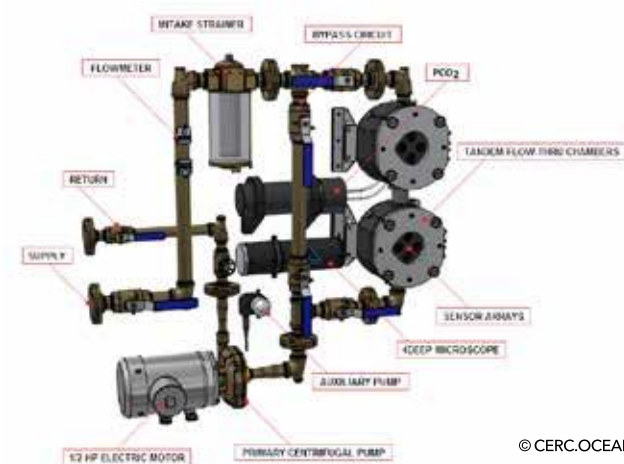


Surface Water Measurements from Mobile Platforms

The past decade has seen a steady increase in the use of ships of opportunity and roaming vehicles to conduct surface water measurements. The vehicles are equipped with versatile systems that can be integrated to collect a large amount of data. Aanderaa makes accurate, compact, stable, low power sensors, and flexible controllers/loggers that integrate sensors from other manufacturers. This application note provides examples of how such systems are used to collect and deliver environmental surface water information.

The [CERC.OCEAN](#) group at Dalhousie University focuses on performing measurements for better understanding of ocean processes in the NW Atlantic. To expand the surface water monitoring capabilities for their research projects, a pumped flow-through system was installed on the supply-vessel [Atlantic Condor](#), in collaboration with Pro-Oceanus Systems Inc. and 4Deep (Canada). Some of the distinct features of this system are:

- Coupled [SooGuard](#) chambers with [Oxygen](#), [Pressure](#), [Temperature](#), [Salinity](#), and [Chlorophyll-a](#) sensors (Fig.1). One of the chambers was designed to host a gas permeable membrane to measure pCO₂ with an accurate and reliable [CO₂-PRO CV](#) sensor
- Direct seawater intake which prevents smearing of the signal
- [DNV certified](#) and 5-bar rated. The system can easily be duplicated and meet compliance requirements of the similar vessels.
- Autonomous and unobtrusive; measures and regulates the flow, detects leaks and shuts down if there are significant problems; full access remotely via cell phone and/or Iridium
- Pipe material in Cu/Ni (Copper-Nickel) alloy for antifouling



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Design of the flow-through system onboard the Atlantic Condor.

Coupled SooGuard flow-through chambers. In the top chamber, open, the membrane of the modified CO₂-Pro CV is seen with Aanderaa sensors mounted on the lid.



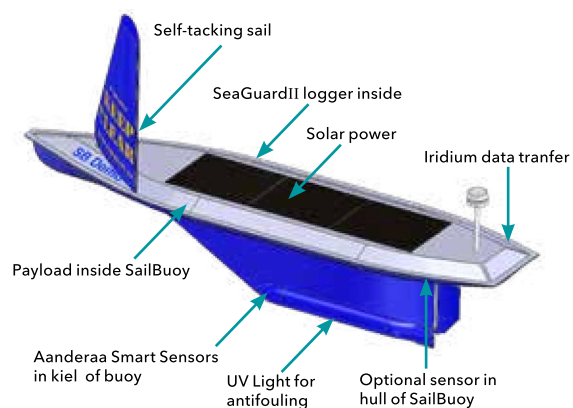
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Fig. 2: Sensors to measure oxygen, salinity, temp, pH and pCO₂ were installed on a stainless steel pole that was attached in the bow of S/Y Hrimfare. Data from the sensors and the position from the boats GPS were logged every 20sec by a [SmartGuard](#) sensor hub. The entire installation took about 2 hours.



Fig. 3: SailBuoy with Aanderaa antifouling protected sensor package placed in the keel bulb



The sensors used in the flow-through system described above are standard off the shelf oceanographic sensors that serve in a wide range of applications. These sensors have often been used for targeted monitoring like on the [Hrimfare sail yacht in the EU-Sheba project](#) (Fig. 2) where the effects of shipping in the Baltic sea were studied.

Another type of vehicle used for water monitoring are the [SailBuoys](#) (Fig. 3). They are 100 % wind propelled, compact, economical platforms that are designed for autonomous offshore operation. They have served in a wide range of missions from the Arctic to the Gulf of Mexico. Sailbuoy platforms offer many advantages. They are easy to operate and navigate, easy to deploy and

recover (the weight is 60 kg), and [almost indestructible](#) by big ships.

An expandable sensors package with inbuilt antifouling, GPS positioning, logging and real-time transmission was developed for Sailbuoys and other autonomous vehicles. In an Arctic project the vehicles sailed along the ice edge to do targeted studies of the carbonate system. They measured temperature, salinity, pH, pCO₂ and O₂ in the water and air. The figure below gives an overview of the components that have served for mobile platforms including two different loggers, different sensors, positioning devices, modems for data transmissions/communication and real-time software.



Real-Time: Iridium, 3G/2G, AIS



Met Sensors



Position: GPS, Compass



Antifouling: UV, Cu/Ni pipes



Aanderaa Sensors



Other integrated UW sensors:

Chla, CDOM, Oil, pCO₂, pH, BGAig, Turb



Controllers: SeaGuardII, SmartGuard



Software: Real-Time Collector, GeoView

For more information and questions please contact us at aanderaa@xylem.com.