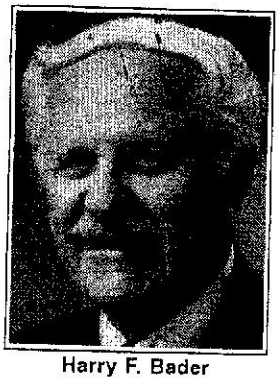

Harry F. Bader

Faulty dipping angles – Latex film drying

Mr. Harry F. Bader, Vice-President, Latex Services, Akron Rubber Development Laboratory in Akron, USA, and a world authority on latex, answers the questions and doubts of readers on latex and latex products.

• **GLOVES and condoms are manufactured using conveyor type equipment. Asian equipment of the early and mid 1980's exhibited pinhole problems due to faulty dipping angles. From your experience what shall be the measurements of (in a typical 55-60 metre long regular single dip line) dipping angles for coagulant and latex? What is the effect of varying immersion and withdrawal angles? (An operating speed of 8 metres/minute can be assumed).**

▲ *Conveyor type dipping equipment became popular in the U.S. and Europe in the mid to late 1950's Virtually all were in-house designs and the dipping speeds were adopted from the previous batch dipping systems. We first found it was necessary to have the latex moving at, or close to, the same surfaced speed at as the line speed. If that was not the case, a wavewould develop around the dipping form similar to the bow wave of a boat.*

The second and probably most important speed data we found were that vertical speeds should be the same as produced good results in batch dipping. With that in mind we established 25 cm/minute as the maximum speed for forms entering the latex. Removal vertical speed was set at a maximum of 60 cm/minute.

When you know both the vertical speeds and the line speed, entry and exit angles can be developed by simple geometry.

It should be kept in mind that both latex viscosity and degree of pre-cure are major factors in the generation of pinholes. Line speeds and dipping profiles which produce pinholes with a high pre-cure and/or a high viscosity latex compound may be pinhole free with a fresh compound having a lower viscosity.

An excessively fast removal speed will cause runs and finger droplets. Remember latex dipping is as much an art as a science.

• **If curing ovens have dimensions of 55 x 2 x 1.2 metres, insulated with 50mm glass wool/mineral wool and an average production rate of 5,000 pcs/hr, what should the flow rate and re-circulation rate of air be in a drying temperature of 140 degrees Celsius with a residence time not exceeding 15 minutes?**

▲ *This is a question which requires more information before a definite answer is possible. However, let me provide some basic information on latex film drying/curing.*

Drying is much like heat transfer in that efficiency is improved with turbulent flow. Generally an air speed across the surface of the wet film in excess of 76 m/min. (250 fpm) will provide that turbulence. Drying at 50°C, with good air flow, can be more effective than 3 times that temperature in relatively still air.

Excessively high temperatures, particularly with poor air flow, can inhibit total drying by drying the surface of the latex film to such a degree that the deep moisture is trapped.