Challenges in Managing Mercury in Field Development and Production

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Application of Non-conventional Technologies in Mercury Removal from Natural Gas Processing Plant

Biography – Dr. Raymond Ooi

Dr. Raymond Ooi is an experienced Chartered Professional Engineer with Engineers Australia and UK. He is a Process Engineer with a PhD in Chemical & Environmental engineering and has over 20 years' experience in the field of Process Engineering Design and Project Management with in-depth technical knowledge and extensive R&D involvement with both academia and industry. Throughout his career, he has had extensive working experience in areas of Field Development, Design, Engineering and Operation roles with companies Shell, PETRONAS & Worley. His current role in OLEOLOGY is as Director of Engineering and focal point for consulting, design and R&D initiatives of the company.

Introduction - Conventional MRU

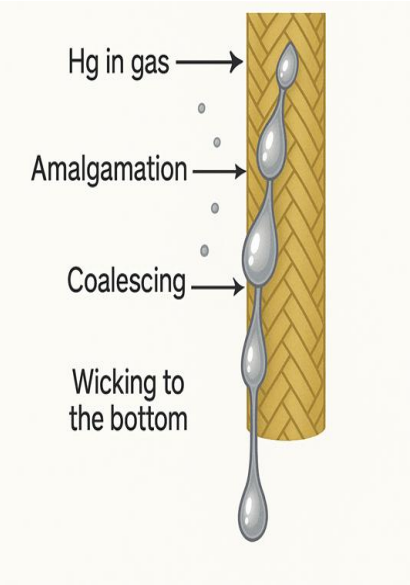
- Fixed-bed MRU adsorbent systems with media
- Media absorbs mercury through chemisorption/ physisorption mechanisms
- Challenges:
  - Need for conditioning of gas pretreatment
  - High replacement and disposal costs
  - Fluctuating mercury concentration levels
  - Space and weight constraints (offshore applications)

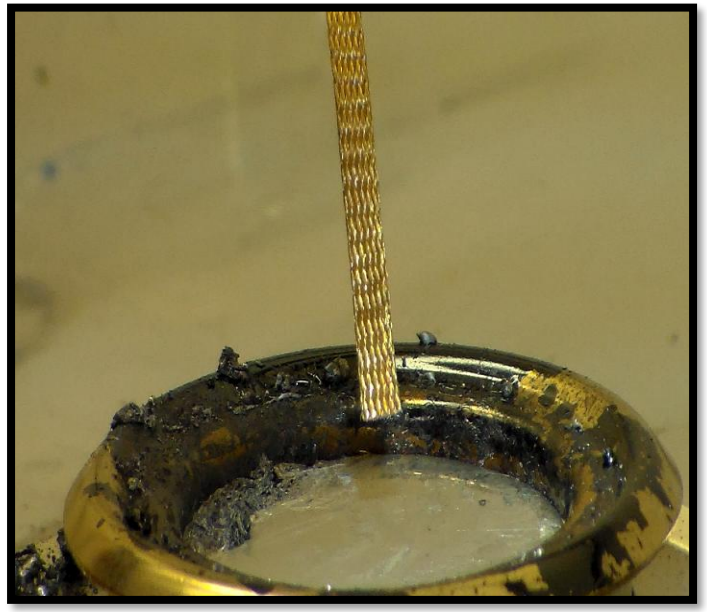
Non-Conventional Mercury Removal

- MYCELX's MERSEP is a patented coalescing system
- MYCELX's MERSEP offers:
  - Smaller footprint
  - Enhance mercury removal efficiency – Hg is recovered
- Standalone set-up
- Hybrid setups with the MRUs improve:
  - Extend MRU bed life

MERSEP – Operating Principles

- Coalescer - NOT Filter
- How is Hg captured on the coalescer?
  - Bonding - Amalgamation with dissimilar metals (Hg with Gold)
  - Coalescing - Gaseous /Aerosol droplets with metallic bonding
  - Draining - Gravity draining by capillary effect (braid)





Case Study: Gas Plant Application of MERSEP

Background

- Gas plant in Asia experiencing high mercury in gas feed post production:
  - Safety and equipment integrity
  - Risk of shutdowns and higher maintenance
  - Non-compliance with environmental, sales specifications.
- Urgent, interim solution required a **fast** turnaround and minimum **modification**

