Dr Eduardo Minguito Cardeña reflects on his 40-year career as he retires from NAVANTIA

Dr Eduardo Minguito Cardeña, Head of Tests and New Technologies Department at Spanish shipbuilder NAVANTIA, is a familiar face to anyone involved in CRS and he has been a regular visitor to MARIN for more than 35 years. On the eve of his retirement Report interviewed Eduardo about his views on the growth of CFD use and why he has always chosen to return to MARIN over the decades, and also if it will be possible to leave hydrodynamics behind as he embarks on a new phase of life.

Eduardo estimates that he has probably seen 150 vessels built over the decades, and laughs that perhaps he is not the easiest person to interview because his career is ‘a game of two halves’ – from 1981 he worked with Astilleros Españoles (AESA) building merchant ships and then from 2005, he has led the Engineering and Innovation Direction Department at NAVANTIA where most of his work concerned navy ships and consequently, remains confidential.

We believe your first project with MARIN was already a considerable challenge – sea trials for the Rio Tinto in 1983 – which were definitely ‘a plunge into the deep end’ for a fresh-faced hydrodynamicist?

“Yes I was straight out of university and was the youngest involved in the Rio Tinto team but my professor at the University of Madrid and leader of the hydrodynamic department at AESA had already taken part in a lot of projects at MARIN. (The team is pictured when they arrived safely back ashore.)

“Rio Tinto was in the context that Astilleros Españoles wanted to investigate a new propeller type for tankers and bulk carriers. Spain and all of the European shipbuilders were trying to be more competitive, as Japan had started to take the flag from Europe.

At the time steam turbines would drive the propeller via a huge condenser, which takes in water from the sea, and the cap of the condenser had blown off. Fortunately, the team managed to get the cap back in position and the vessel limped back into the harbour at 2-3 knots, towed by two tugs.”

The experience didn’t deter Eduardo at all, and he admits it was certainly a dramatic start to his career.

Your projects have always been challenging and demanding, stretching our capabilities and planning. Can we take it as a compliment that you have always come back, even though there are basins nearer home?

“This is not a difficult question. If the computer power and tablets. A few years ago there was nothing! Nothing! This was the start of the competition, or even I would say was between CFD and model tests – mathematical tools versus physical tools. It will be a very long war but the winner is CFD here. Model basins will lose their positions. When the end of the story is finished, I don’t know.”

It sounds like you have doubts about the future role of model basin tests in light of CFD developments?

“When I came to MARIN HQ nearly 40 years ago we were in more open times, there wasn’t such tight security. You could walk into the workshop and see the ship models and their numbers and letters. Now you go to the workshop and it is only numbers! It seems like you have doubts about the future role of model basin tests in light of CFD developments.

“Having said that, to run simulations it is vital to have powerful computers, and the tools needed to run simulations are not so easy to develop. Armed with a good CFD programme and a very powerful computer, we can run simulations and get results. But crucially, we have to learn how to interpret them and how to make the changes to improve performance. And for that you need experience and MARIN. We ask MARIN to...
Position in the market. MARIN’s people have more experience and this is vital to keep its biggest, basins in the world. More employees, “MARIN has one of the biggest, if not the biggest, test basins in the world. What are the main differences between other facilities and MARIN? Following up on that point, you have seen almost all the test basins in the world. What are the main differences between other facilities and MARIN? “MARIN has one of the biggest, if not the biggest, basins in the world. More employees, experience and this is vital to keep its position in the market. MARIN’s people want to go far in facing new challenges.”

AESC is seen as one of the founding fathers of the CR5 which had its 50th anniversary this year. How do you implement the results of CR5 research into your day-to-day business? “Over the years CR5 has contributed many important tools to enhance propulsion, seakeeping, manoeuvring. At NAVANTIA we are very enthusiastic about CR5, we use PRECAL, PROCAL – all the tools. And vitally, CR5 has led to 50 years of knowledge being built up. Essentially it is an enormous technical library. It is easy to find references to non-usual problems and then find solutions. It is great that companies, which are often competitors, can have open discussions in the working groups about common problems.”

MARIN has always been challenged by your research questions. Is it important to have a good ‘sparring partner’? “I have never seen myself as a sparring partner! But perhaps this is because I usually have a challenging project, requiring non-standard, complex technical solutions. We have to use the tools in a new way, design new methods etc. It is often the first time we walk a particular path. I remember decades ago a US shipowner asked the yard to design a 100-metre catamaran which would be used as a casino. At that time, we didn’t know much about cats. I know I needed MARIN! We worked together and used a revolutionary tool at that moment: a linear CFD code for designing the hull lines! This happened at the end of the eighties when nobody thought about using the first CFD codes for practical tasks. On top of that, this meant that we dealt with many of the philosophical issues right at the beginning of the project. So, I guess, we can consider ourselves sparring partners.”

Finally, how will you transfer your knowledge to the new generation at NAVANTIA and given that hydrodynamic research has been such an important part of your life, how will you survive without it? “The transfer of knowledge has been done! I have been working closely with my colleagues for 14 years, I think they are ready to fly by themselves without my help. Perhaps I admit, I will miss the chance to tell them funny stories though. But hydrodynamics is my profession at the end of the day, you always have to have your mind open for new opportunities. Maybe I will do a second doctoral thesis in economics, which is another passion of mine."

Virtual Ship - smart navigation that saves fuel!

MARIN has developed a prototype, navigational aid system, called Virtual Ship. It advises inland skippers on the optimal track and speed during their voyages in order to obtain the lowest fuel consumption possible.

As restrictions in water depth have a negative effect on the fuel consumption, continuously changing water levels and the riverbed morphology make it difficult for skippers to determine the most energy efficient ship operation. Virtual Ship performs calculations based on real time and predicted water depths provided by CoVadem (www.covadem.com). CoVadem is an initiative started by MARIN, Deltares, Azena Marine and Bureau Telematica Binnenvaart. CoVadem makes water depth information available by aggregating, processing and distributing cooperative depth measurements from a growing ‘sailing network’ of about 80 inland vessels.

Better insight into up-to-date and future river conditions, enables Virtual Ship to show the optimal track for a given route. Power and resistance calculations are performed by our ‘Guilliver’ trip simulation software program. It includes environmental data such as currents and water depth. The software also accounts for the calculation of hydrodynamic influences like squat. Virtual Ship will look for the deepest parts of a river for a given route to determine the optimal track, taking the manoeuvring capability of the ship into account.

Furthermore, Virtual Ship optimises the power and fuel consumption on the optimal track in such a way that the given ETA is achieved. From our previous research [RISING] it was found that the minimum fuel consumption is achieved on a waterway by operating in constant power mode, as long as there are no limits with regards to current velocities and power setting. Therefore, inland skippers will be advised to slow down on the track when water depths are limited.

The development of Virtual Ship was commissioned by the European project NOVIMAR [1]. This project investigates the vessel train, a waterborne platooning concept featuring a manned leading ship and a number of followers, which are digitally connected and follow at a feasible distance by means of automatic control. This vessel train concept is a new approach for inland waterway and shortsea transport. To safely guide a vessel train, smart navigational information, as provided by the Virtual Ship, is essential.

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Arens Bons & Marien Reikema arens@marin.nl