

**EFFECT OF NaOH CONCENTRATION ON THE PROPERTIES OF
RECYCLE PAPER**

By

Imnizan binti Ismail

**Final Project Paper Submitted in Partial Fulfillment for the Diploma in
Wood Industries, Faculty of Applied Science,
Universiti Teknologi MARA**

April 2001

ACKNOWLEDGEMENTS

I wish to express my gratitude to my supervisor, Mr. Amran for guiding, reading and offering comments as the thesis evolved. I gratefully acknowledge his helpful suggestion.

I would also like to thank all lecturers and lab assistants in the Department of Wood Industry, MARA University of Technology especially to Ass. Prof Dr. Jamaludin Kasim, as Head of Program for guiding me either direct or indirectly. Also to lab assistant, Mr. Sardi for helping me during the paper making and testing. I wish to pay special tribute to Mr. Wan Mohd. Nazeri Wan Ahmad whose willingness to contribute his knowledge, time and effort till I completed my thesis. Not forgetting, thanks to all my friends and classmate, for helping me throughout the semester.

Thank You.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	v
LIST OF FIGURES	vi
ABSTRACT	vii
ABSTRAK	viii
CHAPTER	
1 INTRODUCTION	1
2 LITERATURE REVIEW	4
2.1 Paper.....	4
2.2 General Grades of Paper.....	5
2.3 Specific Types of Paper.....	6
2.4 The Recovery of Papermaking Potential.....	6
2.4.1 Beating and Refining.....	7
2.4.2 Chemical Additives.....	7
2.4.3 Blending with Virgin Pulp.....	8
2.4.4 Fractionation.....	8
2.5 Fibre.....	9
2.5.1 Wood Fibre.....	9
2.5.2 Cell Wall Structure.....	10
2.5.3 Swelling and Flexibility.....	13
2.5.4 The Effect of Recycling on Cell Wall Structure.....	15
2.5.5 Introduction to Fibre Chemistry.....	16
2.5.5.1 Cellulose.....	16
2.5.5.2 Hemicelluloses.....	19
2.5.5.3 Lignin.....	19
2.5.5.4 Extractives.....	20
2.6 Recycling.....	20
2.6.1 The General Effect of Recycling.....	22
2.6.2 Hornification.....	25
2.6.2.1 Application in Recycling.....	26
2.6.2.2 Prevention of Hornification.....	29
2.6.3 Beating of Rewetted Chemical Pulps.....	29
2.6.4 Effect on Freeness.....	31

3	MATERIALS AND METHODS	34
3.1	Source of Raw Material.....	34
3.2	Pulps Treatment.....	34
3.3	Handsheet Preparation.....	35
3.4	Paper Testing.....	36
3.4.1	Cutting The Lap Paper for Testing.....	36
3.4.2	Testing Process.....	36
3.4.3	Tensile Testing.....	36
3.4.4	Tearing Testing.....	36
4	RESULT AND DISCUSSTIONS	38
4.1	Beating Process.....	38
4.2	Recycling.....	39
4.2.1	Freeness.....	39
4.2.2	Bulk.....	42
4.2.3	Index Tensile.....	43
4.2.4	Tearing Index.....	45
5	CONCLUTIONS	47
	REFERENCES	48
	APPENDICES	49
	VITA	50

**EFFECT OF NaOH CONCENTRATION ON THE PROPERTIES OF
RECYCLE FIBRE**

By

IMNIZAN BINTI ISMAIL

April 2001

A research on the effects of recycling on paper from recycled paper. Three cycles have been done as the basis of this study followed by the different NaOH concentration preparations and testing of the specimens were done according to TAPPI Standard Method. The reduction in physical and optical properties of paper has been observed, especially at the first stage of the recycling. It was due to the irreversible shrinkage of fibres or known as hornification.