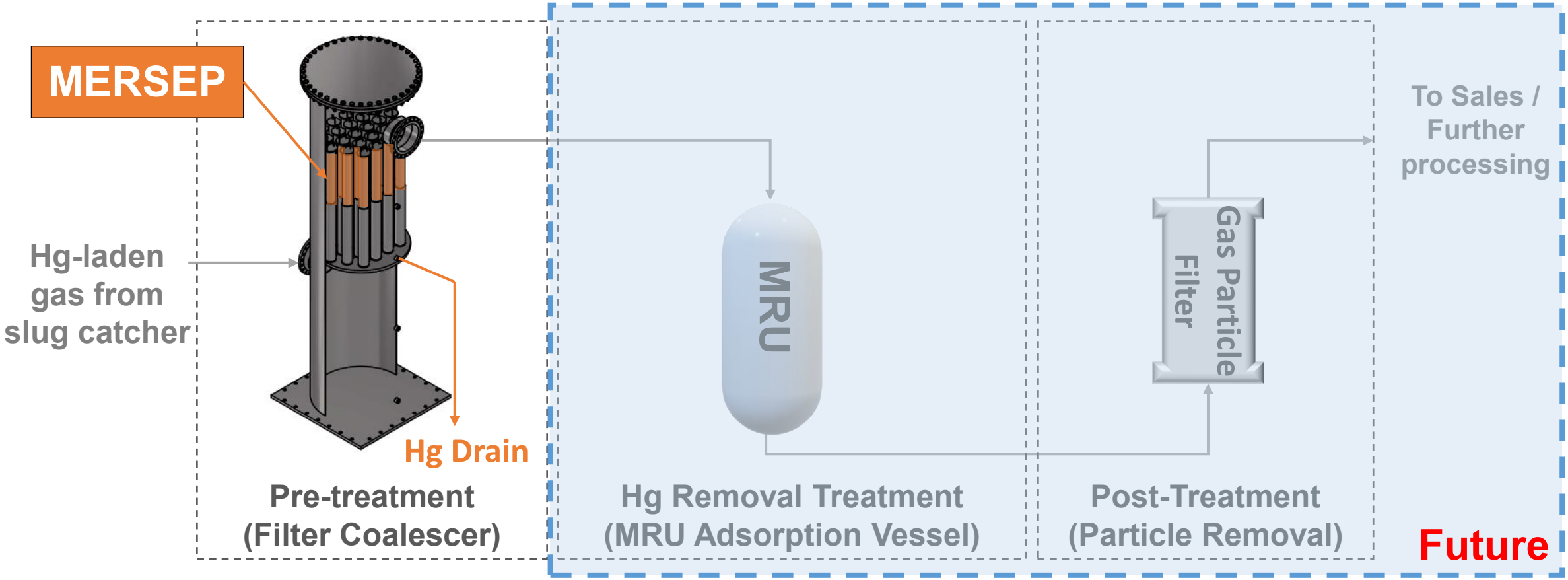
Operating Parameters	
Flow Rate	230 – 280 MMSCFD
Pressure	800 PSIG (55 BARG)
Temperature	30^{o}C
Configuration	2 x 100% (Duty / Standby)

Case Study: Gas Plant Application of MERSEP

Design Set-up/ Configuration	
Total MERSEP Coalescer	24 nos. per vessel
Material of Construction for MERSEP Coalescer	1. Polypropylene and glass fibre 2. MERSEP braiding
MERSEP Coalescer Size	6” (OD) x 40” (Length) per cartridge
Operational Period	3 years – prior to delivery of MRU beds

