EFFECT OF HUMIDITY AND TEMPERATURE ON DRYING OF NATURAL RUBBER

Siby Varghese, Treesa Cherian and Baby Kuriakose
Rubber Research Institute of India, Kottayam – 686 009, Kerala, India.

Submitted: 25 September 2003 Accepted: 30 July 2004

Varghese, S., Cherian, T. and Kuriakose, B. (2004). Effect of humidity and temperature on drying of natural rubber. *Natural Rubber Research*, 17(1) : 53-59.

The effect of temperature and relative humidity on drying of three forms of natural rubber *viz.*, rolled latex coagulum, latex coagulum crumb and field coagulum crumb was studied by recording the percentage reduction in moisture content with time. Influence of the surface area on drying was demonstrated using yeast treated latex coagulum. Results indicated that larger portion of the drying time was for the second phase of drying (below 10% moisture), which involves diffusion of moisture from the coagulum. The rate of diffusion is influenced more by temperature of drying than by relative humidity.

Key words: Diffusion, Drying, Moisture content, Natural rubber, Relative humidity, Sheet rubber.

INTRODUCTION

The method of drying employed for a particular material depends on its characteristics. However, there are certain fundamental considerations which are applicable to all drying methods. If a very wet solid is exposed to air, it immediately commences to lose water by evaporation. The rate of evaporation depends upon the condition of the surrounding air and the surface area of the material exposed. As long as the surface remains wet the rate at which water is removed is independent of the moisture content of the solid (Piddlesden, 1936). Thus, if the external conditions are maintained constant, drying proceeds at a constant rate, and while this persists, the temperature of the solid surface will be the wet bulb temperature of the air (Lowery and Kohman, 1927; Sherwood, 1929; Newman, 1931). This 'constant rate period' continues until dry patches are formed on the surface. At this point drying enters the 'falling rate' period and the water content is called 'critical water content'. This period in turn may be divided into two zones. The first is the zone of unsaturated surface drying in which external atmospheric conditions are still important but are modified by the consideration that, as drying proceeds, the area of effective wet surface diminishes. In the second zone, internal liquid diffusion takes place. At this stage, the nature of the material being dried is of major importance and the condition of the surrounding air has little or no effect (Piddlesden, 1936; Daynes, 1932). The rate of drying is thus divided into at least three zones, each controlled by different sets of variables.

During drying, the layer of air in contact with the wet surface soon becomes saturated with moisture, and evaporation is therefore limited by the rate at which the moisture diffuses through the layer. This in

Correspondence: Siby Varghese (E-mail: siby@rubberboard.org.in)