

A Conceptual Design of MOERI's Ice Model Basin

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ABSTRACT

New hull forms and novel operational concepts are being developed to meet the challenges facing the shipping industries due to increasing demand for ice-strengthening vessels. This in turn leads to increased demand for physical model tests in ice to assist in the design process to improve their ice-going capability and performance. The Korean government has recognized the immediate need for providing research and development support to the Korean shipyards by funding the first model ice basin in MOERI. This paper presents the conceptual design of the new ice modeling facility to be built at Daejeon in South Korea by 2010.

KEY WORDS: Level ice; ice model test; carriage; ice model basin

INTRODUCTION

The world's increasing consumption of energy and mineral has accelerated resource development at the Arctic Ocean and its peripheral zones with the increasing demand for ice-strengthening ships and arctic offshore structures for production and transportation. Furthermore, the increases of shipping via the Northern Sea Route has led to increased potential for international trade between the North Atlantic and the North Pacific regions. New hull forms and novel operational concepts are being developed to meet the challenges facing the shipping industries as a result of the increasing demand for ice-strengthening vessels and arctic offshore structures that must meet the regulatory requirements. Physical modeling is commonly accepted as the most reliable modeling techniques to assist the design of new ships and structures, and the performance evaluation of the final designs. This in turn leads to increased demand for model tests in ice to assist in the design process to improve their ice-going capability and performance. As South Korea owns about 43% of the world's market share in shipbuilding, the Korean government has recognized the urgent and immediate need for providing research and development support to the Korean shipyards, academia and research community in ice modeling to maintain their edge in this important sector by funding the first ice model basin in MOERI, South Korea.

This facility will accelerate the development of the Korean ice modeling technology and equip its ship building industries to face the increasing demand for ships and structures for ice operations. This facility will also provide the research community and the industries a secured access to ice modeling and expertise for their R&D on ice-going vessels and novel structures, advanced transportation system and technology, and operational concepts for service in ice-covered waters. With the support of the Korean Government, the research community and the shipbuilding industries, MOERI has decided to build the next generation ice model basin at Daejeon. The construction will begin in the summer of 2007 and we anticipate full operation as early as 2010. This facility will employ the state-of-the-art modeling technology. The size and shape are designed uniquely to provide enhanced ice modeling capability for ice operating offshore platforms and ship maneuvering.

This paper presents the conceptual design of the new ice modeling facility, and the initial research activities envisioned for the adaptation and fine-tuning of its various ice testing techniques.

MAIN FACILITIES

The ice modeling facility will be equipped with a square ice model basin, a trimming tank, a main xy-towing carriage, a service carriage, two small cold rooms, a machinery and control room and a refrigerating system (Fig. 1).

Ice Modeling Basin

With a dimension of 32m long by 32m wide by 2.8m deep, the proposed ice tank is of a square type (Fig. 1), the size of which was selected with due consideration of required ice modeling capability and construction costs. This square design is similar to the tank at the Helsinki University of Technology's Arctic Offshore Research Centre that is approximately 40 m by 40 m in size. These dimensions are particularly suitable for the studies of ice loads on fixed offshore installations, which require modeling of their interaction with ice across their structural width. It also permits full circle ship maneuvers to be conducted. For a typical ship resistance or propulsion test, the 32m of available ice width will allow more than six parallel model tracks to be