

FROM DATA ACQUISITION TO ENC PRODUCTION

QPS

Quality Positioning Services BV (QPS) based in Zeist, The Netherlands is an independent software design company specialising in integrated navigation and [positioning software systems](#), and electronic chart production tools. [More about Hydrographic Processing Software](#)

Founded in 1986, QPS initially provided positioning and navigation consultancy services to the Offshore Oil & Gas Industry. Since 1995 the main activity of the company has been focused on system integration and the development of software systems used for hydrographic surveying, seafloor mapping, portable pilot units and ENC production. In December 2000 QPS merged activities with HITT (Holland Institute of Traffic Technology), a developer of software solutions for use in the management and monitoring of air and shipping traffic. HITT is based in Apeldoorn, The Netherlands.

At present QPS employs 25 people, including company co-founders Peter Das and Bert Jeeninga.

Changing Roles

Initially oriented towards consultancy, QPS early recognised the evolution in survey techniques that took place in the late 1980s and early '90s. New surveying equipment (GPS, multi-beam systems) together with new operating systems (Windows) required a totally new approach to hydrographic surveying. QPS took up this challenge, and in 1995 began development of the Quality Integrated Navigation System software suite called QINSy. Sales started in 1997 and today over 1,250 vessels use QINSy for navigation, data acquisition and processing. The technology is used onboard offshore construction vessels, pipe-lay barges, drilling rigs, seismic-research vessels, dredgers and hydrographic survey vessels.

QINSy is based on a 'no limits' design criteria enabling future developments and forms the cornerstone of QPS present market position. The key technology behind QINSy is based on precise navigation, data acquisition, presentation, storage and processing large volumes of data, all in real time, to produce almost final results on-the-fly. This also includes techniques in real-time 3D visualisation of the underwater environment. In 2000 QPS introduced portable pilot-unit software better known as QASTOR, primarily used by pilots both for general navigation and for precise docking of large oil and gas tankers. Designed in full compliance with IHO, IMO and IEC standards, Qastor uses bathymetric data available as high-density Electronic Navigation Charts (S-57 ENC) as the 'fuel' that drives its safety features. With these products, QPS has a fast-growing market share in the offshore oil & gas industry, dredging and ports. [More about Hydrographic Processing Software](#)

Recent History

Over past years Electronic Navigation Charts have and continue to gain importance within the hydrographic and navigational industry. Pilots are using Portable Pilot Units for guiding large vessels into port. Vessel management and planning tools have begun to use ENCs with up-to-date depth information. And a standard for inland rivers (Inland ECDIS) was recently defined for ENC use on river barges. A large increase in vessel traffic throughout the world has pressured harbour authorities into finding better and more efficient ways to accommodate more vessel transits. Up-to-date and accurate depth information is an essential requirement. Time-slot planning of vessels, based on vessel draft, water level and actual water depth is becoming more important in the daily operation of each port, and hence the use of Dynamic Under Keel Clearance.

Bathymetric surveying, data processing and planning of dredging activities are now daily port operational procedures. The production of up-to-date charts (paper and electronic) is thus increasingly the business of port authorities. QPS took up the challenge to provide port authorities with the appropriate tools to perform their task in a fast, efficient and - most of all - reliable way. The aim was to produce ENCs within 24 hours of completing a survey.

Bathymetric Data

At QPS we have designed our data acquisition and processing package based on our philosophy regarding hydrographic surveying. This centres on the principle of producing the final product, a fully cleaned DTM, in real time, an approach that is in direct contrast to previous generations of hydrographic survey tools. Earlier developers did not enjoy the luxury of running their software on computers with the current performance levels. On the other hand, neither did they need to cope with the data volumes now acquired. Acquired data used to be recorded and the final product made during post-processing, from recorded data. Any problem was not discovered before the processor, who rarely had any insight into the data-acquisition process, began his or her work. By then the vessel had probably left the survey site and all 'data repairs' had to be done by the post-processor. This approach is counter-productive and final products can be of

poor quality.

