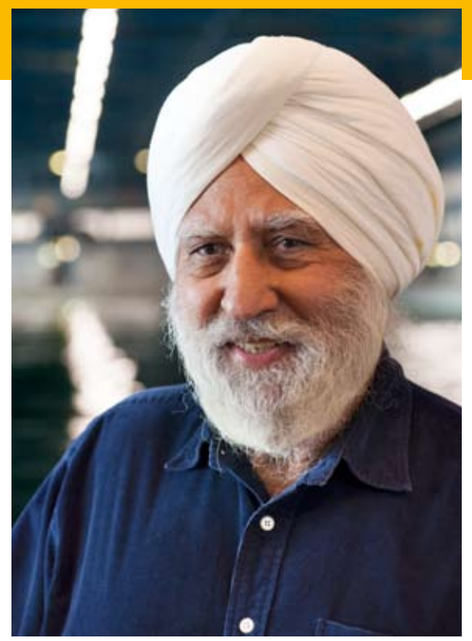
Four decades of DP innovation at Transocean

Report interviews one of the pioneers of DP drillship



Gurbachan Singh Virk

Gurbachan Singh Virk, a Transocean Consultant and formerly Manager of Engineering, Global Marine Drilling Company, has a wealth of experience in the offshore industry and although he shies away from the idea, he is known as one of the world's Dynamic Positioning specialists. Gurbachan talks to Report about innovations the market has seen over the last four decades and how he sees the future of DP and DP drillship.

Gurbachan has an extensive history in the DP sector, dating back nearly 40 years. His first exposure to DP systems came when he joined Global Marine (now Transocean) in 1972. "Global Marine's very birth is synonymous with the offshore drilling industry because it specialised in offshore drilling without any land operations." At the time, Global Marine was operating Glomar Challenger (built in 1968), a DP drillship that specialised in deepwater coring operations under contract to National Science Foundation's Scripps Institute of Oceanography. This was very exciting to be involved in, he says, because over the 15-year coring programme, this drillship finally proved the theory of sea floor spreading and consequently, for continental drift.

But for the birth of DP, it is necessary to travel back to the 1950s. The predecessor to Global Marine was the CUSS Group, formed in 1956 by four oil companies, Conoco, Unocal, Superior Oil and Shell Oil. The mission of CUSS, led by Robert F. Bauer, was to develop techniques for drilling from a mobile platform, including techniques for positioning the platform over the well. The CUSS group bought an old US Navy barge, fitted it with four joystick-controlled, steerable propellers and took the barge to Mission Bay offshore San Diego, in 1961. The DP concept resulting from the tests for controlling the position of the barge with joystick-controlled thrusters was the forerunner of modern-day DP systems, he says. This concept later resulted in the first full DP system onboard the Glomar Challenger in 1968. The first DP drillship for drilling a well, as opposed to coring, was the Sedco (now Transocean) Drillship Sedco 445 (now Deepwater Navigator) in 1971.

Industry-leader Transocean The rest is history! he quips. Now, Transocean leads the industry in high specification deepwater DP drillships.

Gurbachan looks back at the staggering developments that have occurred over the decades, saying that he was extremely proud to have had a chance to work on the design of the Glomar Pacific Class of DP drillships in 1973. "These drillships incorporated the latest station-keeping technology at that time. But compared to the present latest DP technology, I would characterise the Glomar Pacific DP system as analogous to the Ford model-T car!"

Certainly, the list of innovations since the first DP systems were invented is long. But a few developments come to mind, says Gurbachan. Position reference systems, Heading reference systems, Motion Reference Units, Improved sensors and Control systems are just a few. Improved hydrodynamic models of the ship based on model tests, Time domain simulations by using an optimised ship model, Improved thrusters & their drives, Vessel Management Systems & Power Management Systems, are others. Wave feed forward may be the next innovation in improving performance of DP control systems and is the subject of current research, he adds.

Art of DP Model Testing But one thing that has developed beyond recognition is the art of DP Model Testing, he stresses. "Nobody did these kinds of tests when I first got into the design of offshore drilling units. MARIN pioneered the techniques of DP model tests in order to verify if the DP system design can meet its intended performance targets for station-keeping. There are those who believe that one should only determine the environmental forces from the model tests and do the DP design verification by simulation using DP software. I disagree. I think it is not a question of one or the other.

