

**CILBOND 49SF is a One-Component Solvent-Based Bonding Agent for Castable Polyurethane Elastomers and Thermoplastic Polyurethane Elastomers (PU and TPU).**

### BENEFITS OF CILBOND 49SF

#### BONDING CAPABILITIES :

**Cilbond 49SF** is a one coat bonding system for PU and TPU to all metals during the curing process.

**Cilbond 49SF** will also bond PU and TPU to epoxies and fibreglass reinforced plastics, polyamides and other engineering thermoplastics, such as Hytrel®, PBT, PET, PPS, PPO, PEEK, PES, etc.

#### IN-SERVICE BENEFITS :

**Cilbond 49SF** exhibits good resistance to static and dynamic fatigue and bonds survive in fluids such as fuels, oils including all types of lubricants, glycols, inks, lacquers, paints and many cleaning solvents, though for a maximum resistance to aggressive solvents, the use of **Cilbond 49SF** and **Cilcure B** is recommended – see below. (*Cilcure B is a liquid form of diphenylmethane diisocyanate with a selected functionality and is used to improve the environmental resistance of bonded parts*).

**Cilbond 49SF** has good hot and cold water resistance, as illustrated by tests where polyether/MbOCA or polyester/Ethacure cured compounds bonded to mild steel showed 100% rubber tear when peel tested after total immersion for 28 days in water at 176°F.

Bonds made with **Cilbond 49SF** are impact resistant and not brittle down to at least -40°F.

When **Cilbond 49SF** is used as a 2 part bonding agent with **Cilcure B**, it has specific benefits and uses, especially for lower temperature bonding and for exceptional resistance to aqueous conditions, such as boiling water and for long-term exposure to predominantly wet conditions. This system is also suited for higher heat resistance to 355°F and **Cilbond 49SF + Cilcure B** is probably more versatile when used as a primer under **Cilbond 49SF**.

#### PROCESSING BENEFITS :

**Cilbond 49SF** exhibits the capability to withstand long pre-bake cycles and with good control of metal preparation and bonding agent application and using extended pre-bake conditions (see below) the bonds can survive up to ca. 265°F in static and dynamic conditions.

### TYPICAL PHYSICAL PROPERTIES OF CILBOND 49SF

|  |  |
|--|--|
| Appearance                                   | <i>Red Liquid</i>                                  |
| Viscosity - No 3 Zahn Cup @ 78°F             | <i>30 seconds</i>                                  |
| Viscosity - Din 4 @ 78°F                     | <i>50 seconds</i>                                  |
| Non-Volatile Solids                          | <i>24% by weight</i>                               |
| VOC Content                                  | <i>76% by weight (5.8 lbs per US Gallon)</i>       |
| Volume Solids                                | <i>20.3%</i>                                       |
| Weight per Gallon                            | <i>7.6 lbs</i>                                     |
| HAP Content                                  | <i>12.0% (4.9 lb HAP / US Gallon solid)</i>        |
| Specific Gravity@ 78°F                       | <i>0.92</i>  |
| Flash Point (Abel Pensky)                    | <i>28.4°F (-2°C)</i>                               |
| Moulding Temperature Range                   | <i>160 - 400°F</i>                                 |
| Optimum Dry Coating Thickness                | <i>≥ 0.8 mil for maximum adhesion.</i>             |
|  | <i>≥ 1.0 mil for maximum corrosion resistance.</i> |
| Typical coverage at 0.8mil Coating Thickness | <i>610ft² / US Gallon</i>                          |
| Shelf Life                                   | <i>24 Months from Date of Manufacture</i>          |

### WHERE TO USE CILBOND 49SF

**Cilbond 49SF** will bond castable and thermoplastic polyurethanes to metals and plastics at temperatures of 160°F or above, though best results are achieved at  $\geq 185^{\circ}\text{F}$ , particularly if the component is going to be subjected to a severe environment. It is especially suitable for use in dynamic conditions where hydrolytic stability is important.

When bonding MDI Quasi Prepolymer Systems and where the cast PU bond line may not reach much above 160°F, it is recommended that after applying the **Cilbond 49SF**, the coated metal parts are dried thoroughly and then pre-baked for an absolute minimum of 1 hour at 185 - 210°F to ensure a good cement to metal bond.

For the bonding of PU to polyamides (Nylon), using **Cilbond 49SF**, refer to CIL Information Sheet B10.

### END-USE APPLICATIONS OF CILBOND 49SF

End applications for products using Cilbond 49SF include :

- Rollers for the paper and textile industries
- Solid tyres
- Carriage wheels
- Dunnage
- Pipe linings and pipe coatings
- Reinforced screen decks
- Any product with an engineering bond between a PU elastomer and a metal or plastic substrate.

### METAL SURFACE PREPARATION

**Cilbond 49SF** must be applied to carefully prepared surfaces for it to be effective. Surfaces should ideally be grit blasted with clean, filtered sharp alumina or steel grit (200-400 $\mu$ ), and solvent degreased. For cast PU's it is vital that when dealing with hard surfaces, such as case hardened steel, stainless steel and some grades of high carbon cast iron, that the grit is capable of giving a sharp surface.

