



SLOSHING OF LIQUID IN TANK

MOHD NAZRI BIN OMAR
(2002666167)

A thesis submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering (Hons.) (Mechanical)

Faculty of Mechanical Engineering
Universiti Teknologi MARA (UiTM)

APRIL 2005

ACKNOWLEDGEMENT

Primarily, this project, or rather everything that has happened in my life, and will happen are absolutely in the hand of The Almighty, Allah SWT The Most Merciful.

Highest gratitude must I give to Prof. Ir. Dr. Ow Chee Sheng, the Project Advisor of this thesis. Nothing could replace his patience and guidance.

In addition, of course, thousand of thanks to Mr. Jeremy Z. Wu, CHAM Director of United Kingdom for correcting and thus confirm the simulation procedures applied, Mr. Razip, and my colleagues for helping me in so many ways. Only God can repay your kindness.

Thank you so much.

ABSTRACT

The subject of sloshing of liquid in a tank has been discussed frequently in the last five years, due to its significance to the carriers of the liquid such as oceangoing vessels and airplanes. The interaction between water and air in closed rectangular tank is studied. Analysis of the case has been conducted using PHOENICS as the CFD software. The author has collaborated closely with the thesis of Mahamad Hisyam Mahamad Basri [1], for the sake of validation requirement. Few problems have been encountered, which mostly are related to the geometrical development and the simulation results. Remedies and recommendations in refining the case results are discussed and concluded, within various perspectives.

TABLE OF CONTENTS

CONTENTS		PAGE
	PAGE TITLE	i
	ACKNOWLEDGEMENT	ii
	ABSTRACT	iii
	TABLE OF CONTENTS	iv
	LIST OF FIGURES	v
CHAPTER I	PRELIMINARY WORKS	
1.1	Introduction	1
1.2	Objective	2
1.3	Methodology	2
1.4	Scope of Work	2
1.5	Significances of Project	3
1.6	Theory of Sloshing	3
1.7	Literature Review	4

CHAPTER II	COMPUTATIONAL FLUID DYNAMICS (CFD) AND PHOENICS	
2.1	Introduction to Computational Fluid Dynamics (CFD)	8
2.2	Introduction to PHOENICS	11
CHAPTER III	METHODOLOGY FOR PHOENICS SIMULATION	
3.1	Geometrical Development	17
3.2	Simulation	35
3.3	VR – Viewer: The Results	35
CHAPTER IV	RESULTS OF PHOENICS SIMULATION	
4.1	Introduction	39
4.2	Simulation Results	40
CHAPTER V	VALIDATION	
5.1	Introduction to Validation	44
5.2	Validation of Simulation Results Against Experimental Results	46
CHAPTER VI	DISCUSSION	48
CHAPTER VII	CONCLUSION	51