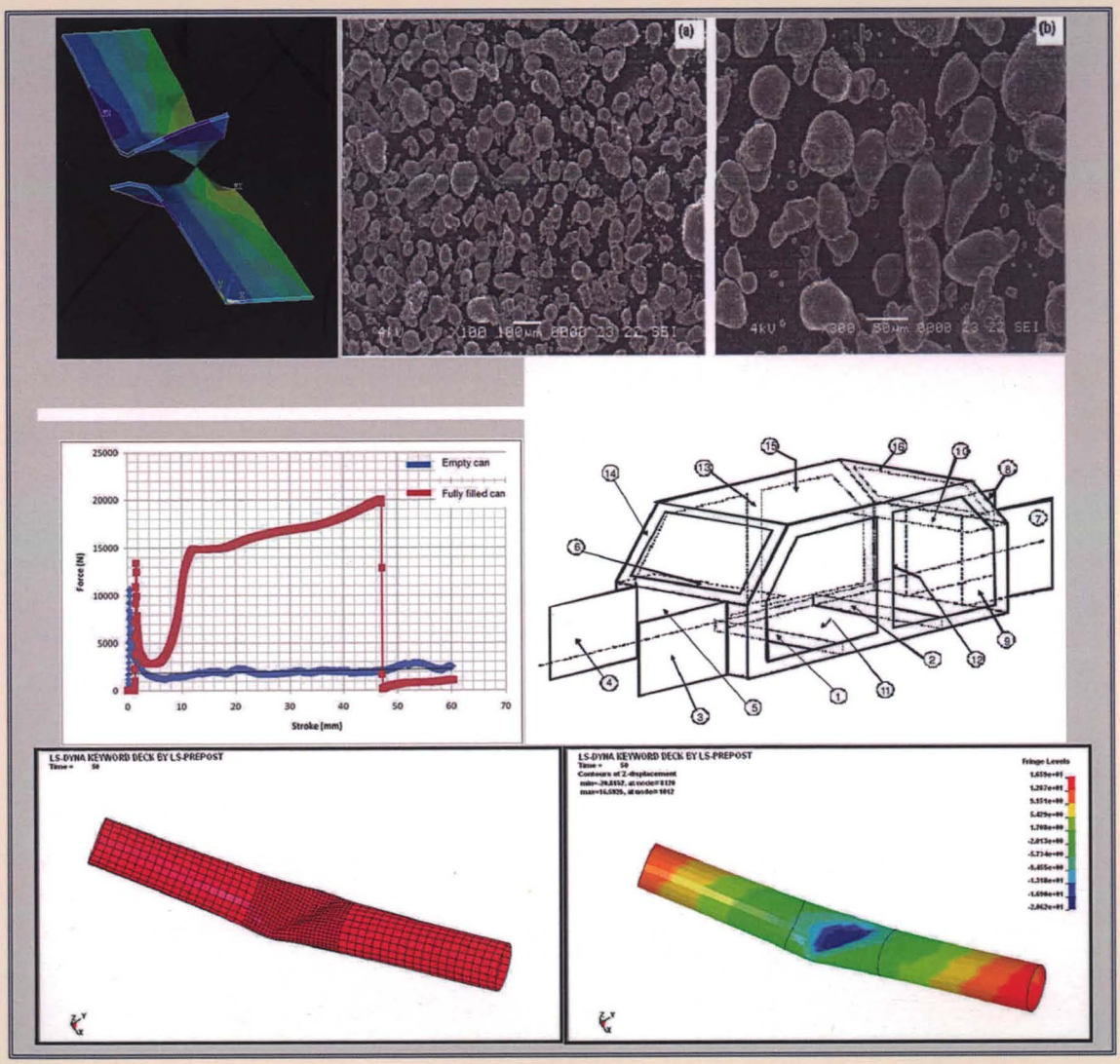
ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



Edited by

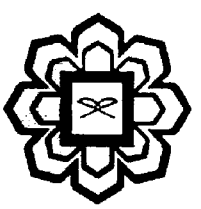
Meftah Hrairi

IIUM PRESS
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS

Edited by

Meftah Hrairi



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

ISBN: 978- 967-418-174-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

Contents

Section 3 Design and Manufacturing

Section 4 Liquid Sloshing

1

CYLINDRICAL SHELL BUCKLING UNDER AXIAL COMPRESSION LOAD

Qasim H. Shah, Hasan M.Abid, Adib B. Rosli

1. INTRODUCTION

Thin-walled cylindrical shells are widely used in many industries. Due to the increasing use of high-strength materials, sophisticated numerical techniques and optimization methods in analysis, the design of such shells is often buckling-critical. In many circumstances these shells are subjected not only to static loads but also to dynamic disturbances and filled with internal fluid. However, thin-walled cylindrical shells when subjected to axial compressive loads often exhibit a highly nonlinear behavior with a high imperfection sensitivity and may lose stability at loads levels as low as a fraction of the material strength. Many studies are concerned with the analysis of shells vibrating in vacuum; far fewer are focused on the analysis of the nonlinear vibrations of cylindrical shells in contact with a dense fluid. The relevant literatures related to this research project are reviewed in the following section. Accordingly, investigations in focus are those related to failure characteristics on fluid filled containers when an impact is applied.

2. LITERATURE REVIEW

Boyarshina performed a theoretical study of the nonlinear free and forced vibrations and stability of a circular cylindrical tank partially filled with a liquid and having a free surface [1]. Here, nonlinearity is attributed to the interaction of free surface waves and elastic flexural vibrations of the shell. Gonçalves and Batista [2] considered simply supported circular cylindrical shells filled with incompressible fluid. To model the shell, Sanders' nonlinear shell theory and a novel mode expansion that includes two terms in the radial direction (the