INDUSTRY CHALLENGES
Despite renewable energy growth, consumer needs continue to drive oil and gas consumption. To meet these demands, oil and gas companies have implemented technologies such as EOR (enhanced oil recovery) and hydraulic fracturing to obtain oil and gas from fields once thought to be exhausted or too costly to access. These efforts have been very successful, but are now exposing pipelines and isolating gaskets to higher concentrations of H₂S, steam, CO₂ and CO as well as higher pressures and temperatures.

CHANGING TIMES
As oil and gas are extracted from deeper wells and with higher pressures, temperatures, steam, H₂S, CO₂ and CO, glass reinforced epoxy (GRE) isolation gaskets are being attacked. G-10 and G-11 are greatly affected by H₂S as the concentration increases. CO₂ and CO permeate through the matrix of the GRE.

CHALLENGES
SOUR GAS
Sour gas makes up more than 40% of the world’s gas reserves according to the IEA (International Energy Agency).

STEAM
Steam enhanced oil recovery (EOR) projects accounted for 417,675 barrels of oil per day (BOPD), or 56% of the total for all tertiary enhanced recovery methods.

TEMPERATURE & PRESSURE
HP/HT wells and UHP/UHT (High Pressure and High Temperature and Ultra High Pressure and Ultra High Temperature) are on the rise. This reduces the number of isolating products that can be used to isolate and seal the flanged connection.

TOTAL COST OF INSTALLATION
Doing more with less - 440,000 jobs have been cut globally throughout the oil and gas production industry. With fewer resources, getting it right the first time has never been more important. Installation errors account for 81% of gasket failures.

EMISSIONS
The Clean Air Act provides some of the most widespread regulatory authority that affects the industry. In recent years, revisions to the Ozone National Ambient Air Quality Standard, EPA methane regulations, and BLM venting/flaring regulations, have openly targeted oil and gas production.
Like most things, electrical isolation has evolved since 1909 when the first synthetic electrical isolator was developed. Various types of gasket designs, materials, and configurations have been brought forth that typically eliminated issues that prior products couldn’t solve. The late eighties saw the greatest leap in isolating kit development with the introduction of the VCS gasket that provided higher pressure capabilities and strength over earlier LINEBACKER® phenolic and GRE isolating products. Since then, variations of the VCS have been developed to overcome limitations that were inherent within the VCS design.

The VCFS was introduced to give all of the benefits of a VCS gasket, but to add fire safe operation to the isolation. The VCS-ID gave a PTFE barrier of protection to the traditional VCS design so that the GRE (glass reinforced epoxy) would be protected from the increasing number of chemicals and steam in oil and gas pipelines. High temperature isolation gaskets were developed for oil and gas pipelines where G-11 was not rated thermally. All products worked well, but forced users to potentially utilize a number of different products to successfully isolate their system.
EVOLUTION™, the best available technology for pipeline isolation, incorporates all of these benefits into one complete and robust package. EVOLUTION™ is a patent pending product that is the first of its kind to be a fully encapsulated isolating gasket. The thinner, ⅛” (3mm) design minimizes the difficulties often encountered while attempting to install thicker isolating gaskets. The total encapsulation allows the gasket to be hydro-tested and kept in the pipeline with virtually no loss in isolation properties. The coating is a GPT proprietary material that is extremely abrasion and impact resistant. The coating is also chemically resistant to attack by H₂S, steam, CO, CO₂ and other chemicals often found in oil and gas pipelines.

EVOLUTION™ has passed API 6FB fire testing in multiple sizes and pressures and has a considerable increase in operating temperature over GRE products. It also has a number of other advantages over traditional GRE laminated products. Since EVOLUTION™ has no laminations, it’s able to withstand high pressures with no ill effects unlike GRE gaskets which are prone to delamination. Furthermore, EVOLUTION™ does not have the permeation issues that plague GRE gaskets.

**FEATURES AND BENEFITS**

**ID Seal**

» **Chemical resistance** - remarkable resistance to typical oil and gas chemicals, in particular H₂S, CO & CO₂

» **Isolates after hydro-testing** - eliminates the need to replace the gaskets following hydro-testing. EVOLUTION™ will isolate after hydro-testing

**Fully Encapsulated (⅛” (3mm) Retainer)**

» **No permeation** - the unique design results in no permeation, a problem that plagues conventional glass reinforced epoxy (GRE) isolations gaskets

» **Easy installation** - thinner design (⅛” (3mm)), minimizing the difficulties often encountered when attempting to install thicker isolating gaskets

**Proprietary Coating**

» **High dielectric strength**

» **Eliminates exotic cores** - fully encapsulated coating prevents the need for expensive exotic cores

» **High temperature** - rated to 500°F/260°C*

**Inconel C-ring**

» **Fire safe** - provides the added security of knowing that the gasket has passed the API 6FB, 3rd Edition Fire Test

