Industry Practices to Address SCP

(Sustained Casing Pressure)

Presented by: Ron Sweatman, RS Consulting LLC
(retired Halliburton & formally with BJ & BHI)
Past Chair (2000-2010) of API 65-1/65-2 Task Group,
Sub-Team Leader for API RP 96, and
API RP 90 "Legacy" Member for RP 90-1 & 90-2 Task Groups

at the

BSEE Cementing Workshop
University of Houston
8 May 2015

SCP Sources

(Sustained Casing Pressure)

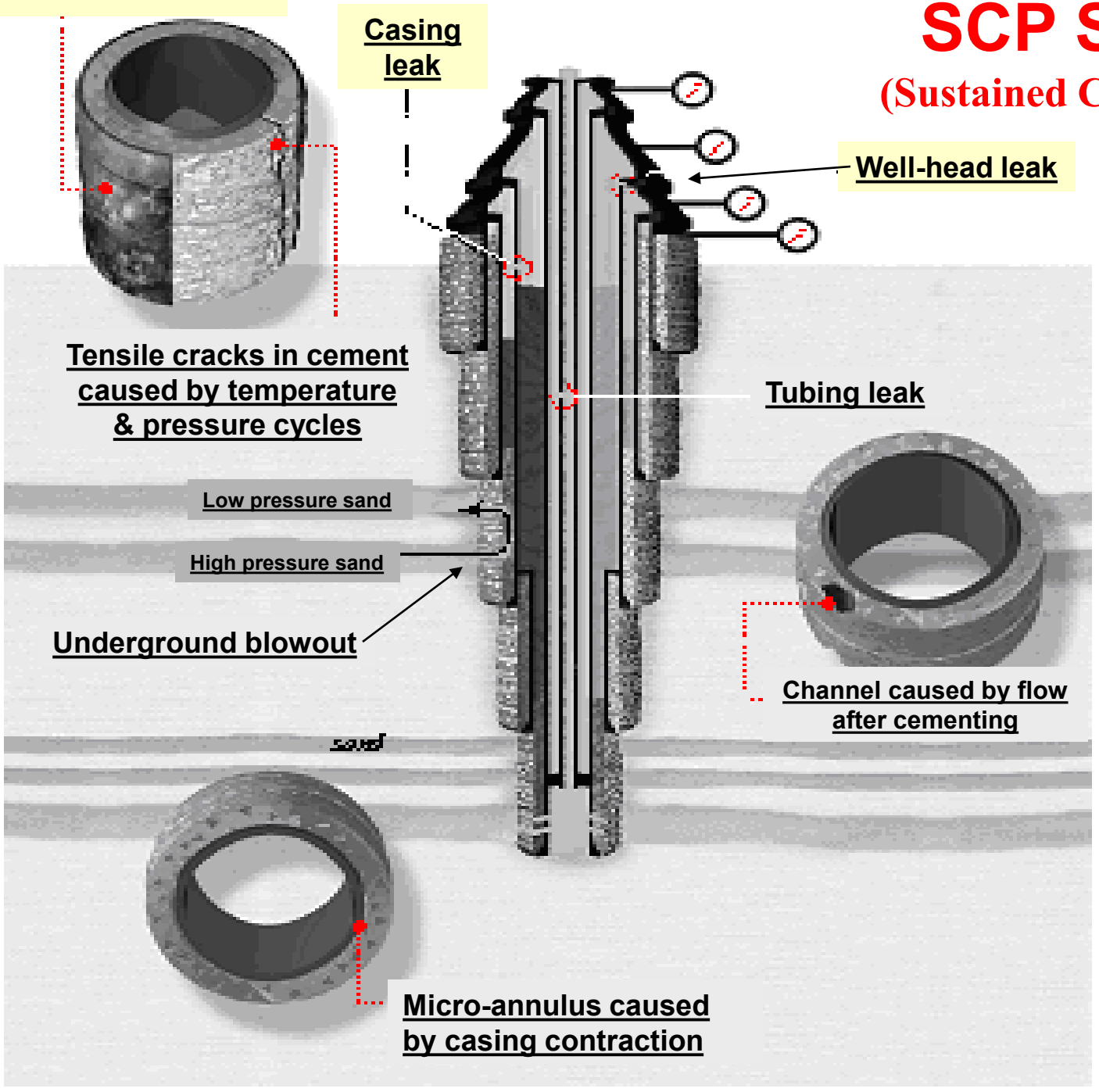
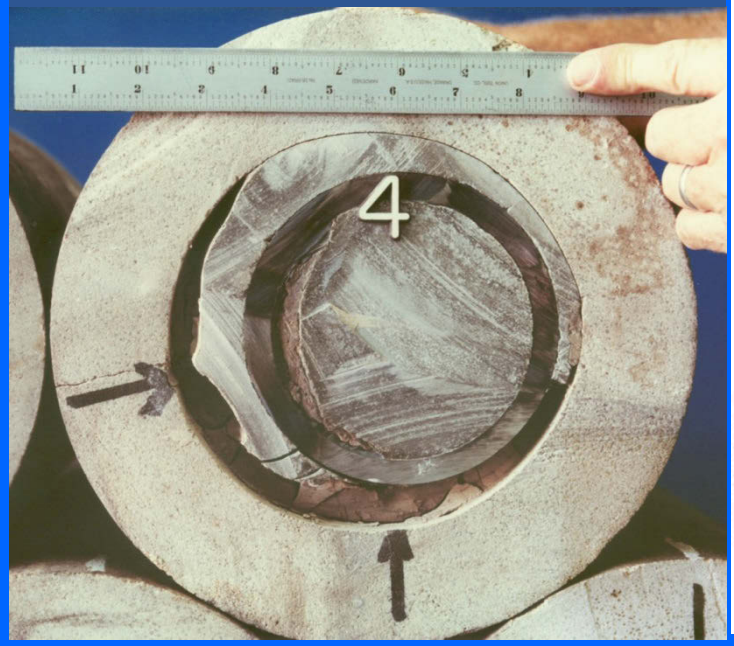


