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Silicones Simplified
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Product Guide

Calendering of XIAMETER® High Consistency Silicone Rubber

Calendering Equipment

Calendering is used for producing unsupported or supported long, thin sheets of uniform thickness. Many XIAMETER® silicone rubber products lend themselves to this process.

Preparing the Rubber

Most XIAMETER silicone rubber requires freshening on a mill before calendering. With soft, sticky rubber that is difficult to calender, let the rubber set 24 hours after milling

Calender

Either a 3-roll or 4-roll calender may be used. The 4-roll unit offers the advantage of working air out of the rubber more thoroughly.

A variable-speed main drive should be provided, to give a centre-roll speed range of .6 to 3 surface metres per minute. In most cases, the calender should be set for skim coating or "even"; i.e. the centre and bottom rolls turn at the same rate and turn faster than the top roll. In rare cases, particularly with stiff or highly filled rubber, an "odd" speed where the centre and bottom rolls turn at different rates gives better results.

Silicone rubber is usually calendered at room temperature. However, a means of heating the rolls should be provided; some rubbers may stick less, and thus process better, with one or more rolls heated. To avoid risk of scorching, the roll temperature must not exceed the decomposition temperature of the vulcanizing agent used.

To keep the rubber from creeping over the ends of the rolls, use nylon ploughs and end plates on all but the bottom rolls. Nylon readily takes the contour of the rolls, and does not give off metal wear particles that might discolor or contaminate the rubber being calendered.

Rotacure

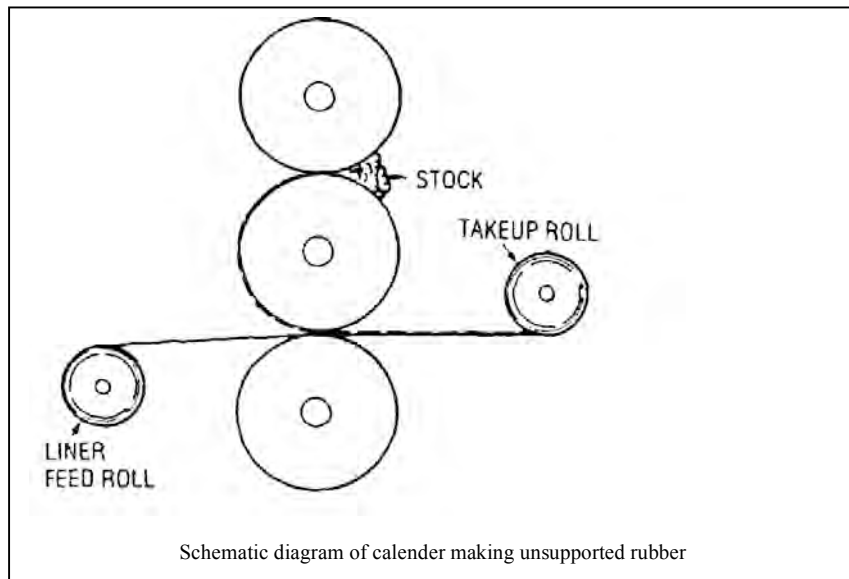
The rotacure unit is a continuous vulcanizing unit consisting of a heated roll with a continuous belt around pressing the sheet to the roll during the vulcanization process. Electrically heated rolls and steam heated rolls are available.

The speed of the rotacure can be adjusted to the speed of the calender so that a continuous vulcanization of calandered sheet is possible. The supporting cloth can be removed in an online process and the finished sheet can be rolled by winding equipment or cut into sheet as needed.

Making Unsupported Sheet

Unsupported sheet is usually made by calendering onto a liner, which is stripped off after vulcanizing. Suitable liner materials include plastic film, holland cloth, and cotton or nylon fabric treated for free release.

