Isolation
Gaskets 101
Discussion Outline

- Isolation Gasket Basics
- Gasket Terms & Definitions
- Standards & Codes
- Materials & Applications
- Product Offering
ISOLATION GASKET

Basics

- Isolating Material
- Sealing Element
- Nut
- Isolating Sleeve
- Isolating Washer
- Steel Washer
- Stainless Steel Gasket Core
- Isolating Washer
- Steel Washer
- Bolt/Stud

Components of an isolation gasket system.
GASKET = SEAL (No leak)

ISOLATION = NO ELECTRICAL CURRENT
ISOLATION GASKET

- Isolating Material
- Sealing Element
- Bolt/Stud
- Steel Washer
- Isolating Washer
- Stainless Steel Gasket Core
- Isolating Sleeve
- Isolating Washer
- Steel Washer
- Nut

Isolation Gasket Basics
Type “E” Gaskets
Full Face

Type “F” Gaskets
Ring Type
Flange Vs Flange Face

FLANGES
- Weld Neck
- Slip-on
- Threaded
- Blind

FLANGE FACE
- Raised Face
- Flat Face
- Ring Type Joint (RTJ)
Types of Isolation Gaskets

- Phenolic RTJ
- Compressed Sheet
- Rubber Faced Phenolic
- Incline Plane Composite
- Spring Energized Steel Core
## Types of Isolation Gaskets

<table>
<thead>
<tr>
<th>GASKET TYPE</th>
<th>Thermal Cycling</th>
<th>Resist Creep</th>
<th>Temperature</th>
<th>High Pressure</th>
<th>Active Sealing</th>
<th>Extreme Service</th>
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<tr>
<td>Phenolic RTJ</td>
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Flanges
CATHODIC PROTECTION SYSTEMS (CP)

• **MUST** have good isolation
  – between sections of pipe to be protected
  – between protected pipe and other structures.
• If no isolation - CP system is much less affective and could be protecting the wrong structures
### Galvanic Corrosion Basics

- **Electrical Potential Difference between metals**
- **Electrolyte must be present and metals must be IN CONTACT**
- **Anode corrodes, Cathode protected**

#### Table 3.3. Galvanic corrosion table.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Zinc</th>
<th>Galvanised Steel</th>
<th>Aluminium</th>
<th>Cadmium</th>
<th>Cast Iron</th>
<th>Lead</th>
<th>Mild Steel</th>
<th>Tin</th>
<th>Lead-Tin Solder</th>
<th>Chromium Plate</th>
<th>Brass</th>
<th>Copper</th>
<th>Nickel</th>
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**Key:**
- **Light Grey** = Galvanic action insignificant
- **Medium Grey** = Galvanic action may occur
- **Dark Red** = Galvanic action will occur

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**Isolation Gasket Basics**
Why Isolation?!?

Dissimilar Metals – Galvanic Corrosion

Stainless steel valve

Carbon steel piping
• Minimum Design *Seating Stress* (y value)
  – Min compression of the gasket to provide seating
  – Determined by gasket geometry and material
  – Used to calculate min seating bolt load

**Incline Plane groove seal: $y \sim 3000$ psi**

**Spring energized seal: $y \sim 7500$ psi**
• Gasket Factor (m factor)
  – A factor that provides the additional load needed in the flange fasteners to maintain the compressive load on a gasket after internal pressure is applied to a joint.
  – Used to calculate min operating bolt load

**ACTIVE seal elements: m = 0**
– No Deformation Required, Pressure Energized Sealing Elements
**ACTIVE seal elements: m = 0**
– No Deformation Required, Pressure Energized Sealing Elements

**Spring Energized Seal**

**Incline Plane Seal**
Gasket Terms: m & y Values

- **m (Gasket Factor)**
  - Used to calculate OPERATING bolt load
  - ACTIVE seal element Gaskets: \( m = 0 \) because no deformation due to pressure energized sealing elements

- **y Value (Seating Stress)**
  - Used to calculate minimum gasket SEATING bolt load
    - Incline Plane Seal Element: \( y \sim 3000 \text{ psi} \)
    - Spring Energized Seal Element: \( y \sim 7500 \text{ psi} \)