» **High pressure** - highest pressure rating of any isolating gasket

*NOTE: Temperature rating is for gasket only or when used with Mica sleeves/washers.
As with many GPT high pressure isolation gaskets, EVOLUTION™

- Has pressure energized seals
- Has a patent pending ID seal
- Has a built in fire safe metal seal

- Is built to match pipe bore
- Is unaffected by moisture or humidity
- Has zero creep relaxation

**COATED C-RING TECHNOLOGY**
The high level of recovery for a metallic c-ring is designed to give EVOLUTION™ the ability to withstand extreme temperature swings in the flange. C-rings are proven to offer greater sealing capabilities than any other seal offered in an isolation gasket to date.

**FIRE SAFETY**
With the focus on improving and increasing joint integrity the importance of fire safety has become a standard requirement across elements of the oil and gas industry. EVOLUTION™ will provide a fire safe seal that is tested comprehensively to API6FB as a standard in all our isolation kits.

**ZERO PERMEATION**
The standard GRE operates using a leak to seal technology and has provided a high level of isolation and sealing. However, as operators drill deeper and enhanced recovery techniques become the norm, more aggressive medias in pipelines will result in GRE becoming increasingly vulnerable to attack and faster rates of degradation over time. We have encountered examples of attack on joints from higher H₂S and CO₂ applications, which drove the imperative of meeting the needs of the future with EVOLUTION™. This product has been tested exhaustively in sour media tests that have resulted in no permeability and no degradation which will meet the industry needs.

**EMISSIONS**
The EVOLUTION™ gasket has the lowest emission values for any pipeline seal available in the market today. With the demands being placed on the oil and gas industry to improve leakage rates, the increased levels of tightness achieved will exceed those demands and give greater joint integrity.

**THINNER SEAL**
To date, most isolation products above Class 600 pressures are a minimum of .250”/6mm thick. This causes issues for installation where pipeline systems are designed for .125”/3mm make up distances or have misaligned flanges with little gap. Regularly, thicker gaskets can be damaged by the gasket being forced into the thinner gap. We designed EVOLUTION™ to be a .125”/3mm gasket to meet your requirements and be installed into pipeline systems with greater ease.

**EXOTIC METAL USAGE**
The presence of aggressive medias often require exotic materials of construction for pipelines and associated equipment. Existing metal cored isolation kits are therefore requested with exotic metallurgy cores which has a negative impact on the purchasing and shipping cost. EVOLUTION™ is fully coated and does not require an exotic core because there is no exposed metal. Therefore, the medias will never come into contact with any metal, making EVOLUTION™ a lower cost, fire safe alternative to exotic cored isolation kits.
**EVOLUTION™ GLASS REINFORCED HANDLE**

The high strength glass reinforced handle is made of an abrasion, impact and UV resistant thermoplastic. It is laser etched to indicate the size, pressure class, gasket description, and identification number of each individual gasket to ensure product traceability. The handle will also be used to test each EVOLUTION™ gasket during manufacturing, providing full isolation confidence.

**PROPRIETARY COATING**

The proprietary coating has been formulated by GPT specifically for use in tough pipeline installations and is unique to the pipeline industry. Successful abrasion, scratch, and impact testing has confirmed that this product can handle the rigors of a typical installation. Chemical exposure testing of the coating in H₂S, steam, and CO₂ prove that this material is a significant technological leap versus traditional GRE type isolation gaskets.

**COMMON EVOLUTION™ MATERIAL PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>ASTM</th>
<th>Test Method</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>D149</td>
<td>Dielectric Strength Volts/Mil (Short Time)</td>
<td>1,100</td>
</tr>
<tr>
<td>D229/D570</td>
<td>Water Absorption (%)</td>
<td>0.03%</td>
</tr>
<tr>
<td>ASTM D4060</td>
<td>Taber Abrasion</td>
<td>&gt;1 Gophms @ 1000 VDC</td>
</tr>
<tr>
<td>Abbrasive Wheel: CS-17 Load: 1000 g Number of Cycles: 5000 Platform Rotation: 72 RPM</td>
<td>Mass Loss [mg]</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Taber Wear Index</td>
<td>11.3</td>
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<tr>
<td></td>
<td>Tensile Strength gasket (psi)</td>
<td>70,000</td>
</tr>
<tr>
<td></td>
<td>Tensile Strength Dielectric Material (psi)</td>
<td>24,000</td>
</tr>
<tr>
<td></td>
<td><strong>Temperature Range °F/°C</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Minimum</em></td>
<td>-60°F/-51°C</td>
</tr>
<tr>
<td></td>
<td><em>Maximum</em></td>
<td>500°F/260°C</td>
</tr>
<tr>
<td>B117</td>
<td>Salt Spray Resistance @5% salt solution with no red rust (hrs)</td>
<td>2,000</td>
</tr>
</tbody>
</table>

