

Rahul Kanotra, CEng. (UK)

Subject Matter Expert (Naval), Founder & Director, Inventocean
Mob. - UAE: +971522560217, India +918949178661, Email: rahul.kanotra@inventocean.com

Summary of Qualifications

Rahul Kanotra is the Founder of Inventocean Technologies, a company focused on transitioning to offshore renewable energy. With over a decade of experience in the offshore oil and gas industry, Rahul has gained extensive knowledge in marine and structural engineering, specializing in various floaters like FSPVs, Spar, TLP, Semisubmersible, and FPSO. He is well-versed in planning and analyzing complex offshore installation operations, including Floatover, Loadout, Offload, Transportation, Upending, Mating, Lowering, Launching, and Mooring.

Rahul has a strong interest in Hydrodynamics, with several research papers on the interaction of floating bodies with the seas. He excels in tackling intricate engineering challenges, supported by a solid mathematical background and advanced skills in mechanics, dynamics, and structural analysis. Rahul is proficient in using the MOSES software, having developed numerous macros for Installation Engineering.

Currently, Rahul is at the forefront of innovation in the Floating Solar industry. He has successfully developed mooring and anchoring systems for multiple Floating Solar plants, with a combined capacity exceeding 150 MW. His intelligent designs and innovative solutions have significantly contributed to cost reductions per MW for his clients. Furthermore, he has pioneered India's first floating offshore wind turbine floater, featuring a scalable and easily manufacturable design.

Rahul strongly believes in harnessing the vast ocean resources to achieve sustainability and energy independence. He advocates for the development of cost-effective ocean technologies, including offshore wind, offshore floating solar, wave power, and more.

Work Experience

2020-Present

Founder & Director, Subject Matter Expert – Naval Architecture
Inventocean Technologies Pvt Ltd, Inventocean Design & Engineering. LLC

- ◇ National Thermal Power Corporation (NTPC)
25 MW Simadhari Floating Solar PV Project.
Innovative Mooring and Anchoring Solution and Analysis of 10 nos of Floating Solar Arrays in Coastal zone.
- ◇ Oil & Natural Gas Corporation (ONGC)
Development of ONGC 2MW Floating Solar Project at OMPL Mangalore
Mooring and Anchoring Design for two reservoirs.
An innovative mooring solution was provided to cope with the varying water elevation of the reservoir.
Each reservoir had 6 floating islands. The mooring system was designed to interconnect the islands using mooring ropes and complex analysis was performed to ensure the plant remains in position during high winds.
- ◇ Bentley Systems International Limited
Technical Support and Training for Bentley's Offshore Engineering Design and Analysis tool MOSES users worldwide.



- ◇ Phelan Energy Group
Floating Solar Float Validation Analysis
Hydrostatic analysis of floats and CFD to determine wind loads transferred on Mounting structure.
- ◇ Bahrain Petroleum Company (BAPCO) Modernization Program.
Motion Analysis of Spud Barge (WCD Karim was performed in MOSES software.
- ◇ ADANI Green Energy
600 MWp Omkareshwar FSPV Project
Bid support, technical consultancy for mooring and anchoring of FSPV at Omkareshwar reservoir.
- ◇ Mahalaxmi Konal Urja Private Limited
100 MWp Middle Vaitarna Dam FSPV
Provided comprehensive engineering consultancy services to assess the feasibility of mooring and anchoring a Floating Solar Photovoltaic (FSPV) system in the Middle Vaitarna Dam. Reviewed various designs and provided installation engineering expertise.
- ◇ JINDAL Stainless Steel
JINDAL Stainless Steel FSPV
Inventocean performed the mooring and anchoring design and CFD analysis of the floating solar platform in MOSES.
- ◇ PETRONAS
Offshore FSPV Pilot Project
This was a challenging project where I performed the jacket launching analysis from Launch Barge. The Jacket and Barge hydrodynamic model was made in MOSES software and the Launch simulation was performed in the time domain.
- ◇ Great Water Maritime LLC
Jacket Launch Analysis
Performed mooring analysis for a highly innovative design of a Floating Solar Photovoltaic (FSPV) system intended for offshore environmental conditions in Malaysia.
- ◇ Great Water Maritime LLC
Wind Turbine Monopile DAF Study
Performed DAF Study in MOSES for wind turbine monopile. The limiting sea states were provided to the client based on the analysis results. To study a vast range of load cases, our team ran multiple time domain simulations in MOSES software. The study involved a comprehensive evaluation of the system to ensure the DAFs were within the operational limitations and the slings and moorings have appropriate safety factors against MBL. The limiting sea states and maximum loads were provided to the client based on the analysis results
- ◇ Sea Delta Marine & Offshore Engineering
Mooring Analysis – Offshore Pipelay
Performed mooring analysis (in MOSES) for the pipelay barges - Leighton Eclipse and Leighton Stealth under operational, docking, and survival conditions. Our team provided the client with the limiting seastates, accounting for applicable safety factors and operational constraints during offshore work and pipelay operations. The mooring system optimization was also provided to ensure effective loads sharing among mooring lines.