Alternatively, surfaces may be phosphated using well-established proprietary procedures.

Good metal preparation is vital if the environment is continually wet such as sub sea situations and/or involves severe dynamic fatigue.

For detailed recommendations on substrate preparation refer to **Information Sheet A1**.

### APPLYING CILBOND 49SF

#### BRUSHING

Application by brushing is normally undertaken without further dilution, but for coating large areas, dilution with MEK or the diluent blend shown below, improves flow and speed of application.

#### DIPPING

Dilute to a viscosity of 16-24 seconds using a Zahn No.2 cup at 78°F or 13-20 seconds using a Din 4 or Ford 4 Cup at 78°F using the diluent blend given below, or use MEK if a fast drying coating is required.

#### SPRAYING

We recommend an HVLP gun using 22 psi air-pressure and a nozzle size of 0.04 – 0.06 in.

Dilute to 16-24 seconds on a Zahn No 2 cup or 13-20 seconds on a DIN 4 or Ford 4 cup at 78°F, using the diluent shown below. If fibrillation (cob webbing) occurs, use diluent containing more higher boiling solvent, such as MPA. **Cilbond Diluent 4000** is a suitable diluent for **Cilbond 49SF**.

Typically, dilute ca. 100 parts of **CILBOND 49SF** with 40-70 parts **Cilbond Diluent 4000**, by weight or volume, depending on the gun type, the nozzle size and pressures used.

If MEK is used as the main diluent, beware of chilling of the sprayed metal parts (due to rapid MEK evaporation) and subsequent condensation of water, which may lead to a micro porous film.

#### ROLLER COATING

Dilute to 35-45 seconds on a DIN 4 or Ford 4 cup at 78°F for most roller application processes. Dilution with a high boiling solvent like MPA may be necessary to achieve the best finish and to reduce the skinning of the bonding agent in the applicator.

#### DRYING

Dry each coat for at least 45 minutes and the final coat for at least 1 hour at room temperature (78°F). At temperatures below 68°F extend the drying time accordingly.

Forced drying may be used provided care is taken to prevent blistering of the films so we recommend temperatures below 140°F in the early stages of drying. Pre-warming the parts *before* coating will also aid drying (140°F is recommended).

#### PRE-BAKING

Pre-baking is required to develop good bonding to the substrate, especially to metals. The minimum pre-bake is 1 hour at 210°F and a **typical recommended pre bake is 2 hours at 210-220°F**, though it is well established that longer pre-bakes (4-8 hrs at 210°F) do maximise bond strengths, percentage bond retention and especially the heat resistance of the bond and environmental resistance. The **Cilbond 49SF** coating should not be pre-baked for more than 48 hours at temperatures of ca. 210°F, 24 hours at 220°F or 16 hours at 265°F.

Pre-bakes at >265°F should be fully validated and very carefully controlled and especially with porous and hardened metals (particularly cast iron and cast aluminium) as de-gassing may affect the cement to metal bond.

As an alternative to extended pre-bakes, consider using **Cilbond 49SF+ Cilcure B** as a primer under **Cilbond 49SF** – See separate section on page 5.

Pre-bakes prior to TPU injection moulding are less sensitive to this problem, partly due to the high injection pressures and temperatures involved, which will re-bond the **Cilbond 49SF** to the metal.

#### COATING THICKNESS

For general-purpose applications use a dry coating thickness of **0.6 mil**.

For dynamic fatigue applications use a dry coating thickness of **≥ 0.8 mil**.

For severe environments use a dry coating thickness of **≥ 1.0 mil**.

Under these conditions it is possible to achieve bonds, which exhibit no sign of edge failure after 480 hours salt spray tests, especially with **Cilbond 49SF + Cilcure B**.

#### STORAGE

Coated parts may be stored for long periods of time (several weeks) provided they are protected from dust and moisture.

#### DILUENTS

The best diluent is the following blend, where parts are by weight:

|          |   |
|----------|---|
| 86 parts | Methyl ethyl ketone (MEK)               |
| 7 parts  | Methyl proxitol acetate (MPA)           |
| 7 parts  | Ektapro (EEP), ethoxy ethyl propionate. |

This solvent blend is available from CIL as **Cilbond Diluent 4000**. For many applications it is possible to dilute with low moisture content MEK, provided that the **Cilbond 49SF** is agitated whilst adding the MEK. If cob webbing occurs on spraying, additions of **Cilbond Diluent 4000**, or mixtures of MEK and high boiling ethers and/or esters, such as MPA will reduce it.

## ADDITIONAL INFORMATION

With certain polyurethane systems, especially those plasticised by polar plasticisers, there is the possibility of the plasticiser in the polyurethane solvating the **Cilbond 49SF** prior to gelation of the PU. This may exhibit itself as an observation of staining of the PU by the red dye in the **Cilbond 49SF** or at worst some failure at the PU to cement bond.

