NGL Recovery Project at Badak LNG Plant

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PT Badak NGL
Bontang-Indonesia
Safety Massage

Safety is Endless Efforts
Agenda

• Background and Objective
• Project Scope
• Plant Location
• Material Balance
• Project Staging
• Conclusions
East Kalimantan Gas Gathering and Pipeline System

- CFG Gas Pipelines
- Oil Pipelines
- SENIPAH
- PECIKO
- BEKAPAI
- TAMBORA
- TUNU
- Bontang
- LNG Plant
- Santan (LEX Plant)
- Muara Badak (VICO)
- Domestic Plants

Map showing locations and pipelines in East Kalimantan, Indonesia.
Background

East Kalimantan Gas Distribution

Lean Gas
1017 btu/scf
150 mmscfd

Rich Gas
1109.2 btu/scf

Domestic Plants

LNG Plant

From Total Indonesie

VICO

Muara Badak KM-0

Chevron Liquid Extraction (LEX) Plant

Santan

KM-53

Bontang KM-57

3,320 mmscfd

300 mmscfd
Background

Domestic Plants

- Fertilizer Plant: 4 Trains
- Ammonia Plants: 2 Plants
- Methanol Plant
- Gas delivery Contract: 457,055 mmbtu/d
- Supplied by 2 x 16”, 20” rich gas, and 16” lean gas pipelines

Badak LNG Plant

- Train Number: 8 (A-H)
- Production Capability: 22.1 mtpa LNG, 1 mtpa LPG, 10 million bbl/yr condensate
- Supplied by 2 x 36” and 2 x 42” gas pipelines
Feed Gas Condition

To LNG Plant
- Pressure: 45-47 kg/cm²g
- Temp: 27-32°C

To Domestic Plants
- Pressure: 35-40 kg/cm²g
- Temp: 27-32°C

**Composition (Vol%)**

<table>
<thead>
<tr>
<th>Component</th>
<th>From Pipeline</th>
<th>Domestic Contract</th>
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<tr>
<td>N2</td>
<td>0.084</td>
<td>0 – 9</td>
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<tr>
<td>CO2</td>
<td>5.528</td>
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<tr>
<td>C1</td>
<td>83.285</td>
<td>70 – 99</td>
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<tr>
<td>C2</td>
<td>5.215</td>
<td>0 – 12</td>
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<td>C3</td>
<td>3.482</td>
<td>0 – 8</td>
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<tr>
<td>iC4</td>
<td>0.718</td>
<td>0 – 5</td>
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<td>nC4</td>
<td>0.823</td>
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<td>iC5</td>
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<tr>
<td>nC5</td>
<td>0.167</td>
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<td>C6+</td>
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<tr>
<td>HHV</td>
<td>1109.2</td>
<td>950–1200</td>
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</table>

HHV in BTU/SCF
Current Situations

- Feed Gas price to Domestic Plants is cheap
- Domestic Plants require primarily methane
- Price of heavier HC components is higher than methane
- Condensed hydrocarbon in pipeline transmission to Domestic Plants is flared
- Part of LPG Component is recombined with LNG to maintain LNG heating value (LPG price is higher than LNG price)
- So, supplying lean gas instead of rich gas to Domestic Plants will benefit from:
  - replacing LPG component in LNG with C2
  - recovering LPG & Condensate from rich gas
  - eliminating flared condensed HC
LNG Plant Process Overview

FEED GAS
K.O.D. CO2 REMOVAL (ABSORBER & REGENERATOR)

DEHYDRATION (H2O & Hg REMOVAL)
FRACTIONATION (SCRUB COLUMN)
LIQUEFACTION (MCHE)

