



Water Quality Monitoring and Event Response with the YSI 6200 Data Acquisition System

It is common knowledge within the scientific community and among water resources protection and regulatory agencies that frequent, consistent data acquisition from an aquatic system is essential if the system is to be characterized. Characterization of an aquatic system requires years of consistent observation of water quality, meteorological and hydrological parameters through numerous hydrologic cycles and is the only reliable means by which the effects of chronic perturbation can be identified and the occurrence of acute or episodic pollution events detected.

Arguably, one of the more serious errors made in the development of a water quality or water resource protection program is the selection of a sampling regime that cannot meet program objectives. Typically, the error in sampling regime development arises from the confusion between a monitoring program and a study. Simply put, a monitoring program is an ongoing, system-wide data acquisition effort aimed at the characterization of the aquatic system(s). Through the extensive (i.e., multiple stations), consistent and frequent acquisition of physicochemical, biological, meteorological and hydrological parameters, over numerous years (if not perpetuity), those responsible for the protection of an aquatic system can identify cause and effect relationships and trends on a large scale. A carefully designed, implemented, and maintained monitoring program can provide a framework from which well-fashioned questions can be formulated, and that will give rise to, or are the basis for, well-designed studies.

Though frequency of sampling in monitoring programs may vary from monthly observations to near-continuous measurements, sampling stations are strategically placed in locations that have proven to or are expected to yield representative information about the system at that location. Though station location selection may be approached similarly, from one program to the next, parameter selection and measurement frequency are strongly objective-specific and reflect a clearer or more detailed definition of the program's principal objectives.

If monitoring is being established primarily to develop a baseline characterization of water quality with respects to seasonal fluctuations, twice-monthly or monthly data collection of select parameters at strategic locations (stations) might suffice to meet program objectives. In such cases, measurements in horizontal and vertical profile can be made manually with handheld systems and/or by strategically placed datalogging sondes for unattended, near-continuous measurements. The inclusion of the latter is preferable particularly if diel fluctuations in water quality are of interest. However, if program objectives include the "capture" of acute episodic events, as well as event response (i.e., automated sampler actuation, extended logging or early warning) data acquisition must be near continuous or continuous, and acquisition technology must include communication.

If a program's principal objective is to forewarn a water treatment facility of an impending cyanobacteria bloom and its consequent taste and odor problems, the parameters selected – i.e., DO, temperature, chlorophyll and turbidity – will reflect that priority. So too will measurement frequency which will be (at least) near continuous, and may also have spatial, temporal and seasonal components. The data acquisition system in this case must not only measure key parameters associated with pre-bloom and bloom conditions, but must also have the capability to "analyze" data based on end-user-prescribed criteria. If water quality conditions appear to meet pre-defined criteria, the system must then provide response, not the least of which is to communicate the apparent approach of a problematic water quality event. Response might also include the actuation of the opening or closing of a weir or gate and the actuation of a pretreatment or interim treatment system (i.e., an aerator).



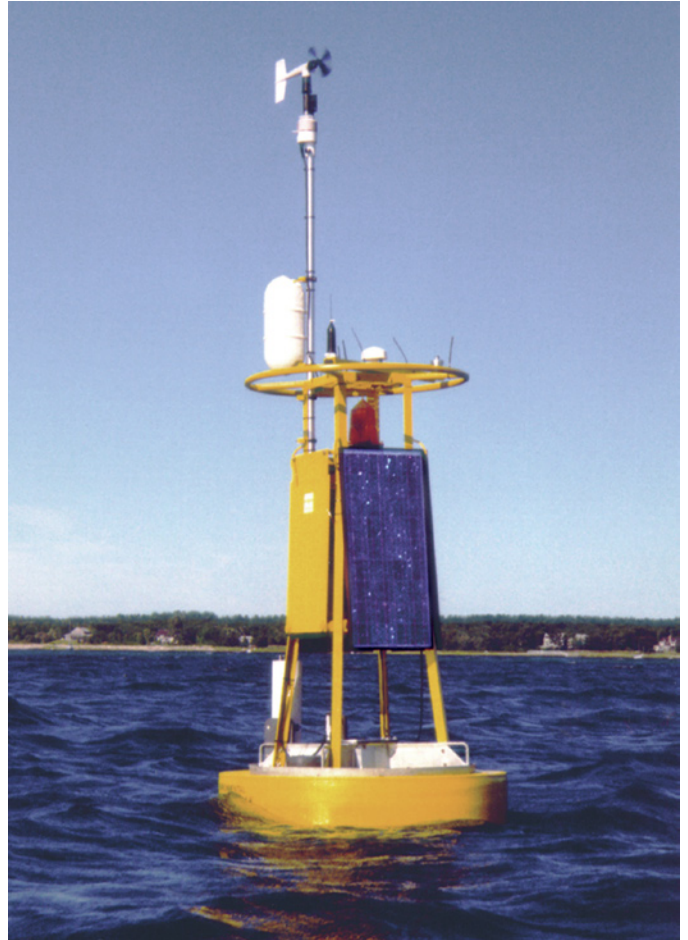
YSI 6200 used with a YSI sonde at a bridge deployment for remote river monitoring.

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General application, and objective-specific data acquisition system development and integration need not be complicated. It is important to clearly identify program objectives and to employ the technology and expertise necessary to design, implement and maintain data acquisition and response to meet those objectives. YSI Integrated Systems & Services provides end-user-configurable data acquisition systems for virtually any water quality, water resources, hydrological and meteorological monitoring and response program. At the heart of these systems is the 6200 Data Acquisition System (6200 DAS) which can collect a wide variety of water quality parameters from one or more YSI multiparameter sondes, while also collecting weather, discharge, wave height and stage data.

In addition, the 6200 can provide automated data reporting and event-actuated response (commands) via a variety of communication modes. The 6200 DAS can be deployed on land, floating platform or buoy. YSI Integrated Systems & Services manufactures 6200 stations, platforms and buoys for virtually any deployment and provides these in a range of sizes suitable for the environment in which they will be deployed. YSI Integrated Systems & Services has specialized in remote data acquisition systems for natural resource monitoring applications for over twenty-five years and has deployed hundreds of 6200 DAS-based systems throughout the world.

Water quality, hydrological, meteorological and oceanographic parameters that can be measured by the 6200 DAS include but are not limited to: DO, temperature, specific conductance, salinity, TDS, pH, ORP, turbidity, chlorophyll, Rhodamine, PAR, nitrate, ammonia, chloride, depth, level, discharge, current speed and direction, rainfall, relative humidity, wind speed and direction, solar radiation, evapotranspiration, wave height, and stage. The event-actuated response and control utility of the 6200 DAS is myriad, therefore a discussion of its capabilities exceeds the scope of this document. Suffice it to say that data collected by the 6200 DAS can be used in a wide variety of ways to notify monitoring personnel of significant changes in water quality, of the presence or apparent approach of acute and episodic events, and to further respond to these events by actuating other mechanical and electronic devices.



YSI EMM2000 buoy with the 6200DAS and YSI sonde.

Strong inference for developing system-wide management and protection policies and programs, as well as early warning and emergency response, can be derived from data obtained from a well-designed, implemented and maintained monitoring program providing data and response in real-time.

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