The QPS approach to surveying is diametrically opposed to this. Gross repairs should not be required if sound survey practices were properly adhered to in the first place. If errors are present during survey they should be addressed at that time. After discovery such errors should be eliminated before continuing with the survey. Sound survey practice dictates proper calibration of all survey equipment used, ensuring that the whole system is tuned for maximum performance. The time invested in preparations is easily justified if no post-processing whatsoever is later required and the final product is ready for delivery at the end of the survey. [More about Hydrographic Processing Software](#)

Data Cleaning

The newer generation of multi-beam echo sounders dramatically increased the number of depth soundings (more beams and higher ping rate). This development called for a new offline data-analysis tool, one ready for the future. In response, QPS developed a 3D data-cleaning tool called Qloud. This tool is specially designed to handle extremely large areas of multi-beam data and to perform statistical data cleaning using parameters such as TPE and algorithms like CUBE and the surface spline filter.

My First ENC

In close co-operation with the Dredging Desk of the Port of Rotterdam, first steps were taken in ENC production. Instead of beginning immediately with the most difficult task, of complete ENC creation from scratch, QPS had chosen to use existing ENC cells. Up-to-date bathymetric data is used to regenerate contour lines, depth areas, spot soundings and non-surveyed areas to update ENC cells covering area of interest. Our philosophy at QPS dictates that accurate and up-to-date depth information is of most importance to the vessels and port operators. The learning curve we followed, along with the Port of Rotterdam, led to the following conclusions:

- find the balance between data density and performance requirements
- use more spot soundings than contour lines cluttering the view
- be smart when generating contour lines; create only high-density contour lines in the most critical depth range and fewer dense contour lines in the rest of the depth range
- scrutinise carefully the river or port area; where more details are required create an ENC cell with high-density information, covering a small area only.

The Port of Rotterdam has established an efficient workflow, from data acquisition to ENC updating. New releases of ENC cells are ready within one working day after completion of survey. In other words, pilots and other port stakeholders can access depth information that was surveyed the day before.

From Past to Present

With the experience gained from the Port of Rotterdam, QPS designed a complete new product, QINSy EPP-57. The QINSy ENC Production Platform 57 distinguishes itself from other approaches to electronic chart-production platforms by its efficient method of data storage and its principle based on semi-static base cells updated with highly dynamic bathymetric data. Bathymetric data is generated directly from the digital terrain model updated constantly through hydrographic surveys. This principle allows for a completely updated ENC cell ready for distribution within hours of completion of a survey.

Distribution of deliverables, such as paper charts in PDF format, bitmaps and ENC, is the last vital link in the data flow. What use are up-to-date ENCs when you are not able to share them in an efficient manner throughout your organisation and among your clients? The internet/intranet network is the key to fast distribution of up-to-date deliverables, the moment they become available. QPS developed an internet-based distribution facility especially for this purpose. Wherever the user has their office, the latest product releases can be downloaded from the internet at any time of day, seven days a week.

As presented, we can conclude that the technology for High Density ENC and fast updating routines has matured. The harbourmaster can improve his planning and entry criteria for large draft vessels, the dredging desk can pinpoint problem areas, and pilots can use their PPU with dynamic under-keel clearance functionality to guide vessels into port. The challenge taken up by QPS about three years ago began as a sandy, dirt track with potholes and other obstacles. Now we have reached the high-speed motorway. Our pragmatic approach, as used in our other products, has proved itself successful. Developments over the last three years ensure that QPS can facilitate those clients who require fast, efficient and reliable tools from data acquisition, from data processing to ENC production and distribution.

And the Future

The future will involve Wide Area Wireless Network along river and port areas. Every vessel will have its broadband internet connection. The hydrographer will review the just-finished survey, update the ENC and place virtual buoys on shallow and dangerous areas. The update will then be broadcast over the internet as a Notice to Mariners. Within seconds, the navigation tool onboard of the vessel will receive the new ENC and display it on the navigation screen. This will lead to instant response on the part of the captain to the new situation.