Silastic® Sponge
Fabrication Guide

Silicone sponge materials are used in applications requiring the benefit of siloxane polymers such as:

- Low temperature flexibility
- Thermal resistance
- UV and ozone resistance
- Electrical insulating properties

In addition, sponge rubber provides lightweight, damping effects and thermal insulation.

A NEW SILICONE SPONGE TECHNOLOGY

Adding chemical blowing agents to a rubber compound produces conventional silicone sponge.

During vulcanization, heating causes the blowing agents to decompose, creating and trapping bubbles of gas in the rubber, to form the cells of the sponge. These conventional blowing agents may produce toxic by-products.

Dow Corning has developed a new silicone sponge technology that replaces the traditional reactive chemical blowing agents or the use of volatile organic materials (VOC) as the expansion source. This new technology uses water as the blowing agent to create a uniform cellular sponge structure that can be used in food contact applications.

A FLEXIBLE PRODUCT RANGE

This new generation of silicone sponge is offered in two different product groups:

- A building block 2-component system
- Ready to use compounds

Typical properties are available from your Dow Corning sales representative and on the web at www.silastic.com.

SILASTIC BUILDING BLOCK SYSTEM

The new sponge technology can be obtained as a system of building blocks, *Silastic Sponge* Base and *Silastic Sponge* Curing Agent.

These building blocks are made from components compliant with the German BgVV and the American FDA for food contact regulations, and may be used as a ratio from 100:1 to 100:5 to obtain different cure speed.

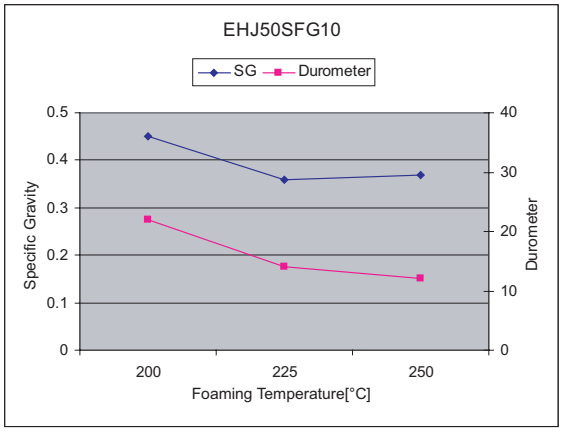
In addition, the surface structure may be modified by adding a small amount of Peroxide (2,5 dimethyl 2,5, di-T-Butylperoxihexane or Dicumylperoxide).

Formulation Flexibility

Other formulations can be achieved with this system to make sponge with different densities and compression deflections. Additives, like heat stabilizers or color masterbatches, can be used to fine tune the product property profile. This offers fabricators simple formulation control and process flexibility to produce a variety of sponge products that meet differing end use requirements.

SILASTIC SPONGE READY TO USE COMPOUNDS

For customers who do not have the equipment to compound or do not want to bother with formulation issues, we offer ready-to-use compounds. The materials, when properly processed, meet the requirements of the German BgVV and the American FDA food regulations.



GRAPH1

Graph 1 shows how modifying the production conditions of *Silastic Sponge* compounds can allow significant variations of product properties, such as hardness or specific gravity, and can cover a wide application area.

PROCESSING INFORMATION FOR *SILASTIC SPONGE* MATERIALS

EXTRUSION

The machinery used for *Silastic* S*ponge* extrusion is standard silicone extrusion equipment. Stock temperature at the screw tip should be from 25 to 50°C, so slight cooling is recommended.

Extrusion die shape should reflect the linear expansion rate of silicone rubber sponge, which is factor 1,45 to 1,65 compared to solid materials (volume increases by factor 3,2 to 4,4 depending on cure conditions).

The extrusion speed that can be reached depends on the geometry of the profile and on the equipment (length and efficiency of heat transfer of the curing tunnel).

