Healing Pipelines since **1969**

Guidelines for Leak Repair & Rehabilitation of Oil & Gas Pipelines

Falguni Sood

4th ICEPIM & OMIC GAS 2018

Falguni Sood: Professional Details

- Masters in Material Science & Engineering: State University of New York Binghamton with focus on Microelectronics Joining Techniques: Alternatives to Lead Solders (2014-2016)
- Research Assistant at Universal Instruments Inc. (NY, USA) and Analog Devices Inc. (MA, USA) (2014-2017): Materials and Process Control for Microelectronics Components
- Metallurgist at Vee Kay Vikram & Co. LLP (India) – (2017-2018)

Common Defects in Pipelines

- Metal Loss
- Cracks
- Indented Defects
- Weld Defects
- Hard Spots
- Buckles/Wrinkles
- Grooves
- Arc Burns
- Blisters
- Hydrogen Induced Cracking
- Scratches
- Notches

➢ These defects may eventually lead to leaks in pipes

Repair of Leaks

- Permanent: >2 years; Non Permanent : <2 years [a]
- Common repair methods:
  - Mechanical Clamps*
  - Leak Repair Bandages / Composite Wraps*
  - Full Encirclement Steel Sleeves*
  - Repair by Weld Deposition
  - Freeze Plugging
  - Hot Tapping

* Presented in following slides

[a] "Temporary/permanent pipe repair – Guidelines"; Prepared by AEA Technology Consulting for the Health and Safety Executive; OFFSHORE TECHNOLOGY REPOR T 2001/038

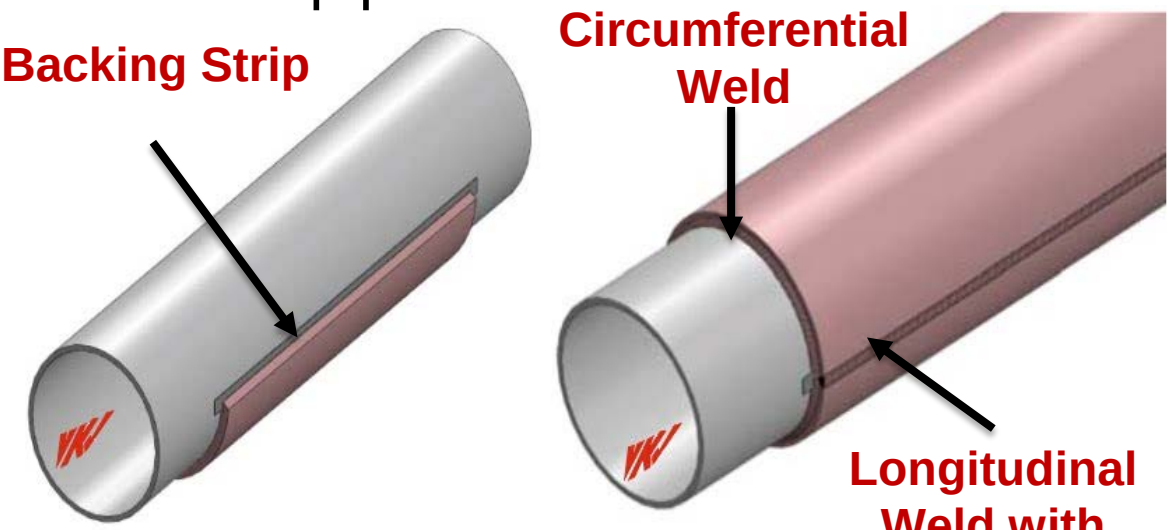
Leak Repair Bandages / Composite Wraps

- A composite material
- Permanent / non-permanent depending on operating parameters
- Generally a fiberglass reinforced bandage used in combination with a sealing material like epoxy
- Maximum pressure used successfully 30 Bar at PDO Oman