- ◇ Turquoise Engineering (UK)
Vent Boom Removal Project
Performed a stability and Dynamic lift study for VENT boom removal offshore Turkish coast. The limiting seastates were provided to the client based on the analysis results. The vent boom was safely removed.
- ◇ Great Water Maritime LLC
Boat Fender Dynamic Lift Study
Performed a detailed Dynamic lift study of boatfender. To study a vast range of load cases, our team ran multiple time domain simulations in MOSES software. The study involved a comprehensive evaluation of the system to ensure the DAFs were within the operational limitations. The limiting seastates were provided to the client based on the analysis results.
- ◇ ADANI Power (Mundra) Ltd
Technical Assistance for Floating Solar Development at Different sites of Adani Power Limited
As part of the project, I managed and successfully completed a comprehensive scope of work for Floating Photovoltaic (FPV) projects. This involved reviewing reservoir drawings, calculating power potential, selecting standard solar PV modules, assessing water savings, studying shadow effects, choosing suitable floaters and anchoring systems, providing electrical interfacing details, preparing general arrangements, estimating BOQ, and evaluating CAPEX & OPEX.
- ◇ Hazelett Marine (USA)
Elastic Mooring System for FSPVs
I provided consultancy services to Hazelett Marine to apply their elastic mooring system in floating solar applications. The successful management of a project with Inventocean involved designing the mooring components catalog in SOLIDWORKS. My services included offering engineering consultation and support for various Hazelett Marine projects, encompassing layout and design recommendations, providing CAD drawings, and assessing and delivering marine simulation results.
- ◇ Turquoise Engineering (UK)
STS Crane Transportation and Loadout Engineering
I led and managed the naval architecture team responsible for conducting stability and transportation assessments, as well as mooring and loadout engineering for the STS crane during its transportation on the pontoon barge named ALKOR. The mooring and loadout operations were optimized based on the limiting elevation of the quayside.
- ◇ Neeraan Internationa Contracting (SAUDI ARABIA)
Mooring Analysis of Floating Desalination Plant in YANBU, Saudi Arabia
Led and executed successful Mooring Analysis project for a Floating Desalination Plant. Generated hydrodynamic model in MOSES software, performed time-domain analysis, and ensured compliance with API RP 2SK guidelines. Delivered comprehensive report providing valuable insights and solutions to ensure safe and efficient mooring.
- ◇ Sea Delta Marine & Offshore Engineering
Mooring Analysis – Offshore Pipelay
I successfully conducted a comprehensive mooring analysis project for Gulf Marine Services (GMS) through Sea Delta Marine & Offshore Engineering (SDMO). Utilizing Bentley's MOSES software and adhering to API RP 2SK and DNV standards, I ensured the safe mooring of a Floating Dock next to the jetty. The analysis covered various aspects, including pre-tension estimation, dynamic tensions, damage assessment, and system verification.

- ◇ Dubai Drydocks – A DP World Company
Mooring Analysis – Offshore Pipelay
I led the project at Inventocean, where we provided a multi-body mooring analysis of the FPSO Voyageur, which was to be moored at Dubai drydock for a duration of one year. My responsibilities encompassed performing intricate dynamic mooring analyses, preparing the engineered mooring arrangement, and documenting the findings in a comprehensive mooring analysis report. Throughout the project, I ensured that all comments and feedback from various stakeholders, including DDW, the client, and MWS, were diligently attended to and addressed, ensuring a collaborative and successful outcome. Leveraging our expertise and proficiency with the MOSES software, we efficiently tackled the complexities of the project. As a result of our team's dedication and proven track record in similar jobs, Inventocean was recommended as the consultant for this highly specialized scope of work.

