



# CORROLON C-2000™



Product Code # SOL-TG075

## Pioneered For Extreme Abrasive Environments:

### Combining Non-Stick Performance With Chemical Protection For Extreme Wear Conditions

- ▶ Reduces severe wear and friction on metal substrates
- ▶ Thin coat application prevents undersize designs
- ▶ Continuous Operating Temperature 550°F (260°C)
- ▶ Application of tungsten carbide directly to part substrate for maximum adhesion & bond strength
- ▶ Superior erosion and corrosion protection
- ▶ Non-stick characteristics reduce galling & seizing
- ▶ Allows engineers a variety of metal substrates
- ▶ Combines the advantages of a thin, non-stick fluoropolymer with the strength of tungsten carbide

**CORROLON C-2000™** is a revolutionary multi-step coating process that combines all of the superior non-stick properties of a fluoropolymer application with a hard underlay of **MATRIX™** tungsten thermal alloy spray. By designing a coating system that offers an extremely durable and chemically-resistant solution, **CORROLON C-2000™** protects metal substrates against extreme wear (sand & silica), corrosion and abrasive conditions.

Pioneered for extreme abrasion environments, the **CORROLON C-2000™** coating system enhances pump run-life by means of exceptional release against asphaltine scale buildup and H<sub>2</sub>S service. In addition, the tungsten carbide matrix bonds equally well with ferrous and non-ferrous materials, thereby enabling most industrial applications the flexibility to work in materials suited to their specific requirements.

### Engineering Data & High Performance Characteristics:

#### Temperature Specifications

Designed for aggressive downwell service, **CORROLON C-2000™** operates very efficiently in high temperature environments. The thermosetting resins in this innovative coating enable it to perform in both a cryogenic and high temperature setting. Coated parts exhibit strength and non-stick properties, remaining highly flexible in demanding industrial use.

Continuous Operating Temp    500°F (260°C)  
Intermittent Temperature        555°F (290°C)



As a result of its extreme hardness and chemical protection, **CORROLON C-2000™** represents the most advanced technology in coating systems for aggressive downwell environments.

Solutions for Extreme Wear & Chemical Applications



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## Custom Global Coatings



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## Corrosion Resistance

Employing advanced fluoropolymer technology **CORROLON C-2000™** resists organic and inorganic compound attacks by means of a barrier (that can be applied in multiple coats) which impregnates the metal substrate.

In environments where corrosion protection is important, process equipment and function-to-success parts are enhanced by reducing oxidization, fretting (vibration), galvanic corrosion, and increasing chemical resistance.



CORROLON C-2000™ (prior to fluoropolymer top coat) applied evenly to pancake pump stages in Centrilift - California (Huntington Beach) for use in extreme sand wells.

## Thickness

**CORROLON C-2000™** provides an even application that enables protective enhancement without affecting critical engineering tolerances in designs. This coating system is uniform in thickness and ranges from 0.0015" to 0.004" (+-0.0005").

In addition, high build requirements of up to 0.02" (+-0.001") can be achieved with this versatile coating for re-works and tolerance build-ups. *This coating is post-process machinable.*

## Hardness

As a result of its combination application, **CORROLON C-2000™** has a dual-hardness rating for the top and bottom layer of coating:

*Base Coat* - tungsten carbide-derivative thermal alloy spray has a superior hardness rating (ASTM 785) of Rockwell Rc 68 (+-4.0)

### BASE HARDNESS PROPERTIES:

|   |                |
|---|----------------|
| <b>Hardness</b>                                   | 68 Rc          |
| <b>Adhesive Strength</b>                          | > 13,000 psi.  |
| <b>Abrasion Resistance</b><br>Taber (ASTM D 1044) | Excellent      |
| <b>Oxides</b>                                     | Less Than 0.5% |
| <b>Porosity</b>                                   | Less Than 0.5% |

*Top Coat* - fluoropolymer Corrolon™ has a hardness rating (ASTM D 785) of Rockwell 60 (+-2.0) and Pencil Hardness 3-4 H

## Wear Resistance

As a solution for reducing extreme wear to parts, **CORROLON C-2000™** prevents asperites (metal surface peaks) from making physical contact. The fluoropolymer coating acts as a cushion by spreading high point loads in bearings and reducing element fatigue. Another advantage of this coating is its ability to reduce "boundary lubrication failure", caused when equipment is frequently started and stopped; thereby allowing oil films to become too thin to function as a lubricant.



## High Performance Applications

- ▶ Downwell Packer Systems
- ▶ E.S.P. Staging
- ▶ "Frac" Hardened Parts
- ▶ Pipe & Tubing
- ▶ Latch Couplings
- ▶ Military Applications
- ▶ Mining & Water Pumps
- ▶ Pump Wash Zones
- ▶ Tanks & Valves
- ▶ Gears & Springs
- ▶ Completion Systems and Fishing Tools
- ▶ Part Re-tolerance and Reclamation
- ▶ Industrial Housings
- ▶ Offshore Platforms
- ▶ Fail-Safe Devices



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## Scale & Asphaltine Resistance

Nuclei site formation is a common problem in both oil and industrial applications. **CORROLON C-2000™** provides a barrier between the hostile molecules and the protected substrate. An unprotected substrate is prone to scale and corrosion attack.

## FDA /CFIA Compliance

Utilized in Foodservice processing equipment and cookware applications, **CORROLON C-2000™** complies with FDA (US)\* and CFIA (Canada) regulations.



