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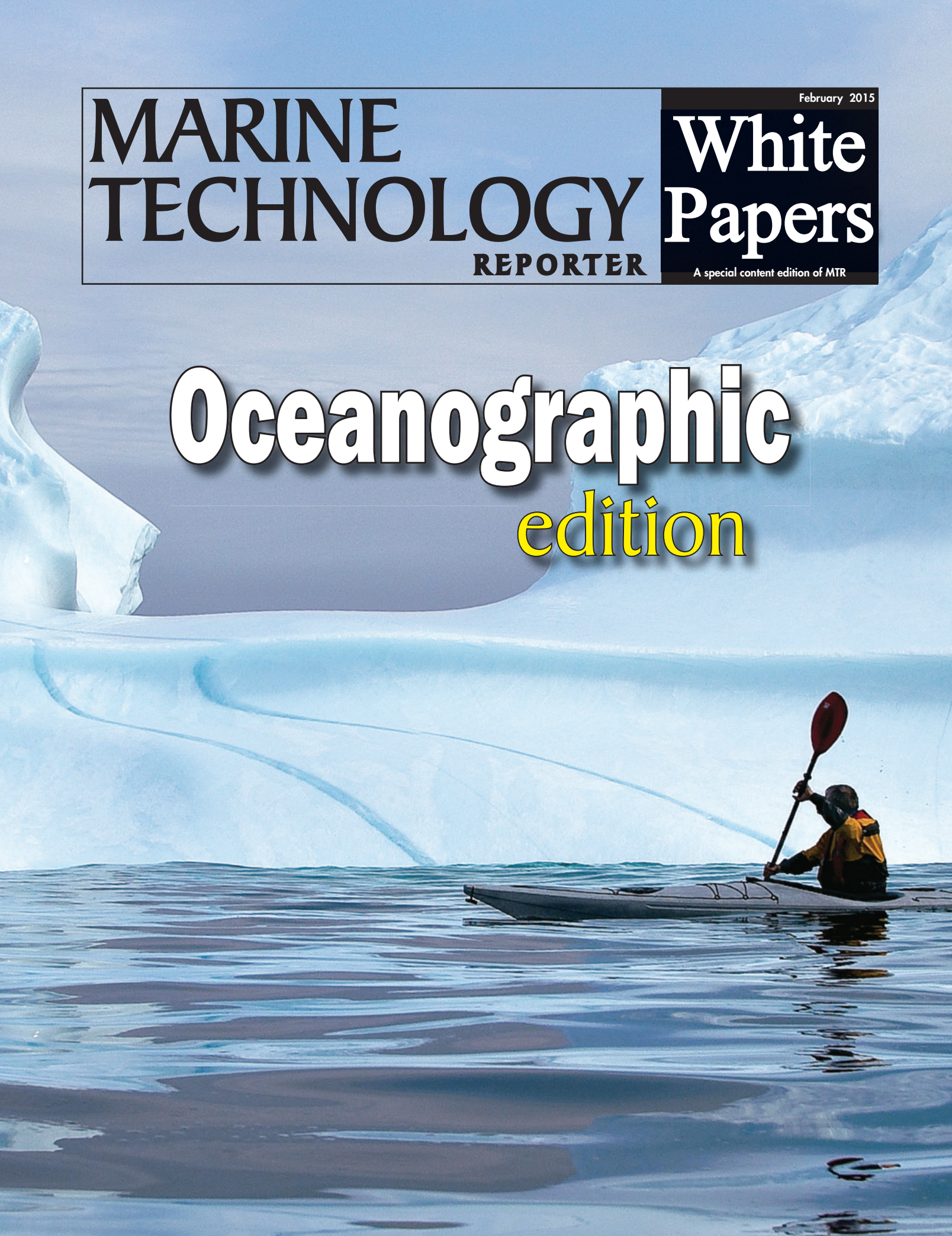


