

# IHC Presents Non-Radioactive Slurry Density Measurement Tool



Jacco Osnabrugge, Manager R&D IHC Systems

Royal IHC, a supplier of innovative and efficient equipment, vessels and services for the offshore, dredging and wet mining markets, recently presented a patented non-radioactive slurry density measurement tool for inland CSD dredgers at CEDA Dredging Days.

In order to present this new development to our readers, we caught up with Jacco Osnabrugge, Manager R&D IHC Systems and Kris Zych, R&D Engineer IHC Systems, and talked about the latest innovation for the dredging industry that IHC is currently working on.

*DT: Would you be so kind to share some insights on the origins of this new technology?*

Royal IHC: IHC was on the search for the non-radioactive density measurement to supplement its successful Radioactive (RA) production system. One of the considered ideas to measure the density was to use radio waves induced inside the slurry pipeline.

The principle of operation is based on the physics, that the speed of EM waves in water is the slowest among all natural materials. Therefore the presence of soil in carrier water must cause the speed to increase.

With a proper measurement geometry of antenna-pipeline-antenna, the detection of time delay the radio signal undergoes upon passing the pipe, can be a base for derivation of density. Detection of those time changes, caused by flowing sand, takes a precision in the nanoseconds region.

Confidence that electronics can deliver the required performance, and having in-house expertise to design it, was the starting point for detailed designing of the radio wave based density measurement system called the and radio frequency (RF) system.

The resulting combination of required frequency of operation, bandwidth, noise levels and an enormous signal loss, showed that we are dealing with a challenging electromagnetic problem. To add to that, flowing slurry is among the most harsh industrial materials under test there is. Mating the high-frequency radio components into a dredging pipeline, in the way that its mechanical integrity and wear resistance is not compromised, created yet another set of challenges.

When it came to practical implementation, it is where our expertise of slurry measurement systems played a crucial role.

To deal with an unavoidable initial trial-and-error process, we needed a development platform, a test setup which would allow to reassemble the slurry characteristics typically to be found on dredger, but in a controlled, laboratory conditions.

We thus built a dedicated, closed-loop flowing slurry setup, where a full scale prototype could be tested under full range of densities from 1.0 till 1.7 t/m<sup>3</sup>. We built 4 subsequent prototypes, each with different antenna –pipe arrangements.

Each prototype went through an extensive test campaign. When the final configuration was established, the final tweak and tune process was done and then could see the new RF density measurement delivers the same performance as the standard RA system.



The system reached maturity onboard a dredger. In cooperation with our customer, Baggerbedrijf De Boer – Dutch Dredging, we performed extensive and long-term validation tests with the RF system installed on a sand winning vessel Cornelis Senior.

This simple story told here took more than 10 years in total, included building 4 prototypes, numerous electronic systems, wear off two pipe impellers and 3 pump shaft seals. And contributed to several Msc. and PhD projects.

*DT: What are the advantages of this very interesting innovation?*

Royal IHC: Some of the main advantages of this technology are:

- no permits required;
- intrinsically safe: highest voltage applied 24VDC, 100% shielding of radio waves;
- robust, wear-resistant, versatile and reliable;
- high accuracy (comparable with the RA density);
- small pipe piece and flange dimensions fully compatible with corresponding RA density transmitter;
- in line mounting utilized in any part of the pipeline (both horizontal as vertical) where the density is supposed to be representative.

*DT: Can you tell us something about the major benefits of using this technology?*

Royal IHC: The radio frequency (RF) system, as a non-radioactive density measurement method, offers a relief from all the logistical and special safety regulation burdens related to the conventional radioactive-source based systems reducing the cost of ownership significantly.

*DT: Have you already received some feedback from the users?*

Royal IHC: During the development phase the radio frequency (RF) system is extensively tested and validated in cooperation with customers. The RF system for inland (river water) dredgers is now commercial available. First commercial releases are expected in the coming months.

*DT: What are the latest innovation for the dredging industry that IHC is currently working on?*

Royal IHC: One of IHC's latest innovations is the development of the Dredge Fleet Monitoring System (DFMS). DFMS enables monitoring of the vessels' dredging performance from the office and is helpful in remotely assisting operators maximizing dredging production and up time.

DFMS is a first and important step towards the future of dredging with remotely supervised dredgers with a high level of autonomy.