



## CHAPTER I

### INTRODUCTION

#### **General aspects**

At present, Thailand is the largest rubber producer. The major areas for natural rubber plantation are in the Southern and Eastern parts. Most of natural rubber producing countries produce natural rubber for export. Natural rubber needs to compete in quality and price with synthetic rubbers. NR has high resilience and elasticity, easy processing, tack and high strength. But its presentation was as a commodity at a price subject to wide market fluctuations while price of synthetic rubber was at a stable price. Variation of technical properties in NR namely viscosity, rate of vulcanization and oxidation resistance was well known. The synthetic rubbers are supplied at controlled viscosities, so natural rubber should be produced at constant viscosity grade to meet requirement of the consumers. At present, the increased demand in high quality natural rubber is expected.

The advantage of NR in the form of solid rubber such as block rubber, sheet rubber and is a advantageous over latex because solid rubber having high solid content are convenient for transportation and storage. There are several possible methods for modifying solid rubber into special type rubbers with controlled viscosities and easy processing characteristics.

Non-rubber constituents can affect the physical properties of NR especially protein content. Several attempts have been made to produce solid rubber with a low protein content in order to improve the dynamic properties of natural rubber thereby enhance its consumer's acceptability. This rubber with a low protein content has been generally known as Deproteinized Natural Rubber (DPNR) or sometimes Low Nitrogen Natural Rubber (LNNR) which have been receiving more consumer attention and acceptance mainly for various engineering applications.

## Raw rubber production

Total production of NR in Thailand increased from 587,975 metric tons in 1983 to 1,530,941 metric tons in 1992. In the year 1992 domestic consumption of NR in Thailand had reached to 118,372 metric tons as shown in Table 1.1 (Rubber Research Institute of Thailand, 1994) The highest consumption of NR used by local rubber industries are various types of tyres and tubes for motorcars and airplanes. Exports of NR rose from 552,486 metric tons in 1983 to 1,412,850 metric tons in 1992. The usage of NR in various products in 1988 to 1992 increased every years as shown in Table 1.2 (Rubber Research Institute of Thailand, 1994).

Natural rubber can be classified into 2 types : solid rubber and concentrated latex. Solid rubber was divided to 3 major groups : conventional sheet rubber, technically specified rubber and other specialized grade rubber process such as CV-NR (constant viscosity rubber), SP-NR (superior processing rubber) and OENR (oil-extended natural rubber). Nowadays, Thai producers produced 5 forms of dry rubbers: RSS (ribbed smoked sheet), ADS (air dried sheet), crepe rubber, TSR (technically specified rubber or block rubber) and skim rubber. Block rubber has different names depend on producer in a country like SMR (Standard Malaysian Rubber), SIR (Standard Indonesian Rubber) and TTR (Thai Tested Rubber) (กรมการยาง, 2532)

Most of the produced and exported rubber in Thailand are ribbed smoked sheet which are comparingly low price and quality. Thailand is increasing the produce of higher quality rubber, this is because of the demand for rubber as raw material used in rubber industries. Special rubbers are produced to meet the demand of consumers and made properties suitable for different applications, therefore development of CV-DPNR will lead to increasing price and quality of natural rubber.

Table 1.1 : Thailand Total NR Production 1983-1992

Unit : metric tons

Year	Exports	Domestic Consumptions	Change in Stock (+/-)	Imports	Production
1983	552,486	32,056	3,433	-	587,975
1984	595,585	31,653	1,951	-	629,189
1985	684,851	32,738	4,282	-	721,781
1986	755,157	39,550	-12,529	58	782,120
1987	873,212	47,081	1,373	108	921,558
1988	906,420	57,339	11,278	158	974,879
1989	1,100,580	77,601	265	58	1,178,388
1990	1,150,790	99,131	25,379	196	1,275,104
1991	1,231,945	103,107	5,632	88	1,340,596
1992	1,412,850	118,371	-268	12	1,530,941

Source : Thailand rubber statistic, 1994

Table 1.2 Domestic consumption of NR in Thailand, 1988-1992.

Unit : metric tons

Type of product	1988	1989	1990	1991	1992
Tyre & tube for motorcars and airplanes	20,559	32,348	38,411	42,069	50,597
Tyre & tube for motorcycles and bicycles	3,673	4,737	6,567	6,437	6,342
Re-treading	1,624	1,213	1,078	1,815	2,029
Belt	287	498	502	463	613
Shoe layer	1,612	821	1,955	2,127	2,768
Hose	572	624	5,215	787	1,397
Accessory parts for motor vehicle	2,283	2,318	3,315	3,436	3,795
Husk cracker for rice mill	123	149	254	196	235
Battery body	484	589	519	529	570
Canvas shoes & foam sandal	5,693	6,147	7,504	7,620	8,678
Rubber band	4,612	10,063	11,378	11,544	11,902
Elastic	1,256	4,028	4,756	5,469	6,824
Balloon	75	132	101	118	146
Foam products	185	285	331	749	579
Scientific instruments	30	30	-	-	-
Carpet backing	124	354	395	440	498
Doll & condom	153	239	33	488	726

(continued)

Table 1.2 Domestic consumption of NR in Thailand, 1988-1992.

Unit : metric tons

Type of product	1988	1989	1990	1991	1992
Wind screen fixing rubber	84	86	108	-	-
Cushion foam	171	159	578	-	-
Fishery float	16	9	91	-	-
Glue, tape for electric wire cover	165	245	263	433	740
Glove	11,813	11,825	14,008	15,342	16,882
Football	-	-	601	926	1,304
Teat	-	-	-	1,594	753
Rubber	-	-	-	5	1
Compound rubber	-	-	-	227	327
Others	495	344	1,138	266	653
<b>Total</b>	<b>57,339</b>	<b>77,601</b>	<b>99,131</b>	<b>103,108</b>	<b>118,372</b>

Source : Thailand rubber statistic, 1994.

## Objectives

- 1) To study effect of agitation on Mooney viscosity of CV-DPNR produced from latex clone RRIM 600 using Papain and Alcalase at optimal condition.
- 2) To compare change in Mooney viscosity of CV-DPNR prepared from three different rubber clones i.e. RRIM 600, GT 1 and PB 5/51 when they were stored over a period of time.
- 3) To compare the CV-DPNR and CV-NR obtained from three different rubber clones for their physical properties and vulcanizate properties.