Figure from "A Review of Sustained Casing Pressure (SCP) Occurring on the OCS" by Bourgoyne et al (March 2000)

SCP Caused by Flow After Cementing

Gas flow path thru bypassed mud channels in cemented annulus

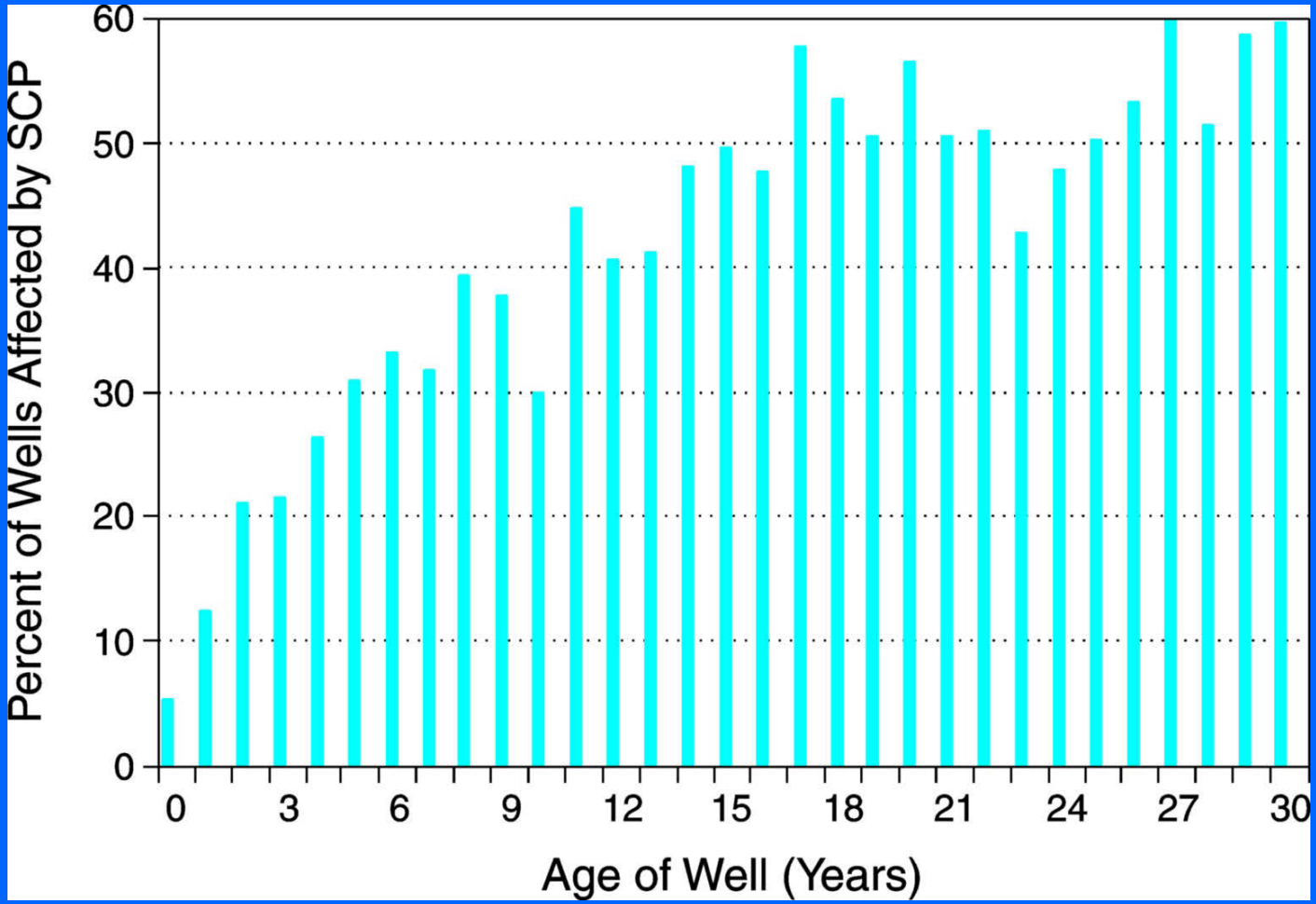


Gas flow paths up the cemented annulus by loss of hydrostatic pressure overbalance before cement developed enough static gel strength to prevent gas channeling

BSEE records on percentage of wells with SCP

Snapshot in time that changes as wells are drilled and abandoned

(Figure 1 in SPE 97168)



Offshore Industry Standard Practices

- Avoid or reduce SCP via zone isolation in well construction
  - 33% of SCP linked to the primary cementing process
  - API Standard 65-2 for,
    - ✓ Cementing design, execution & evaluation
    - ✓ Mechanical sealing devices
  - API RP 96 for,
    - ✓ Deepwater well pressure barrier design & verification
  - Field SOP (standard operating practices)
  - Well specific practices based on actual conditions
- Detect and manage SCP
  - Annular pressure monitoring as per API RP 90
  - Evaluation of SCP as per API RP 90
  - Report to BSEE and agree on further action,
    - ✓ Continue production or TP&A
    - ✓ Repair well via SOP or P&A as per abandonment rules

