CILBOND® 24
TECHNICAL DATA SHEET

CILBOND 24 **is a High-Performance One-Component Solvent-Based Bonding Agent for NR, SBR, CR, BR and Vamac® Compounds to Metal and Plastic Substrates.**

BENEFITS OF CILBOND 24

BONDING CAPABILITIES :

Cilbond 24 is a one-component bonding system developed to give high performance bonding with the following elastomers:-

- Natural Rubber (NR)
- Styrene Butadiene Rubber (SBR)
- Chloroprene Rubber (CR)
- Polybutadiene (BR)
- Synthetic Polyisoprene Rubber (IR)
- AEM / Vamac® G
- Polyepichlorohydrin (ECO)
- Chlorosulphonated Polyethylene (CSM / ACSM)
- Polyacrylate Rubbers (ACM)
- Carboxylated NBR (XNBR)
- Polynorbornene
- Ethylene Vinyl Acetate EVA (EVM)

Cilbond 24 has also been designed as an effective post-vulcanising (PV) bonding system and has the further benefit of being suitable for bonding rubbers to certain fibres, cords and fabrics, such as cellulose, polyamides, polyester and glass.

IN-SERVICE BENEFITS :

- Superior heat resistance / low temperature resistance - bond resistant from -50ºC to 200°C
- Exceptional salt-spray resistance. Unstressed parts exceed 1000 hours, 30% E stressed parts exceed 400 hours salt-spray in 5% salt-spray at 35ºC with minimal signs of corrosion.
- Exceptional dynamic and static fatigue resistance
- Superior chemical resistance to : Petroleum spirit fuels, unleaded petrol, kerosene, fuel oils, mineral oils and synthetic ester turbo oil at high temperature, ethylene glycol and propylene glycol at high temperature (such as 160ºC), acids and alkali, hot water, including boiling water.
- **Cilbond 24** passes all established hot water tests including the 504 hour / 70ºC Volvo tests and 100 hour boiling water stress tests.

PROCESSING BENEFITS :

- Almost zero mould fouling or staining.
- Excellent pre-bake resistance of up to 30 minutes at 160ºC prior to bonding (depending on the compound).
- Components can be swaged without causing bond failure at the points of metal strain.
- Dried **Cilbond 24** coatings do not chip during normal handling and though they may mar, this does not affect bonding quality.
- Elastomers can be injection moulded at up to or even above 200°C if necessary

TYPICAL PHYSICAL PROPERTIES OF CILBOND 24

Appearance	*Black Liquid*
Viscosity - No 3 Zahn Cup @ 26°C	*17 seconds*
Non-Volatile Solids	*25% by weight*
Specific Gravity, 26°C	*0.97*
Flash Point (Abel Pensky / Seta Flash)_	*-3°C / -5ºC*
Bonding Temperature Range	*120 - 230°C*
Recommended Dry Film Thickness	*15 - 20 micron (>20µ for maximum environmental resistance)*
Typical Coverage @ ca. 15 microns	*ca. 15 m² / Litre*
Shelf Life	*12 Months from Date of Manufacture*

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METAL SURFACE PREPARATION

For optimum bonding with **Cilbond 24**, all metal surfaces MUST be contaminant free. Grit-blasting with clean, sharp, chilled iron grit (200-300µ) to grey-white finish should yield excellent bonding surfaces with ferrous metals. For non-ferrous metals such as aluminium, blasting with aluminium oxide grit is strongly recommended. All parts to be bonded should ideally be degreased.

Other methods of metal preparation, which will still give excellent bonds, include phosphate and chromate conversion coating or acid and alkaline pre-treatments. Whilst chemical treatments are very effective in metal preparation, great care MUST be taken to ensure that the correct dwell times, concentrations and temperatures are used. Cleaning solutions must also be changed when contaminated to avoid incomplete cleaning.

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

APPLYING CILBOND 24

AGITATION

Cilbond 24 consists of a specially formulated polymeric base with other chemicals dissolved or dispersed in an organic solvent system. The dispersed portions of the mix can settle out and so it is vital that affective re-dispersion is always carried out before using the system - preferably with a high-speed propeller type agitator.
Note – When stirring Cilbond 24, avoid damaging the protective lacquer inside the drum. Exposed steel may cause gelation of the Cilbond 24 on long term ageing of stirred drums put back into storage for >>2 months and especially if storage temperatures are >30ºC.

BRUSHING

Application by brushing is normally undertaken without further dilution, but for coating large areas, dilute with up to 20% Toluene, Xylene or Toluene/MEK blends. Care should be taken to obtain as uniform a flow pattern as possible, and minimise streaking which will give poor bond strength

DIPPING

Use without dilution for small and simple shaped items. For more complex or large shapes dilution may be necessary and diluents include Toluene, Xylene, MEK or Toluene/MEK blends. In most cases a fast drying solvent such as MEK is preferred.