It's Time to Think in ~~Months~~ *Years!*

480 Days and Counting

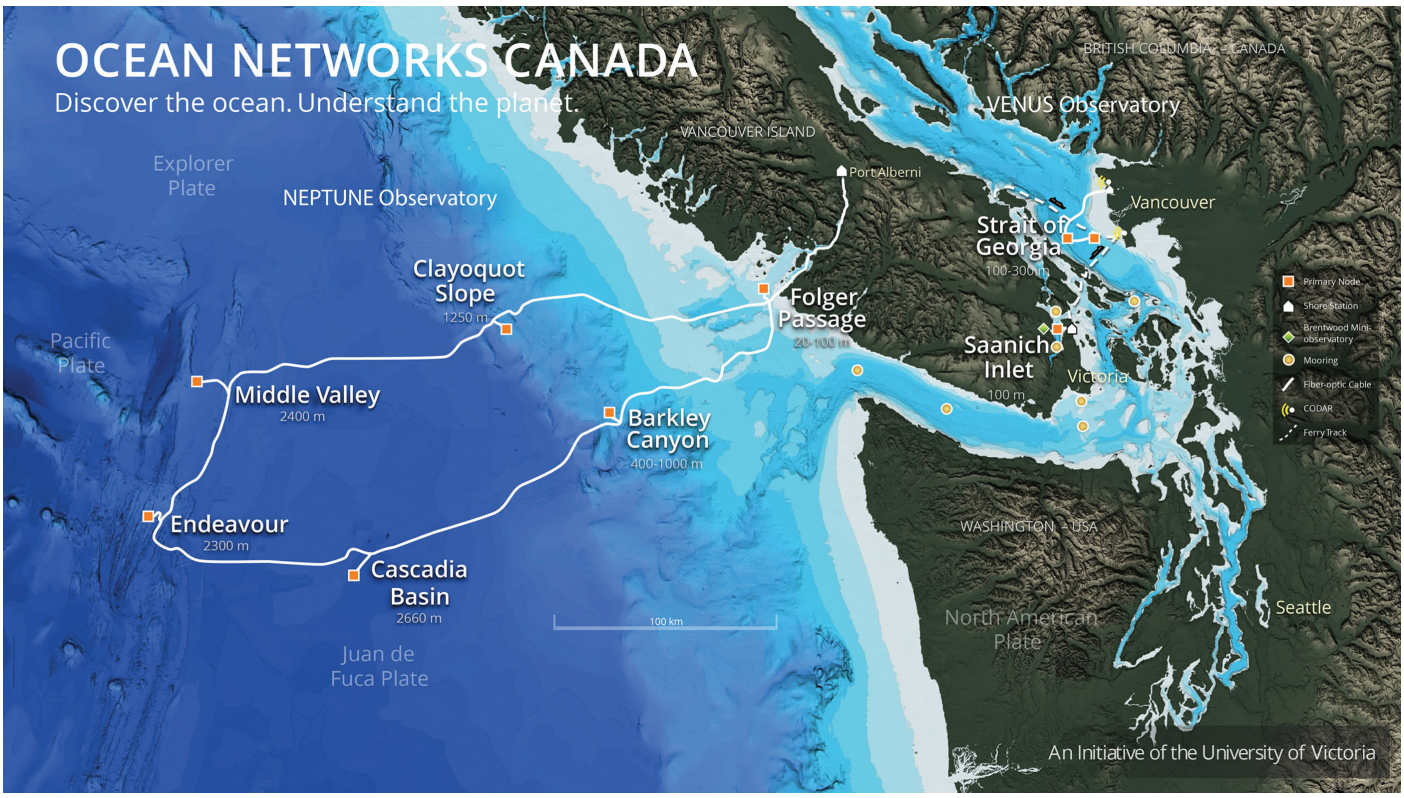
By Pete Reedeker, Director of Sales & Marketing, AML Oceanographic

*For the past 16 months, **AML Oceanographic** has watched their sensors protected by **UV•Xchange** biofouling control technology produce accurate data. AML instruments were originally deployed in October of 2013 at Ocean Networks Canada's Folger Pinnacle site and continue to operate today, suggesting a big step forward for environmental sensing.*

When it came time to put their new UV biofouling control technology to the test, AML approached **Ocean Networks Canada** (ONC) about deploying instrumentation on one of their platforms. Ocean Networks Canada operates the world's most advanced cabled ocean observatories off British Columbia's coast and the Arctic for the advancement of science and the benefit of Canada. These observatories supply continuous power and Internet connectivity to a broad suite of subsea instruments from the coast to the deep sea, allowing researchers to operate instruments remotely and transmit real-time, digital data globally.

To demonstrate the efficacy of UV light as an antifoulant, three **Metrec•X** instruments were deployed at the **Folger Pinnacle** observatory near Folger Passage off the coast of Vancouver Island, Canada **(Figure 1)**. Two instruments were equipped with UV•Xchange to protect them from biofouling,and one was left unprotected as a control. A Sea-Bird SBE-19 PlusV2 was also deployed on the platform. Originally scheduled for a one year trial to finish October 2014, the deployment remains operational today with the AML sensors protected by UV•Xchange continuing to produce consistent data.

