

# Mobile Harbor: A New Technology for the 21 Century

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## ABSTRACT

KAIST Mobile Harbor Project was launched as a project to solve a big problem relevant to the 21<sup>st</sup> century human living. This refers to a new concept to load/unload containers in the open sea with a comparable efficiency of portal quayside cranes. In 2009, original core technologies have been developed and their technical feasibility demonstrated on an ocean water basin. In this presentation, the main core technologies will be explained with movies and videos. How the project is operated will be explained in relation to design research and education in KAIST, in addition to other possible applications to industries.

## I. INTRODUCTION

Recent trends in marine cargo transportation market include continued increase in global container shipping volume and the introduction of mega-sized containerships. It implies that container cargo handling capacity, worldwide, must increase accordingly. A natural consequence of these trends is the need for enhanced port capacity and capability. However, this is not the best solution as it comes with a number of other problems: it brings environmental or security concerns, prohibitively large scale of SOC investment and so on. Also we need container handling solutions especially for ports with insufficient infrastructure such as those in Africa, Middle East, Southeast Asia, and so on.

## II. CONCEPT OF A MOBILE HARBOR

In KAIST Mobile Harbor project, we develop an integrated system called "Mobile Harbor (MH)" that can enhance economical and environmental benefit to maritime logistics. It is a novel maritime container transport solution that can go out to a ship anchored in the deep water to load/unload containers on sea and take them to their destination ports regardless of their water depth. This is an unprecedented mega-sized project for a university.

The core of the technology is the precision handling of containers. The two key words are "under open sea condition of Sea State 3" and "efficiency comparable to the speed of portal quayside crane." This refers to a very challenging technology never tried before, since we are talking about huge systems problem, in this case, a height of 40m and an outreach of 40m and a hoisting weight of more 60 tons.

Original core technologies have been developed and demonstrated experimentally on ocean water basin last year. Several essential component technologies are combined to facilitate very demanding requirements for the precision handling of containers.

## III. CORE TECHNOLOGIES DEVELOPED

The four key technologies to be combined are: 1) Zero Moment Crane (ZMC) is a very innovative crane stabilization concept non-existent before, 2) Spreader positioning control, 3) Cable control for heave and 4) Ship-to-ship docking by vacuum pad and tensioned cable. All these are demonstrated on a 1/20 scaled model on ocean wave tank as shown below

