World Academy of Science, Engineering and Technology
International Journal of Marine and Environmental Sciences
Vol:18, No:08, 2024

Hydrodynamic and Water Quality Modelling to Support Alternative Fuels Maritime Operations Incident Planning & Impact Assessments

Authors : Chow Jeng Hei, Pavel Tkalich, Low Kai Sheng Bryan

Abstract : Due to the growing demand for sustainability in the maritime industry, there has been a significant increase in focus on alternative fuels such as biofuels, liquefied natural gas (LNG), hydrogen, methanol and ammonia to reduce the carbon footprint of vessels. Alternative fuels offer efficient transportability and significantly reduce carbon dioxide emissions, a critical factor in combating global warming. In an era where the world is determined to tackle climate change, the utilization of methanol is projected to witness a consistent rise in demand, even during downturns in the oil and gas industry. Since 2022, there has been an increase in methanol loading and discharging operations for industrial use in Singapore. These operations were conducted across various storage tank terminals at Jurong Island of varying capacities, which are also used to store alternative fuels for bunkering requirements. The key objective of this research is to support the green shipping industries in the transformation to new fuels such as methanol and ammonia, especially in evolving the capability to inform risk assessment and management of spills. In the unlikely event of accidental spills, a highly reliable forecasting system must be in place to provide mitigation measures and ahead planning. The outcomes of this research would lead to an enhanced metocean prediction capability and, together with advanced sensing, will continuously build up a robust digital twin of the bunkering operating environment. Outputs from the developments will contribute to management strategies for alternative marine fuel spills, including best practices, safety challenges and crisis management. The outputs can also benefit key port operators and the various bunkering, petrochemicals, shipping, protection and indemnity, and emergency response sectors. The forecasted datasets provide a forecast of the expected atmosphere and hydrodynamic conditions prior to bunkering exercises, enabling a better understanding of the metocean conditions ahead and allowing for more refined spill incident management planning

Keywords : clean fuels, hydrodynamics, coastal engineering, impact assessments
Conference Title : ICMEM 2024 : International Conference on Marine Environmental Modeling
Conference Location : Kuala Lumpur, Malaysia
Conference Dates : August 22-23, 2024