Figure 1. Image courtesy: Ocean Networks Canada



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The demonstration has many highlights. Perhaps most spectacular is the longevity of good conductivity data from AML unit #1. The instrument has been running continuously with no maintenance for over 480 days. Only UV antifouling technology has been used; no chemicals or mechanical wipers. Tom Dakin, Sensor Technology Officer at Ocean Networks Canada was impressed:

> ***"I am quite astounded by the results of this test. I expected the UV antifouling system to be a significant improvement, perhaps doubling the time between required maintenance, but I did not expect it to outperform the TBT protected CTD. We operate our CTDs continuously on the Observatory. The pumped CTDs, protected with TBT, last about 7 or 8 months before the TBT is depleted and we also wear through the pumps. Near hydrophones, where we cannot use pumps, the CTDs last 2 months at best. The UV protected CTD at our most challenging site has lasted over 15 months and shows no loss of accuracy yet."***

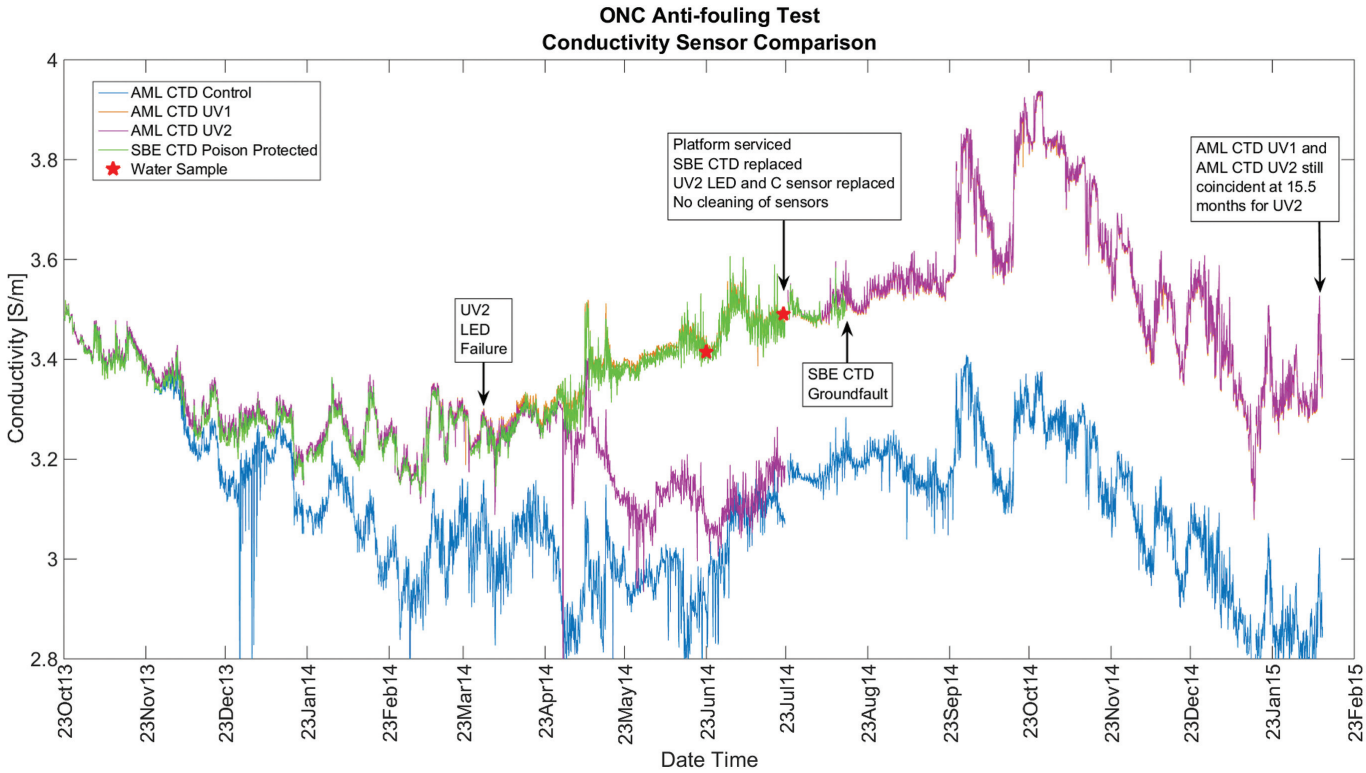
AML's conductivity sensor, **C•Xchange**, is unique to the industry with its 4 electrode transverse design. Originally developed at the Institute of Ocean Sciences (IOS) Canada, this sensor design has been used with AML instruments for high speed profiling for over 15 years. With some recent changes to the electrodes, AML has optimized its performance for in-situ measurements when used with UV•Xchange. The design is conducive to UV biofouling protection due the accessibility of the electrodes and open flow characteristics. Where the electrodes of other conductivity sensors are buried within the walls of a long tube, the electrodes and volumetric regions of C•Xchange are exposed. This allows UV light to reach all of the critical regions of the cell, giving stability to the sensing volume and thus maintaining its performance.