Viscosity Guide @ 26ºC :-	DIN 4 Cup	: 18 - 24 sec
	Ford 4 or Frikmar Cup	: 18 - 24 sec
	Zahn Cup No 2	: 24 - 28 sec

For continuous dipping it is recommended that constant stirring is undertaken, especially if the product has been diluted.

SPRAYING

Spraying is an efficient and effective method of applying **Cilbond 24**. For detailed recommendations on dilution, viscosities and spray-gun settings, see separate section below.

DILUTION

Irrespective of the diluent used, it is vital that **Cilbond 24** is stirred whilst solvent is added. Localised incompatibility can result if this is not done, or if the amount of Xylene or Toluene used is excessive. In both cases this can cause precipitation of the polymer and gelation of the bonding agent.

DRYING

After coating, **Cilbond 24** must be completely dried. Incomplete drying results in residual solvent, which can cause porosity in the elastomer during the bonding process.
At room temperature, drying time is typically 30 - 45 minutes.
Forced drying may be used reduce drying times - 5 minutes at 60°C would be typical, although with experience, temperatures up to 90°C may be used if necessary.
Pre-heating **Cilbond 24** using trace-heated spray lines will also reduce drying times, but the trace heating should not exceed 70°C. Ensure lines are cooled and solvent-flushed after use.
Pre-heating parts to <60ºC prior to coating will also speed up drying.

APPLYING CILBOND 24 (Continued)

FILM THICKNESS

Irrespective of the method of application for the bonding agent, it is vital to lay down as uniform a film as possible to obtain optimum and uniform bond strength results.

When used as a One-Component Bonding System we recommend the following :

General Purpose Bonding	: 15 – 20 microns (dry coating thickness)
Superior Environmental Resistance	: 20 – 35 microns (dry coating thickness)

Film thickness on dipped components may be controlled by pre-warming the metal components being bonded or by the rate of withdrawal of the components from the bonding agent. Fast evaporating solvents will yield thicker films and conversely, slower solvents will yield thinner films.

In many cases, as for most so called one-coat systems, it may be and generally is double applied.

STORAGE

It is recommended that components are bonded within 7 days of application of the bonding agent. However under validated, controlled conditions (designed to avoid contamination of parts), they may be stored for much longer periods, such as up to 2 months.

SPRAYING CILBOND 24

Spraying is an efficient and effective method of applying **Cilbond 24**. For continuous spraying it is recommended that constant stirring is undertaken, especially if the product has been diluted. Uniformity of spray pattern is vital in obtaining a uniform film thickness and a good spray pattern is characterised by a smooth, wet, glossy finish (prior to drying) on the metal component. CIL recommend HVLP spray systems.

CONVENTIONAL AIR SPRAYING

Recommended diluents used with **Cilbond 24** for spraying are Toluene, Xylene or Toluene/MIBK blends or Toluene/MEK blends.

Typical Ratios (by weight) :
100 parts **Cilbond 24** to 20-40 parts (maximum) of Xylene or Toluene
or 100 parts **Cilbond 24** to 20-40 parts (maximum) of Toluene / MIBK (mixed 50:50)
(if additional dilution is still required, use MIBK or MEK).

Spray Viscosity	16-24 seconds at 26°C, Zahn Cup No 2
or	8-13 seconds at 26°C, Zahn Cup No 3
or	13-20 seconds at 26°C, DIN 4, Ford 4 Cup or Frikmar Cup
Nozzle Size	1.0 – 1.5 mm
Flow Rate	330 - 350 ml/minute
Air Pressure	1.5 – 2.0 bar *Excessive air pressure can lead to cob-webbing.*
Fluid Pressure	0.5 - 1.5 bar

AIRLESS SPRAYING

Cilbond 24 sprays satisfactorily in most airless systems with no dilution. For improved atomisation up to 25% (by volume) dilution with Toluene or Xylene may be used.
In-line heaters up to 70°C will also improve the atomisation by reducing the viscosity. Ensure lines are cooled and solvent-flushed after use.

Viscosity	20-26 seconds at 26°C, No 2 Zahn Cup
or	10-16 seconds at 26°C, No 3 Zahn Cup
or	15-25 seconds at 26°C, DIN 4, Ford 4 Cup or Frikmar Cup
Nozzle Size	0.25 - 0.50 mm
Pressure	60 - 140 bar

Orifice size and pump pressures will vary according to the spray angle, pattern size and production rate required.

ELECTROSTATIC SPRAYING

Cilbond 24 can be sprayed electrostatically using equipment designed to spray conductive solvent based paints. The same viscosity as for Conventional Air Spraying may be used with a conductivity value between 90 - 100 micro amperes.

