Consumer Solutions

Dispensable Adhesive/Sealants for Automotive Applications

Sealing Methods Tutorial

Dow Silicone Solutions

As the pioneer of silicon-based technology, Dow has been improving customers' products and profitability for more than 60 years. With a full range of product and application solutions, reliable supply, world-class manufacturing and global reach, Dow can meet virtually any silicone-related need through our total solution offering and technology leadership.

Dow (**consumer.dow.com**) provides performance-enhancing solutions to serve the diverse needs of more than 25,000 customers worldwide. A global leader in silicones, silicon-based technology and innovation, Dow offers more than 7,000 products and services through the DOWSIL™ and XIAMETER™ (xiameter.com) brands. More than half of Dow's annual sales are outside the United States.

Form-in-Place Gasketing (FIPG)

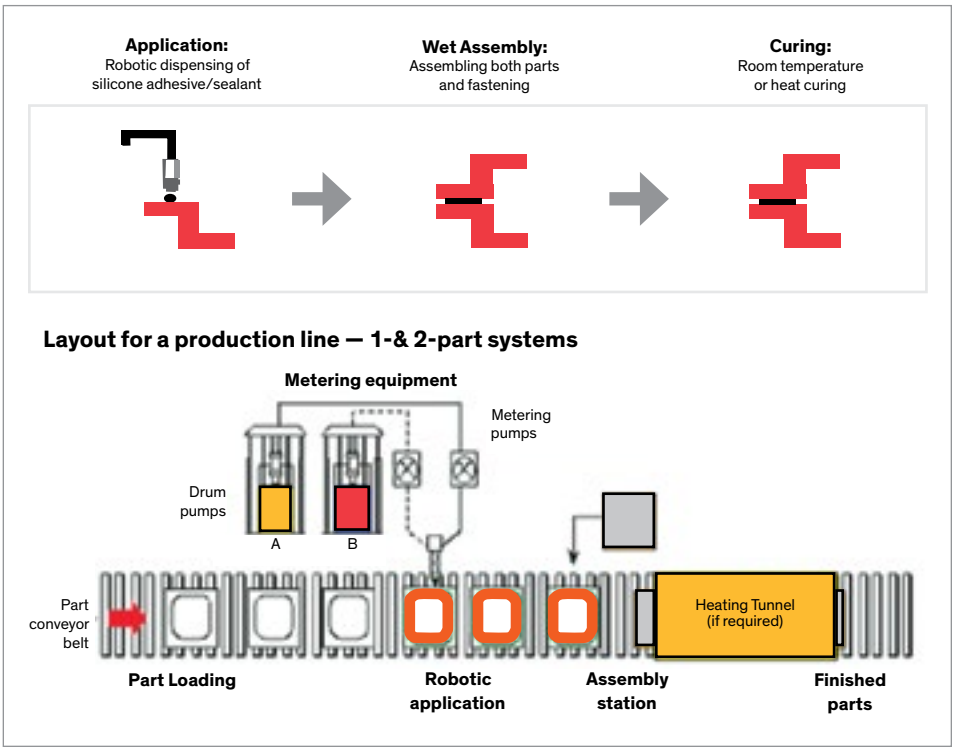
Typical FIPG Benefits

- Potential reduction of component bonding/sealing costs through automation
- Specific products are suitable for oil, coolant and environmental sealing
- Strong adhesive seals for permanently assembled components
- Proper fit and reliable sealing for most component interfaces through wet assembly
- Strong bonding and sealing on metal, glass, plastics and composite substrates
- Easy-to-process one- and two-part systems can be used
- Adhesive/sealants made by Dow maintain elastomer properties from -40 to 150°C (-40 to 302°F) and provide better performance than many organic polymer sealants
- Oxime-free products are available

Possible FIPG Process

In situ robotic dispensing of assembly bonds and seals uses specialty one- and two-part silicone adhesive/sealants. The robotic dispenser follows the contour of the component and applies a precisely metered bead of sealant directly onto one surface. The component can be assembled and retained with fasteners while the adhesive/sealant is in its uncured form. After a short cure time at either high temperature or room temperature, depending on the product type, the seal is ready for use.

