

ENERGY CONSIDERATION DURING MIXING OF CARBON BLACK WITH NR AND SBR

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Khastgir, D., Bhattacharya, A. K. and De, P. P. (1993). Energy consideration during mixing of carbon black with NR and SBR. *Indian Journal of Natural Rubber Research*, 6 (1 & 2) : 101-104.

Different aspects of energy consumption in the process of HAF black mixing with natural rubber (NR) and styrene-butadiene rubber (SBR) in a Brabender Plasticorder and the effect of different processing parameters like mixing temperature, rotor speed and fill factor on the rate and efficiency of mixing, energy consumption and the temperature rise are reported. It is found that energy consumption is higher for SBR-black mixing as compared to NR-black mixing and the former process is more exothermic in nature. The rate of dispersive mixing increases with increase in temperature, rotor speed and fill factor. Relatively smoother energy profiles are observed for NR-black mixing as compared to SBR-black mixing.

Key words : Natural rubber, Styrene-butadiene rubber, Mixing, Carbon black, Energy consumption.

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INTRODUCTION

The mixing of carbon black with rubbers is the most energy intensive process in the manufacture of rubber products. The optimization of the process of black-rubber mixing especially with respect to proper energy utilization and to get the high degree of mixing has attracted the attention of many workers in the past and is still a subject of interest (Whitaker, 1970; Dolezal and Johnson, 1980; Nakajima *et al.*, 1982; Wolff, 1984). The present paper deals with different aspects of energy involvement in the process of mixing of HAF (N-330) black with NR and SBR in an internal mixer like Brabender Plasticorder. The effect of different processing parameters like (1) mixing temperature (2) rotor speed and (3) fill factor on the rate of mixing, the energy consumption and the rise of temperature in

excess of initially set temperature for mixing are discussed.

EXPERIMENTAL

The mixing was accomplished in a Brabender Plasticorder (model PL-330) according to the formulation and sequence given in Tables 1 and 2 respectively. The energy profile or torque time curve and the variation of temperature during different processes are continuously recorded during mixing.

Table 1. Formulation of the mixes

Rubber *	-	100
ZnO	-	5
Stearic acid	-	2.0
HAF black	-	40
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* NR - ISNR 5	SBR - SBR 1502	

Presented in the International Natural Rubber Conference, 5-8 February 1992, Bangalore, India.