



**Oceanlinx Wave Energy Converter Barge  
PK Gateway Port Kembla NSW 2505  
OHS System Review**

## Executive Summary

National Safety Council of Australia (NSCA) was engaged by Oceanlinx Limited to carry out a review of the Wave Energy Converter Barge, located at the PK Gateway Dock facility Port Kembla on the 18<sup>th</sup> of November 2008

## Findings

### OH&S System

A number of System based deficiencies were identified in the areas of Auditing, Performance Program, Contractor Management, Incident Management and Reporting, Manual Handling and Divers in Confined Spaces.

Deficiencies with regard to senior management commitment and the Oceanlinx website were identified also.

### Site Inspection

This identified a number of deficiencies with regard to: Housekeeping, Working at Heights, Welding, Electrical Safety, PPE and Boat use.

### Recommendations

All recommendations are based on the requirements of the NSW OHS Act 2000 and the NSW OHS Regulations and supporting Codes of Practice and Australian Standards. Recommendations also incorporate Industry best practice where possible.

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## 1. Introduction

National Safety Council Australia (NSCA) was engaged by Oceanlinx Limited to carry out a review of the Wave Energy Converter Barge, located at the PK Gateway Dock facility Port Kembla on the 18<sup>th</sup> of November 2008

James Ryan OH&S Consultant visited the site in the company of Emil de Graaff Oceanlinx Project Manager. Present on site were Stuart Weylandsmith Chief Operations Officer and John Andersen Port Kembla Operations Manager.

## 2. Background

The Wave Energy Converter Barge is a self contained platform designed to be positioned no more than several hundred meters off shore in a semi submerged state. Power generated by the Denniss-Auld Turbine is converted on board from DC to 415V ac and is then transmitted via a 3-phase 30mm marine electrical cable to the power grid.

The unit has been designed to have a second capability to convert seawater to drinking water.

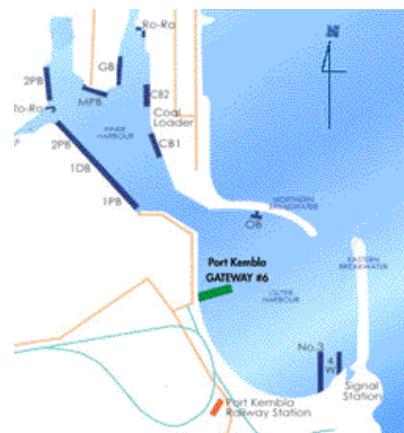
As this barge is still experimental and has undergone numerous design modifications a systems approach to OHS Management is highly desirable. The barge weighs in excess of 500 tonnes and is manufactured in Asia and towed to Australia for electrical fit-out and installation of the turbine. The value of the unit is approximately 8 million dollars.

The Marine operating environment and the complex operating and maintenance environment necessitate a comprehensive system based approach to hazard and risk management to prevent incidents occurring at this site or other sites it may be located at in the future.

## 3. Site Description

The barge was undergoing a major inspection and maintenance programme at the PK Gateway Dock at Port Kembla. The barge was moored close to the dock and access to it was by means of a twin engine inflatable boat acquired for that purpose.

The dock area is under the direct control of the Port Authority



## 4. Report Aim

The principle objectives of this report were to:

- Review the Safety policies and procedures that are in place
- Review the Risk Management controls in place
- Carry out an inspection of the facility and record observations

## 5. Report Scope

The scope of the report was limited to:

- The barge and the area immediately surrounding it.
- The Safety and Risk Management policies, procedures, documentation and its control.

## 6. Methodology

The methodology consisted of:

The use of a questionnaire based on AS/NZS 4801:2001 Occupational Health and Safety Management Systems to ascertain the scope and effectiveness of the Safety Management systems already in place and the level of employee knowledge regarding same.

An inspection of the barge and the associated dock area was carried out. This was intended to identify any hazards to Oceanlinx Employees, Contractors and other Wharf users

## 7. Key Findings

Key System findings included the following:

- **Company Safety Policy and Line Management Responsibilities**

Oceanlinx does have company safety policy but it was not available at the Port Kembla facility. The Manager's accountabilities and responsibilities were not clearly known. There is an organisational chart but is not well communicated. Morning Tool Box talks are carried out and safety notices are distributed via e-mail. Safety Inductions, JSA's, Safe Work Method Statements are used and developed for major contractors but not for minor maintenance tasks and visitors

- **Document Control and Records Management**

There is in place a Safety Document Control and Record management system and a local list is available. There was no evidence a Document Controller was specifically assigned to safety documents. Confidential records are securely kept at the Port Botany facility.