- **EXAMPLE:**
  - 3-Flow/Lamons Gasket; \( m = 0, \ y = 3000\text{psi} \)
  - Standard spiral wound; \( m = 3, \ y = 10,000\text{psi} \)
  - Calculations will yield a MUCH higher force needed to maintain a seal with a SWG!!
Gasket Reaction Diameter

G = Gasket

Reaction Diameter

Moment Arm

Ring - Joint Flange

Raised Face Flange

Ring - Joint Flange Fluid Trap Area is Eliminated!
• Flange Standards
  – ANSI/ASME
    • Energy Market
    • American National Standards Institute
    • American Society of Mechanical Engineers
  – AWWA
    • Water Market
    • American Water Works Association
• ANSI/ASME
  – B16.5
    • Flanged connection and piping code
    • ½” – 24” connections
  – B16.47 Series A & Series B
    • 26” and larger connections
    • .47 Series A is **OLD** MSS-SP 44
    • .47 Series B is **OLD** API 605
• ANSI/ASME
  – Defines “Pressure Classes”
    • 150
    • 300
    • 600
    • 900
    • 2500
  – ANSI 4” Class 600
    • 4 600#
• AWWA C207-07
  – Divided into TABLES and CLASSES
  – Table = Dimensions
  – Class = Pressure Rating

<table>
<thead>
<tr>
<th>TABLE</th>
<th>CLASS</th>
<th>DEFINITION</th>
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<tr>
<td>2</td>
<td>B</td>
<td>Ring Flanges</td>
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<tr>
<td>2</td>
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<td>3</td>
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<td>7</td>
<td>B, D, E, F</td>
<td>Blind Flanges</td>
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</tbody>
</table>
Glass Reinforced Epoxy (GRE)

- Layers of fiberglass bonded with epoxy resins
- Types of GRE:
  - G10
  - G11
- Used for 40+ years in flange isolation industry
• G10 vs. G11
  – Temperature

G10 – Max Temp = 302°F, 150°C

G11 – Max Temp = 392°F, 200°C
Glass Reinforced Epoxy

• Why GRE?
  – Dielectric strength
    • 700-800 Volts/mill
  – Water absorption
    • .1%
  – Compressive strength
    • 50,000psi +
  – Excellent chemical and thermal resistance
Phenolic Materials

- Phenolic
  - Very similar to GRE except Phenolic uses resin to bond layers instead of Epoxy.
  - Does not always mean fiberglass as layers; can also be:
    - Paper (Rubber Faced Phenolic)
    - Cotton
Phenolic Materials

• Phenolic Properties
  – Nearly all properties are less desirable when compared to GRE
    • Dielectric strength
      – 500 Volts/mill
    • Water absorption
      – 1.6%
    • Compressive strength
      – 25,000psi + (depends on base layers i.e. cotton, paper, glass)
    • Good chemical and thermal resistance
GRE vs Phenolic

**Materials & Applications**

**Dielectric Strength**
- More provides better isolation

**Water absorption**
- Less means better isolation over the long term

**Compressive Strength**
- More means less likely to break gasket when bolting

**Flexural Strength**
- More means gasket can withstand more bending load
Glass Reinforced Epoxy

- **GRE Limitations**
  - Use chemical compatibility chart or contact Engineering Department
  - Problem medias include:
    - Steam (>50%)
    - Sulfuric Acid (>75%)
    - Nitric Acid (>50%)
    - Phosphoric Acid (>40%)
    - Sulfur Dioxide (dry)
Sleeves & Washers

Isolation Sleeve

Isolation Washer

Materials & Applications
Sleeves & Washers

**ISOLATION SLEEVES**
- G10 (same as the gasket material)
- Mylar
- Poly
- One Piece Minlon
- Nomex (High Temp)

**ISOLATION WASHERS**
- G10
- Phenolic
- Hardened Coated
- G3 (high Temp)
• When to use what sleeves and washers
  – Temp can be a factor
  – Media is **NOT** a factor because not in contact!
  – See “Lamons Gasket Assumptions” handout for standard kits to offer if unsure
Current Lamons Gasket Products

