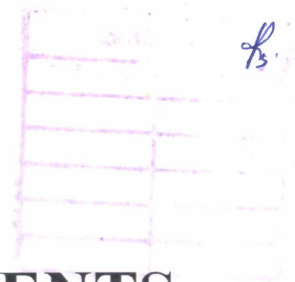


174369

D
19/07/2004

Rs. 3000/-



QUALITY IMPROVEMENTS OF NATURAL RUBBER LATEX FOAM

CR
C-10
C-10

By

Kuruppu Achchige Prabha Samanthi Kuruppu

174369

M.Sc. (Polymer Science & Technology)

2001- December

ABSTRACT

Natural rubber latex foam is a highly profitable product for Sri Lanka as a third world country. European market is available for natural rubber latex foam very competitively with Polyurethane foam. Natural rubber latex is very cheap and a highly available source in Sri Lanka. So the production cost is low when compared with other products. But Sri Lanka has to compete with countries such as Malaysia, India, Thailand, Bangladesh and Pakistan. So the quality of the product has become the major need today.

The quality of the natural rubber latex foam depends on the quality of the latex. The quality checking was carried out by testing; dry rubber content, total solid content, ammonia content, volatile fatty acid content and mechanical stability time. The qualitatively prepared dispersions and compounded latex were tested. A selected recipe given by the company's management was changed. Those changes were made mainly with the added chemicals and physical parameters of the process to improve the quality of latex foam.

Effects of chemicals mainly studied were zinc oxide, diphenylguanidine and sodiumsilicofluoride. The physical factors, which mainly influenced the quality of the natural rubber latex foam, were initial temperature of the compounded latex, diphenylguanidine adding time and maturation time of the compounded latex. In addition to this pH variation and density variation in the final foam product were studied in depth.

CONTENTS

	Page
List of figures	vi
List of tables	vii
Abstract	ix

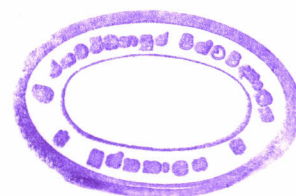
CHAPTER I

1.0	Introduction	1
1.1	History	2
1.2	The Dunlop process	4
1.2.1	Batch wise foaming process	4
1.2.2	Continuous foaming process	5
1.3	The Talalay process	6
1.4	The Revertex process	7
1.5	Formulations	8
1.5.1	Natural rubber latex foam	8
1.5.2	Synthetic lattices in foam industry	12
1.6	Ingredients incorporated in latex foam	16
1.6.1	Vulcanizing agents	16
1.6.2	Antioxidants	18
1.6.2.1	Amine type antioxidants	18
1.6.2.2	Phenolic type antioxidants	18
1.6.3	Accelerators	19
1.6.4	Stabilizers	19

	Page
1.6.5 Gelling agents	20
1.6.6 Foam promoters	21
1.7 Defects of latex foam	22
1.7.1 Poor foam structure due to high ammonia content	23
1.7.2 Oil nature of the foam surface due to defect excessive mould releasing agent	23
1.7.3 Shrinkage	23
1.7.4 Foam collapse	24
1.7.5 Settling	24
1.7.6 Complete distortion of the foam	24
1.7.7 Rat holes	25
1.7.8 Tear	25
1.7.9 Clotting problem due to diphenylguanidene adding time	25
1.7.10 Edge defect	26
1.7.11 Skin defect	26
1.7.12 Dirt	26
1.7.13 Finger moulds	26
1.7.14 Delayed gelling action due to too much soap	26
1.7.15 Bad colour	27
1.7.16 No uniformity in foam due to filling in too serious	27
1.7.17 Rough skin	27
1.7.18 Varying hardness	27
1.8 Latex specifications	28
1.9 Aim of the project	29

CHAPTER II

	Page
2.0 Experimental	30
2.1 Preparation of dispersions	30
2.2 Main steps of foam production	35
2.2.1 Compounding	35
2.2.2 Maturation	35
2.2.3 Foaming	35
2.2.4 Gelling	35
2.2.5 Vulcanization	36
2.2.6 Washing	36
2.2.7 Drying	36
2.3 Process flow chart	37
2.4 Experimental	38
2.4.2 Laboratory foam compounding operations	39
2.4.3 Procedure	40
2.5 Testing of dispersions	42
2.5.1 Turbidity test	42
2.5.2 pH value test	42
2.5.3 Total solid content	42
2.6 Testing of latex	43
2.6.1 Dry rubber content test for natural rubber latex	43
2.6.2 Total solid content for natural rubber latex	44
2.6.3 Alkalinity test for natural rubber latex	44



	Page
3.2 Test results for latex used	54
3.2.1 Dry rubber content	54
3.2.2 Total solid content	55
3.2.3 Alkalinity test	56
3.2.4 Volatile fatty acid number	57
3.2.5 Mechanical stability time test	58
3.3 Test results for compounded latex	59
3.3.1 Chloroform test	59
3.3.2 Boric acid test	60
3.4 Chemicals affecting on gelling time	60
3.4.1 Zinc oxide amount on gelling time	60
3.4.2 Diphenylguanidene amount on gelling time	62
3.4.3 Sodiumsilicofluoride amount on gelling time	64
3.5 Physical factors and gelling time	66
3.5.1 Effect of initial temperature of compounded latex on gelling time	66
3.5.2 Effect of maturation time of compounded latex on gelling time	68
3.5.3 Effect of diphenylguanidene adding time on gelling time	70
3.5.4 Density of the foam product	72
3.5.5 pH variation in gelation	74
Conclusion	77
Further studies	79
References	80