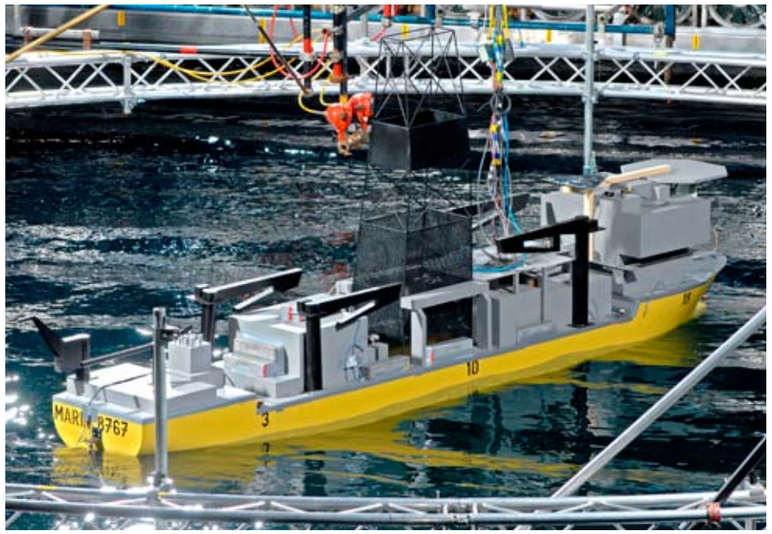
"One does need model tests to determine the environmental loads a DP system must overcome. However, it is not possible to capture the full physics of the real life DP operations just by the computational tools."

A better approach is to do a preliminary simulation to determine the best setting for the DP model tests, carry out the DP model tests under fully automatic DP control and then extend the matrix of model test cases by carrying out time domain simulation by using a model optimised from the DP model tests, he says.

"Recently, MARIN has developed a new class of model thrusters that allow a very accurate assessment of the thruster performance in model tests such as DP station-keeping, calm water tests and sustained speed tests in waves."

Commenting on when he first came in contact with MARIN, Gurbachan says that actually a drillship, named after the Global Marine founder Robert F Bauer, was model tested at MARIN back in 1981. The resistance and propulsions tests were carried

Full DP model tests on a drill ship in the Offshore Basin



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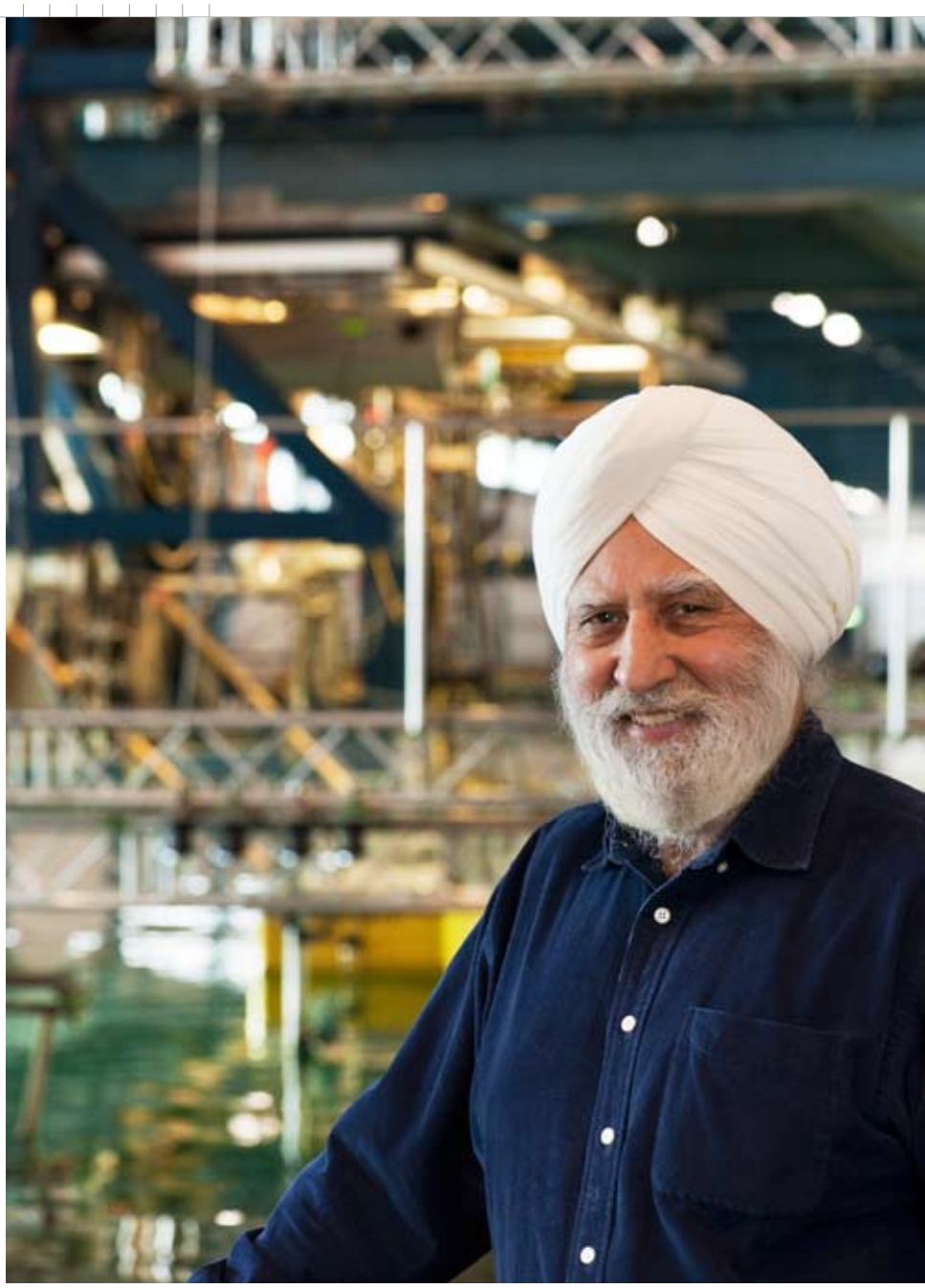