Figure 1: Form-in-place Gasketing



Choosing a One- or Two-Part Adhesive/Sealant System

- One-part systems: Room-temperature-curing adhesive/sealants generally require 24 hours or longer to cure.
- Two-part systems: Generally used for lighting and other assembly processes that require a short cure time.

Cure-in-Place Gasketing (CIPG)

Typical CIPG Benefits

- Potential reduction of component sealing and gasketing costs through automation
- Specific products are suitable for oil and coolant seals and gaskets
- Wet-dispensed gasketing allows flexibility in component design
- Sealing defect rates may be reduced by precise gasket positioning
- Sealing gasket fabrication can be integrated with component fabrication
- Self-priming DOWSIL™ adhesive/sealants provide reliable bonding
- Silicone-based sealants have outstanding resistance to environmental degradation
- Easy-to-process two-part sealing systems use a 1:1 mix ratio
- Wet-dispensed sealants help maintain bead profile through controlled rheology
- DOWSIL™ adhesive/sealants maintain elastomeric properties from -40 to 150°C (40 to 302°F) and provide better performance than many organic polymers for seals and gaskets
- Fast cure at high temperature; typically 5 to 10 minutes at 150°C (302°F)
- No post cure required; the seal is ready for use after an initial cure

Possible CIPG Process:

In situ robotic dispensing of compression seals uses liquid silicone rubber adhesive/sealants. The robotic dispenser follows the contour of the component and applies a precisely metered bead of adhesive/sealant directly on the sealing surface. After a short cure time at high temperature, the seal is ready to use. Rheology of the liquid sealants, together with their built-in adhesion promotion, helps the cured bead stay in place and retain its dispensed profile and size.

Dispensed Foam Gasketing (DFG)

Typical DFG Benefits

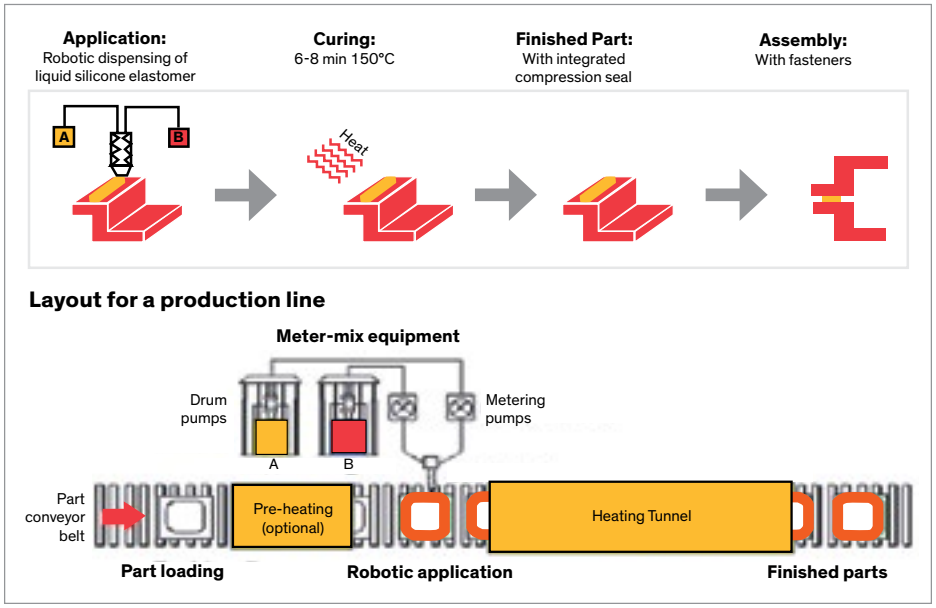
- Potential reduction of component sealing costs through automation and use of self-foaming silicone rubber elastomers
- Suitable for air, dust and moisture sealing
- Self-foaming sealants promote flexibility in component design
- Reject rates may be reduced by gasket positioning and foam expansion
- Foam gasketing fabrication/placement can be integrated with part fabrication
- Silicone sealants provide outstanding resistance to UV and other environmental degradation
- Easy-to-process two-part system uses a 1:1 mix ratio
- Foam sealant expands during cure without external blowing agents or solvents
- Elastomeric properties are maintained from -40 to 150°C (-40 to 302°F); special compounds are available for higher temperatures
- Fast cure at low temperatures; typically 15 minutes
- No post cure is typically required; the seal is ready for use after an initial cure
- Adheres to many plastic and metal surfaces; use corona, flame treatment or chemical primers
- High resistance to compression set over a wide temperature range

