UNIVERSITI TEKNOLOGI MARA

NUMERICAL TECHNIQUE BASED ON TRANSFER MATRIX METHOD FOR PREDICTION OF MUFFLER PERFORMANCE

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Thesis submitted in fulfilment of the requirements

for the degree of

Masters of Science

Faculty of Mechanical Engineering

February 2008

ABSTRACT

Mufflers are commonly used for automobile exhaust systems to attenuate the noise levels produced by automobile engine to atmosphere. Since a muffler plays an important part in attenuating the noise level in an automobile exhaust system, reliable, superior and affordable procedures and methods are applied for the analysis of a muffler is the main focus of this study.

This study presents an alternative method to analyse the noise performance of a muffler with different configurations and parameters. The prediction of the Transmission Loss (TL) of muffler is the item of interest in the analysis of the noise performance. Computing source code is developed based Transfer Matrix Method (TMM).The formulation was derived from plane wave and acoustic theory, which utilised for accurate prediction of the Transmission Loss (TL) of the muffler.

The efficiency and accuracy of the Transfer Matrix Method was illustrated by comparing the numerical results of Transmission Loss (TL) with the results obtained from establish papers and journal. The numerical results showed very good agreement with the results presented in the previous published journals.

ACKNOWLEDGMENTS

In the name of Allah, the Most Merciful and Most Gracious. Praise is for God, Lord of the world, Guide of the bewildered and joiner of those who are severed; Whose help we seek in worldly matters and in religion. May His blessings and peace be upon our master Muhammad, the Truthful and Trustworthy, and upon his Family, and Companions, and all those excel in following them until the Day of Reckoning.

I am grateful to the following people who have contributed towards shaping this research. At the outset, I would like to express my sincere gratitude and appreciation to my supervisors Prof. Madya Dr. Ahmad Azlan Mat Isa for his invaluable guidance, advice, encouragement and helpful discussions through the research. The expressions are extended to my co-supervisor Dato' Prof. Dr. Mohamed Dahalan Mohamed Ramli who gave constructive comments and suggestions during the initial phases of research work.

I also would like to express my sincere thanks to Encik Mahmud Othman for generously sharing his time and knowledge on the development of FORTRAN source code.

Next, I would like to thank Mr. David Paul Starbuck who shared his experience in technical knowledge.

My great appreciation for, Mr. Sham who willing to share his knowledge towards this research work. I am very appreciatory of his contributions and great soul.

Special thanks to my loving parents Haji Yunus and , my wife, Noradauwiah, daughters, Nur Syahirah Farhana, Nur Syasha Afrina and Nur Syazana Batrisyia, for their love, patience, understanding and support

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

Acoustic Noise is usually defined as unwanted sound, an undesirable by product of society's normal day to day activities. In physical terms, sound is a longitudinal wave, which is produced by the compression and rarefaction of matter. Whenever an object moves or vibrates, consequently structure borne noise is generated where a small proposition of the energy involved is lost to the surrounding medium as sound. The noise is undesirable not only because of unpleasant sound but may affect the performance of the system adversely due to energy losses and reduction. The noise emitted by automobile has become one of the most predominant sources of annoyance from noise, particularly in large city, M. L Munjal [1], Mihai Bugaru et al [2], S.N. Y Gerges et al [3], Michael Junge et al [17], and J.R Hassall et al [30]. Exhaust noise contributes significantly to the total noise emitted by many types of vehicles. Although the suppression of exhaust noise may not achieve a satisfactory degree of quietness in all cases without attention to both intake and engine noise, the reduction of the exhaust noise is an important first step to achieving a tolerable level of noise output from automobile, [2] and SAE test procedure J1169, [18].

The automotive industry is vibrant and fast changing. Thus a successful muffler design has to meet a relatively large number of exacting requirements and is not surprising that it may involve building and testing many prototypes and also investigating alternative procedures and methods from which accurate prediction of muffler performance can be obtained.