out at MARIN's HQ and this was the first time he had visited the organisation.

In his opinion MARIN's primary function is to help clients in the process of design verification. And MARIN should, if feasible, provide the client with a means of improving the design either by providing calibrated computational tools and/or by offering design services, he adds. "MARIN, by continuously innovating, should maintain its leading position in the field of marine model testing, computational tools, design verification, design improvement and advancement of the education of marine professionals."

MARIN does an excellent job of carrying out specified model test programmes, he emphasises. "I am particularly impressed by the professionalism of the MARIN staff and the desire to do the job right no matter how long it takes, irrespective of whether a client is on site or not. This is a reputation which MARIN has earned and it is paramount this culture of excellence is maintained and reinforced.

"MARIN also has a leading position in computational fluid mechanics, covering significant aspects of the marine industry. And it is playing a leading role in disseminating the knowledge and the application of new computational tools to industry by offering focused courses."

Challenges ahead In the future, Gurbachan points out that there are several areas that should continue to receive attention. Drilling, with a strong focus on environmental protection and having an incident-free work place continue to be important challenges, he stresses. "Transocean minimises the environmental footprint of its operations and continues to improve work place safety and it has an impressive record on both counts."

In addition to the best practical environmental protection, the rig designs must be customised for the extreme cold weather climactic conditions of the Arctic region, says Gurbachan. These features include winterising and the use of construction materials that can maintain their mechanical properties in such cold temperatures.

A critical element of the drilling unit design is the need for a robust station-keeping system that can maintain station in prevailing ice conditions during the seasonal window for drilling operations. Considering the extremely random nature of the ice loads and potential for high forces, some sort of feed forward loop in the DP control system to compensate for the ice loads may be necessary. Recognising the technical difficulties of DP in ice, the 2009 Marine Technology Society DP Conference in Houston organised a special session on Arctic DP.

He stresses that no ice model basin has yet carried out fully automatic DP model tests on a drilling unit. It would make a lot of sense for MARIN to partner with an ice model basin to provide the DP control system know-how, he says.

Another area where MARIN could make a contribution is to offer time domain simulation services using MARIN's aNySIM*pro* model of a drilling unit optimised from the open water DP model tests of the drilling unit. In particular, the ability of the model to accommodate client furnished environmental loads, such as ice loads, could be very valuable.

Looking back over the last 40 years, there have certainly been many pioneering developments. Both MARIN and Transocean will continue to innovate and play a role in any future developments.