MATTRESS TO GO

Latex Foam Manufacturing Process

1. What is latex?

Latex is a resin obtained by cutting the bark of the heveas brasiliensis tree. This resin quickly solidifies and becomes rubbery and elastic.

2. What are the benefits of Latex?

Latex has natural qualities that simply make it perfect material to sleep on. It dynamically conforms to your every movement during sleep so that you are assured optimal orthopedic support in any sleep position. This unique ability to conform to your body also alleviates areas of high pressure that cause you to toss and turn, interrupting your sleep. And latex is hypoallergenic and dust mite resistant, making it perfect for allergy sufferers.

3. Why is Latex medically recommended?

Natural latex is inherently hypoallergenic. Mildew, staphylococcus and other bacteria can't live in latex foam, making it the perfect choice for allergy sufferers and anyone wanting to breathe fresh clean air while they sleep.

Latex Foam – Dunlop Vs. Talalay

In foaming processes ambient air is introduced into the latex by whipping or beating. The first machines used to create latex foam were simple, unadapted standard type cake mixers. Later on, more advanced latex foam machines were introduced. However, the essentials of the foaming process are still the same. It is of interest to consider briefly the mechanism how such whipping processes produce foam. It is necessary that the wire whip should travel through the latex sufficiently fast to create a void behind it. This void fills with air, and a large bubble is trapped as the latex flows in over the top. Subsequent rotations of the whip comminute this bubble so that it is reduced to a very large number of little bubbles. These air cells can be exceedingly even in size, although their walls are thin. This process of comminuting large bubbles to form small ones is continued until the desired expansion has been achieved. The last turn of the whip incorporates a few larger bubbles, which usually work their way to the surface, and discharges them. Between these last large bubbles and the very fine bubbles intermediate bubbles are formed.

Dunlop foam process

The first stage of the batchwise process is the compounding of the latex with stabilizers, foam promoters and the remainder of the formulation ingredients, with the exception of the foam stabilizers, zinc oxide and the delayed action gelling agent. After a period of maturing at warm room temperature, the compounded latex is rapidly foamed with the whip rotating at a high speed. As whipping proceeds, the volume of the foam produced increases at first and then passes through a maximum. The presence of this maximum is associated with the exhaustion of the foam and latex stabilizers, and with loss of ammonia. Foaming is slower and the maximum foam volume is usually lower if zinc oxide is present at this stage. The viscosity of the latex compound can also have a marked influence the rate of foam formation.

When the desired degree of expansion has been achieved, the whipping rate is reduced while the foam is refined. During the refining, all large bubbles should be eliminated, and the cell size of the resultant foam should become more uniform. At this point the foam stabilizer may be added. At the end of the refining, the zinc oxide and a delayed-action agent are added, either separately in that order, or together. When the zinc oxide and sodium silicofluoride have been added, the foam must be rapidly transferred to the warmed mould. In a well-balanced latex foam formulation, the foam will require about 5 minutes to set, and this must be regarded as the upper limit of time that is available for transferring the sensitized foam from the bowl to the mould. The moulds are closed and then left to stand for a period of 10 minutes or more to allow gelation to be completed. In the next stage the moulds are placed in a continuous oven or in hot water for vulcanization to take place. After curing, the moulds are cooled somewhat and then stripped. After cleaning, the moulds are ready for service again.

Continuous foaming processes have also been developed. Dunlop patented the first continuous foaming process. Compounded latex and air were metered into the base of a long vertical chamber and beaten to foam. The foam flowed continuously from the chamber down a chute into a second chamber, also provided with a beater, where the zinc oxide and gelling agent dispersions were metered in as the foam passed down to an aperture in the base. It takes only a few seconds to mix and to pass the two stages. The materials to be mixed are proportioned in a continuous stream through the head, and in consequence every region of the mixture is processed to the same extent. In this case the materials being mixed are latex and air, and the result is fine-celled foam of uniform texture.

It is claimed that natural rubber latex foams of specific gravity as low as 0.06 can be produced with this mixing head. The foam density is varied and controlled by means of the ratio of air to the latex that is fed to the machine. The throughput of latex is controlled by means of a latex pump and an air regulator.

Typical specifications for natural rubber latex concentrates are available. The initial ammonia content must be higher for the batchwise processes than when foaming is continuous. This is because a certain amount of ammonia is lost during the stage of prolonged beating and exposure to the atmosphere.

Talalay foam process

In the modern Talalay process, mechanically foamed latex is expanded by application of vacuum, and is then fixed by a freeze-gel technique. The latex is placed in aluminum moulds which are specially designed to allow the circulation of heat-transfer fluids through their bodies, and which are equipped with cord paper gaskets in order to make the cavity permeable to gases but not to latex. The foam is then quickly cooled to a temperature below the freezing point of water. As a result, the viscosity of the foam continuum increased, drainage and collapsing tendencies are arrested, and a limited amount of cells interconnection occurred. It is interesting to note that this preliminary foam fixation takes place without any appreciable change of pH. Allowing carbon dioxide completes fixation to permeate through the foam, when a very positive gelation occurs as the pH falls. The mould is then warmed and heated by the circulation of suitable fluids (poly-ethyleneglycol), in order first to thaw and then to vulcanize the foam.

A compound of relative high ammonia content is employed, and one of the functions of the carbon dioxide is to increase the solubility of the zinc oxide through the formation of ammonium ions and the fall in pH. Gelation occurs by interaction between complex zinc ions and fatty acid-like stabilizers. Compounded latex is converted, without prior maturation, into fairly heavy density foam. A carefully metered amount of this pre-foam is transferred into the mould, and a partial vacuum is applied after mould closure. Expansion of the foam takes place, after which the foam is frozen and gelled with carbon dioxide. It is than thawed and vulcanized by means of fluids which are circulated through the body of the mould.

The advances of the Talalay process as compared with the Dunlop process are that the foam density, and hence compression modulus, may be readily varied by adjusting the amount of pre-foam placed in the mould. Furthermore, the process itself is more readily adapted to automation.

Source

E.W. Madge, *Latex Foam Rubber*, MacLaren and Sons Ltd., London, 1962