PIPELINE & GAS INFRASTRUCTURE DESIGN AND CONSTRUCTIBILITY

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INDOPIPE 2014
OUTLINE

• INTRODUCTION
• GAS DISTRIBUTION SYSTEM
• OFFSHORE GAS PIPELINE
• GAS INFRASTRUCTURE
  • TOWER YOKE MOORING SYSTEM (TYMS)
• PROJECT CHALLENGES
INTRODUCTION

REKAYASA INDUSTRI (REKIND)

- Domestic (Indonesian) Integrated Industrial EPC Company
- EPC Petrochemical, Chemical, Refineries, and Fertilizer Plant
- EPC Oil & Gas Facilities and Infrastructure
  - Upstream & Downstream
  - Onshore & Offshore
- EPC Geothermal Facilities and Infrastructure
- EPC Power Plant
- EPC Mining Infrastructure
GAS DISTRIBUTION SYSTEM

• Upstream
  • From well head to production facilities
  • From production facilities to downstream industry
    • LNG Carrier
    • Pipeline
GAS DISTRIBUTION SYSTEM

Upstream Processing Unit → Pipeline / Shipment → Storage and Offloading Facilities → Pipeline → Receiving Facilities → Pipeline → Customer
GAS DISTRIBUTION SYSTEM

- Upstream: From well head to production facilities
- From production facilities to downstream industry
- LNG Carrier
- Pipeline

Source: www.kline.co.jp
GAS DISTRIBUTION SYSTEM

ONSHORE PIPELINE

Source: http://enerdynamics.files.wordpress.com/
GAS DISTRIBUTION SYSTEM

Source: www.nusantararegas.com
OFFSHORE GAS PIPELINE
Offshore Pipeline Classification (Dr. Boyun Guo, 2005)

- Flowlines transporting oil/gas from satellite subsea wells to subsea manifolds;
- Flowlines transporting oil/gas from subsea manifolds to production facility platforms;
- Infield flowlines transporting oil/gas between facility platforms;
- Export pipelines transporting oil/gas from production facility platforms to shore;
- Flowlines transporting water or chemicals from production facility platforms, through subsea injection manifolds, to injection wellheads
GAS PIPELINES

PGN SSWJ Phase 1:
32” Pipeline, 105km

PGN SSWJ Phase 2:
32” Pipeline, 161km
GAS PIPELINES DESIGN

- **INDONESIAN REGULATIONS:**
    Tentang Keselamatan Kerja Pipa Penyalur Minyak Dan Gas Bumi.
  - Keputusan Dirjen Migas no.84K/38/DJM/1998
    Pedoman dan Tata Cara Pemeriksaan Keselamatan Kerja atas Instalasi, Peralatan dan Teknik yang Dipergunakan dalam Usaha Pertambangan Minyak dan Gas Bumi dan Pengusahaan Sumber Daya Panas Bumi.

- **INDONESIAN STANDARD (SNI):**
  - SNI 3474
    Sistem Penyaluran dan Distribusi Pipa Gas
GAS PIPELINES DESIGN

INTERNATIONAL CODES & STANDARD:

- DNV OS F101 – Submarine Pipeline System
- ASME B31.8 – Gas Transmission and Distribution Piping System
- API 5L – Specification for Linepipe
GAS PIPELINES DESIGN
Pipeline Design Analysis Diagram

- Design Requirement
- WT Selection
- Material Grade Selection
- Route Selection

FAIL
FAIL

- Optimal Design
- Installation Analysis
- Stress Analysis
- Pipeline Protection
INSTALLATION SEQUENCES

1. Pre – Construction Survey
2. Pre – Trenching (Backhoe, CSD, Grab)
3. Pipelaying
4. Crossing (if any)
5. Post – Trenching
6. Pre-commissioning & Testing
PIPELINE INSTALLATION METHODS

Offshore Pipeline Installation Methods:
1. Laybarge:
   - S – Lay (Shallow Water Installation)
   - J – Lay (Deep Water Installation)
2. Reel barge:
   - Horizontal Reel
   - Vertical Reel
3. Towing:
   - Bottom Tow
   - Off Bottom Tow
   - Controlled Depth Tow
   - Surface Tow
1. Laybarge
PIPELINE INSTALLATION

