

Tutorial – How to apply and cure silicone coatings

Typical Application Methods

Typical methods for the application of silicone coatings to fabric include:

- **Knife coating** (knife-over-roll, knife-over-gap/air or knife-over-blanket) (Figure 1)
 - With knife-coating methods, the outcome is influenced by blade type and angle as well as the substrate. (Figure 2)
- **Dip/immersion coating or kiss coating** (lick roll) (Figure 3)
- **Rotogravure coating** (Figure 4)
 - The gravure process ensures that the topcoat is delivered at a constant application rate and is not affected by substrate variability. This method facilitates higher line speeds.
- **Extrusion** (Figure 5)
- **Spraying** (Figure 6)

The use of opposing knives or knife-over-air methods facilitates substrate penetration.

Squeeze-roll, reverse-roll and knife-over-roll methods facilitate film forming. In squeeze- and reverse-roll methods, roll pressure governs the deposition of the film. Knife-over-roll, on the other hand, relies on blade type and angle.

Figure 1 – Knife coating.

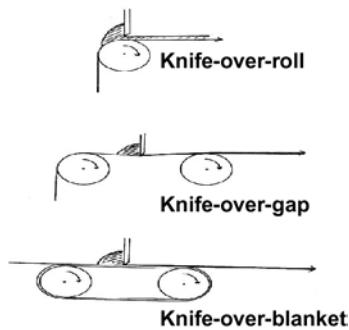


Figure 2 – Knife shapes.

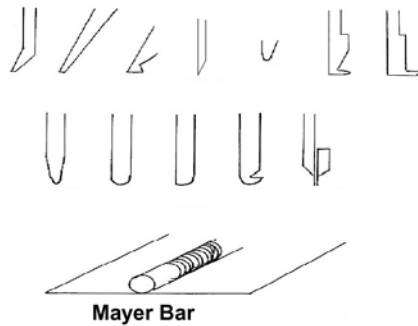


Figure 3 – Dip/immersion coating or kiss coating.

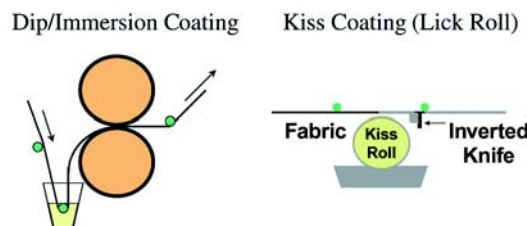


Figure 4 – Rotogravure coating.

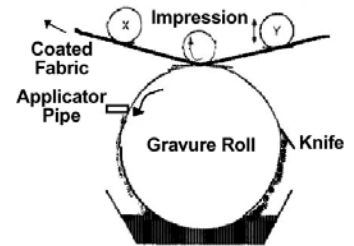


Figure 5 – Extrusion.

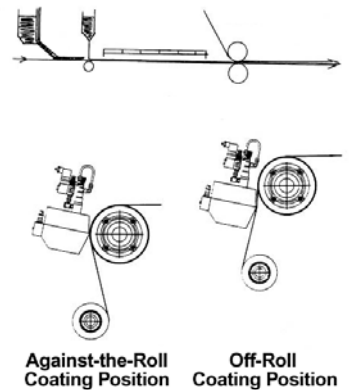
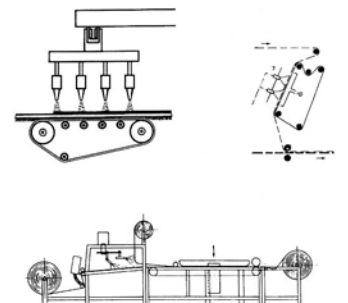


Figure 6 – Spraying.



Liquid silicone rubbers (LSRs)

LSRs are usually sold as two-component systems (kits). Mix ratios vary from 1:1 to 10:1.

For laboratory trials, LSR can be mixed with a laboratory mixer or by hand. Pot life will vary depending on the amount of inhibitor in the formulation. To avoid air bubbles, the mixture must be put under vacuum before use.

In production settings, static mixers are preferred over dynamic mixers. Dynamic mixers can add excessive heat or cause the filler to separate.

LSR Application Methods

- Conventional coating machines can be used.
- For thick layers use knife-over-roll.
- For fine layers (up to 40 g/m²) use knife-over-air or gravure.
- Addition of solvent makes thinner coatings possible.
- Screen-printing is also possible for some materials.

Curing LSRs

- With LSRs, deep-section cure is possible.
- Pot life varies according to inhibitor/catalyst level; most LSRs have a 24-hour pot life.
- Most LSR coatings cure in 1 to 2 minutes at 160-180°C (many organic systems are solvent-based and require a temperature gradient to gently remove the solvent prior to cure).
- There are no reaction byproducts and only a small amount (1-2 percent) of volatile silicones (cyclics); consequently, recycling air is not a problem.
- The LSR's platinum catalyst can be poisoned by contaminants: Lewis bases (such as amines, ammonia, neoprene, sulfur, mercaptides, vinyl groups, Buna rubber).
- If the LSR Part B becomes contaminated with water, strong acids or bases, there is a potential for the release of hydrogen gas.

Room-Temperature-Vulcanizing (RTV) Elastomers

RTV Application Methods

When the RTV is used at 100 percent solids as a sealant or adhesive, it is applied via extrusion using a pump system with a follower plate and an extrusion head at the point of use.

When the RTV is used as a coating, or if it is being applied to an uneven substrate, it is diluted with solvent and sprayed. Airless spraying is preferred. Air contact should be avoided before application as the product will skin over in 5-10 minutes.

Cleaning

- Uncured silicone can be removed using white spirits.
- Cured silicone is very difficult to remove; strong acid or base may be required.
- Cured and uncured silicone may be removed by Digesil NC (available from American Digesil Co. – telephone 1-201-344-3600).

Figure 7 – Typical LSR coating line.