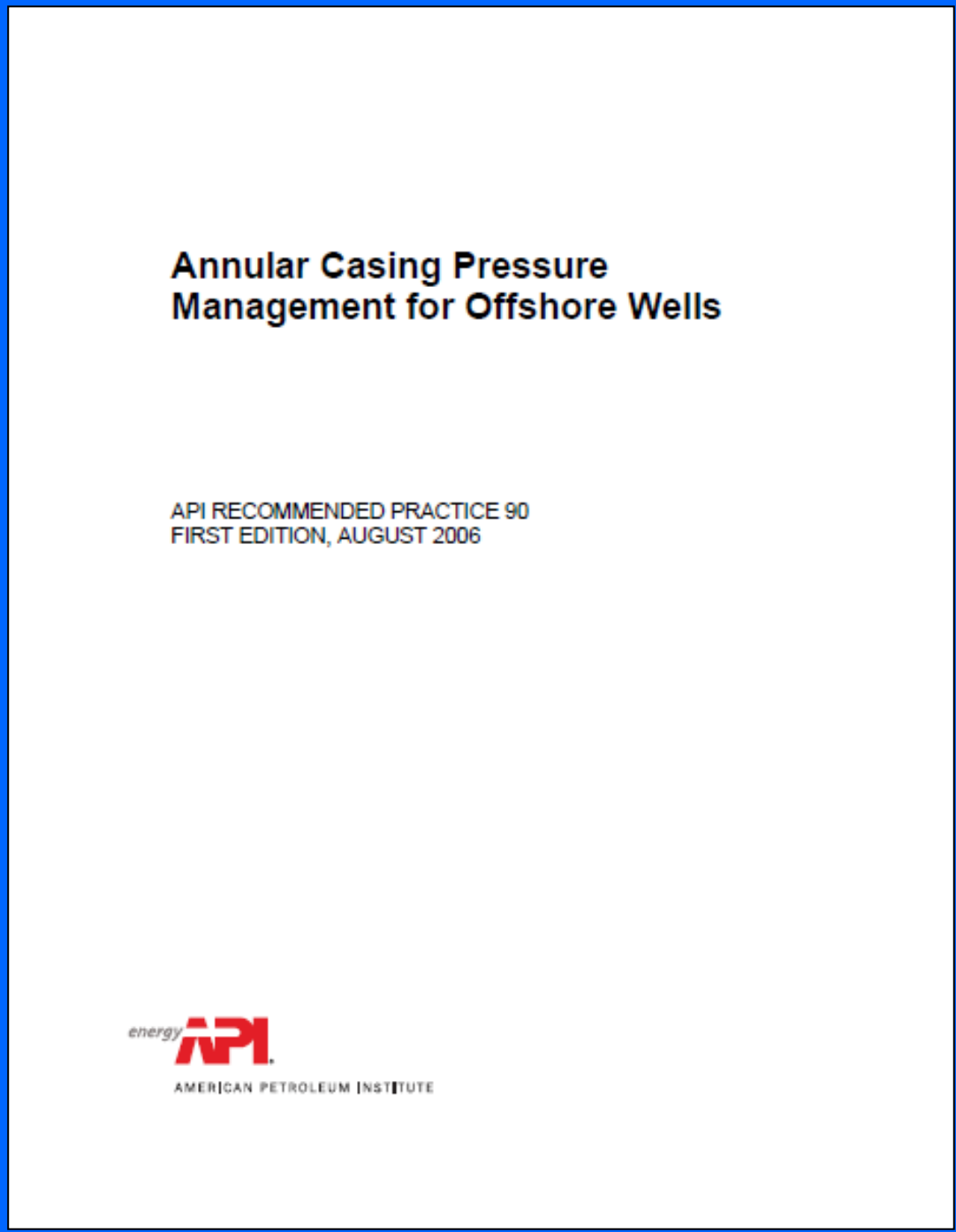
API Standard 65-2 Contents

"Isolating Potential Flow Zones During Drilling & Cementing"

