Challenges in Managing Mercury in Field Development and Production

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Application of Non-conventional Technologies for Mercury Speciation and Treatment

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Introduction

- Mercury speciation plays a role:
  - Effectiveness, selection, service life (bed) depend on speciation.

- Traditional Fixed-bed adsorbents elemental mercury (Hg^0).
  - Hg Complexity
  - Inadequate to remove ionic / organically mercury.

Type of Mercury Species

Mercury Species	Form / Type	Examples	Occurrence in Oil & Gas	Properties	Removal Challenges
Elemental Mercury	Metallic, volatile, free state	Droplet / vapor, gaseous Hg^0	Gas, condensate, crude oil streams	Volatile, migrates with gas phase	Removed using standard fixed-bed adsorbers
Inorganic Mercury	Ionic, oxidized, water-soluble	$HgCl_2$, Hg^{2+}, HgS salts	Produced water, sour gas, fluids	Soluble, reactive, forms complexes	Requires specialty or chemical treatment
Colloidal / Organic Mercury	Carbon-bound, stable, lipophilic	Methylmercury, phenylmercury	Crude oil, condensate, biogenic	Stable, oil-soluble, persistent form	Evades beds, needs advanced removal

Challenges in Characterization of Mercury

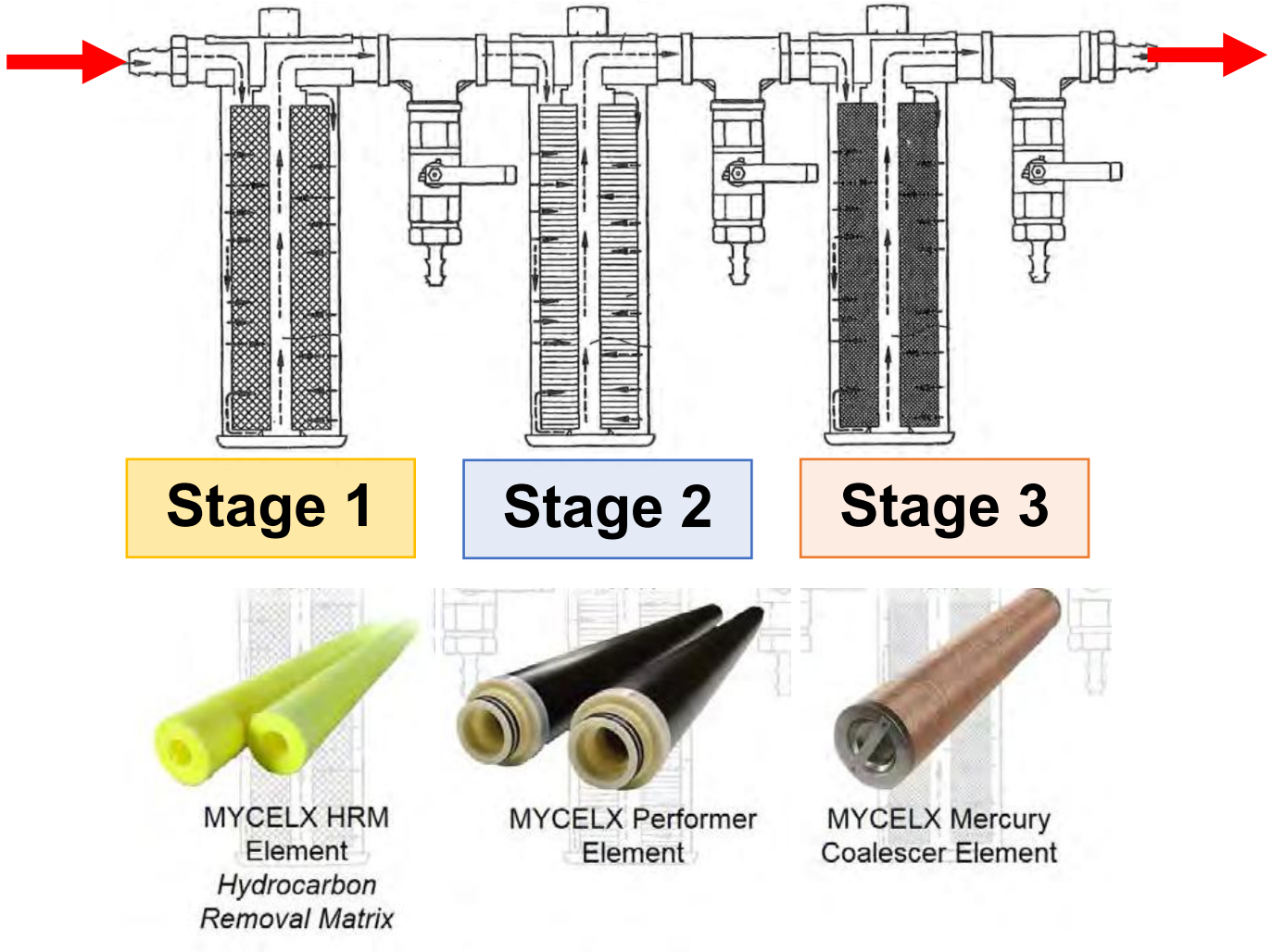
- Limitation of conventional laboratory instruments.
- Sampling uncertainties.
- Species unstable during sample handling.

Non-Conventional Tech for Mercury Speciation

- Run through for a defined duration.

Post Trial

- Mercury concentration tested via:
  - Atomic Absorption (AA) or
  - Inductively Coupled Plasma (ICP) techniques
- Directly Scalable



Non-Conventional Tech for Mercury Speciation

Stage 1	Stage 2	Stage 3
Isolated Colloidal / organically bound Hg	Isolated Ionic Hg	Isolated Elemental Hg
• Capture Colloidal / Organic	• Capture ionic mercury adsorption method. • High efficiency precipitating ionic mercury.	• Capture (coalesce) elemental mercury.

Binds organics into cohesive mass

Non-Conventional Tech for Mercury Speciation

The methodology allows:

- Enables accurate mercury speciation assessment.
- Uses time-weighted averages, not grab samples.
- Captures behavior under real conditions.
- Improves technology selection and process design.
- Supports environmental and regulatory compliance.
- Ongoing field assessment

Non-Conventional Tech for Mercury Speciation

Methodology Conclusion: Assured Design

- Speciation = Appropriate Design / Tech Selection

- Appropriate Design = ESG
- Appropriate Design = CAPEX & OPEX (optimized)

- Ongoing Use = Assurance or Adjustment
- Ongoing Use = Optimized OPEX

- Directly Scalable & Reduced Waste
- ONGOING EFFECTIVE Hg MANAGEMENT SOLUTION

THANK YOU