emulator. Once communications have been established and the PO4> prompt is visible, enter

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$KCO Argument
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The "Argument" is a positive integer in pump counts (pump counts at 2 Hz). For example, entering the text: \$KCO 120 will cause rinsing to occur 120 pumps, or 60 seconds after the analytical signal has been selected. 120 is the recommended value for this feature.

New, more aggressive, cleaning method

Background: The current Cycle maintenance procedure calls for periodic cleanings with Micro-90 (~every 1000 samples). Users have found that this cleaning isn't always effective enough to regain enough counts, especially in high phosphate and heavy clay waters. Micro-90's cleaning mechanisms are two-fold: 1) a surfactant to help remove organics and 2) a chelating agent that renders the blue complex colorless.

An alternate mechanism effective for both rendering the blue complex colorless and removing natural materials is oxidation. Bleach has been found to be effective at regaining counts in Cycle and at eliminating the blue color. Bleach is already known for its powerful cleaning and antifouling properties. The Cycle sensor materials are compatible with bleach, but care must be taken not to 1) pump any reagent while bleach is in the system and 2) to thoroughly rinse the Cycle after bleaching. Because bleach and Micro-90 use different mechanisms, it has also been found that in some cases they can have an additive effect. It is ok to use both procedures to clean a Cycle, but make sure that the Cycle is fully rinsed between cleanings.

New method instructions:**WARNING**

Bleach should never be mixed with ammonia as it can produce dangerous gases. Follow safe handling and disposal instructions on bleach containers and use PPE.

Note

Never pre-dilute bleach, it will go bad.
Bleach has an expiration date. Use bleach well within its useful lifetime.

Bleach comes in several different concentrations: Clorox® “Pro Results” concentrated outdoor, “Ultra,” and “Regular.” The best results have been obtained with Pro Results bleach. Depending on the type of bleach it will have to be diluted differently:

- Pro Results 9:1
- Ultra 2:1
- Regular without dilution.

For example, mix Pro Results bleach at 9 parts water to 1 part bleach. For Cycle you will only need 40 mL total, so 4 mL bleach and 36 mL of water.

Make sure the Cycle has been flushed (i.e. a run has completed or you have used “Flush” with clean water). Perform the bleach cleaning similar to the Micro-90 cleaning procedure by having a 1/8” ID inlet tube in the bleach. Fill this tube using the syringe and connect it to the Cycle sample intake. Push **Flush** on the *Settings* tab and wait 5 minutes. Rinse the tube and place it in a container with clean water (filtered to at least 10 µm). Prime it with the clean water using the syringe and attach tubing full of water to the sample intake barb. Put a check in the “S” box only and enter 15 in “Pump Controls” on the *Settings* tab. Let the bleach solution sit in the sensor for 30–60 min. Push **Flush**. Flush the sensor 2 more times for a total of 3 clean water flushes.

Comparing the “Flush1” values in the summary file from before and after cleaning will give an indication of the counts recovered from cleaning.