### 7.1.

## Risk Management Systems

- **First Aid and PPE**

First Aid kits are relevant to the site are readily available and inspected on a monthly basis. There is one Occupational First Aider and 5 First Aiders. First Aid treatments are recorded and all employees and contractors are aware they have to report all injuries. The Operations Manager informed me that a rescue stretcher is to be purchased to enable a casualty to be removed from the barge.

All PPE is registered and regular inspections are carried out. Line Managers ensure appropriate PPE is worn and fitted correctly. Safety Helmets had been replaced recently and an inspection carried on safety harnesses in use at the facility.

- **Workplace Risk Management and Safe Work Practices**

Workplace hazards have been identified using pro-active safety principles. Line Management are identifying hazards both before new items are purchased and are maintaining a workplace risk register and are encouraging Employees to identify and report hazards. Employees are aware of and are briefed in the use of JSA's and SWMS and are supervised to ensure that safe work practices are being complied with.

- **Traffic Management**

Access to the barge is by means of a recently purchased twin engine inflatable boat. Access to the boat is restricted. Operation of the boat is only by staff with boat licences. Embarking and disembarking from the boat at the dock or at the barge can be challenging and requires a JSA and a procedure. There is a dedicated purpose built boat ramp on the barge for use at sea. It is lowered by a battery operated winch mechanism. The winch mechanism had exposed battery terminals and by its nature would require a formal risk assessment as well as an induction and training program to ensure its safe use. The boat appeared to be well maintained and had recently been overhauled at a maintenance facility, however there was no maintenance check sheet available to give to the maintenance mechanic and no available record of maintenance carried out or records of the training provided by the vendor.

Traffic Management at the dock is in conjunction with the Port Authority. Access to the wharf posed significant slip, trip and fall hazards as equipment used by other companies is left in a haphazard way all over the wharf. In addition there were various pieces of hardware and supplies positioned so as no clear walkway was available for use by persons

- **Dangerous Goods, Hazardous Materials and Substances**

All Dangerous Goods & Hazardous Substances have been compiled into a register and all MSDS records are current, and Employees are aware of its location. It was noted that a concerted effort has been made to keep quantities to a minimum, however DG&HS risk assessments or consultation records were not evidenced.

- **Manual Handling and Plant**

While there is an awareness of Manual Handling there is no formal training program, risk assessments or records in place. With regard to Plant a register is established for all items of Plant and a system exists for tagging of faulty equipment. There is no consolidated Plant & Equipment register that identifies inspection and repair dates. Isolation of the major electrical systems is automatic with manual shut down points. There is a register of isolation points. Pneumatic isolation points are not clearly recorded or identified.

- **Working at Heights and in Confined Spaces**

The Barge design by its nature presents very significant Working at Height risks. Line Management have JSA's and SWMS developed and implemented for maintenance tasks only. Slip, trip and fall hazards at height are managed, however barricading is an issue as some unprotected fall hazard areas are not blocked off. Maintaining adequate fall protection for walkways while the Barge is in service, due to the wave and corrosion damage they are subjected to is a serious area of concern that will require attention in the future. There is a documented skill/training record for Employees working at heights but not Contractors who do a significant amount of this type of work.

Confined Space training has been given to Employees. Confined Space permits are in use and only Employees with them enter confined spaces, however there is no system for Divers

- **Safety Communication and Consultation**

Safety briefings are being conducted by competent persons and are being conducted on a regular basis and records are kept. Safety consultation is carried out by an OH&S Committee, who have trained members, use appropriate agenda and minute forms, meet regularly and its members are displayed on notice boards.

- **Safety Observations/Inspections and Safety Induction System**

There is no formal Safety Observation/Inspection system in place and consequently no training has been given to Employees in relation to hazard Identification. It was noted that the Operations Manager was undertaking a Cert.IV in OH&S. A Safety Induction system exists but it needs to be formalised with regard to delivery training and records retention.

