

Guarding the Pa Sak River, Thailand

WATER QUALITY MONITORING WITH PISCES PONTOONS & EXO2 SONDES

Thailand, as in many of the ASEAN countries, has been rapidly growing and industrializing in the past few decades. Along with the benefits of this economic growth, there are also the associated costs, which often surface as unexpected externalities, such as air and water pollution.

While, according to the Water Environment Partnership in Asia (WEPA), Thailand's overall surface water quality is rated fair and improving in the majority of its river basins, rivers in the south adjacent to the major city centers remain stressed by municipal and industrial pollution sources, resulting in harmful algal and bacterial blooms, anoxic events, and large fish kills. One such river, the Pa Sak, located within the Chao Phraya River drainage basin, has been heavily polluted over the years from municipal and industrial wastewater discharge. Several large and high profile fish kill events (e.g. *Trichopodus trichopterus* - an abundant local species) has prompted the government to action, including the funding for real-time water quality monitoring projects.

Water quality monitoring programs are playing an ever increasing and vital role in helping to enforce environmental policy in Thailand, and around the globe. Xylem YSI's local partner, Green Banyan, has been managing one such program along the Pa Sak in Saraburi Province (NE of Bangkok), known for its ancient Buddhist temples. Funded by the Ministry of Interior, the scope of the project includes eight (8) [EMM 350 Pisces pontoon buoys](#) equipped with [YSI EXO2 water quality sondes](#), configured to measure surface temperature, conductivity, pH, dissolved oxygen, total algae (including blue-greens), and turbidity, among other calculated parameters. Each EXO2 is also equipped with a central wiper to help prevent biofouling and mitigate any risks of data loss due to fouling of sensors.



Figure 1: Looking over the Pa Sak River, Thailand.



Figure 2: Map of the Chao Phraya River drainage basin (map source: Wikipedia).



Figure 3: Pisces pontoon moored in the Pa Sak River near Saraburi Ban Suai Village.

The Pisces buoys are a lightweight pontoon platform to support both the EXO2 sonde and the power and logging systems. They were assembled by YSI's Integrated Systems and Services (ISS) in the U.S., and delivered to Green Banyan in two phases: the first set of four Pisces buoys were delivered and installed in 2016 (see opening ceremony, to the right in Figure 4); with the second set of four buoys delivered and commissioned in 2018. The eight buoys are serviced monthly, where the team travels to each site to check all systems, calibrate the sensors, and provide general maintenance and cleaning (Figure 5).

According to Green Banyan's Project Director, Opart Rungsiri, "the aim of this program is not only to help enforce the local environmental laws, but also to strengthen the relationship and confidence between citizens and industry."



Figure 4: Opening ceremony for Pa Sak River monitoring program.



Figure 5: Xylem YSI and Green Banyan personnel providing monthly servicing of Pisces buoy



Figure 6: Storm Central real-time data display from the Station 5 Pisces buoy. Each site has a sign posted with project information and URL for public data access.

Water quality data is transmitted via a [WaterLog Storm 3 data logger](#) and GSM-3G cellular modem from each buoy, in near real-time, to a government server and Green Banyan using WaterLog’s Storm Central cloud-based data solution. An alarm system was built into the software to provide users with real-time warnings if a certain parameter (e.g., dissolved oxygen) exceeds its government-recommended threshold. The warnings can then be transmitted to the local community for appropriate responses. In conjunction with the eight data transmissions and web data pages, Green Banyan developed their own GIS for the eight sites (see: www.online-monitoring.net/buoyancy_System/main_page.php) for operational support.

According to Green Banyan’s Project Director, Opart Rungsiri, the aim of this program is not only to help enforce the local environmental laws, but also to strengthen the relationship and confidence between citizens and industry. It also helps researchers and agencies to provide an overall picture of the Pa Sak’s health and response to tighter pollution regulations, as well as serve as a “proof-of-concept” for similar future project in the Chao Phraya basin and beyond.



Figure 7: Custom support frame for high flow events

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