Oct 2015-Nov 2021

Consultant Subject Matter Expert – Naval Architecture
Freelance/Greatwaters Maritime LLC, Dubai, UAE

- ◇ National Thermal Power Corporation (NTPC)
100 MW Ramagundum Floating Solar PV Project.
Mooring and Anchoring Design and Analysis of 24 nos of Floating Solar Arrays. Estimation of Wind and Wave Loads. Wind variability analysis and post-processing of 25 years of available wind data. Mooring line selection based on estimated creep. Design according to IS-875.
- ◇ National Thermal Power Corporation (NTPC)
Kayakulum Floating Solar PV Project.
Mooring and Anchoring Design and Analysis of 6 nos of Floating Solar Arrays in Coastal zone.
- ◇ Lamprell Energy Limited
GEOSEA Moray Firth Offshore Wind Energy Project
The full scope of Naval Architecture Engineering. Transportation, Loadout, Motion Analysis for 45 Wind Turbine platforms for Moray Offshore Windfarm.
- ◇ Albwardy Damen Shipyard
Hopper Barge (FATMAN) Stability
Stability booklet for FATMAN hopper barge. Created innovative macros to simulate outflow of liquid cargo (from hopper) for calculations of righting arm curves.
- ◇ Abu Dhabi National Oil Company (ADNOC)
Arzanah Decommissioning Project (Removal of 14 Tripods, 11 Monopods, CPP, Bridges, Flare Tower and Recovery of 18 Km Subsea Power Cable from Arzanah Field)
ADNOC approved “Performing Authority”. Lead Project Engineer/Field engineering support for the removal of offshore structures. Onboard AOS Neptune DP2 vessel. Subsea cable recovery of 18 Km power cable from Arzanah Island to Central Processing platform.
- ◇ Kuwait Integrated Petroleum Industries Company (KIPIC)
Al-Zour Refinery Project
Mooring Analysis for Riser and Tie-in Spool Installation
- ◇ Sapura Kencana
Floatover Bid Evaluation



Floatover Engineering Study - 11500 MT deck on FLB-1 Barge. FLB-1 Barge strength, stability, and mooring calculations. Floatover specs preparation for LMUs/DSUs and External ballasting system identification.

Aug 12-Sept 15

Naval Architect
McDermott International, Houston, Tx, USA

- ◇ Petronas
Kepodang Gas Development Project
Floatover of 3700 MT CPP platform.
Floatover Engineering from FEED studies to Installation.
Lead a team of Naval Architects and Structural Engineers and engineered the float-over operations.
Vendor qualification and specifications of float over hardware (LMUs & DSUs).
Floatover field engineering support working alongside ballasting engineers, deck crew, and barge superintendent.
- ◇ Petrobras
Papaterra Field Development (South America's 1st Tension Leg Platform Installation)
Transportation & Float-over installation of Tension Leg Wellhead Platform (TLWP) P-61 weighting ~11,000MT by the float-over method. Floatover engineering calculations.
Complex tendon installation analysis in MOSES. Modeling of the ratchet type connections (between the tendon and TLP deck).
Field Engineering onboard DB50. Assisted in the actual offshore tendon integration operation.
- ◇ Anadarko
Hiedelberg Spar Installation Project
Transportation & Upending analysis of the spar platform in MOSES.
Field Engineering support onboard DB50 during spar upending.
- ◇ British Petroleum (BP)
BPTT Trinidad Accommodations Project
Workability Study for living quarters installation.
Bimodal workability studies for DB50 Installation barge in the side & stern lift configuration. Weather window analysis.
- ◇ VAALCO Energy
Etame and Seent platform development Project
Upending analysis for ETAME & SEENT Jackets. Feasibility study for 2-block-upending.
Transportation and Motion analysis of Decks & Jackets.
- ◇ Williams
Discovery Junction Deck Loadout
Loadout Engineering, Ballasting plan development, and Field Engineering support to the loadout team.
- ◇ Saipem Kasawari Floatover
Bid evaluation study
Floatover assessment of 21000 MT deck on INT-650 barge.