Possible DFG Process

In situ robotic dispensing of compression seals uses dispensed silicone foam. The robot follows the contour of the component and applies a precisely metered bead of silicone foam adhesive/sealant directly onto the sealing surface. After a short time at low temperature, the dispensed silicone foam expands and cures to a strong elastomeric seal.

- Elastomeric sealing properties are maintained from -40 to 150°C (-40 to 302°F) and higher, a wider service temperature range than possible with most organic polymer sealants

Figure 2: Cure-in-place Gasketing



- Fast cure at high temperature; typically 30 to 90 seconds at 150 to 180°C (302 to 356°F), depending on the substrate and bead cross-section
- No post cure is typically required; the seal is ready for use after an initial cure

Possible MIPG Process

In situ injection molding of compression seals uses specialty liquid silicone adhesive/sealants for wet-dispensed sealing. The component to be sealed (plastic or metal) is placed in an injection-molding tool, which is then closed. Silicone elastomer is injected into the seal cavity. After a short curing time at high temperature, the mold can be opened and the part with the integrated seal removed.

Mold-in-Place Gasketing (MIPG)

Typical MIPG Benefits

- Potential reduction of integrated component sealing costs through automation
- Specific products are available for oil and coolant sealing
- MIPG wet-dispensed process allows flexibility in component design
- Sealing/gasketing reject rates can be reduced by precise gasket positioning
- Gasket fabrication and placement can be integrated with part fabrication
- Self-priming grades of DOWSIL™ adhesive/sealants provide reliable adhesion
- Outstanding resistance to environmental degradation
- Easy-to-process two-part system uses a 1:1 mix ratio

