



NIVOBOB Automated Ullage Sensor System for Dredging Contract Payment

Dredging Innovations Group (DIG)

U.S. ARMY CORPS OF ENGINEERS

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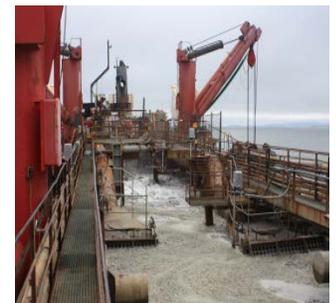
Problem

The U.S. Army Corps of Engineers Portland District (NWP) payment basis for the hopper dredging contract on the Mouth of the Columbia River dredging project is based on measuring hopper load (sand) volume. Ullage measurement consists of determining the elevation of dredged sediment in the hopper, and by incorporating the geometric/volumetric relationship (ullage table) the hopper load volume can be calculated. This required two inspectors to be onboard 24/7 to observe and verify manual soundings over the hopper in good weather and bad. This was costly and required dredging contractors and USACE personnel to sometimes work in less than optimum conditions (e.g. at night in heavy seas).



Study Description

The objective of this effort was to provide the information, knowledge, tools, and guidance to implement an automated ullage system as a defensible dredging contract payment basis for use by NWP as an alternative to manually conducting the bin measurement on a 24/7 basis. R&D previously conducted by DOER, in conjunction with NWP and the USACE Dredging Quality Management (DQM) Program had resulted in the development of a successful automated ullage sensor prototype system (NIVOBOB). The DIG program, once again in conjunction with NWP and DQM, successfully transitioned this prototype system to an operational status that NWP used to pay the contractor.



Products

The primary products from this R&D consist of the operational automated ullage measurement system, supporting contract technical specifications, and documentation on its development, operational metrics, and use. The heart of the system is composed of 10 NIVOBOB sensors installed over the hopper that (each) deploy a sounding lead via an electric motor that rebounds off the sand surface. The sensors are activated from the bridge and their respective ullage values stored on a computer. The average of these measurements is applied to a certified ullage table to determine sand volume. All these values are telemetered to the DQM center's database, and a trip report subsequently produced that is reported to NWP.

Summary

This project has provided NWP with a robust hopper measurement method that automatically and accurately measures sand volumes in a hopper dredge equitable and consistent with the actual work performed by the contractor. In fact, the contractor is also using this system internally to measure load volumes for optimizing contemporaneous hopper dredge operations. NWP used this system as a payment basis for the 2014 Mouth of Columbia River dredging contract project. This reduced dredging costs by lowering the number of dredge inspectors from two to one (approximate savings of \$15,000 per week over an estimated 4 month-long contract totaling \$240,000 in savings) and increased safety by reducing labor time required on deck to sound the hopper at night. This system is also being considered for potential use on other west coast dredging projects.



Addressing complex dredging challenges and building institutional capacity for long-term mission sustainability.



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