Nov 10-Aug 12

Naval Architect
McDermott Middle East Inc, Dubai, UAE

- ◇ Saudi Aramco
Safaniya Field Development (Platform Installation), Arabian Gulf
Transportation & Floatover of 6000 MT CPP platform.
Floatover Engineering, Mooring analysis, Barge feasibility studies.
- ◇ Abu Dhabi Marine Operating Company (ADMA)
Zakum water injection Upgrade Project.
Transportation & Floatover of 3900 MT CPP platform.
Floatover Engineering, Mooring analysis, Barge feasibility studies
- ◇ McDermott Derrick Barge
DB101 Incline Test (Keppel Tuas Shipyard)
Conducted the deadweight survey, prepared procedures for the inclining
experiment, and provided infield support.
- ◇ Oil & Natural Gas Corporation (ONGC)
Cluster-7 Well platforms Project
Upending analysis for ONGC B192-1, B192-5, B192-8, WO-24, and BHE
platforms. Studied various contingency cases for jacket upending analysis,
and prepared procedures and drawings for offshore operations.
- ◇ BHP BILLITON
Macedon ITT Project
Motion analysis of DB-30 pipelay barge.
- ◇ Petro Vietnam (PTSC)
Bien Dong 1 Development Project
Engineering lift of WHP-MT1 (2700 MT) Deck by DB101 barge.
Liftoff from material barge studies.
- ◇ Exxon Neftgas Ltd.
Sakhalin Arktun-Dagi Offshore Pipeline Project
Mooring analysis of Derrick Barge KP1 for 20" pipe lay (Beachpull location).
- ◇ Larsen & Tubro/ Oil and Natural Gas Corporation
Mumbai High N14 Jacket Installation Project
Mooring analysis of Derrick Barge DB101.
- ◇ Saudi Aramco
Upgrade of Crude gathering facilities, Phase 1
Mooring analysis for 42inch pipeline during pipelaying operations.
- ◇ Reliance
SPM Replacement Project, India
Transportation analysis for offshore trips for miscellaneous Items.
- ◇ Saudi Aramco
KARAN gas field development, offshore platforms, and subsea pipelines
Project
Transportation analysis of Karan6, 9/16 Bridge, and Flare tower on barge
Miclyn 3316.



Sep 09-Oct 10

Assistant Executive Engineer - Marine
Oil and Natural Gas Corporation, Mumbai, India

- ◇ Inspection, Maintenance and Repair Group (IMR)
Posted in Mumbai Offshore Onboard ONGC's multi-support vessels as ONGC's Representative / Vessel In-charge.
Administered offshore support jobs which included Diving Support, Crane Assistance, Inspection Maintenance and Repair of Subsea Structures/Pipelines, SBM-SPM Mooring Support, etc.

May 07-July 09

Researcher
Indian Institute of Technology Madras

- ◇ Deepwater Structures Inc, Houston, Tx, USA
Experimental Analysis of a Non-Ship Shaped FPSO
Researched on state of the art non-ship-shaped FPSO vessel for the applications to the frontier fields, including the Arctic, deep-water and harsh environment.
Completed experimental studies of the 1:45 scaled model in a Wave Flume at IIT Madras.
Researched on the use of heave and skirt plates to reduce the motions of the platform. Investigated the effect of different mooring designs.
Co-authored and presented papers on the innovative concept in Offshore Mechanics and Arctic Engineering (OMAE) 2008 conference in Portugal and the Society of Petroleum Engineers (SPE) 2008 conference in Moscow.
- ◇ Summer Internship at Norwegian University of Science and Technology, Trondheim, Norway
Tension Leg Platform Design to Support 5MW wind turbine.
Analyzed a Tension Leg Platform to support the wind turbine in extreme environments using Wave analysis software WAMIT.
- ◇ Deepwater Structures Inc, Houston, Tx, USA
Experimental Analysis of a Dry Tree Semisubmersible.
Numerically analyzed the dry-tree semisubmersible in wave analysis software WAMIT. Completed experimental studies of 1:70 scaled model in a Wave Flume at IIT Madras.
Co-authored papers on the innovative concept which were published in Offshore Mechanics and Arctic Engineering (OMAE) 2009 conference in Hawaii and The International Journal of Ocean and Climate Systems (IJOCS) in 2014.