Pipeline Repair Bandage

Full Encirclement Steel Sleeves

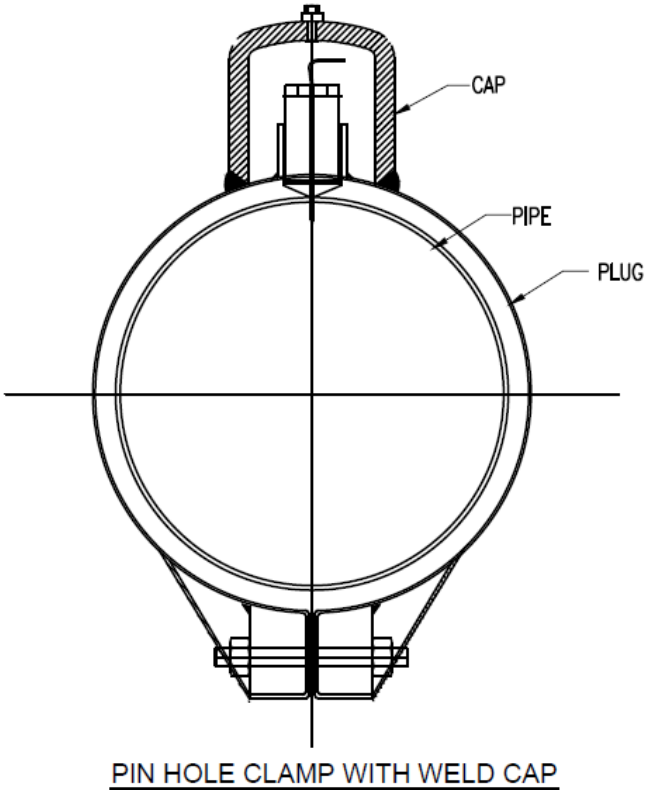
- A sleeve is a hollow cylindrical ring that is used to reinforce a weak section of a pipe.
- Sleeves are welded for installation thus limiting their application in offshore pipelines.



3m long sleeve

Pin – Hole Leak Repair Clamp

- Seals small sized leaks in pipeline; maximum 12mm size
- Conical seal
- Screw mechanism adjusts the conical seal on the leak
- The screw can then be encapsulated in a welded cap.



PIN HOLE CLAMP WITH WELD CAP

Pin – Hole Leak Repair Clamp

Mechanical Bolt-On Clamps

28” 1500 Class Mechanical Bolt-On (Encapsulation) Clamps for Offshore Application

- Permanent Repair of Pipeline
- Sealing Material: Fluoro Elastomer

18” X 5meter Encapsulation Clamp (Offshore Application)

- Important points to consider for longer clamp life (critical in offshore application)
  - Seal Material
  - Seal Grooves to be overlaid with Inconel 625
  - Coating on Clamp FBE
  - Anodes to be installed

Clamp Installed with Tensioners

Flange Clamp 48” ANSI 1600

Sealant injection ports to seal the stud & nut of flange

Development in On-Site Clamp Installation Procedures

CASE STUDY 1

- The studs were being tightened on stiffeners without any lubricant/grease
- Significant effort put in to tighten the studs which was not required
- Studs would damage the facing metal
- This damage can cause loss of integrity of the clamp and additional stress

Development in On-Site Clamp Installation Procedures

- A lubricant with a known coefficient of friction was used.
- Resulting torque reduced
- Damage avoided

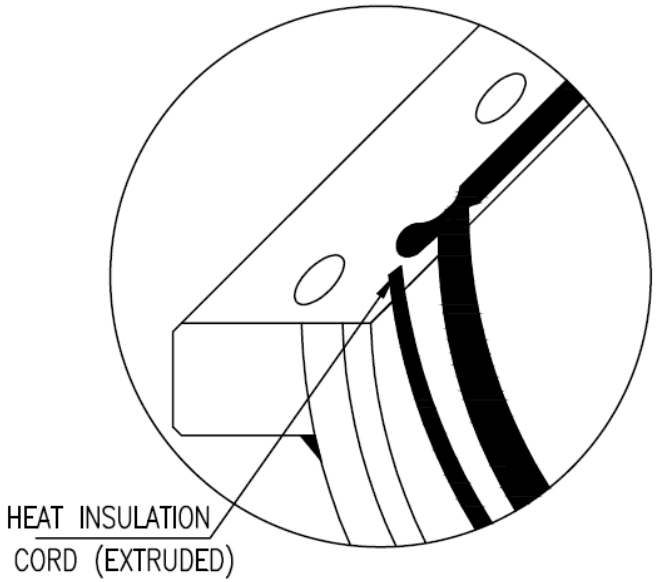
Clamp Size	C_f	Stud Size	Torque without Lubricant (ft.lbs)	Torque with Lubricant (ft.lbs)
18”	0.11	1”3/8	4400	1100
30”	0.11	1”3/4	5000	1980

C_f - Coefficient of Friction

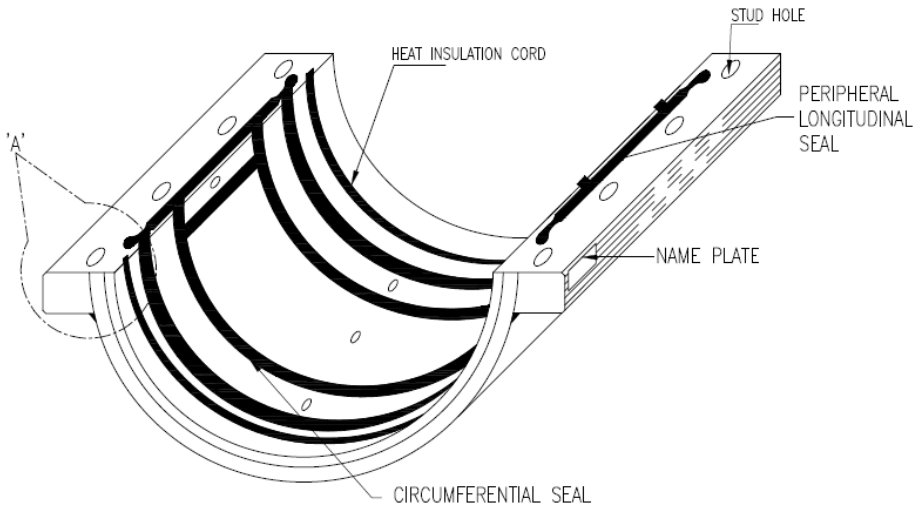
Development in On-Site Clamp Installation Procedures