An ONC camera has provided footage of the demonstration since commencement. As can be seen in the time-lapse video to date (**Figure 3**), UV•Xchange has kept all critical surfaces free of fouling. Note the various cycles of growth, as well as the marine life that inhabits the installation area.

Critical areas of the AML sensors are not the only surfaces still clean at the demonstration site. Areas on various apparatus in and around the platform – up to 47 cm away and at a wide diameter – have remained clean, proving the scope of UV•Xchange and sister product **Cabled UV** to be much greater than first envisioned. This capability suggests the potential for use on a much broader variety of applications than just sensors.

True to AML's collection of **X•Series** instrumentation

A graph of the conductivity data vs time of all four instruments is shown in **Figure 2**, with notations on various events within the test period. **Figure 2.** Image courtesy: Ocean Networks Canada



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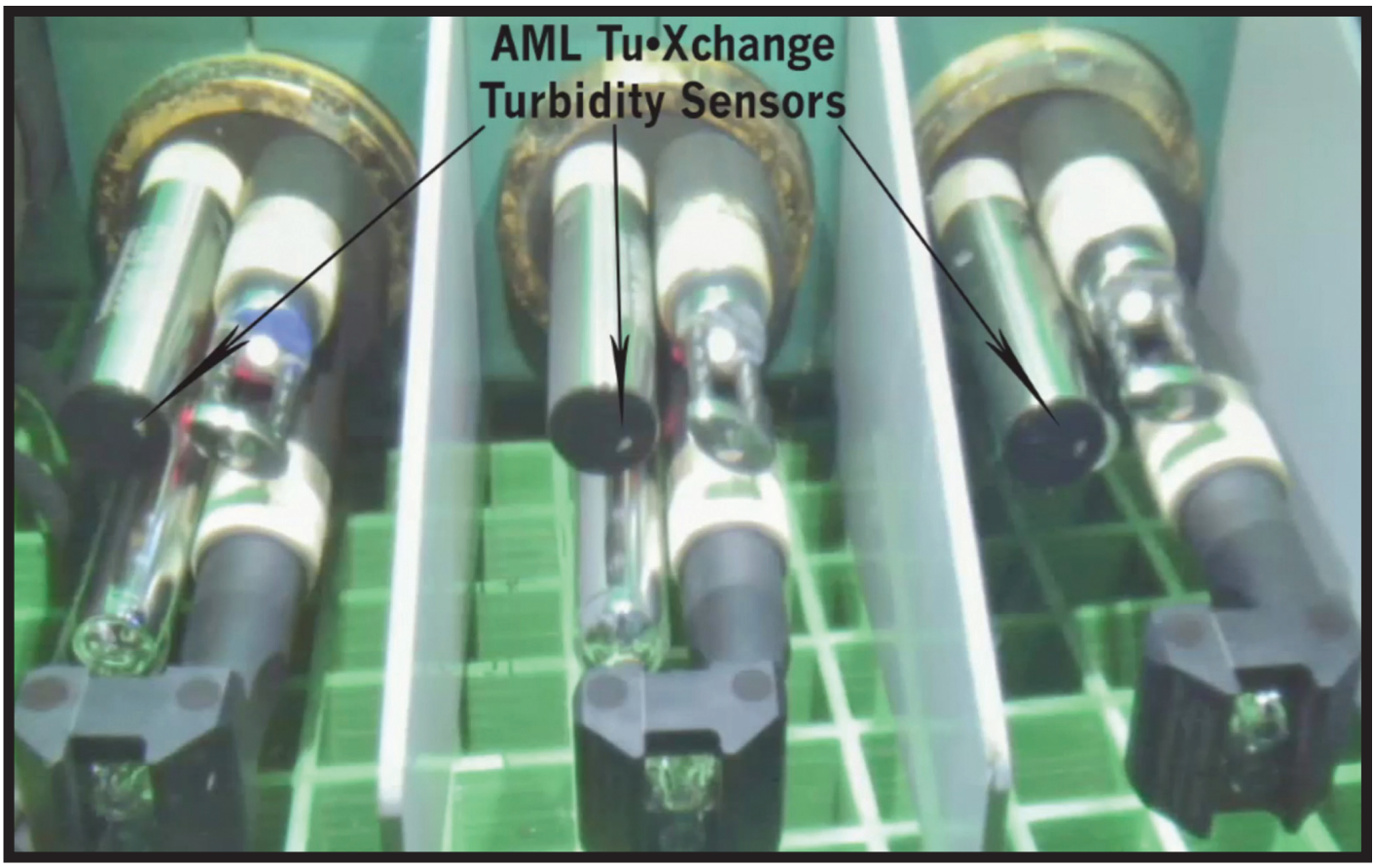
AML Director of Engineering Dustin Olender, PhD, says,"When I saw our sensors come back pristine - after months underwater - I knew we had something. You can completely rethink your deployments: Biofouling typically necessitates monthly maintenance, but with UV, you can start thinking in years."

