

Anti-Fouling Kits Significantly Slow Rate of Biological Fouling on Water Quality Instruments



Stop the Fouling!

What happens when an environmental monitoring organization can't make it back into the water to check on its expensive water quality equipment? The reasons are numerous: bad weather, rough sea state, a budget that can't afford another boat rental, or personnel that are tied up with other pressing matters. Whatever the reason, the results are often dismaying. The equipment gets eaten alive!

We're not talking about sharks or other predators. We're talking about the many tiny organisms found in fresh and marine waters that adhere to surfaces, including water monitoring equipment. The organisms are commonly referred to as biofouling and include bacteria, sponges, barnacles, algae, and mussels. These tiny monsters wreak havoc on sensitive scientific instruments, even those that have been designed to work in these tough environments.

Site Visits Are Expensive

For water quality monitoring groups, regular maintenance of equipment is important to protect their sizable investments and ensure accurate data. But frequent trips to the field can be very costly or even become impossible in bad weather, especially for off-shore sites

In the middle of Tampa Bay Sherryl Gilbert faces a challenge. Funding for her ocean monitoring program is "bare bones" these days, so money is tight when she needs to rent a boat for the 30-minute ride to equipment owned by the University of South Florida. "It's expensive and can be dangerous to get out there," Gilbert says.

When valuable research and data collection are on the line, many groups do the best they can.

Florida is "the worst place in the world to monitor," notes Gilbert, referring not only to the hurricane-prone weather but also the extreme rate of biofouling that occurs in these warm waters. Her organization has built relationships with others in order to stretch their collective resources. With a mixture of mirth and exasperation, Gilbert notes, "When money is tight, we even hitch rides with the harbor pilots!"

Halfway across the country, a water resources agency in Texas faces a similar issue. "Each service visit requires cleaning, verification readings, and switching sondes on a small platform that is not very friendly in windy weather," observes the local program



After two weeks in the water, monitoring equipment can become covered with a variety of biofouling organisms

manager. "The employee drop-off/pick-up to the raft can be a dangerous exchange," The agency has monitoring equipment suspended from a raft in a man-made freshwater reservoir. The raft, located at the reservoir's dam, has very little protection from the strong winds racing across the flat terrain of the state.

Reducing the Number of Visits Needed

In response to these two situations, and many similar ones encountered by our customers, YSI sought improvements to its equipment. The company has been conducting research for the past two years at ten U.S. sites.

The goal: Extend the length of time equipment can be deployed,

thus reducing the frequency of maintenance trips. The path to this goal: Develop new equipment that can stay underwater longer without being affected by biofouling.

The result? “We basically cut the visits in half in our algae fresh-water environment,” reports the manager in Texas.

His site and the other test sites represent different environments, including fresh, estuarine, and marine waters. The development effort consisted of installing YSI water quality instruments (6600 V2-4 sonde) into these challenging fouling conditions. Over time the company introduced a variety of prototype parts to the sites, testing which materials and parts succeeded in reducing the effects of biofouling while remaining durable.

After extensive testing, YSI identified several copper-based components that indeed prevent the growth of the troublesome organisms. These components are now available as affordable “anti-fouling kits,” which include a copper-alloy sonde guard, copper tape for probe housings, copper-alloy wiper assemblies with extended brushes, and port plugs.

Copper-Alloy Parts Provide Return on Investment

In Florida, Gilbert has also had encouraging results with her instruments that are equipped with the anti-fouling components. Her site visits were reduced by 60%. This has provided a little more breathing room in her tight budget.

Test results from Florida and Texas for YSI sondes deployed with anti-fouling kits and control sondes:

Marine Site:

Maintenance costs over 12-month intervals

<i>Without anti-fouling kit</i>	<i>With anti-fouling kit</i>
<i>approx. every 2 weeks</i>	<i>approx. every 6 weeks</i>
<i>\$600/day for boat & crew</i>	<i>\$600/day for boat & crew</i>
<i>\$15,600</i>	<i>\$5,200</i>

Freshwater Site:

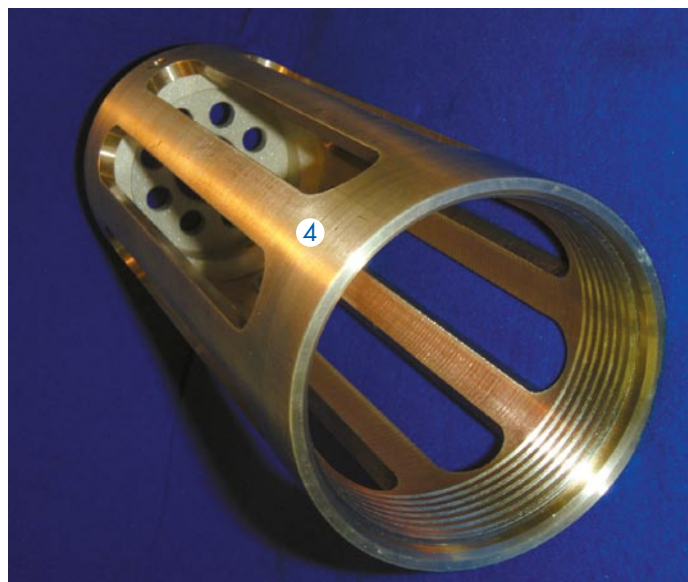
Maintenance visits over 11-month intervals

<i>Without anti-fouling kit</i>	<i>With anti-fouling kit</i>
<i>20 (approx. every 2 weeks)</i>	<i>8 (approx. every 4-5 weeks)</i>

Cleaning and Calibration a Breeze

If you own water monitoring equipment, you can’t avoid the regular maintenance required to keep these instruments at peak condition. The accuracy of data depends on it.

Previously organizations could spend anywhere from several hours to a couple days cleaning hardened biological organisms off their equipment. “With all the scraping and hacking I had to do, I was afraid I’d wind up breaking the equipment,” cautions Gilbert.



Anti-fouling kits include 1) copper tape, 2) wiper assemblies with larger pads, 3) extended brushes, and 4) sonde guard

With anti-fouling kits, monitoring equipment is remarkably free of biofouling after one week (above) or several weeks' deployment (below)...versus the control equipment

Now, with the anti-fouling components on her YSI sonde, “all I really need is a small brush and a ten-minute soak in vinegar to clean it off.” She noted that the harder barnacles were not growing as quickly as before on the sonde, thus “the chance of breaking the equipment while cleaning it is significantly reduced.”



Labor for cleaning sonde after deployment

<i>Without anti-fouling kit</i>	<i>With anti-fouling kit</i>
<i>24-hour soak</i>	<i>10-minute soak</i>
<i>2 hours scraping</i>	<i>30 minutes scraping</i>

The agency in Texas sees additional savings for its program. The less frequently it has to retrieve sondes for maintenance, the more it saves money on calibration solutions and saves time on post-data processing and labor. Plus it conserves gas, since the drive to the lake is one hour and forty-five minutes. Given the unpredictable nature of the wind on the lake, fewer site visits also mean increased safety of the agency’s employees.

Overall, YSI’s anti-fouling kits decrease site visits and maintenance for customers who collect data at remote sites. The cost savings realized by this helps to stretch tight budgets. And in the best scenarios, it could lead to more water quality data collection sites being added to networks – a boon to natural resource monitoring in Texas, Florida and around the world.

YSI would like to thank the following agencies for their participation in the extensive field testing of our anti-fouling components:

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