- **Procurement and Contractor Management**

There is no system of pre-approved suppliers of goods. Contractors JSA's and SWMS are not reviewed to ensure they capture all relevant hazards and their controls.

- **Incident Management and Emergency Response**

A site incident response has been developed however Emergency Wardens have not been trained and no rehearsals have taken place. This would need to be done in conjunction with the Port Authority to meet legislative and local government regulations. An effective casualty evacuation plan must be in place for the Barge and it must be rehearsed.

- **Safety Incident Reporting and Investigation**

There is an informal system where Line Management conducts workplace investigations; however there is no requirement to complete investigations within 24 hours. Employees are aware of the need to report all incidents to Management within 24 hours and the Line Managers are aware that certain serious incidents are reportable to WorkCover.

- **Safety Action Management and Employee Health Management**

No formal system of documenting and managing Safety Actions resulting from incident investigations and inspections exists. Safety Actions are based on the hierarchy of risk control and there is some feedback to the OH&S Committee. There is no system for generating progress reports or feedback to the originator of the Safety Action request. The Management team felt there was no need for a Health Management program. Consideration should be given to an annual Medical check of all employees working on the barge as any underlying serious health condition such as diabetes or heart disease, were it to occur on the barge could significantly increase the risk to the Employee as there would have to be an off shore rescue. Consideration needs to be given to fatigue management due to the considerable travelling time between Sydney and Port Kembla. The issue of Workplace Violence was considered to be a low risk by Management.

- **Safety Auditing**

The Company does have a trained Auditor but no Safety Auditing takes place at Port Kembla.

## 7.2

### Port Kembla Facility

The following is a list of my observations during my visit.

- **Site Housekeeping**

Housekeeping on the barge was good with limited quantities of spares and consumables on board. Workshop areas were somewhat untidy, see fig. 1 and some of the plant and equipment such as drills and compressors were not "Industrial Grade" but were tested and tagged.



Housekeeping on the wharf was of a poor standard, with numerous serious Slip trip and fall Hazards. A number of these were created by other businesses that use the facility.



- **Working at Heights**

Scaffolding was in use throughout the Barge for working at height tasks. It appeared to be well erected by competent persons; however a number of deficiencies were observed where barricading was required to prevent falls. Continuous improvement and vigilance in this area is mandatory.

The “Pontoon” vessel, used to access areas near the waterline has limited fall protection and requires a risk assessment to identify all hazards while in use.



- **Electrical Lead and Gas Hose Safety**

I observed a number of areas of concern with regards to poor routing and protection to both Electrical lead and Oxy Acetylene hoses. Suspension hangars were available but not deployed.

The boat ramp winch had exposed battery terminals and poor cable routing.



- **Welding Safety**

The use of welding equipment in a marine environment surrounded by metal structures is potentially very hazardous. Electrocution from electric arc welders can occur. The use of rubber mats is recommended and welders need to be switched off when electrodes are to be replaced. The shutting off after use and separation of oxy acetylene equipment from electric arc welding activity is essential to prevent inadvertent ignition of the flammable gases involved.

- **PPE and Safety Signage**

There was no safety signage evident on the Barge. Signage needs to be in place warning of all the main hazards. PPE use was much in evidence however when on the Barge the wearing of Safety Eyewear is mandatory as well as protective gloves to protect against any sharp edges and protrusions. There is a strong case for the wearing of life vests, if for example a fall should occur and the Employee is rendered unconscious.

- **Embarking and Disembarking from the Inflatable Boat**

The procedure for getting on and off the inflatable boat presents a number of risks to persons. There needs to be a documented procedure to minimise risks. This is particularly so when the Barge is deployed and its boat ramp is in use.



## Overview

My discussions with Management with regards to OH&S demonstrated a high level of OH&S awareness with regard to their responsibilities and obligations. There was strong awareness of the significance of OH&S systems and a willingness to embrace change and devote time and resources to maintaining a safe workplace.

I have identified a number of system deficiencies as well as some areas of concern on site.

