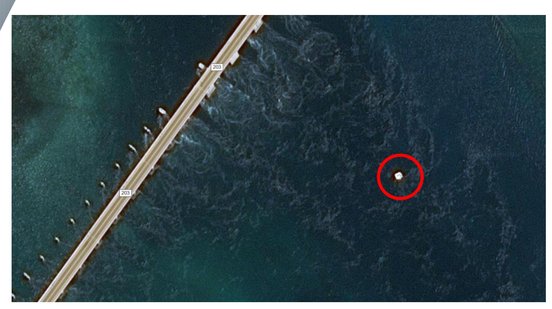
NSYSU Tidal Current Energy Conversion Project at Penghu

INTRODUCTION

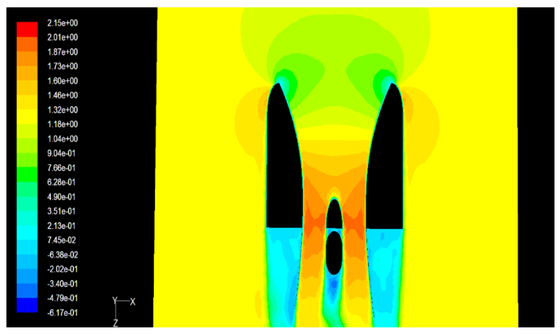
At present, a large number of concepts for wave energy devices have been proposed, but only a few are likely to have progressed to meet commercial demands. Commercial-scale wave power stations exist and are delivering power to grids. Tidal current turbines are basically underwater windmills. The tidal currents are used to drive an underwater turbine. Developers have shifted toward technologies that capture the tidally-driven coastal currents or tidal stream. Smaller units that can be deployed individually or in multiple units characterize tidal current stream technologies. A study on harvesting ocean current power is proposed in this integrated project with five subprojects that are headed by researchers from marine, mechanical and electrical engineering. The cross-disciplinary project, in the combination of cross-field research of mechanical engineering, electrical engineering, ocean engineering and underwater technology, is set up to design and establish current energy capture system at Penghu. The average electricity generation is 888 W, and the maximum electricity generation is 4.9kW .

Finished product of the energy capture platform

On-site test at Penghu



Energy capture platform on the google map

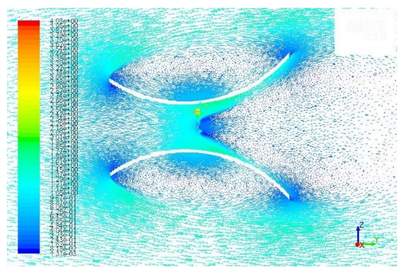


Velocity contour of the duct simulated by ANSYS Fluent

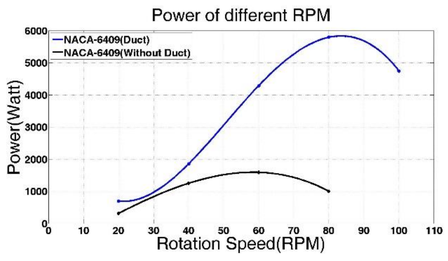
Computational Fluid Dynamics Lab.

Room :
MAEV C4005

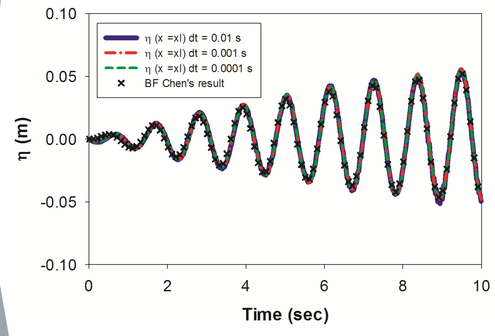
Professor :
Bang Fuh, Chen



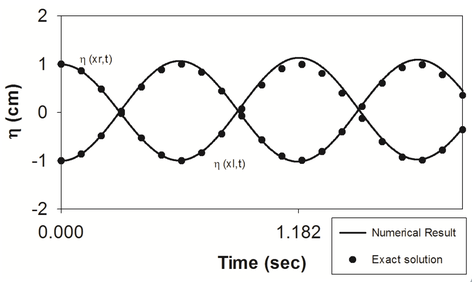
Simulated velocity vectors around duct



NACA 63621 with and without duct



Free Surface Profile at Left Wall of Tank; (b) Beat Phenomenon Occurs in Surge Motion