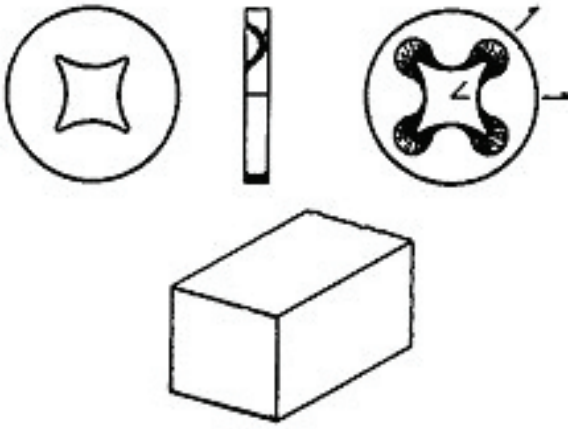


FIGURE 1

Fig. 1: *Die for making square extrusion. Side openings are made convex so straight sides are formed as the silicone rubber swells upon leaving the die. Corners have a slight radius to help obtain smooth corners. Part of the die has been cut away to obtain a balanced flow of rubber.*

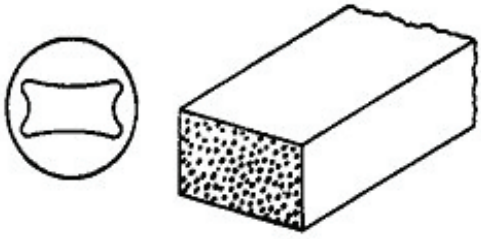


FIGURE 2

Fig. 2: *Die for extruding sponge of square cross section. Dies for sponge must allow for expansion during blowing (sponge formation) in addition to the expansion that is normal for extrusion (see fig. 1).*

CURING

The cure temperatures depend strongly on the heating equipment which is used.

General rule:
Cure temperatures of *Silastic Sponge* should be higher than temperatures for conventional, chemically blown sponge. The higher the cure temperature level, the lower the density. The temperature at the entry of the curing tunnel should exceed 210°C to obtain good sponge.

Basically there are three types of curing ovens used in extrusion:

1 - Vertical shock ovens
They work with free falling profile. This is the easiest way to process sponge extrusion as the length change of the profile during the cure process does not affect processing. Using this type of equipment, the possibilities to influence the thickness of the compact skin and the specific gravity are quite limited. The temperature should be adjusted relatively low for this type of oven (approx. 400 to 500°C).

2 - Horizontal cure ovens
Using this type of equipment, it is important to make the traction tape runs 50% faster than the output of the compact raw material from the extruder, and to use a belt that allows the profile to slide (or to apply a slight amount of talc to the profile after the extrusion die). Otherwise, the length increase will result in a bending of the profile in the cure tunnel. That can lead to burns as the profile may touch the electric heating. Curing tunnels with segmented pull off zones that can be adjusted to different speeds in the line to reflect the linear expansion are available (Gerlach GmbH, Erkelenz).

2.A - Horizontal cure ovens heated by infrared

Particularly those equiped with a shock zone give more flexibility to influence specific gravity and skin thickness. A hot shock zone will give a thicker skin. Due to differences in the geometry and the efficiency of the heating of different ovens, it is not possible to give a general temperature profile recommendation.

A typical temperature profile recommended to start with is:
- 250°C to 300°C in the initial zone or shock zone
- Followed by ca. 250°C in the middle zone
- And ca. 280°C to finish curing

2.B - Horizontal cure ovens heated by hot air

High speed air circulation results in a very efficient heat transfer, and compared to infrared ovens, increased extrusion speed. Equipment can be obtained from Colmec or Vanzaghelli in Italy, or Berstorff in Germany. As with IR ovens the differences in the design of the equipment do not allow to for a generally valid recommendation for the temperature profile.

A typical temperature profile to start with would be:
- 215°C at the entry of the cure tunnel
- 250 to 280°C in the middle
- 290 to 320°C to finish curing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Very precise profiles with Silastic Sponge

To get more information about *Silastic Sponge* and Dow Corning Elastomer Solutions, visit our website at www.silastic.com or contact Dow Corning Customer Service centers:

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