and field-swappable **Xchange™** sensors, the modularity of UV•Xchange and Cabled UV enables unrivaled adaptability to prevent biofouling on a variety of surfaces and devices. With LEDs that can rotate 360° and be stacked and flipped over to reverse the angle, the UV light can be directed in almost any direction. Coupled with mounting on a flexible cable as with Cabled UV, the applications are boundless. While UV•Xchange is ideal for protecting Xchange™ and third party sensors on X•Series instrumentation, prime candidates for Cabled UV include ADCPs, LISST instruments, SVPs in a vessel's sea chest, cameras, and other peripherals. Being non-contact and non-toxic, UV is an ideal antifoulant for sensitive environmental parameters such as turbidity, chlorophyll, pH, and dissolved oxygen. Another unique advantage is the silence. Noise-making instruments equipped with pumps and wipers interfere with hydrophones, which are becoming more prevalent in mammal tracking, ship fingerprinting, and surveillance.

Servicing in-situ platforms is critical to maintaining accurate data and keeping equipment operational. The cost, however, can be extreme. Thousands of dollars can be spent on a single platform recovery and refit. The costs skyrocket when changing weather and currents cause delays due to safety concerns. By reducing maintenance intervals, system costs can be dramatically reduced. According to Tom Dakin, "The cost of the UV system is about 25% of one maintenance trip to the Folger Pinnacle site, so this technology will have a significant impact on the operations budget, in addition to improving the

Figure 3. A Time-lapse Video.



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data quality. "By using UV•Xchange or Cabled UV to prevent fouling, not only can intervals between service be extended, but the time involved in servicing can be condensed due to the reduced the amount of scraping and cleaning!

The success of AML's UV systems and resulting sensor performance has prompted ONC to utilize this technology in upcoming projects, including the **Smart Oceans™** program. Smart Oceans™ is being developed by Ocean Networks Canada, an initiative of the University of Victoria, to harness its data and create data products that will improve marine and public safety, as well as enhance environmental monitoring along the British Columbia coast.

Scott McLean, Director of ONC's Innovation Centre, had this to say:

> ***"With the incredible results of the AML Oceanographic CTD and UV anti-biofouling system in our technology demonstration program we are very pleased to be deploying these systems across coastal BC as part of the Smart Oceans™ program. High biofouling areas in the coastal zone create a huge challenge in ongoing operations and maintenance costs for any observatory, especially in remote locations. After 15 months and still going, at our worst bio-fouling site, the sensors remain clean and operating fine. We are all absolutely amazed. AML Oceanographic has really made a revolutionary advance in anti-biofouling technology with this new product."***

More information on the AML technology development and related products can be found on AML's website at ***http://www.amloceanographic.com/Biofouling***

More information on Ocean Networks Canada's activities, installations and a host of other resources is available at ***www.oceannetworks.ca/***

Figure 4."On the dock at Bamfield, BC, during the July 2014 summer maintenance of Folger Pinnacle platform.

Image courtesy: Ocean Networks Canada