# Challenges in Managing Mercury in Field Development and Production

8–9 JULY 2025 | KUALA LUMPUR, MALAYSIA

# Mercury Partitioning and Distribution at an Offshore Gas Development Project

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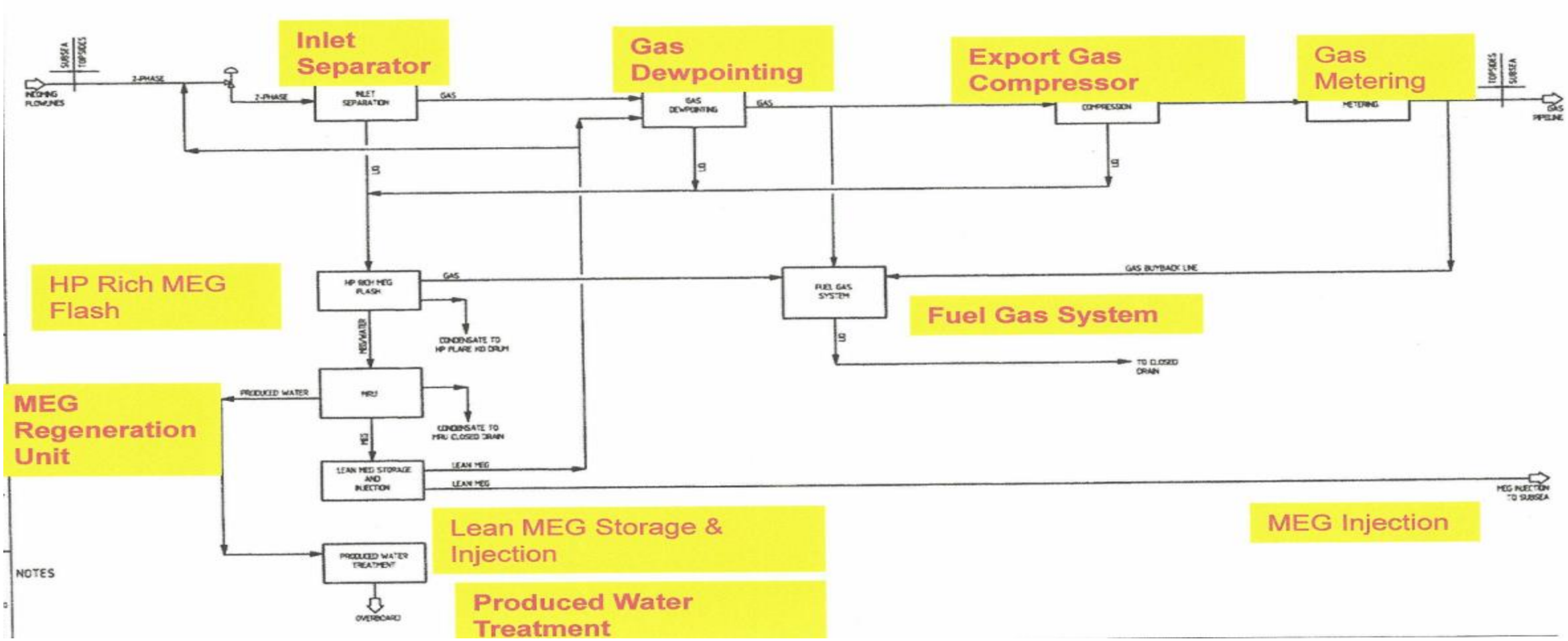
# Objective

- Determine mercury partitioning and distribution
- Offshore gas field with FPU
- 6 process streams studied
- Commercially-available model used
- 50,000 kg/hr total flow to FPU
  17 MMscmd
- Assumed 200 µg $Hg/Sm^3$
- Mercury assumed to be all elemental

# Process Flow Diagram



# Input to Model

- Heat & Material Balance
  - Temperatures
  - Pressures
  - Flow rates
- Gas composition
  - C1 – C15, BTEX, non-hydrocarbon gases
  - Acentric factors

# Inlet Separator Results

90 barg and 2.8°C

- Overall Hg = 0.142 kg/hr
- Hg in gas = 0.0563 kg/hr
- Hg in water = 0.000162 kg/hr
- Hg liquid dropout =  0.0852kg/hr

# Low Temperature Separator (dewpointing)

75.5 barg and -16.1°C

- Overall Hg = 0.0563 kg/hr
- Hg in gas = 0.00943 kg/hr
- Hg in water = 4.69E-07 kg/hr
- Hg liquid dropout = 0.0469 kg/hr

# Export Gas Compressor & Discharge Cooler

73.1 barg and -3.9°C  201.1 barg and 45°C

- Only gas phase is present
- Hg in export gas = 0.00943 kg/hr
- Equivalent to 3.54 µg Hg/$Sm^3$
- Sales gas Hg limit is 0.1 µg/$Sm^3$
- MRU for gas required

# High-pressure MEG regenerator

48 barg and 40°C

- Overall Hg = 1.63E-04 kg/hr
- Hg in gas = 9.51E-07 kg/hr
- Hg in water = 1.62E-04 kg/hr

# Low Pressure MEG Regenerator

3.6 barg and 41.4°C

- Overall Hg = 1.62E-04 kg/hr
- Hg in gas = 1.289E-05 kg/hr
- Hg in water = 1.49E-04 kg/hr

# Hg in Fuel Gas and Overboard Produced Water

- Hg in fuel gas ranges from 3.77E-03 to 1.89E-06 kg/hr
- Equivalent to 1.57 to 3.06 molar ppb
- MRU for gas would eliminate Hg emissions to atmosphere

- Hg in overboard produced water discharge = 7.35 ppbw
- Produced water discharge limit is 5 ppb
- MRU for water required

# Conclusions - Hg Removal

- Knockout pots for draining liquid Hg
- Bethlehem containers for shipping Hg
- MRU for gas
    - Adsorbents
- MRU for water
    - Activated carbon impregnated with S
    - Thiolated adsorbents
    - Precipitation