S – Lay :

PIPELINE INSTALLATION

J– Lay:

2. Reel Barge

Source: www.technip.com
PIPELINE INSTALLATION

3. Towing

PIPELINE INSTALLATION

3. Towing

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GAS INFRASTRUCTURE
TOWER YOKE MOORING SYSTEM
Conventional Tower Yoke Mooring System

- Yoke Structure & Bearing
- Fluid Transfer System
- Articulated U-Joints & Link Arms
- Mooring Support Structure (MSS)
- FSRU
- Swivel Stack
- Main Bearing & Turntable
- Manifold Deck
- Piled Jacket Structure
- Ballast Tank
TOWER YOKE MOORING SYSTEM

Fixed Platform Design Stage

Design Criteria

Conceptual Design

Detail Design

Documentation

Third Party Check
TOWER YOKE MOORING SYSTEM

Platform Fabrication

- PILE FABRICATION
- JACKET FABRICATION
- TOPSIDE FABRICATION
- MSS FABRICATION
- YOKE FABRICATION
TOWER YOKE MOORING SYSTEM
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Installation

JACKET INSTALLATION

TOP SIDE INSTALLATION

YOKE INSTALLATION & ROTATION TEST

POST INSTALLATION SURVEY

HOOK UP
TOWER YOKE MOORING SYSTEM
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PROJECT CHALLENGES
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South Sumatera West Java Phase 2 (2006)
Client : Perusahaan Gas Negara
Length : 161 km
Pipe Diameter : 32in
Max Water Depth : 85m

Challenges :
1. Hard soil found at post – trench area
2. Long lines (161km)
3. Huge pipelines (32in diameter)
4. Pipeline Crossing
5. Free Span (install support – mini jacket)
6. Island to island pipeline (2x push pull activities, 2x AWTI activities)
PROJECT CHALLENGES

Oyong Phase 2 (2008)
Client : Santos
Length : 57 km
Pipe Diameter : 14in
Max Water Depth : 56m

Challenges :
1. SIMOP
2. Brownfield project
3. Modification of existing offshore facilities (revamping)
PROJECT CHALLENGES

EPCIC & ORF Muara Karang, Jakarta (2012)
Client : Nusantara Regas
Length : 15 km
Pipe Diameter : 24in
Max Water Depth : 24m

Challenges :
1. Linepipe using DNV instead of API 5L
2. Re-route pipeline
3. Interfacing with other parties
4. Pipeline installation at very dense boat traffic
EPC 3 Mobil Cepu Ltd (ongoing)
Client : Mobil Cepu Ltd
Length : 23 km
Pipe Diameter : 20in
Max Water Depth : 33m
Scope : Offshore Pipeline & Mooring Tower

Challenges :
1. Project interface with other parties (EPC1,EPC2,EPC4,EPC5)
2. Engineering, Procurement, Fabrication, Installation of Mooring Tower
PROJECT CHALLENGES

FSRU LAMPUNG (ongoing)
Client : Perusahaan Gas Negara
Length : 21 km
Pipe Diameter : 24 in
Max Water Depth : 24 m

Challenges :
1. Hard soil area at pipeline route
2. Seakeeping FSRU activities during pipeline laydown
3. Seakeeping FSRU activities during riser installation
PROJECT CHALLENGES

TOWER YOKE MOORING SYSTEM (2014)
Client : HOEGH LNG
Max Water Depth : 24m
Project Location : Labuhan Maringgai, Lampung

Challenges :
1. Weather (squall wind every night approx 35 knots)
2. Connecting FSRU to TYMS
3. FSRU seakeeping during connection to TYMS
PROJECT CHALLENGES

Sectional Pipeline Relocation – PHE WMO (ongoing)
Client : PHE WMO
Length : 20 km
Pipe Diameter : 16 in
Max Water Depth : 19 m

Challenges :
1. Route selection
2. Interface with third party work
3. 2 AWTI at the same time (new pipeline tie-in to existing pipeline)
SUMMARY

Constructability issues are driven by some factors:

1. Unproper Design Input & Output
2. Interface with other parties
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THANK YOU