BOIL OFF TO PLANT FUEL

LNG STORAGE
LPG STORAGE
LNG MARINE LOADING
LPG MARINE LOADING

PROPANE REFRIGERATION
MCR REFRIGERATION
FRACTIONATION

C5+
Objective

NGL Recovery
Ethane Plus Extraction Plant (EPEP) Project

- To recover 99.2% of ethane and 100% components heavier than ethane from pipeline rich gas delivered to Domestic Plants
- To eliminate the flared condensed hydrocarbon in pipeline to Domestic Plant
Turboexpander Unit

Project Scope

TURBO EXPANDER TECHNOLOGY FOR ETHANE PLUS EXTRACTION PROJECT

-106°C
19 kg/cm²
EPEP Plant Characteristics

- High NGL recovery: 99.2% of C2 and 100% of other heavier HC components
- Highly Energy-efficient plant: fuel consumption 4.2% of its feed (Plant thermal efficiency of 95.8%)
EPEP Plant Utilities

- Hot Oil: 5,000 m$^3$/h, WHRU Preheater + Furnace
- Electricity: Gas Turbine Generator, 3 x 50%
- Air: Instrument, Utility (compressor 3 x 100%)
- Nitrogen: Cryogenic and PSA Units (2 x 100%)
- Fuel Gas: High, Medium and Low Pressures
- Wastewater Treatment
- Smokeless Flares and Blowdown: LTCS, LTSS, Wet Flares, Liquid Drain Collection and burnpit
- Water Storage (supplied from LNG Plant): Amine water makeup, Potable, Utility & Fire Suppression Water System
- Air cooling system
**Before EPEP Project**

**LEX PLANT LEAN GAS**
- 150 MMSCFD
- HHV 1,017.0 BTU/SCF

**FEED GAS DISTRIBUTION**
- 275 MMSCFD

**FROM FIELD**
- 3,595 MMSCFD
- HHV 1,109.2 BTU/SCF

**DELIVERY CONTRACT**
- 457,055 MMBTU/D

**BADAK LNG PLANT**
- 3,320 MMSCFD

**PRODUCTS**:
- LNG 365 std cargoes
- LPG C3 500,657 tons/year
- LPG C4 477,006 tons/year
- CONDENSATE 10,849,417 bbl/year

1 LNG std cargo = 125,000 m³
After EPEP Project

**Material Balance**

**LEX PLANT LEAN GAS**
- 150 MMSCFD
- HHV 1,017.0 BTU/SCF

**RESIDUE**
- 304 MMSCFD
- HHV 1,000.3 BTU/SCF

**DELIVERY CONTRACT**
- 457,055 MMBTU/D

**FEED GAS DISTRIBUTION**

**TO EPEP**
- 385 MMSCFD (Addition 110 MMSCFD)

**BADAK LNG PLANT**
- 3,320 MMSCFD

**FROM FIELD**
- 3,705 MMSCFD
- HHV 1,109.2 BTU/SCF

**NGL RECOVERIES:**
- C2 261,285 tons/year
- C3 257,901 tons/year
- C4 150,444 tons/year
- i-C5+ 1,043,683 bbl/year

**PRODUCTS:**
- Net Gain
  - LNG 4.37 std cargoes
  - LPG C3 257,901 tons/year
  - LPG C4 150,444 tons/year
  - CONDENSATE 1,043,683 bbl/year

110 mmscfd additional rich gas to EPEP Plant is required for:
- Makeup for energy shrinkage: 94 mmscfd
- EPEP Fuel consumption: 16 mmscfd (4.2% of EPEP Feed)
Conclusions

- EPEP Plant will be capable of recovering 99.2% of C2 and 100% of heavier HC components from rich gas by Turbo-expander technology.

- EPEP Project will gain additional production up to 4.4 std cargoes LNG, 0.4 mtpa LPG and 1 M bbl condensate by NGL recovery from rich gas delivered to Domestic Plants.

- EPEP Plant is energy efficient with fuel consumption of 4.2% from its feed.

- EPEP Plant will require 110 mmscfd additional gas supply for residue gas energy shrinkage and plant fuel consumption.
Thank You