

**NOISE MEASUREMENT
AND
CONTROL IN A CYPRUS INDUSTRY**

by

KALOGEROU ANDREAS

Project Report

Submitted to

the Department of Mechanical Engineering
of the Higher Technical Institute

Nicosia Cyprus

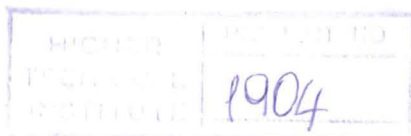
in partial fulfillment of the requirements

for the diploma of
TECHNICIAN ENGINEER

in

MECHANICAL ENGINEERING

June 1991



ACKNOWLEDGEMENTS

I would like to express my sincere thanks and appreciation for help and guidance given to me by my project supervisor Mr. P. Eleftheriou, BS, MS, Ph.D, Lecturer at the Mechanical Department of the HTI.

I would like also to thank Mr. Phivos F. Constantinides, Director of Inter Engineering Ltd who help me with the control methods and selection of the shock absorbers.

Finally I would like to thank Mrs P. Georgiou and Miss Maria Joseph for typing this project and all those who helped me to bring this project to a successful end.

A B S T R A C T

This project is related with the noise measurement and control in an industry.

A particular machine, an automatic press, was tested, the noise was measured using an appropriate instrument and the results were compared against the American standards for noise exposure.

All the noise results were taken according to the ISO method (ISO 3746-1979 (E)). After the noise measurement, the control of the noise was the next part of this project with this control excess noise is eliminated.

The project can be divided into two parts. The first part deals with the noise measurement and the second with the control of noise.

CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	
ABSTRACT	
INTRODUCTION	
<u>CHAPTER 1 : NOISE</u>	1
Introduction	2
1.1 Sound Frequency	3
1.2 Sound Pressure level	3
1.3 Sound Power level	4
1.4 Definitions	4
1.4.1 Hearing impairment	4
1.4.2 Hearing handicap	4
1.4.3 Fence	4
1.4.4 Risk of hearing handicap	5
1.4.4.1 Risk of hearing handicap due to noise	5
1.5 Decibel	5
1.6 Determination of over-all levels from band levels	5
1.7 General Categories of Noise	6
<u>CHAPTER 2 : NOISE MEASUREMENT</u>	7
Introduction	8
2.1 Definitions	9
2.2 Acoustic Environment	10
2.2.1 Criteria for adequacy of the test environment	10
2.2.2 Criterion for background noise	10
2.3 Measurement of weighted sound pressure level	10
2.3.1 Measurement surface	10
2.3.2 Reference Surface	11
2.4 Measurements on hemispherical measurement surface	11
2.4.1 Microphone positions	11
2.4.2 Comments	13
2.5 Measurements on rectangular measurement surface	13
2.5.1 Microphone positions	13

2.6	Number of microphone positions	14
2.6.1	Large sound sources	14
2.6.2	Results	14
2.6.3	Calculation of surface sound pressure level	17
2.6.4	Calculation of sound power level	18
2.7	Tall sound sources	20
2.7.1	Results tables	21
2.7.2	Calculation of surface sound pressure level	22
2.7.3	Sound power level	24
2.8	Background noise	26
2.9	Information	26
2.9.1	Sound source under test	26
2.9.2	Instrumentation	28
2.10	Comments - Conclusions	28

CHAPTER 3 : HEARING, HEARING LOSS AND PSYCHOLOGICAL EFFECT OF NOISE

	Introduction	31
3.1	The human ear	32
3.2.1	Anatomy	32
3.2.2	Frequency and Loudness response	34
3.3	Damage of the ear due to exposure to noise for long period (years)	37
3.4	Damage - risk criteria	39

CHAPTER 4 : CONTROL OF NOISE

	Introduction	42
4.1	General	43
4.2	Sound field designation	43
4.3	Reverberation	43
4.4	Noise exposure curves	45
4.5	Sound absorption	51
4.6	Control methods	53
4.7	Selection of methods for control of noise	61
4.8	Only hood and vibration methods	61
4.9	Hood	62

4.10	Vibration control	71
4.10.1	Alteration of Source	71
4.10.2	Isolation	72
4.10.2.1	Metal Springs	72
4.11	Comments on metal springs	77
4.12	Shock Isolation	78
CONCLUSIONS		79
REFERENCES		80
APPENDICES		81