CHAPTER II
LITERATURE REVIEW

Natural rubber latex is the raw material for the latex dipping industry because of its outstanding film-forming characteristics and gel strength. Centrifuged natural rubber latices with dry rubber c ontent o f 6 0% a re m ost c ommonly u sed, a lthough creamed and evaporated latices may also use. Normally, the latex must be mixed with a number of other materials before use in a dipping process. These materials generally include the 0.2-0.5 phr of stabilizer, the 0.3-1.5 phr of sulphur, the 0.3-1.5 phr of accelerator and the 0.1-2.0 phr of zinc oxide required for vulcanization, and an antioxidant to protect the product against aging. Many of these additives are powders and must be prepared dispersions before addition to the latex. Dispersions are prepared by means of ball-mills or other grinding equipment (Immamura, 1982).

In compounding process, there are many interested effects that were studied. First, it has been known that the performance of rubber compounds, e.g. their tensile properties and tear strength can be improved by loading the compounds with silica. A coupling agent must be mixed with the silica for at high temperature (150°C) for bonding of the organosilane to the silica surface before compounding. It is then mixed with rubber latex for reaction between the organosilane and the rubber polymer. The coupling is added to improve the mechanical properties of silica-filled rubber vulcanizates (Reuvekamp *el al.*, 2001). Next, in modern compounding practice there is a tendency to use levels of zinc oxide lower than the traditional five parts per hundred rubbers (phr); a level of three parts is now often used. It is therefore of interest to determine whether this change has any noticeable effect on the tensile properties of natural rubber. The results were shown that the tensile properties were slightly decreased by the reduction of zinc oxide level (Sears, 1981).

Maturing p rocesses u sed w ith n atural r ubber l atex r equire t he compounded latex to be matured or prevulcanized to obtain particular processing characteristics or product properties. During prevulcanization or maturation it was important to be able to determine the degree of crosslinking that had been reached in the latex. A modified solvent swell test which allows the crosslink density of natural latex to be assessed in twenty minutes had been developed. A film of latex was spread on a special coated paper and allowed to dry. When a sample was removed using a die punch and placed in toluene, the latex film separated from the paper and reached equilibrium swell in fifteen minutes. The linear swelling ratio, and thus the degree of crosslinking can be readily measured (Murray, 1982).

The latex dipping process consists essentially of immersing a suitably shaped former into a coagulant solution, with-drawn, dried and then immersed into the latex compound (or pre-vulcanized latex). The purpose of the coagulant is to produce a greater deposit thickness than is achieved by straight dipping. The deposit thickness obtained depends not only on the viscosity and total solids content of latex compound but also on the concentration of the coagulant solution and the dwell-time in the latex (Hannam, 1973).

The vulcanization process is carried out in circulating hot-air oven at high temperatures (more than $100^{o}C$). However, the elevated cure temperatures produce a network with lower crosslink density, in particular a lower polysulphidic crosslink density.

In 2000, Amder eliminated the proteins in natural rubber with a simple, elegant and inexpensive method is by using fumed silica additives. The fumed silica attached itself to the rubber particle and substitutes the proteins. The proteins were then easily removed. All this can be performed on-line; i.e. eliminating chlorination and/or extensive washing and handling of the products off line. The silica also affected to enhance mechanical properties.