Installation of Subsea Modules

Installation of subsea modules has always been a major issue in engineering of subsea platforms. As the world offshore oil and gas production moves to deeper fields, the need for more efficient and more economical deployment methodologies acquires increasing importance. Considering the current boom in subsea operations and serious restrictions for access to heavy lifting vessels in Australian waters, the availability of the proper deployment method for offshore installation jobs is one of the most important parts in subsea projects in Australia.

Mehrdad Kimiaei, as a member of WAERA's project on Compact Sub-sea Gas Processing Technology, is working on numerical models for installation of subsea modules. **Mehrdad Kimiaei** has been working on numerical models for subsea installation jobs using Conventional Installation Method (CIM) and Pendulous Installation Method (PIM) since 2006. In Conventional Installation Method, subsea platforms are lowered directly towards seabed through a steel wire rope form a floating vessel (Figure 1) whereas in Pendulous Installation Method, the pendulous motion is utilized for deployment of subsea modules (Figure 2). CIM is being used widely by offshore operators and installation contractors while PIM is a relatively new installation method which needs more investigation. In CIM, the capacity of the lifting vessels and dynamically amplified loads are the major concerns while in PIM, overall stability and integrity of the module (particularly at early stages of the pendulous motion) are the most important issues.

Figure 1: Conventional Installation Method for deployment of subsea modules

A series of numerical analyses have been carried out in COFS for CIM in assessing the hydrodynamic forces, dynamic amplification factors (DAF) and possibility of snap forces in lifting wires when the subsea objects are passing through water surface zone. Results of these analyses were compared with DNV guidelines for subsea installation operations and it was found that existing guidelines for CIM sometimes may lead to very conservative estimations. Figure 3 shows the crane hook load for one of those numerical studies. Results of this study have been accepted for presentation in the Marine Operation Specialty Symposium, to be held in Singapore in 2008.

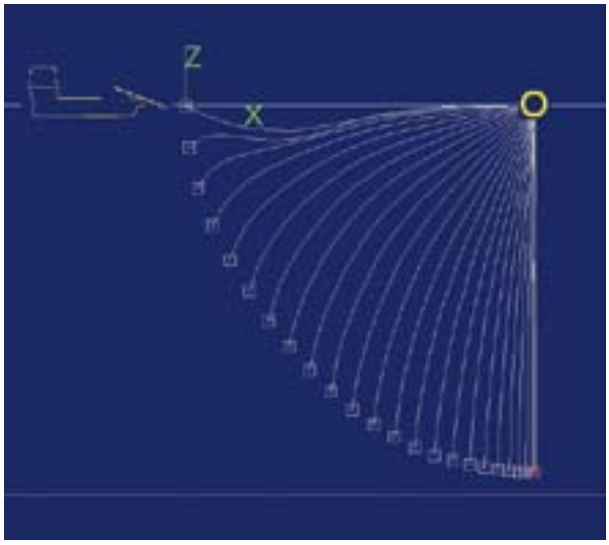

Figure 2: Pendulous Installation Method for deployment of subsea modules

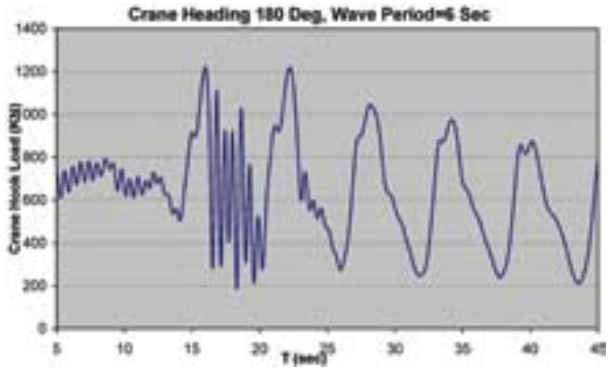

Figure 3: General trend of tension load in lifting wires for subsea installation jobs using CIM

Mehrdad Kimiaei in conjunction with **John Halkyard** (Technip, Huston office) performed a series of feasibility study on PIM and free fall methods for deployment of a heavy dead weight anchors in ultra deep waters on rock type seabeds (Figure 4). Results of this study show that PIM, with some modifications, can be a feasible alternative for such subsea installation jobs as well.

Sensitivity of PIM to main input parameters : (i) horizontal distance between barges (ii) ratio of pendulous line length (iii) hydrodynamic coefficient of subsea module, were studied in 2007. These numerical studies will be continued on more comprehensive models in next stages of this research . **Mehrdad Kimiaei** in conjunction with **Krish Thiagarajan** (WAERA) is preparing a case study for conducting laboratory tests at UWA in deployment of subsea modules using PIM and CIM in next year.

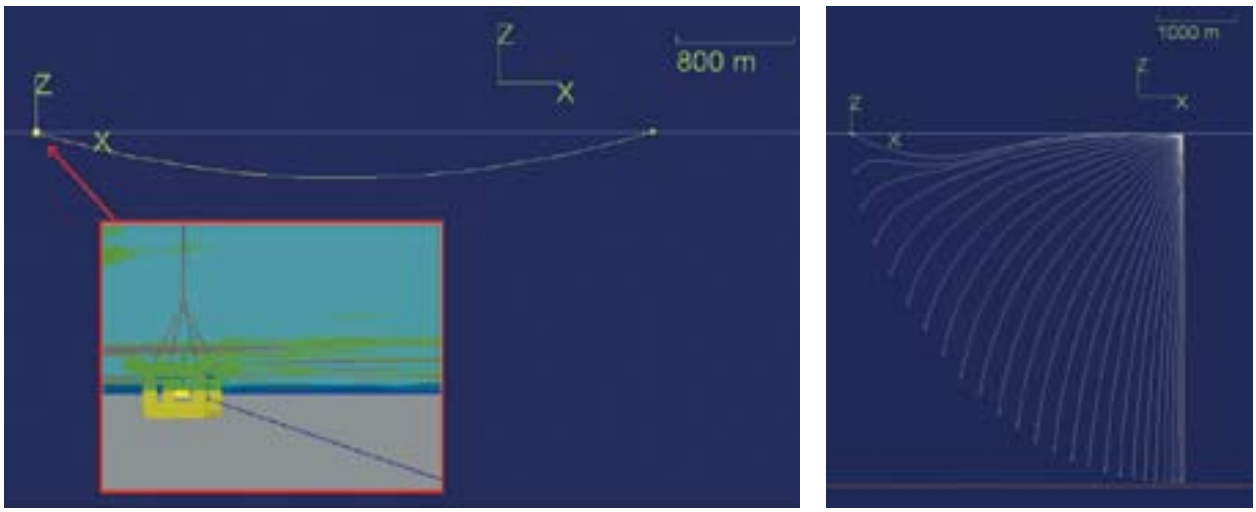

Figure 4: Deployment of heavy dead weight anchors in ultra deep waters using PIM