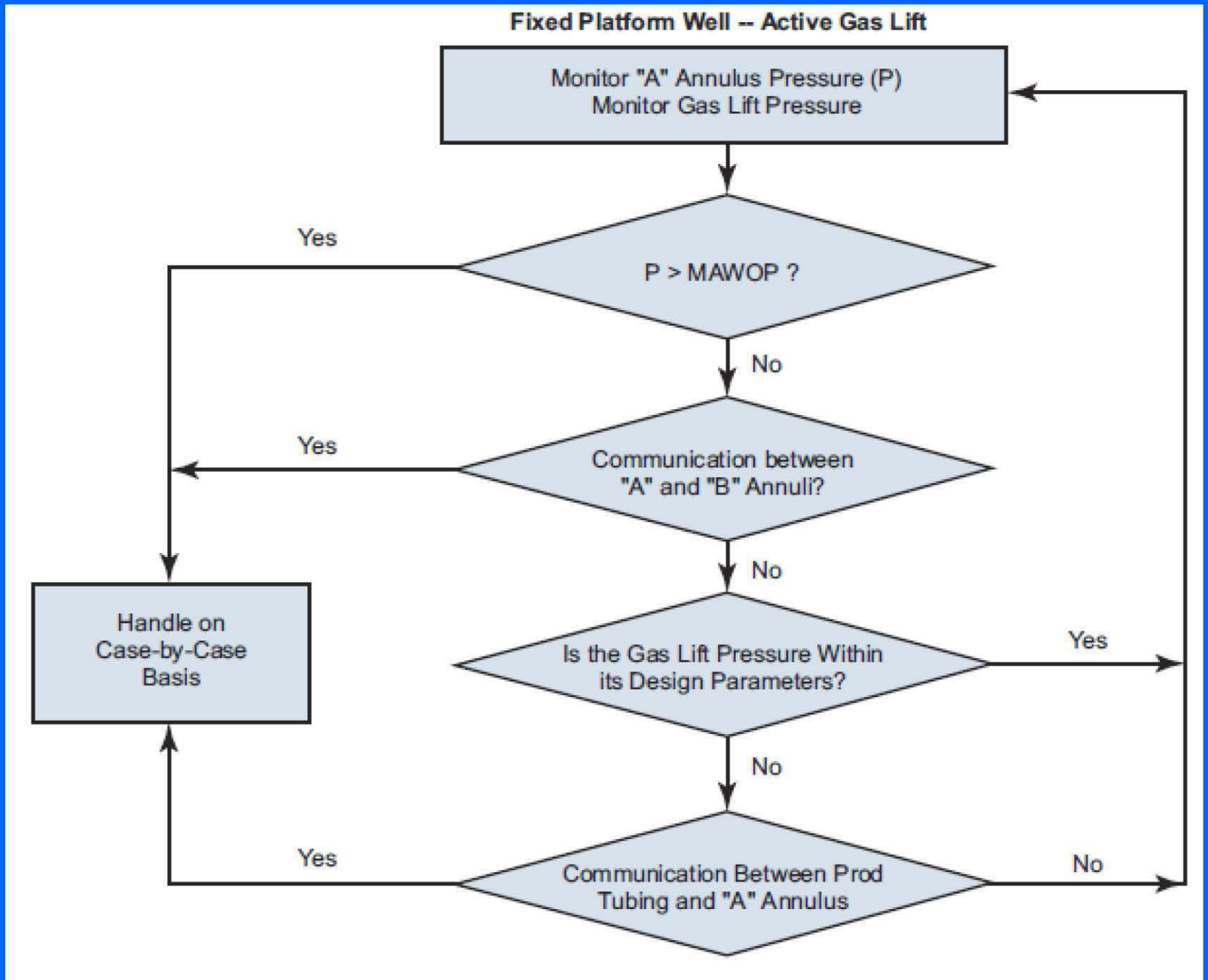
- Preface, Scope, & Background
- Well Planning and Drilling Plan Considerations
  - ✓ Helps Install Cement & Mechanical Barriers & Enhances Sealing Performance
  - ✓ Drill a Quality Hole (Avoid Severe Doglegs, Washouts, Spiraling, etc.)
  - ✓ Hole Cleaning (Remove Cuttings Beds, Gelled Mud, etc.) & Mud Conditioning
  - ✓ Maintain Wellbore Stability (Control Losses, Kicks, & Breakouts)
- Mechanical Barriers
  - ✓ Sub-Surface Devices (Packers, Annular Seal Rings, etc.)
  - ✓ Sub-Wellhead Liner Hanger Profiles
  - ✓ Surface/Wellhead Devices (Casing Seal Assembly)
  - ✓ Wellbore Devices (Retrievable tools, drillable bridge plugs, retainers, etc.)
- Primary Cementing Job Design and Operations
- Post Cementing Operations & Job Evaluation
- Appendices
  - ✓ Background & technology with references
  - ✓ General well design & drilling plan/operations information
  - ✓ Process Summary: Check List for Key Parameters

API RP 90

- Manage APB & SCP
- MAWOP Monitoring
- Diagnostic Methods
- Decision Trees
- Identify Leak Paths
- Well Design Considerations
- Use API Std. 65-2 to Avoid or Reduce SCP



Example Decision Tree in RP 90



Industry Standards Activities

- API RP 90, 1st Edition
  - ✓ 2nd Edition RP 90-1 Being Developed
  - ✓ Coordinated with RP 90-2 Development
  - ✓ Rewritten to Improve Readability & Explanations
  - ✓ Considering New Calculation Method for MAWOP
  - ✓ Anticipated Publication by End of 2015
- API Standard 65-2, 2nd Edition
  - ✓ No Updates Since Published in December 2010
  - ✓ Review for Continuation or New Edition

AMERICAN PETROLEUM INSTITUTE

Thank you for your attention.

Questions?

Comments?