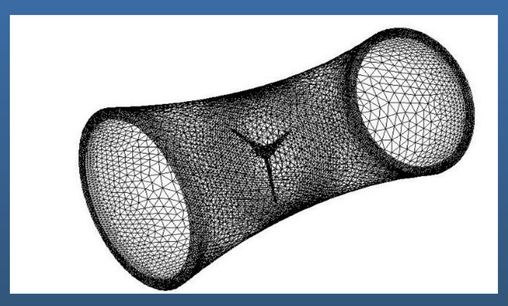


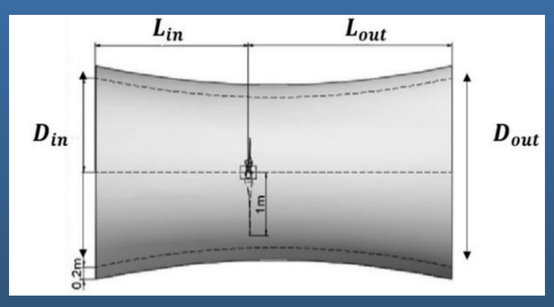
Free Surface Elevation of standing Wave at Both Walls of Tank

Nozzle And Diffuser In Drifting Horizontal Turbine Flow

INTRODUCTION

In this study, a shrouded nozzle-diffuser horizontal turbine was designed. Five geometric parameters are determined to have an optimal power take off (PTO) from the ocean current. The Harmony search technique was used to search for the best combination of the geometric parameters. The simulation are made by ANSYS Fluent.



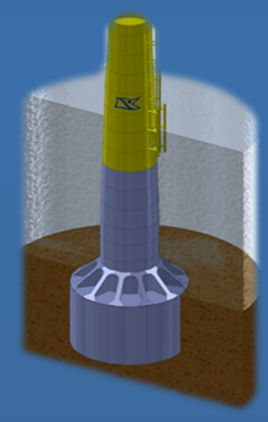


The nozzle-diffuser duct and meshes arrangement.

Installation Analysis of Suction Piles

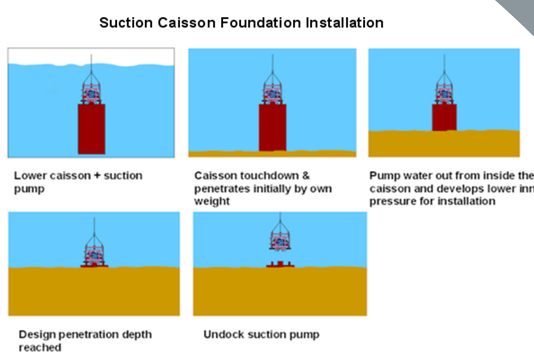
INTRODUCTION

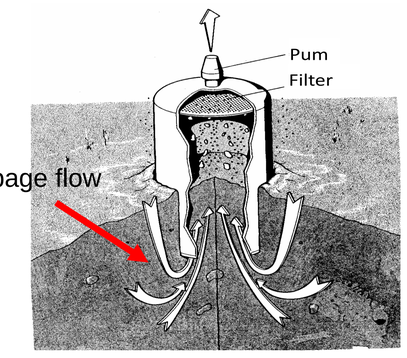
Suction caisson anchors are gaining considerable acceptance in the offshore industry. The suction caisson is a highly versatile and efficient anchor concept that can be installed easily as compared to driven piles, especially in deep waters. The installation procedure is simple and requires no heavy lift vessel. As for any form of foundation system, evaluation of the capacity of a suction caisson requires (a) a conceptual and analytical model of the collapse mode, and (b) decisions on appropriate model parameters and soil parameters. These topics will be studied in the future.



Schematics of a suction pile

Picture and Data originated from: Tsung-chow Su





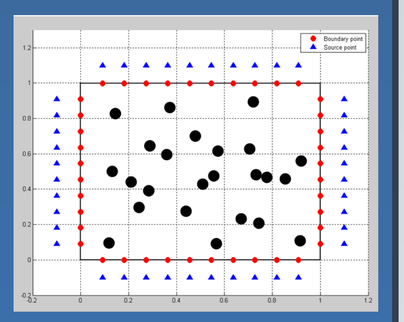
The complicated dynamic behavior of the suction bucket

Picture originated from: Tsung-chow Su

Meshless Method To Study Sloshing Fluid In a 2d Tank Under Surge Motion

INTRODUCTION

In this study a meshless numerical model is proposed to solve a potential flow problem with nonlinear free surface. We adopt method of fundamental solutions (MFS) based on using fundamental solution of the Laplace equation as the radial basis functions (RBFs), and solving the problem by the collocation of boundary points and source points



Distribution of the boundary points and source points