
2025
UNVEILING THE MAGIC OF MIDSTREAM INNOVATION
GPA MIDSTREAM CONVENTION
Welcome!

Doubling Adsorption Cycle Time in Gas and LNG Treatment: Optimized Molecular Sieve Drying Technologies

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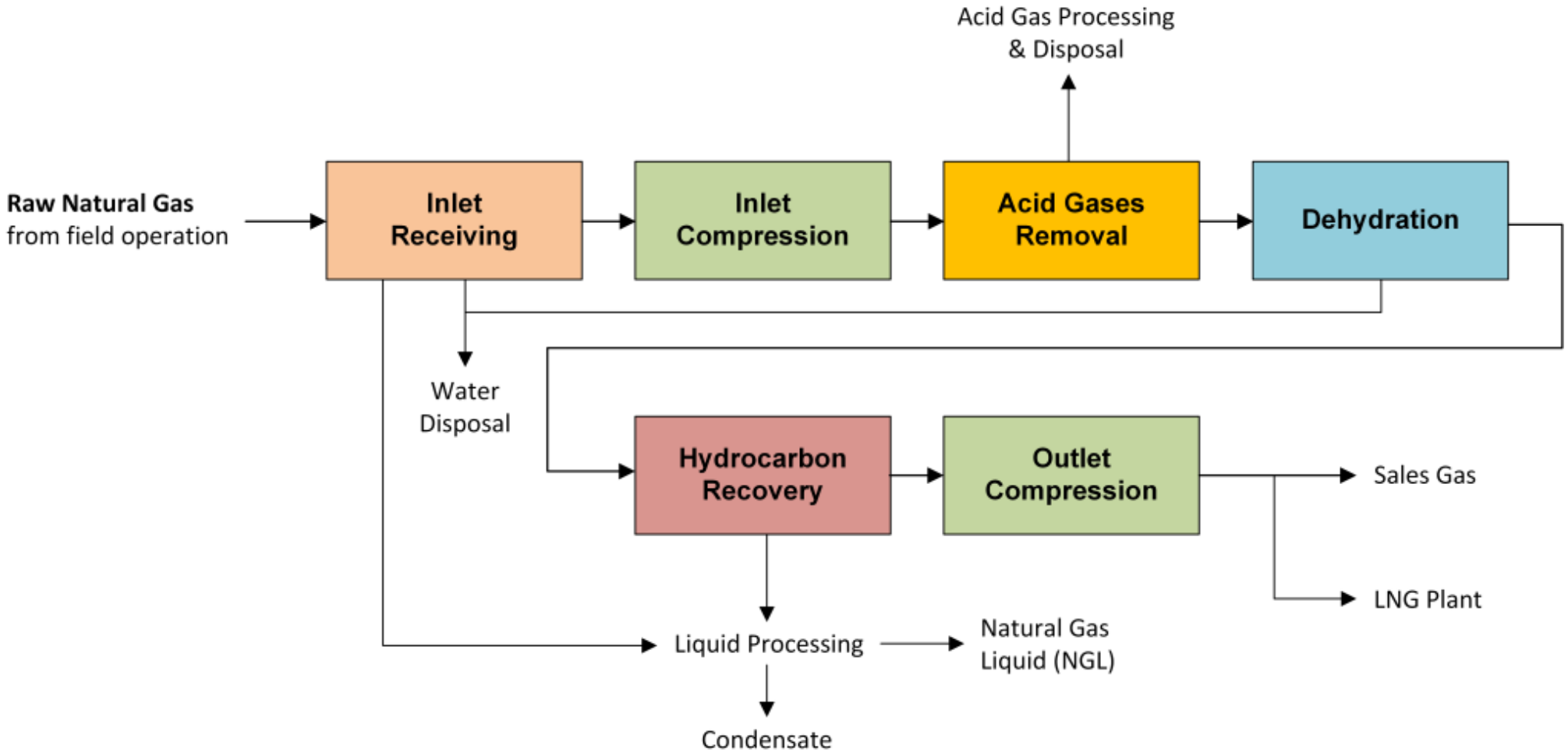
Agenda & Objectives

- **What We'll Cover:**
  - General Introduction to Molecular Sieves
  - Industry Context and Key Challenges
  - Our Solution: Economic, Operational, Sustainability Benefits
  - Case Studies
- **Delivering What Matters Most:**
  - Economic Value
  - Operational Resilience
  - Environmental Performance