## Chemical Corrosion Guideline Table:

| Chemical                       | Concentration %    | Hours | Effect on Coating Function |
|--------------------------------|--------------------|-------|----------------------------|
| <b>Water</b>                   |                    |       |                            |
| Deionized—Boiling              | 100                | 1000  | none                       |
| Salt (immersed)                | 30                 | 4000  | none                       |
| Salt (Spray)                   | 5                  | 1000  | none                       |
| Tap—250°F (120°C) @ 10,000 psi | 100                | 24    | none                       |
| <b>Acids</b>                   |                    |       |                            |
| Hydrochloric                   | 36                 | 24    | none                       |
| Hydrochloric                   | 15                 | 150   | slight                     |
| Hydrochloric                   | 2 pH               | 300   | none                       |
| Hydrochloric 125°F (50°C)      | 2 pH               | 300   | none                       |
| Sulfuric                       | 25                 | 1500  | none                       |
| Nitric                         | 35                 | 24    | none                       |
| Picric                         | saturated solution | 120   | none                       |
| <b>Base</b>                    |                    |       |                            |
| Caustic                        | 2                  | 24    | none                       |
| Caustic                        | 100                | 336   | slight                     |
| Caustic                        | 12.5 pH            | 150   | slight                     |
| Caustic                        | 9.5 pH             | 300   | none                       |
| Caustic 125°F (50°C)           | 9.5 pH             | 300   | slight                     |

| Chemical  | Concentration %   | Hours | Effect on Coating Function |
|---|---|-------|----------------------------|
| <b>Solvents</b>                                     |   |       |                            |
| Acetone   | 100   | 1500  | none                       |
| Benzene   | 100   | 1500  | none                       |
| DMAC  | 100   | 1500  | none                       |
| Ethanol   | 100   | 1500  | none                       |
| Fluorocarbons (12, 22, 113)                         | 100   | 1000  | none                       |
| MEK   | 100   | 120   | none                       |
| Methanol  | 100   | 1500  | none                       |
| Methylene Chloride                                  | 100   | 1500  | none                       |
| Perchlorethylene                                    | 100   | 1500  | none                       |
| Phenol  | 5   | 120   | none                       |
| Toluene   | 100   | 120   | none                       |
| Xylene  | 100   | 1500  | none                       |
| <b>Other Fluids</b>                                 |   |       |                            |
| Skydrol (hydraulic fluid)                           | 100   | 1500  | none                       |
| JP-4 (jet fluid)                                    | 100   | 1500  | none                       |
| Break Fluid (auto)                                  | 100   | 1500  | none                       |
| H <sub>2</sub> O + gas at 250°F (120°C), @ 2000 psi | 79% CH <sub>4</sub> , 6% CO <sub>2</sub> , 15% H <sub>2</sub> S | 24    | none                       |

\* All data reflected above was conducted in room temperature and assumes pinhole-free coating film.

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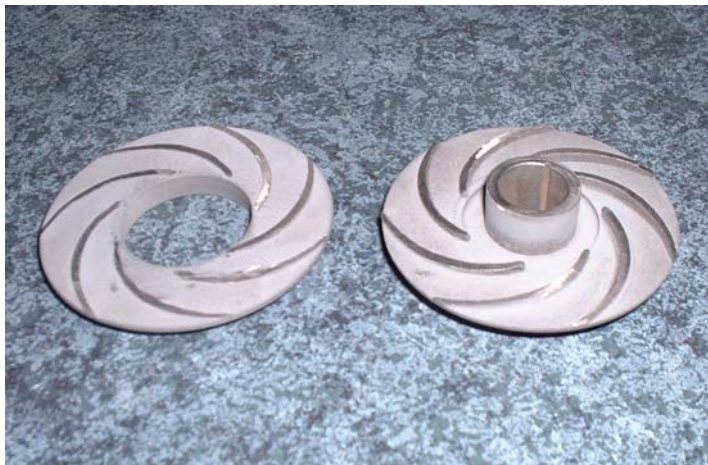
|                        |                         |  |
|------------------------|-------------------------|--|
| <b>CORROLON C-2000</b> |                         |  |
| DEVELOPMENT ENGINEER:  | M. MILLER               |  |
| TECHNICAL MANGER:      | R. HUIZINGA             |  |
| APPROVAL BY:           | M. FEARON               |  |
| REVISION 1.4.1         | ISO DATA SHEET #710-B-1 |  |

## Factors Affecting Chemical Resistance

Chemical resistance and attack are very complex matters. The known factors which affect the chemical stability of **CORROLON C-2000™** fluoropolymer and **MATRIX I™** tungsten carbide-derivative for chemical application, not listed in order of priority, are as follows:

- ▶ Environment temperature and temperature variations.
- ▶ Specific chemical or mixture composition.
- ▶ Exotherm or heat of reaction or mixing.
- ▶ Pressure due to the effects of pressure on concentration of reactive gas.
- ▶ Concentration of the chemical which may be a complex different than the individual components.
- ▶ Velocity.
- ▶ Suspended solids.
- ▶ Thickness.
- ▶ EMF potential of the supporting metal compared to the ground potential.
- ▶ Time of exposure.
- ▶ Stress levels.

Other factors affecting chemical resistance probably exist but the aforementioned list is all of the known factors at this time.



Utilizing a unique application process, CORROLON C-2000™ is applied to pancake stages for thin and even coverage. This cross-section of an FC pancake impeller demonstrates how MATRIX I™ tungsten carbide provides a complete coating at 0.007" in order to reduce pre-machining requirements.



CORROLON C-2000™ is applied to oilfield packer pieces for Baker Oil Tools in order to "Frac" Harden parts for aggressive environments with severe abrasion and hostile temperatures.



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