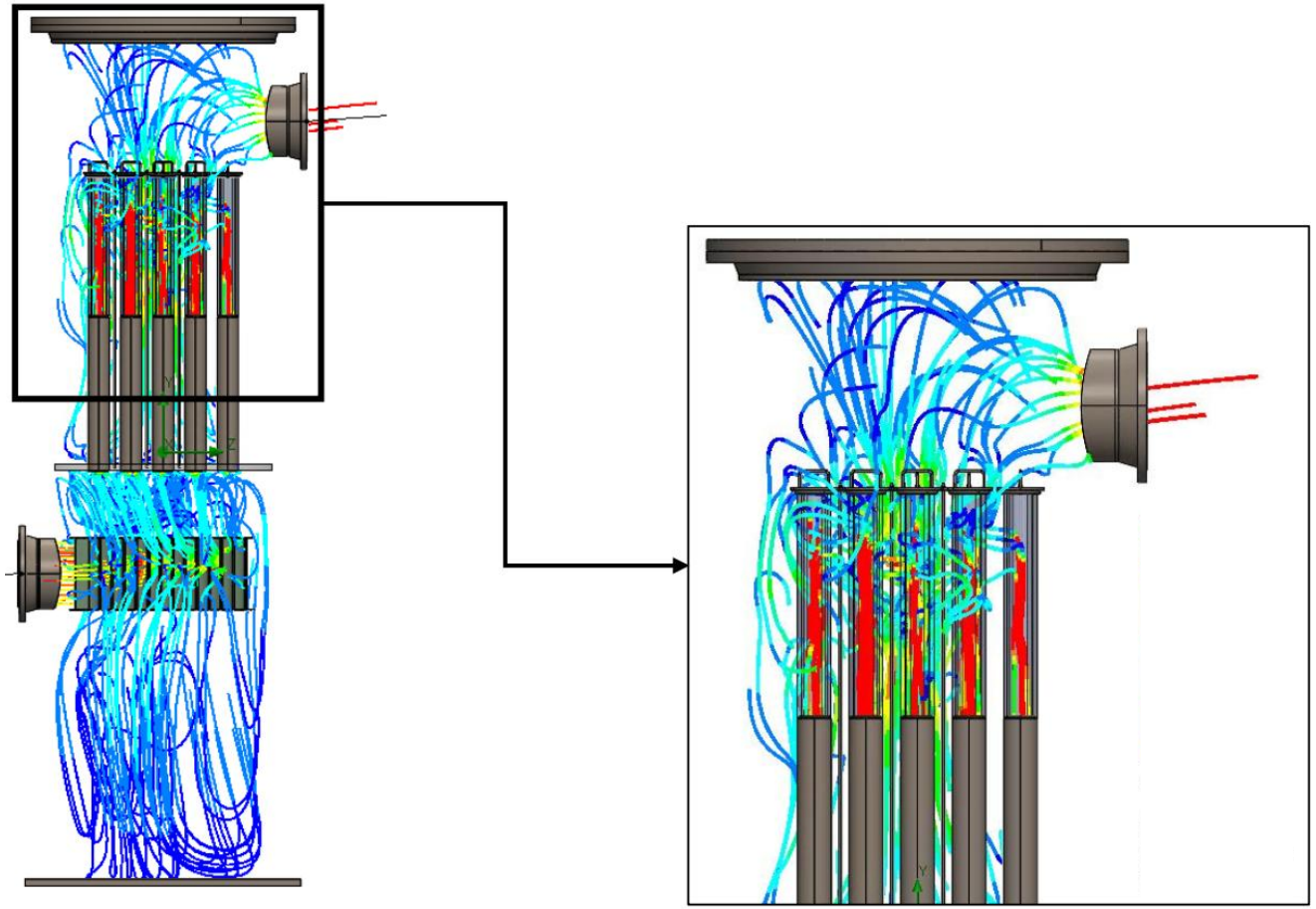
Case Study: Gas Plant Application of MERSEP

Intervention- Solution

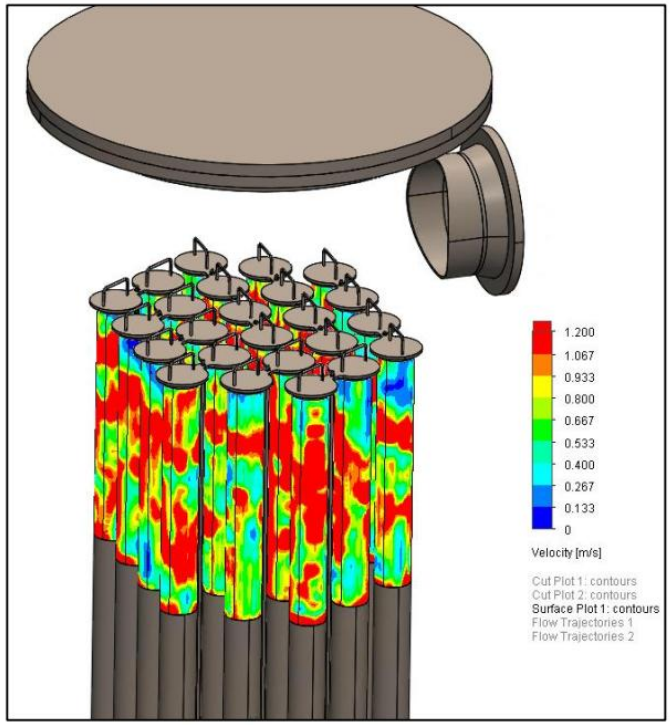


Case Study: Gas Plant Application of MERSEP

Computational Fluid Dynamics (CFD) Modelling – Flow distribution



Velocity contours on filter OD.



Case Study: Gas Plant Application of MERSEP

Coalescer Performance

Parameter.	Value	Remarks
Inlet Hg content in Gas	100 – 125 µg/Nm^3	0.65 kg/day – 0.99 kg/day
Outlet Hg Content in Gas	10 - 15 ng/Nm3	Up to > 99.99%
Pressure drop across	<10 PSI ΔP	Min. pressure drop

Case Study: Summary

- Effective mercury removal- efficiency up to 99.9%
- Strategically installed upstream for early protection
- Reduced maintenance and downtime
- Improved HSSE and environmental compliance
- Solution for Greenfield and Brownfield plants