

▲ Performance Evaluation Facilities - St. John's, NF

COLLABORATION

A collaborative project with the Terra Nova Alliance is underway to examine the performance of evacuation systems on a Floating Production, Storage and Offloading vessel (FPSO), in a variety of environmental and damage conditions. The project is investigating the effectiveness of lifeboat delivery to the water and its ability to move away safely from the FPSO.

The experiments mark the first of their kind for an FPSO vessel. The Terra Nova Alliance is contributing funding to the project, while the Institute for Marine Dynamics (IMD) is providing modifications to the FPSO model that was used in an earlier set of tests.

Negotiations are still ongoing with Terra Nova partner FMC Ltd. to enter into a long-term collaborative research agreement. Under consideration is a project that would use computational fluid dynamics software to investigate the effects of high seas, or green water, running over the deck of an FPSO.

Elsewhere on the collaborative front, a steering committee has been established to oversee research specific to offshore escape, evacuation and rescue (EER). The committee includes NRC, the Canadian

Association of Petroleum Producers, Natural Resources Canada and Transport Canada. The first phase of their effort is focusing on several tasks, including:

- conducting a review of existing EER research done nationally and internationally,
- communicating that knowledge and evaluating its relevance to the Canadian environment,
- developing a common user database on EER in Canada, and,
- undertaking value-added R&D to support development of regulations for offshore rig evacuation systems.



95 Bonaventure Ave., Suite 401
P.O. Box 28009, St. John's
Newfoundland, Canada
A1B 4J8

Telephone: (709) 722-9060
Facsimile: (709) 722-9064
Email: oceanic@oceaniccorp.com
URL: <http://www.oceaniccorp.com>

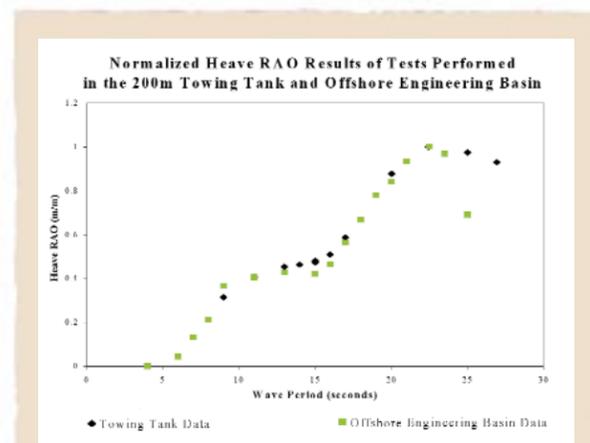
QUALITY ASSURANCE THROUGH REPEATABILITY *Claire Smith*

A measure of a test program's quality is the ability to replicate the experimental results. When evaluating a novel design, a model will sometimes demonstrate unexpected behavior. Oceanic's unique collection of facilities permits us to repeat the experiment in a different facility and compare the results.

The initial experiments were conducted in the Offshore Engineering Basin (OEB) in three meters of water. To ensure that the discrepancy encountered was not due to water depth, the experiment was repeated in the 200m Towing Tank at a water depth of 7 meters. In both experiments, the model's motion response was measured. As illustrated below on the plot of heave Response Amplitude Operator (RAO) at a 180 degree heading, there was a direct correlation between the results of both tests.

Oceanic is committed to providing our clients with quality performance evaluation services. The above example illustrates how our range of test facilities assists us in meeting the high standards demanded by clients in today's competitive marketplace.

▼ Heave RAO Results



▲ Semi-submersible in waves

In recent tests involving a novel concept semi-submersible, a discrepancy arose between the client's numerical predictions of heave response and the results of the model tests. The numerical analysis predicted a point at which the inertial loads of the pontoon cancelled the hydrostatic loads on the columns. However, the test results indicated that the model did not reach the cancellation point

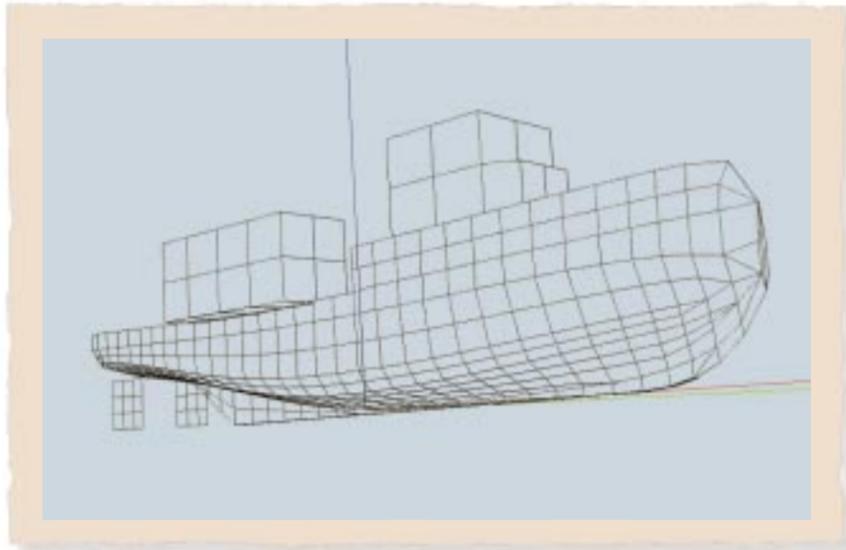
within the wave period range tested. It was suspected that this was due to the inability of the numerical model to predict viscous effects. However, it was first necessary to ensure that the differences were not a result of shallow water waves acting on the pontoon or problems with the model setup.