Education

May 2014

Licensed Chartered Engineer (Engineering Council of UK)
CEng. License Number 614158

2007-2009

Master of Technology in Naval Architecture & Ocean Engineering
(Under Dual Degree Program)
Indian Institute of Technology Madras
(CGPA 8.29/10)

2004-2009

Bachelor of Technology in Naval Architecture & Ocean Engineering
(Under Dual Degree Program)
Indian Institute of Technology Madras
(CGPA 8.29/10)



Conferences Attended / Key Speaker

27th International Conference on Offshore Mechanics and Arctic Engineering-OMAE 2008, Estoril, Portugal, June 2008.

- ◊ Amongst 21 graduates selected worldwide in Outreach for Engineers specialty forum “Career Opportunities in Offshore and Arctic Engineering”, sponsored by Transocean and ABS.
- ◊ Presented a paper on Hydrodynamics of a Spar Shaped FPSO.

SPE Russian Oil & Gas Technical Conference and Exhibition, Moscow, Russia, 28–30 October 2008.

- ◊ Presented a paper on the design of a Non-Ship Shaped FPSO.

Key speaker in MASTECH (December 2011) - An international Maritime Technical conference organized by the Middle East Alumni of Ship Technology.

Paper Presentation - 31st International Conference on Offshore Mechanics and Arctic Engineering - OMAE 2012, Rio De Janeiro, Offshore Mechanics, and Arctic Engineering Conference).

Key Speaker - Marine Operations Specialty Symposium (MOSS 2012), Singapore.

Publications

Srinivasan N, Chakrabarti SK, Sundaravadivelu R, **Kanotra R**, “Hydrodynamics of a SPAR type FPSO Concept for Application as a Production Platform”, Proceedings of 27th International Conference on Offshore Mechanics and Arctic Engineering, OMAE2008-57093, Portugal, June 2008.

Srinivasan N, Singh N, Chakrabarti SK, Sundaravadivelu R, **Kanotra R**, “Design of a Non-Ship-shaped FPSO for Sakhalin-V Deepwater” SPE Paper Number: SPE-114882, 2008 SPE Russian Oil & Gas Technical Conference and Exhibition held in Moscow, Russia, 28th –30th October 2008.

Srinivasan N, Chakrabarti SK, Sundaravadivelu R, Selvakumar R, **Kanotra R**, “Innovative Harsh Environment Dry-Tree Support Semi-submersible for Ultra-Deepwater Applications” Proceedings of 28th International Conference on Offshore Mechanics and Arctic Engineering, OMAE2009-8005, Honolulu, Hawaii, USA, May – June 2009.

Rahul Kanotra, Mohamed Abou-Malwa, Chellakat Joe-Joe, Sajith Nair, and Vijoy Koottungal (2012) Dynamics of a heavy deck lift-off from transportation barge (P. OMAE2012-83458), Rio de Janeiro, Offshore Mechanics, and Arctic Engineering Conference).

Rahul Kanotra, Chellakat Joe-Joe, and John G. Nolte, III. Engineering a Marine lifting operation (P. MOSS-32) Marine Operations Specialty Symposium (MOSS 2012), Singapore.

Sundaravadivelu, Ranganathan, **Rahul Kanotra**, & Nagan Srinivasan. "Transportation analysis of dry tree semisubmersible." The International Journal of Ocean and Climate Systems 5.2 (2014): 105-116.

Rahul Kanotra and Ravi Shankar. “Floating Solar Photovoltaic Mooring System Design and Analysis”, OCEANS 2022: Chennai. IEEE, 2022

Vandaarkuzhali G, **Rahul Kanotra**, and Panneer Selvam R. "Hydrodynamic Analysis of a Hexagonal Shaped Wind Floater with 5MW Wind Turbine." Presented at the International Conference on Ships and Offshore Structures (ICSOS 2023), 25 – 27 September 2023, Yantai, China