- FireSafe
- Steel Core
- Incline Plane
- Rubber Faced
- Custom
DEFENDER FS - FireSafe

• Tested and Certified to API 6FP (Third Edition).
• Two integral robust sealing elements for sealing and isolating in an engineered Fire Safe design.
• Serves as a sealing/isolation for Fire Safe Applications.
• Incorporates industry proven Kammpro® sealing technology.
• Critical Service Gasket – MEDIA CAN NOT LEAK!
  – H2S/CO2
  – High Pressure (ANSI 2500, API 5 & 10K)
  – Extremely flammable media
  – Mate mismatch (RTJ and Raised Face) flanges
  – Flange face protection
DEFENDER

• Press-n-Lock “Glue-Less Seal Groove Technology”. An industry first!
• Spring energized seal element
• Proven design based on the industry leader
• Tested to Shell Certification Standards
DEFENDER

• ¼” (0.250” total thickness
• Metal Core 0.120” thick – 316 Stainless Steel
• Laminate 0.065” per side

DEFENDER MATERIAL OPTIONS:

RETAINER

G10S
G11S

SEALS

Teflon
Viton
Nitrile
 IsoGuard – Incline Plane

• 1-Piece (non spliced) Teflon seal up to 24”

• Industry proven “incline-plane” groove design and rectangular seal element.

• Up to ANSI Class 1500# pressures

• Self-energizing seal element allows for low bolt loads.
• 1/8” (0.125” total thickness)

IsoGuard MATERIAL OPTIONS:

RETAINER

G10
G11

SEALS

Teflon
Viton
Nitrile
EPDM
IsoMate – Rubber Faced

• 40+ year old industry spec “rubber laminated” design
• Economical solution for basic gasket performance
• Most common in the water market
No ACTIVE seal element therefore only suitable for low pressure and no larger than 24”
How to Order Guide

Gasket Only (Gray)
Flange Isolation Kit (Gray + Red)
2-CG-150#F-40-G10ST-SD

Nominal Diameter
Varies between gasket type.
CG = ½” - 36”
PG = ½” - 48”
FM = ½” - 24”

ANSI Class
150# = ANSI 150
300# = ANSI 300
600# = ANSI 600
900# = ANSI 900
1500# = ANSI 1500
2500# = ANSI 2500

Bore
STD = STD
Schedule 10 = 10
Schedule 20 = 20
Schedule 40 = 40
Schedule 80 = 80
Schedule XH = Extra Heavy
Schedule 120 = 120
Schedule 160 = 160
Schedule XXH = Double Extra Heavy
Schedule 00 = Customer Specified

Seal Element
COREGUARD™
T = Teflon®
N = Nitrile
V = Viton®
POINTGUARD™
T = Teflon®
N = Nitrile
S = Silicone
V = Viton®
E = EPDM
FLATMATE™
F = Rubber Faced

Single/Double Washer Set
S = Single Washer Set
D = Double Washer Set

Gasket Brand Name
CG = COREGUARD™
PG = POINTGUARD™
FM = FLATMATE™

Gasket Type
E = E Type
F = F Type

Retainer
COREGUARD™
G10S = G10 Isolating Material/SS Core
G11S = G11 Isolating Material/SS Core
POINTGUARD™
G10 = G10 Retainer
G11 = G11 Retainer
PH = Phenolic Retainer
FLATMATE™
PH = Phenolic Retainer

Sleeve/Washer Sets
COREGUARD™ & POINTGUARD™
E = Economy = Mylar Sleeves
Steel ZP Washers
Phenolic Washers
V = Value = Mylar Sleeves
Steel ZP Washers
G10 Washers
S = Standard = G10 Sleeves
Steel ZP Washers
G10 Washers
SX = Standard Heavy Duty = G10 Sleeves
Steel ZP Washers
Steel HC Washers
T = High Temperature = Nomex® Sleeves
ZPS Washers
G3 Washers
XX = Customer Specified
FLATMATE

E = Economy = Mylar Sleeves
Steel ZP Washers
Phenolic Washers