Refinery and FCCU Expansion Joints

REFCOMM
GALVESTON
MAY 2-6 2016
Valtech Fabrication

New Construction

- 106,000 square feet (9800 square meters)
- Crane capacity 300,000 lbs (136 metric tons)
- 60ft (18.3m) under hook
- Refractory shop
- Heat cure / PWHT
- Paint shop
Valtech Engineering
Design and Engineering

- Solid Modeling (Creo 2.0)
- FEA
- Custom Software
Valtech Engineering

Design and Engineering

- EJMA
- ASME B31.1, B31.3, Sec VIII, Div 1 U stamp (R pending)
- PED Module G
- API 5L, 582, 620, 650, 934 A and E, 936
Valtech Engineering

Field Service

- 24/7 Emergencies
- Inspections
- Online Repair
- Offline Repair
Multi Ply Bellows

Advantages
- Low Spring Rate
- High Cycles

Disadvantages
- Lower Squirm Pressure
- More cost
How to Make a Bellows

Resistance Weld

Resistance Weld: GOOD

Edge Weld: BAD

Trim

Full Penetration

Lack of Penetration
How to Design Bellows

- STP and 3M’s
- Size
- Temperature
- Pressure
- Materials
- Medium
- Movements
- Weld ends or flanged
How to Design Bellows

Bellows Materials

- 300 series stainless steels, L and H grades
- Hastelloy C-22, C-276
- Incoloy 800, 800H, 800HT, 825
- Inconel 600, 625
Movements

Axial

Compression  +  Extension
Movements

Lateral (For Single Bellows)
Movements

Angular
Types of Expansion Joints

Single
Types of Expansion Joints

Hinge
Types of Expansion Joints

Gimbal
Types of Expansion Joints

Universal
Types of Expansion Joints

Tied Elbow Universal Crossover
Packed vs. Purged

- Purged requires maintenance
- Packed does not
Internal Liner Styles

- Cold Wall with Refractory
- Hot Wall with Refractory
- Hot Wall without Refractory
- Internal Reactor Riser Termination
Cold Wall with Refractory

- External Insulation
- 650 F (343 C) External
- Carbon Steel Duct
- 4-5” (100-125mm) Castable Refractory
- Braid Seal
- Internal Insulation
- 1450 F (788 C) Internal
Options

- Nav
- Spoiler
- Rims
Options

2 Ply Testable

Gage/Valves

Go/No Go Leak Detector
Options

Pressure Retaining Covers

- Sealing Ring
- Pressure Relief
Options

Thermocouples
Options

Single Pantograph

• Support spool in vertical orientation
• Only allows lateral in-plane

Heavy Center Spool
Options

Gimbal Pantograph

- Support spool in vertical orientation
- Allows lateral in and out of plane
Damage

Bellows Damage

Small Crack
Repair

Clamshell

Leaking Bellows
Repair

Cartridge

Advantages

- No seam weld in field
- Can use 2 ply testable
Repair

Refurb In Shop

6 Day Turnaround