For such systems, we strongly recommend the maximum pre-bake prior to casting. If this fails to give good bonding, use **Cilbond 49SF+ Cilcure B**

## WHEN TO USE CILBOND 49SF + CILCURE B

If bond line temperatures are likely to be below 160°F, or if a pre-bake of the coated substrates is not feasible, or if the in-service environment is extreme, then consider the use of **Cilbond 48** (see separate Technical Data Sheet) or **Cilbond 49SF + Cilcure B**.

Applications for **Cilbond 49SF+ Cilcure B** include low-temperature casting or spraying of PU, the rotational casting of small and medium sized rollers and applications involving dynamic fatigue at temperatures of  $\geq 285^{\circ}\text{F}$ .

CIL strongly recommend **Cilbond 49SF+ Cilcure B** for applications that involve continuous use in aqueous environments. The resistance of PU to metal bonds made with **Cilbond 49SF+ Cilcure B** at a ratio of 100:10 and subjected to water at  $< 120^{\circ}\text{F}$  is predicted to be  $\geq 20$  years and the use of **Cilbond 49SF** as a cover coat is covered below.

**Cilbond 49SF+ Cilcure B** yields bonds capable of withstanding boiling water for up to  $220^{\circ}\text{F}$  for  $\geq 200$  hours.

**Cilbond 49SF+ Cilcure B** gives improved adhesion to many substrates; especially epoxy resins, such as FBE, GRP/FRP, glass, ceramics, etc.

**Cilbond 49SF+ Cilcure B** is recommended for highly plasticised PU systems and for systems where the curing agent could potentially solvate the bonding agent layer, such as trans CHDI/CHDM PU systems.

**Cilbond 49SF+ Cilcure B** or **Cilbond 49SF+ Cilcure B** as a primer under **Cilbond 49SF** produce bonds capable of withstanding temperature of up to  $355^{\circ}\text{F}$

## HOW TO USE CILBOND 49SF WITH CILCURE B

The standard mix ratio of **Cilbond 49SF + Cilcure B** is **100:10** by weight, but for some applications, it may be possible to use a mix ratio down to 100:5, especially for very fast cure 2 component PUs.

**Cilbond 49SF** (100 parts by weight) should be mixed with **Cilcure B** (10 parts by weight), preferably by adding the **Cilcure B** to the **Cilbond 49SF**, whilst stirring. Stir well until homogeneous. Allow to stand for a few minutes, stir again and it is then ready for use.

Ideally make up sufficient mix to last ca. 8 hours, which is the recommended pot life. Dispose of any material after this, especially if it has a gelatinous nature.

Apply this mixture following the same procedure as for **Cilbond 49SF**, except that a pre-bake is now not a definite requirement, though the dried parts must be brought up to the moulding temperature or to  $\geq 120^{\circ}\text{F}$  prior to casting the PU. If parts are dried at  $\geq 160^{\circ}\text{F}$ , then best bonding is achieved, even if the metals are at  $\geq 120^{\circ}\text{F}$  when the PU is cast.

A high temperature pre-bake is possible, but it must be stressed that long pre-bakes must be avoided, though the system will tolerate up to ca. 4 hours pre-bake at  $210\text{-}220^{\circ}\text{F}$  without any adverse effect on bonding.

Longer and higher temperature pre-bakes may be possible, depending on PU type, i.e. Vulkollan®. However this must be fully validated to ascertain reproducible results.

## END USE APPLICATIONS OF CILBOND 49SF + CILCURE B

Applications benefiting from **Cilbond 49SF + Cilcure B** include:

- Low temperature applied spray coatings and any difficult to bond very fast curing PU.
- Low temperature casting of PUs, especially rotational casting of small and medium sized rollers and pipe, where some limited heat input is possible
- Applications required to withstand boiling water, hot water, where bonded items are continually in aqueous environments or where the bonds must survive up to 355°F.
- Applications where aggressive solvents are employed.

## CILBOND 49SF + CILCURE B AS A PRIMER UNDER CILBOND 49SF

This combination is used for those applications where the benefits of **Cilbond 49SF + Cilcure B** as a primer can be combined with the long open time and pre-bake resistance of **Cilbond 49SF**, with the added advantage that this system gives bonds with the same heat resistance as **Cilbond 49SF+ Cilcure B** on its own.

A primer coat of **Cilbond 49SF + Cilcure B** is **100:10** by weight is applied to well prepared metals to give a minimum of 0.6 mil dry coating thickness and dried for 1-2 hours at ambient temperature or with gentle applied heat. A second coat of **Cilbond 49SF** is applied to give a total coating thickness of  $\geq 1.0$ mil and dried thoroughly.

This system is now treated as though it was a dried coating of **Cilbond 49SF** to produce the bonded component and bond performance is equal to using **Cilbond 49SF + Cilcure B** at **100:10** by weight.

## PACKAGING

**Cilbond 49SF** is supplied in 2.5, 6.5 and 55 US Gallon containers. ½ pint trial samples are also available upon request.

## FURTHER INFORMATION

For more information on **Cilbond 49SF** or for details of our other products please visit [www.cilbond.com](http://www.cilbond.com) or e-mail [sales@cilbond.com](mailto:sales@cilbond.com)

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