## **8. Key Recommendations: OH&S Systems**

Key recommendations include the following:

### **1. Oceanlinx Website**

There needs to be a significant upgrade to outline the company's commitment to OH&S principles and procedures. The publication of the Oceanlinx OH&S policy would be an unambiguous commitment from the CEO and the Senior Management team to the primacy of a safe workplace for all. This would enable the fostering of a stronger OH&S culture that would enshrine the principle that Safety is everyone's responsibility.

### **2. Senior Management Commitment to an OH&S System**

There needs to be a clear demonstration of commitment to OH&S by the CEO by leading by example e.g. opening all meetings with OH&S as the first topic on the agenda, setting aside definite times to carry out inspections/observations with Line Managers. That he is made aware of all significant OH&S related incidents in a prompt manner and becomes involved in the close out of subsequent investigations.

All Managers should receive formal safety awareness training commensurate with their responsibilities.

### **3. OH&S System review**

That a review of the Oceanlinx OH&S Management Systems and Policies be carried out to address all system deficiencies particularly in the areas of Auditing, Performance Program, Contractor Management, Incident Management and Reporting, Manual Handling and Divers in Confined Spaces.

### **4. Weather and Sea Condition Assessments**

A formal system should be in place to ensure that accessing/working on the Barge is only carried out within certain weather and sea condition parameters. This will minimise the risk of injury to staff by limiting their exposure to heat and cold for example.

## 8.1. Key Recommendations: Port Kembla

Key recommendations include the following:

### 1. Housekeeping

It is recommended that a meeting be arranged with Oceanlinx Management and the Port Authority to ensure safe use of the Wharf for all users and to remind them of their Duty of Care responsibilities.

### 2. Working at Heights

A full review of working at height activities be undertaken to minimise the significant risks in this area. An area of concern is the lack of barricading to prevent access to areas that have no fall protection in place.

### 3. Electrical Lead ,Gas Hose and Welding Safety

Ensure all Contractors using this equipment are operating to the highest standards and they submit comprehensive JSA's and SWMS to Oceanlinx Line Management

### 4. Embarking and Disembarking Procedure

It is recommended that a comprehensive documented procedure be in place particularly when the barge is in operation. The boat should only be operated by competent persons and access to the Barge should ideally be limited to only approved and essential personnel. The wearing of life vests at all times is essential.

### 5. PPE and Signage

It is recommended that Safety Eyewear and Protective Gloves be worn by all persons on the Barge. Consideration should be given to the use of Life Vests by everyone and Immersion suits when being accessed in the wintertime or when the Barge is deployed.

### 6. Employee Health Management

Consideration should be given to Annual Health checks for Employees who access the Barge when it is deployed so as they are fit and able to work safely. Random Drug and Alcohol testing would add to the level of safety on the site as impaired judgement and motor skills could have very serious consequences.

### 7. Securing the Barge

During my visit an inspection of mooring lines was made. It is recommend that this is formalised as a procedure to minimise the risk of the Barge coming adrift and causing incident or injury. There is a monitoring system to ensure unauthorised persons do not climb aboard the Barge when it is in use by having a security patrol monitor it from the shore. It is recommended that this operation be maintained into the future.

### 8. Barge Cranes

The use of Cranes and winches on the Barge and their harsh marine operating environment necessitates a maintenance program of them that is thorough and carried out by competent persons in a timely manner and maintenance records be retained.

## 8.2. SUMMARY

The overall compliance with and implementation of OH&S systems and procedures was generally quite good. I was assisted greatly by the frank and open co-operation of Stuart Weylandsmit and his Management team. There are areas that are in need of improvement to comply with current OH&S best practice. I feel the use of a system based approach is the only way to effectively manage hazards in the complex environment the Barge operates in and while it is undergoing maintenance. The fact it is operationally designed to have minimal requirements to have frequent visits while it is generating power reduces the likelihood of incidents or injury to persons.

The development of a comprehensive and effective OH&S Management system in the development phase which it is now in will be of significant benefit when Oceanlinx enters the manufacturing phase of its operations and sale of Ocean Wave Generators to customers. This will position the company to more easily prevent Safety incidents occurring in this challenging environment.

An added benefit for Oceanlinx is that a well developed and tested Safety system is in place to support future marketing efforts.

The author would like to thank Stuart, Emil and John for their time and considerable assistance during the review. Should any clarification of the findings be required please feel free to contact me.

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