CASE STUDY 2

- During installation, it was observed that the heat chord was slightly out from the shell
- This was ignored and later this extension caused a leak in the clamp



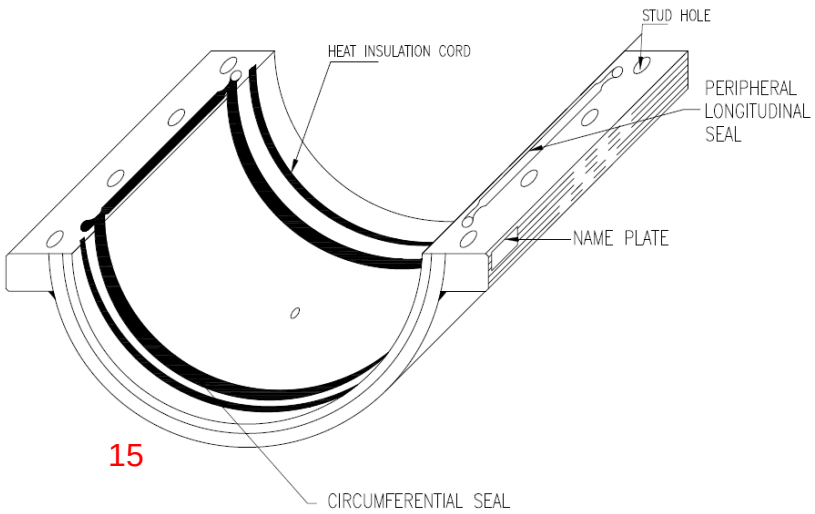
DETAIL–A



Development in On-Site Clamp Installation Procedures

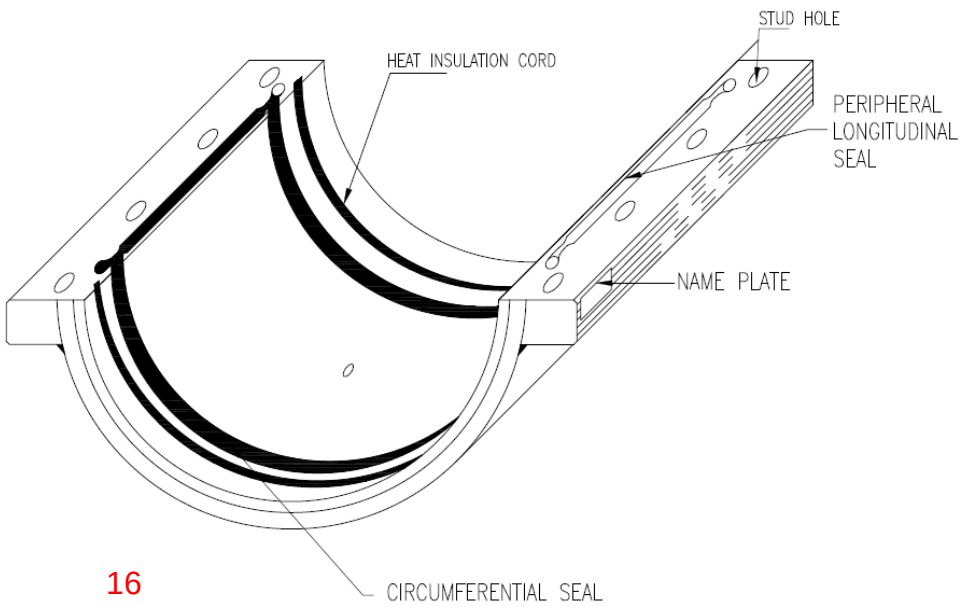
CASE STUDY 3

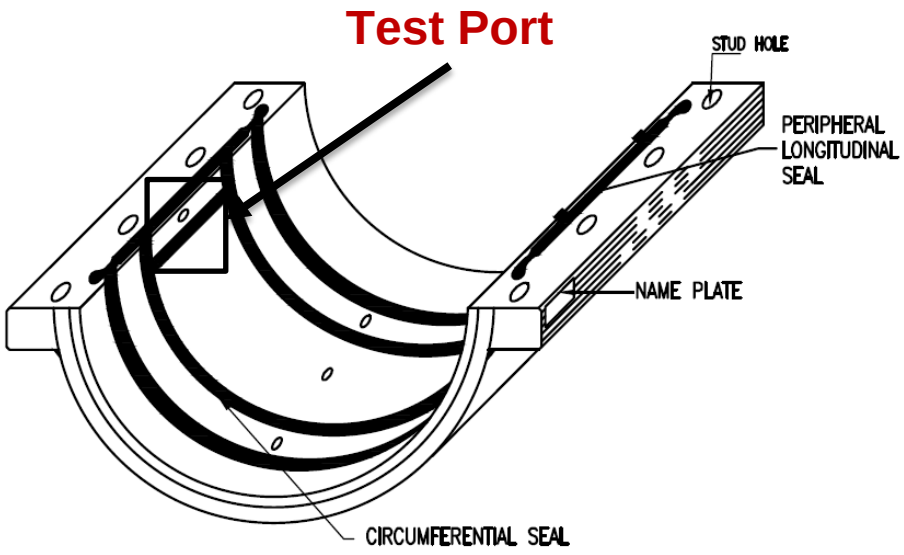