*NOTE: With mica sleeves/washers only. Standard kit is with G-11 sleeves and washers with a temperature rating of 392°F/200°C. For temperatures up to 770°F/410°C, please use our VCXT isolation gasket.*
EVOLUTION™ | The Future of Isolation

**EVOLUTION™ TEST RESULTS**

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression Test - EN 13555 @ 260°C</td>
<td>180 MPa (Ed)</td>
</tr>
<tr>
<td>Creep Relaxation Factor $P_{00}(T_0)$ - EN 13555 @ 260°C</td>
<td>1.00</td>
</tr>
<tr>
<td>Hot Blowout Test - HBOT @ 260°C @ 62.3 bar</td>
<td>No Blowout</td>
</tr>
<tr>
<td>Shell Leakage Test - MESC SPE 86/300-3.3.2 @ ambient @ 81.9 MPa (gasket stress) @ 51 bar (test pressure)</td>
<td>6.48x10^-12 PA-m^3/s/mm Tightness Class A</td>
</tr>
<tr>
<td>Shell Leakage Test - MESC SPE 86/300-3.3.2 @ 260°C @ 81.9 MPa (gasket stress) @ 42 bar (test pressure)</td>
<td>3.08x10^-8 PA-m^3/s/mm Tightness Class B</td>
</tr>
<tr>
<td>Shell Cycle Test - MESC SPE 86/300-3.3.2 @ 260°C @ 81.9 MPa (gasket stress) @ &lt;0.1 bar (pressure drop)</td>
<td>&lt;0.1 bar (pressure drop)</td>
</tr>
</tbody>
</table>

**EVOLUTION™ ISOLATION KITS & KITTING**

**SLEEVES** - each kit contains one G-11 sleeve per bolt. The sleeve length is the combined thickness of the flange, plus raised face or RTJ height, plus gasket, plus three washers. The wall thickness is a nominal 1/32” (.08mm) thick.

G-11 is a higher temperature sleeve material meeting or exceeding NEMA G-11 requirements. The product is a high strength sleeve capable of withstanding moderate side-loading while resisting fractures during installation.

**WASHERS** - each kit includes four DIAMOND-HYDE™ coated HCS Washers per stud which are more abrasion resistant and stronger dielectrically than the older generation isolation washers. Rated from -50°F/-46°C to +425°F/218°C, DIAMOND-HYDE™ provides long life and superior electrical performance. DIAMOND-HYDE™ coated HCS Washers provide a chemically resistant barrier. The isolating washer can be the weakest link in a flange isolating kit. By using DIAMOND-HYDE™ coated HCS Washers, the washer is extremely impervious to cracking, chipping, or scratching. The product has successfully passed API 6FB fire testing. The washer ID has a custom diameter to accommodate the sleeve wall thickness.

NOTE: All values are for G-11 sleeves

| Temperature rating: | 392°F/200°C |
| Water absorption:   | 2%          |
| Flex strength:      | 80,000 psi  |
| Tensile strength:   | 43,000 psi  |
| Compressive strength: | (.5”) - 63,000 psi |
| Breakdown voltage:  | (.062”) - 60,000 volts |

**NOTE:** For higher temperature applications up to 600°F/260°C, please order MICA sleeves and MICA washers.

To specify EVOLUTION™ please find specification at www.gptindustries.com
**OUR COMMITMENT TO YOU**

Garlock Pipeline Technologies is dedicated to innovating and introducing the best products for sealing, connecting and protecting the world’s pipelines. Our desire to be the supplier of choice for the pipeline industry is exhibited through our commitment to employing a technically proficient sales force, our large staff of R&D, process and application engineers, and our solid network of distributors.

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**MADE IN USA**

The EVOLUTION™ gasket, sleeves and washers are manufactured and assembled in the USA at our Denver, Colorado plant.

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**ENVIRONMENTAL**

- Salt fog spray
- Steam immersion*
- Sweet & sour gas
- UV*
- API 6FB Fire
- API PR2*
- Bend*
- Blowout - (Hydro)
- API 6FB Fire
- API PR2*
- Bend*
- Blowout - (Hydro)
- Chevron fugitive emissions
- Coating compression*
- Explosive decompression*
- Sealability
- Sour gas aging*
- VDI 2200*
- VDI 2440 - (TA Luft)*
- HOTT
- HOBT
- 10 EN 13565
- ASTM F37-06
- ASTM F 607
- Electrical Isolation*
- ISO 15848-1
- DIN EN 13565
- HOTT
- Abrasion
- Adhesion
- Cross-cut adhesion
- Scratch
- Taber abrasion
- ASTM D149
- Electrical VAC breakdown
- Electrical VDC resistance
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