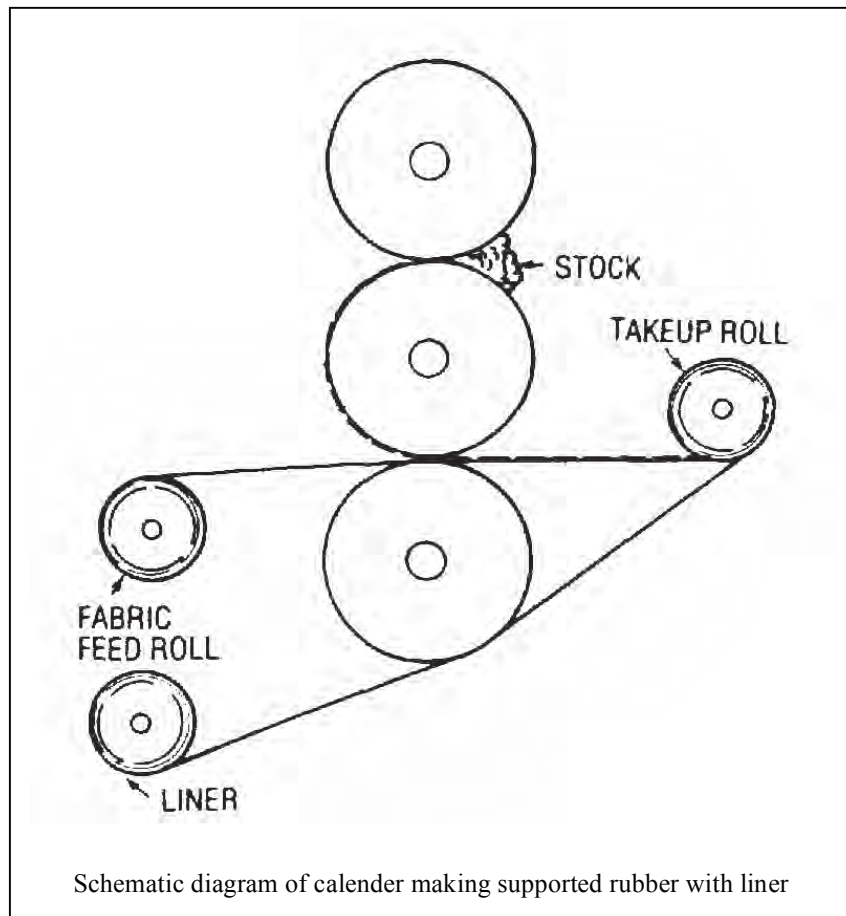
Feed the milled rubber to the calender as illustrated, and insert the liner between the calendered rubber and the bottom roll. To start calendering onto the liner, it may be necessary to cut the rubber away from the centre roll when the liner first comes through the rolls, calender the desired gauge onto the liner, and wind it onto a hollow core.



Making Supported Silicone Rubber Sheet

XIAMETER silicone rubber may be calendered onto untreated fabrics such as glass, nylon, Nomex high-temperature nylon, Orlon, Dacron, rayon and cotton. To apply XIAMETER silicone rubber to both sides of the fabric, the usual practice is to calender the rubber to the first side and partially vulcanize. Partial vulcanization takes 10 to 30 seconds at 150 to 315°C -the time and temperature depends on the thickness of rubber, vulcanizing agent, and heat-stability of the fabric. Heating for this brief interval can be accomplished by passing the calendered material over a hot drum or by feeding it through a hot-air vulcanizing unit. If the supported sheet is wound onto a core for storage or vulcanizing, use a liner as described under "Making Unsupported XIAMETER Silicone Rubber Sheet" to prevent adhesion between layers.

Insert the liner next to the bottom roll – polyethylene liner should be used if the calendered sheet is not to be vulcanized. Mylar[®], Kodacel, or holland cloth should be used when the calendered sheet is to be vulcanized with a core (aluminium or steel) that will withstand the heat of vulcanization.



In addition to the XIAMETER® brand materials showcased in this guide, Dow Corning Corporation offers a wide variety of *Silastic*® brand specialty silicone and fluorosilicone elastomers, as well as service options to help you keep your innovative edge in the marketplace. Visit www.dowcorning.com to learn more about additional options available from Dow Corning.

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