- During on-site clamp installation; to find out if a seal is leaking or not, the entire line has to be pressurized.
- If the seal leaks; the entire exercise is futile



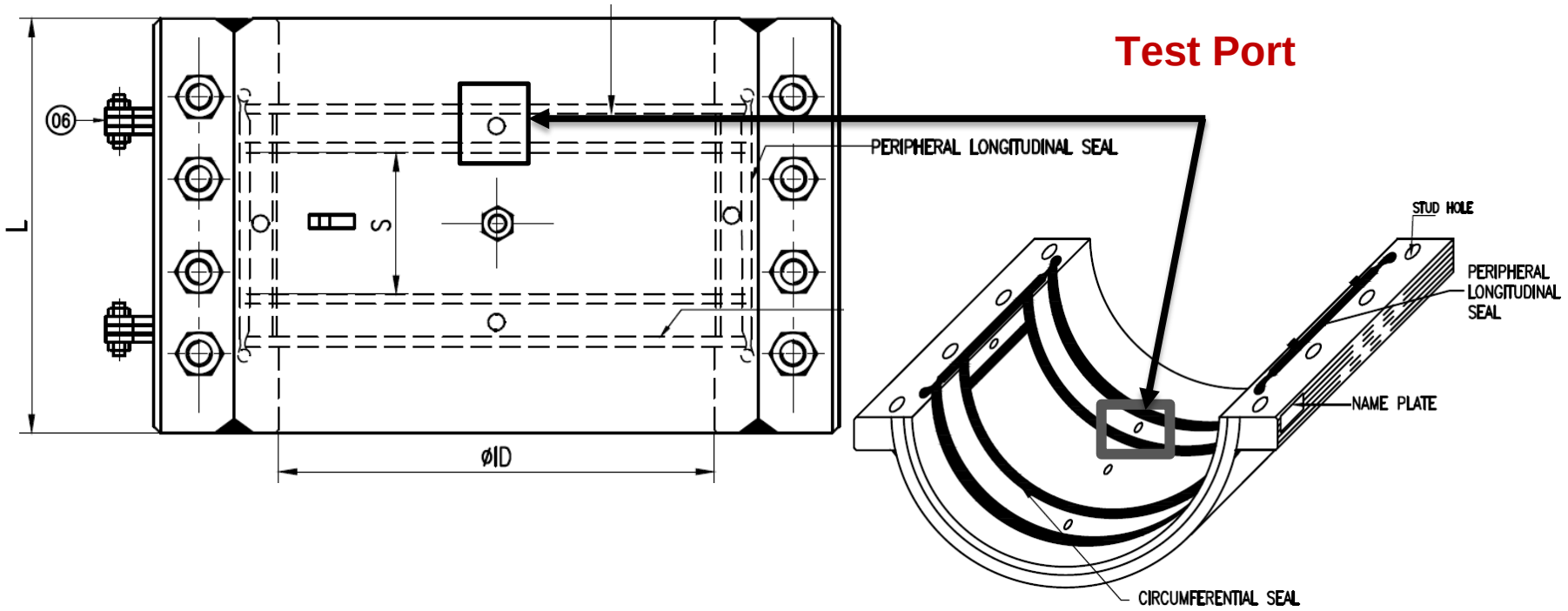
Development in On-Site Clamp Installation Procedures

- Proposed Solution
  - Single Seal
  - No Test Port
  - Double Seal
  - With Test Port





Development in On-Site Clamp Installation Procedures



Questions?

Thank You