NEW APPLICATIONS FOR NUMERICAL SIMULATION

Brad Rixmann

While marine performance evaluation services have traditionally been used by vessel designers and builders to help them refine their designs prior to construction, the services of Oceanic Consulting Corporation have a much broader range of application. This is particularly true of Oceanic's numerical simulation capabilities.

One example of such a non-traditional application is the assessment of a vessel's suitability to a given task. Logistics personnel, particularly in the oil and gas industry, are frequently confronted with constraints which prevent them from using the vessel best suited to their often massive cargo. Limitations such as canal or lock dimensions en route may make it necessary to use a smaller vessel than standard



▲ Supply Vessel with Deck Cargo

practice would dictate. Numerical seakeeping simulation provides a cost-effective means of determining the dynamic stability of such a vessel with the client's particular cargo onboard.

Oceanic's seakeeping code, MOTSIM, enables the simulation of sea conditions including irregular wave spectra from any heading with or without forward speed. The code uses a non-linear, time-domain solver allowing the simulation of severe seas and transient phenomena such as rudder operation not possible in more common frequency domain simulations. MOTSIM has proven its accuracy and reliability through extensive validation during its development at National Research Council of Canada and Memorial University of Newfoundland and as part of its ongoing commercial use at Oceanic.

The output from MOTSIM is time-series of vessel position and orientation. Displacements, velocities and accelerations at any point on the vessel or its cargo may be quickly computed from this basic output and analyzed using MOTSIM's post-processor programs. Once the stability of a vessel is confirmed, Oceanic's software development team can provide customized data processing to generate information such as the deck loads associated with a given loading arrangement in a particular seaway. This information can be used to ensure the structural suitability of a vessel and to guide the design of sea fastenings.

Oceanic's simulation and analysis services can also be used to evaluate the effect of proposed modifications to a vessel from the addition of a ride control system to increasing fuel capacity. Continued development of Oceanic's numerical simulation capability ensures that we can provide timely, cost-effective answers to help our clients make informed decisions.

FOCUS ON EXPERTISE

Ron Drodge

Ron Drodge has developed expertise in performance evaluation throughout his entire professional career. Upon completing his formal education in Naval Architectural Engineering at Memorial University of Newfoundland in 1986, he began work with the local offshore industry through a private company that specialized in developing Newfoundland's marine testing facilities. He has maintained his presence in this community through his marine performance evaluation work at the Institute for Marine Dynamics. His one excursion from the marine performance evaluation community was to apply himself to shipyard duties on an offshore oil project.

Through testing for the offshore industry, Ron has developed an expert knowledge of the requirements for various types of offshore vessels, test procedures and test facilities. He has performed tests of gravity-based structures, semi-submersibles, FPSOs and a variety of mooring buoy designs. His involvement in any project generally covers the complete scope of work: planning, design and model construction, testing, analysis and reporting. Today's offshore industry demands accurate modeling and testing of many different types of mooring arrangements, an area in which Ron has developed considerable expertise. An accurate and thorough analysis of test

OCEANIC'S EXPERIENCE WITH GRAVITY-BASED STRUCTURES

Even though Gravity-Based Structures (or GBS) rest on the ocean floor, they must still withstand significant environmental abuse. Hence the design of a good platform requires considerable research and study. Tested in 1993, the Hibernia GBS was the first such structure tested at the Institute for Marine Dynamics (IMD). A large-scale model (1:40) was constructed and a series of experiments was completed in the Offshore Engineering Basin to determine wind and wave forces on the model. The model was assessed for the severe weather conditions the structure would face in the North Atlantic off the Newfoundland coast.

In addition to physical model tests, numerical simulations of the Hibernia structure were also undertaken at IMD. The Institute partnered with other Canadian companies to determine hydrodynamic loads and structural responses of an elevator tower on the GBS and to develop software used during the rig tow-out to its final position. Since this initial project, several such structures have been tested in the Offshore Engineering Basin.

Currently, Oceanic is consulting on the design of a GBS for potential offshore development in Russia. This involves testing the GBS model under simulated environmental conditions in order to investigate the design of the proposed structure and to assist with fine-



▲ Model Test of Hibernia GBS

tuning various aspects of the platform's design. Based on our experience with offshore structures, offshore development companies continue to choose Oceanic Consulting Corporation for their marine performance evaluation work.

results is also a necessity, a valuable skill which Ron has finetuned through his past project work. He notes that clients demand more accurate analysis today than that which was considered acceptable in the past.

Ron sees the requirements for model testing expanding and changing as the offshore oil industry moves into deeper water and harsher environments. To further meet the needs of the industry, both Ron and Oceanic Consulting Corporation have identified specific areas where model testing methods and equipment require further development. Examples of this work include validating and correlating results in deep water as well as developing equipment that will allow the modeling of deep water moorings in more cost effective basin depths. With the goal of providing Oceanic's clients with the best possible testing and analysis methods, this development work is already underway.

Hibernia GBS ►

