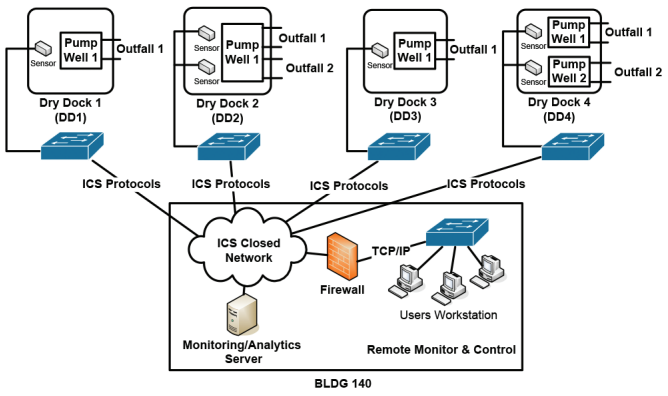
PROJECT ID:
582

Sensor Interface and Infrastructure for Monitoring



Conceptual framework for closed network monitoring solution with data analytics and user interface. (Schematic Credit: Henry Au)

OBJECTIVE:

This team is developing an integrative approach for near real-time wastewater monitoring that ensures more accurate analytics and data visualization and reduces the manpower requirements associated with current processes.

PROBLEM STATEMENT:

Navy environmental program managers are responsible for ensuring that wastewater discharges from Navy facilities meet regulatory requirements. For most of these facilities, gathering information about these discharges (effluent) requires the manual operation of monitoring equipment and sensors. While requirements may differ among Navy facilities and regulatory agencies, a common issue is the manpower and time required to gather and analyze effluent data.

For example, Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility (PHNSY&IMF) is required to monitor drydock discharges for volume, nutrients, metals and other water quality parameters (pH, turbidity, etc.). On-site monitoring equipment is available to ensure compliance with sampling or monitoring, but requires personnel to manually download data and then process these data offline before being used to assess compliance with permitted levels. Access to each of these monitoring locations is limited and must be coordinated with operators and site personnel. All these factors result in time- and labor-intensive monitoring and data that are out of date.

As a result, mitigating actions may not be executed in time to avoid permit violations and exceedances. Such a scenario has occurred at least twice related to volumetric flow exceedances at PHNSY&IMF in 2018 and may likely recur until equipment is modernized for real-time data collection and telemetry.

While requirements may differ among Navy facilities and regulatory agencies, a common issue is the manpower and time required to gather and analyze effluent data.

Other sites that have been identified with similar needs related to sulfide monitoring within their wastewater systems are Naval Air Station North Island (NASNI) and Naval Amphibious Base Coronado. Pretreated industrial wastewater is conveyed to treatment facilities through the City of San Diego's municipal sewer system. NASNI in the past has exceeded the city's sulfide limits specified in their discharge permits. Naval Facilities Engineering Command Southwest has installed chemical control systems

on site, but consistent control of the dosing to control the sulfide has not yet been realized. A remote monitoring system would help to provide awareness for sulfide levels in the system so that permit violations can be avoided.

DESCRIPTION:

Current approaches to meeting monitoring requirements are often piecemeal solutions that are site-specific, require updating soon after implementation or lack cyber security measures. The goal of this team is to develop a model that is readily adaptable for various base sizes and compatible with current and future sensors and monitoring requirements.

Most sensor modules for water quality measurements are capable of utilizing an Industrial Control System (ICS) communication protocol to report data over a network. This project team plans to utilize standard ICS protocols and updated infrastructure to enable a near real-time monitoring (RTM) solution. A software interface will be developed to manage the data streams from existing sensors, along with a graphical user interface with an emphasis on environmental monitoring and permitting requirements.

Much of the basis for this effort will leverage previous experience with ICS/ Supervisory Control and Data Acquisition (SCADA) cybersecurity projects initially developed for smart energy metering under the Office of Naval Research's Energy System Technology Evaluation Program.

The system will employ a graphical user interface accessible via computer or mobile device. Data can be automatically analyzed to provide notifications to program managers (i.e., visual cues and/or SMS/mobile notifications). Depending on specific site requirements, updated infrastructure could include secured (Federal Information Processing Standard 1402 compliant) RF modems or standard gateways/routers for closed wired network.

The team will first test the interface in a laboratory mockup that simulates conditions at a drydock location. Based upon successful performance of the interface and network architecture, a demonstration will take place at PHNSY&IMF. If this demonstration is successful, the physical interface hardware will be installed at PHNSY&IMF to run the software system.

TRANSITION DESCRIPTION:

The near-RTM solution will be designed and implemented with close coordination from end-users at PHNSY&IMF. Final training documents and support will be provided once the system is installed. To reach other end users, a design guide will be developed to assist with meeting guidelines for sensor output and possible interface methods with the near-RTM framework. A final report will also be written which documents any lessons learned, cyber security considerations, costs and required operations and maintenance actions. Information will also be shared with the appropriate working groups.

CONTACT:

For more specific information about this project, contact the Principal Investigator at 808-221-7180. Contact the NESDI Program Manager at 805-982-4893 for more general information about the program.

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development demonstration and validation program, sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Systems Command from the Engineering and Expeditionary Warfare Center in Port Hueneme, CA. The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes and materials and by filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Navy readiness and lethality.

Visit the program's public website at https://www.navfac.navy.mil/NESDI for more information.