Figure 3: Dispensed Foam Gasketing

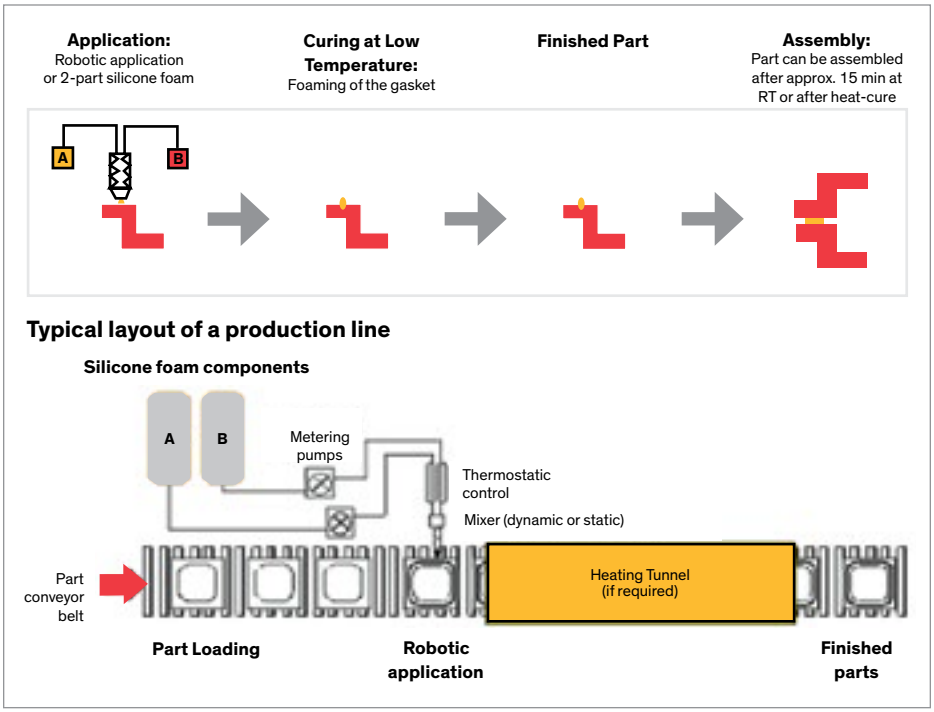
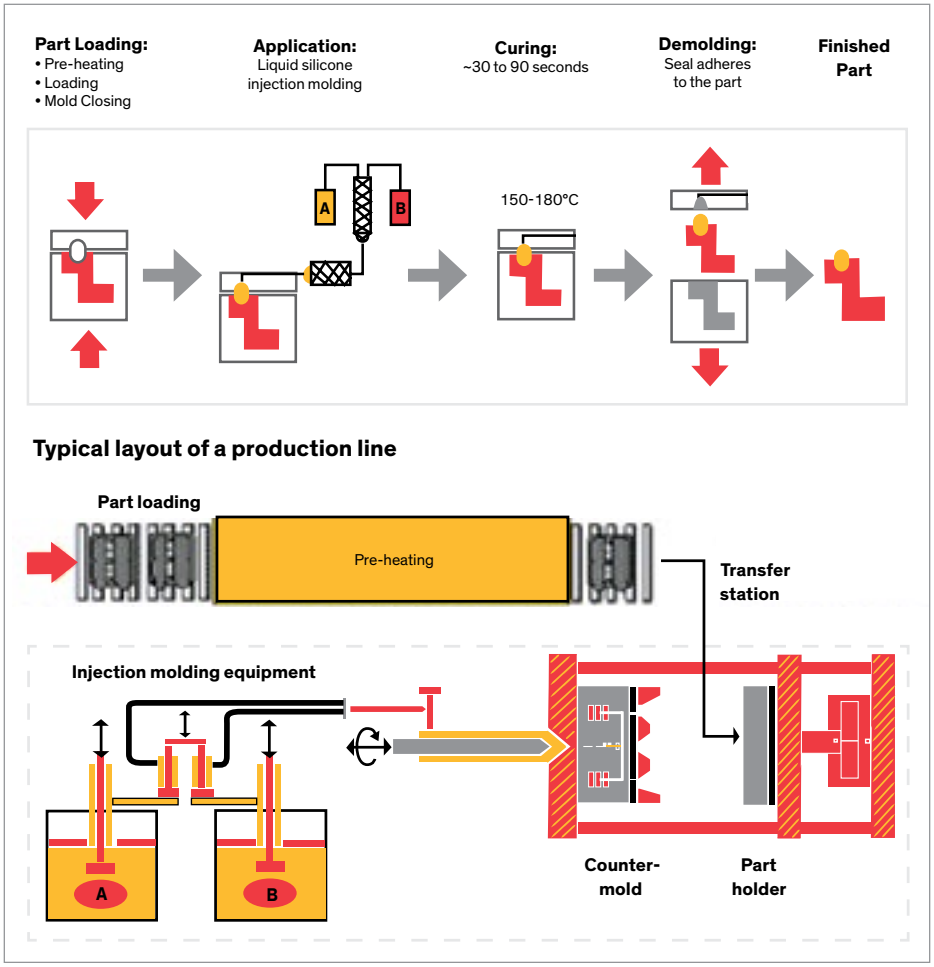


Figure 4: Mold-in-Place Gasketing



Contact Dow

Dow is a global solutions provider for today's automotive industry. We have sales offices, manufacturing sites, and customer service and engineering centers strategically located worldwide. For more information, please visit **consumer.dow.com/contactus** for addresses and phone numbers of locations in your geography.

30023848 Form No. 80-3467-01 B