Latex Today with Jim Finn

Glove Making 101

In a previous column, I had stated that the world's population uses about 12,000 gloves per second; a significant number to be sure. As countries become more developed and their healthcare systems become more sophisticated, this number will only increase. Seventy-five percent of these gloves are intended for the medical field, and more than half of these gloves will be made from nitrile latex. While natural latex can make a perfectly acceptable exam glove because of its flexibility, toughness and feel, the fact that it contains proteins that can cause an allergic response in sensitized individuals has diminished it favorability in this application. Nitrile latex, while not having the softness and feel of natural latex, does not contain these particular proteins and has become the default material for this application. The evolution of a thinner, lighter weight nitrile glove has compensated for its higher modulus and somewhat "stiffer" feel.

The U.S. is by far the largest consumer of medical gloves; however, 90% of the gloves used here are produced off shore. Recently, the U.S. government has set a goal to annually produce 50 billion gloves domestically to cover the most critical medical applications for this PPE. This is a particular challenge for a number of reasons. First, most of the glove production began to move to Southeast Asia in the early 1990s. In the past 30 years, those most familiar with the glove making technology have left the industry. Second, to produce 50 billion gloves annually, it would require about 1 billion pounds of nitrile latex, little of which is produced in the U.S. Dow-Reichhold Specialty Latex, a major producer of nitrile latex, closed shop in 2008. Currently, the major sources of nitrile latex are Korea, Malaysia, Italy and China.

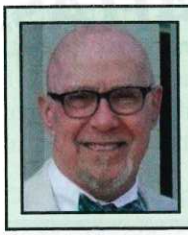
With that background, we move to the actual process for making a glove. Surprisingly, the same process can be used to produce an industrial glove, balloons, catheters or any number of thin filmed rubber articles. The formal name for the process is the anode process, where a coagulant is applied to a glove form and the form is dipped into a latex to produce a latex film. An alternative is the Teague process, where a form is first dipped into the latex, then into the coagulant to "set" the film. This process is not used in medical glove production. A third process is simply a straight dipping process where no coagulant is used. This technique is used to produce condoms, a simple dip and dry, dip and dry.

The anode process, if you search for it online, sounds pretty straightforward and relatively simple. Trust me: The industry is littered with the wreckage of companies that had not focused on the important details and minutiae that spelled the difference between success and failure. We, in this short column, will focus on the basics, and leave the rest for a further discussion.

Most gloves today are produced on a continuous machine with porcelain glove forms, either in single file or in sets of two or four forms mounted in a specific position on the chain drive. The forms can be made to spin or remain steady at particular areas of the process. Even the glove forms themselves can be made from a variety of materials, depending on cost and availability.

The process begins with a clean former, warmed and dipped into a coagulant, a salt solution of calcium nitrate or calcium chloride, or a combination of the two. The coagulant, then dried, is dipped for a few seconds into a compounded latex, containing the necessary vulcanization chemicals, in dispersion form. Depending on a number of factors, such as latex total solids, stability, viscosity, formulation and dwell time, the form with be deposited with a thin layer of latex "wet gel." The former/film will be dried and passed into a leach tank containing warm water to remove the residual coagulant from the film, and is then vulcanized at a much higher temperature to vulcanize the thin film. The next step is the immersion of the former into a solution of chlorine to reduce the surface tack, or a hydrogel or polymer coating which will facilitate the donning of the glove when finished. The final step is the stripping of the glove from the former. A variety of methods is used for this stage, from doing it manually to using sophisticated stripping machines. The gloves are turned inside out during this stripping stage so that the outside of the glove becomes the inside. The gloves are subsequently inspected and packaged after a series of rigorous tests is performed to guarantee an acceptable quality level.

This is a straightforward process, but the devil is in the details. Each step requires a plethora of conditions and controls to assure a predictable outcome. This is indeed an exciting time as the medical glove industry begins its return to the United States.



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