MOULDING INFORMATION

Cilbond 24 may be used with all moulding methods including compression, transfer, injection and extrusion moulding. The temperatures required to produce good bonding may vary from 120°C to 230°C.

Two of the benefits of **Cilbond 24** are its ability to bond with very low reject rates and exhibit almost zero mould fouling/staining.

Metal components to be bonded, that have been coated with **Cilbond 24** will withstand considerable pre-baking during mould loading without adversely affecting the bond quality. Pre-bakes up to 10 minutes at 160°C will not normally cause problems and depending on the compound being bonded, pre-bakes of up to or over 30 minutes at 160°C can be used.

Cilbond 24 is extremely efficient at post vulcanisation bonding (PV Bonding) of many elastomers. Its primary use is in PV bonding of NR & SBR but it can PV bond NBR, HNBR, XNBR, Vamac® and other elastomers and **Cilbond 24** should be used where PV Bonding is the only feasible method of producing a component.

ENVIRONMENTAL RESISTANCE

The chemical structure of the polymer systems used in **Cilbond 24** gives it the temperature resistance and chemical resistance to out-perform competitive systems.

Typical automobile components, where NR has been bonded to mild steel with **Cilbond 24**, have been boiled in water under a tension of 2kg/25 mm bond line width for up to 100 hours and yielded better residual bonds than competitive two coat systems; the **Cilbond 24** showing no loss of adhesion and no creep.

Cilbond 24 shows no failure when subjected to a very severe boiling water test conducted under a 12 kg/25mm peel width for 24 hrs.

Cilbond 24 passes the 504 hour Volvo hot water test at 70°C.

Cilbond 24 shows no failure when subjected total immersion in a 50/50 wt/wt mix of water/glycol at 120°C for 360 hrs

In salt spray tests, competitive one and two coat systems are outperformed by **Cilbond 24** coated at a total thickness of 25 microns or above. Examples of actual components in an unstressed condition exceeding a 1000 hour salt spray test and even under static stress there are cases of components exceeding 400 hours, without any sign of edge corrosion.

Cilbond 24 bonded components will survive hot ethylene and propylene glycols to 160°C or above over extended periods (> 1000 hours) without any sign of cement to metal failure. For the very best glycol resistance **Cilbond 24** should be used alone, any cover coat will reduce the glycol resistance.

Cilbond 24 bonded components will survive full immersion in synthetic ester turbo oil at 130°C for 1000 hours with no loss of adhesion.

Cured **Cilbond 24** exhibits exceptional heat resistance to 200°C without reversion, embrittlement or loss of metal adhesion.

Cilbond 24 is recommended for Vamac® G where service temperatures could reach 200°C.

Cured **Cilbond 24** is flame retardant and does not contribute to a fire.

Cured **Cilbond 24** exhibits good resistance to acids and alkalis and out-performs competitive one and two coat systems, when used at the correct coating thickness, usually 25 microns or above. For maximum protection against such media, the components benefit from a post cure.

BONDING PROBLEMS SOLVED WITH CILBOND 24

By virtue of its novelty as a one-coat bonding system, **Cilbond 24** is considered for many bonding applications. Below is a brief summary of some of the more interesting problems solved to date.

- Bonding to stainless steel and Nickel - excellent results.
  NOTE: On smooth non-blasted stainless steel, a minimum drying time of 2 hours at 25°C is needed, or force drying for 2 - 5 minutes at 85 - 95°C is required.
- Bonding metal treated with yellow chromated zinc, **Cilbond 24** gave excellent bond results.
- **Cilbond 24** has proved especially satisfactory when used as a post vulcanisation system for components exposed to salt water environments.
- Epichlorohydrin rubber and Vamac® bonded to mild steel with **Cilbond 24** gave excellent heat resistance.
- **Cilbond 24** has been shown to give the best compromise of bonding and glycol resistance for NR based hydromounts.
- For post-vulcanisation (PV) bonding **Cilbond 24** can bond all elastomers listed in the introduction, plus HNBR and even FKM, but each compound must be tested individually for suitability.

HEALTH AND SAFETY

Prolonged exposure to the vapours from **Cilbond 24** can be harmful, so the system should only be used in a well ventilated area. The solvents used in **Cilbond 24** are volatile and flammable, hence normal fire safety measures MUST be observed. For further information see Health & Safety data sheet.

PACKAGING

Cilbond 24 is supplied in 10L, 25L and 200L containers. 250ml trial samples are also available upon request.

FURTHER INFORMATION

For more information on **Cilbond 24** or for details of our other products please visit www.cilbond.com or e-mail sales@cilbond.com

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