Introduction to Molecular Sieve Dryers



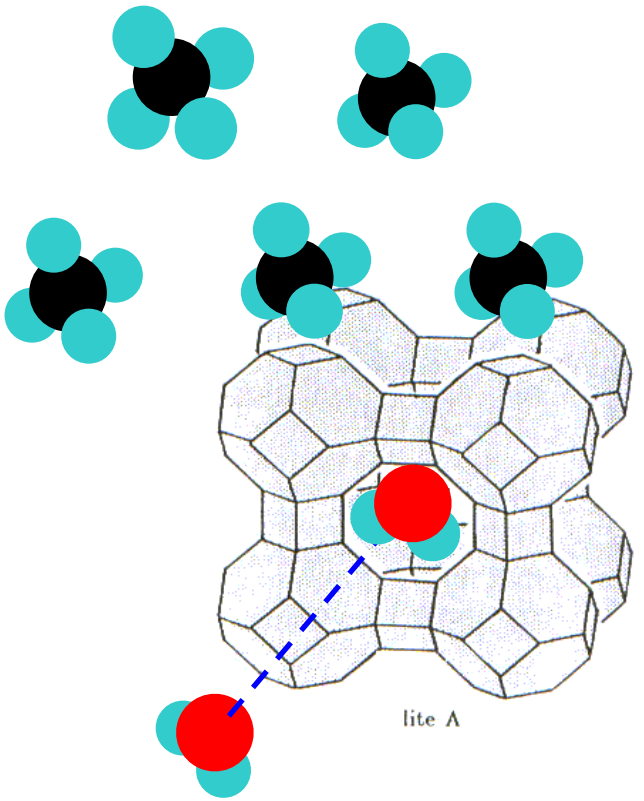
Molecular Sieves: What For?

→ Molecular sieves are zeolite-based adsorbents

→ They are used to separate impurities, by size and polarity, from a gas or liquid

- Alumino-silicates with crystalline structure showing channels and cavities (pores)
- The electronic activity of the large internal surface attracts polar molecules
- If they are small enough to enter the pores they are **adsorbed** (captured)
- Other molecules go their way

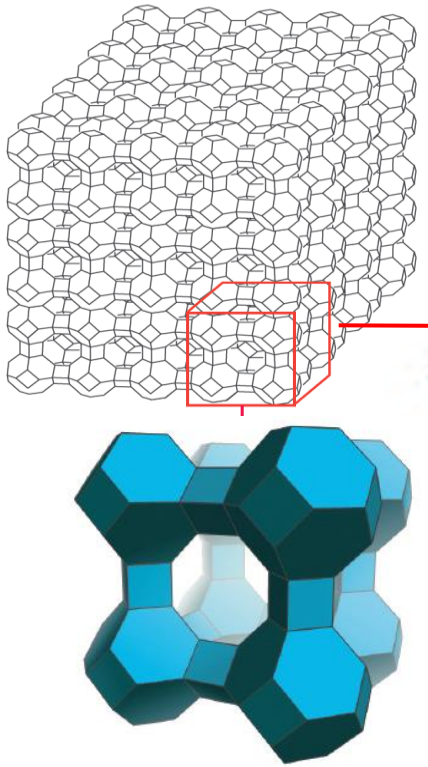
→ Performance depends on:
  - Type of sieves
  - Operating conditions : concentration, temperature, pressure
  - Contaminants



Molecular Sieves: Structure & Forms

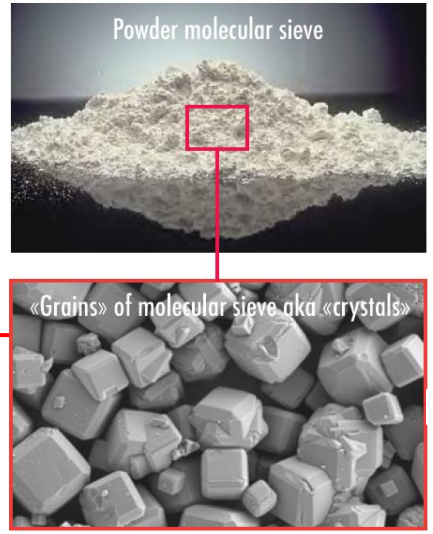
→ The initial crystal

- Zeolite (alumino-silicate)



→ The zeolite powder

- SEM photograph



→ The final material

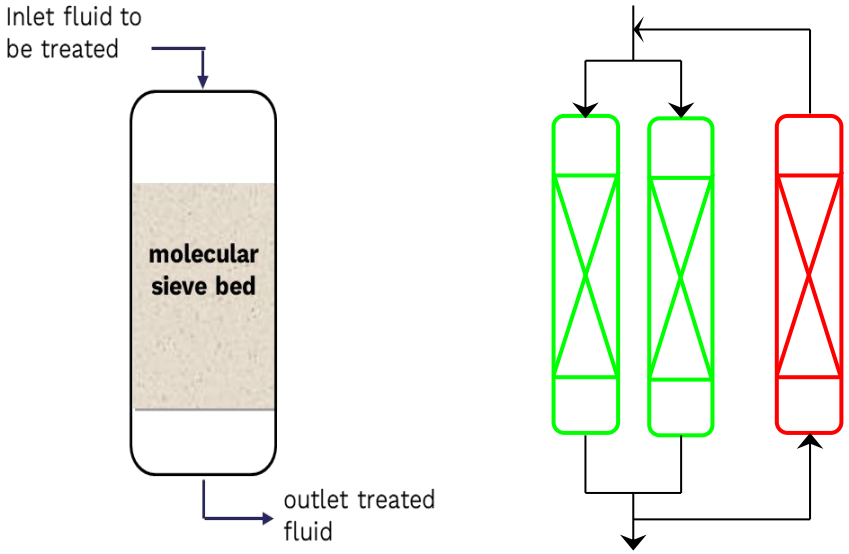
- Powder + binding clay
- Beads or pellets

Industrial adsorption: Dynamic Mechanism

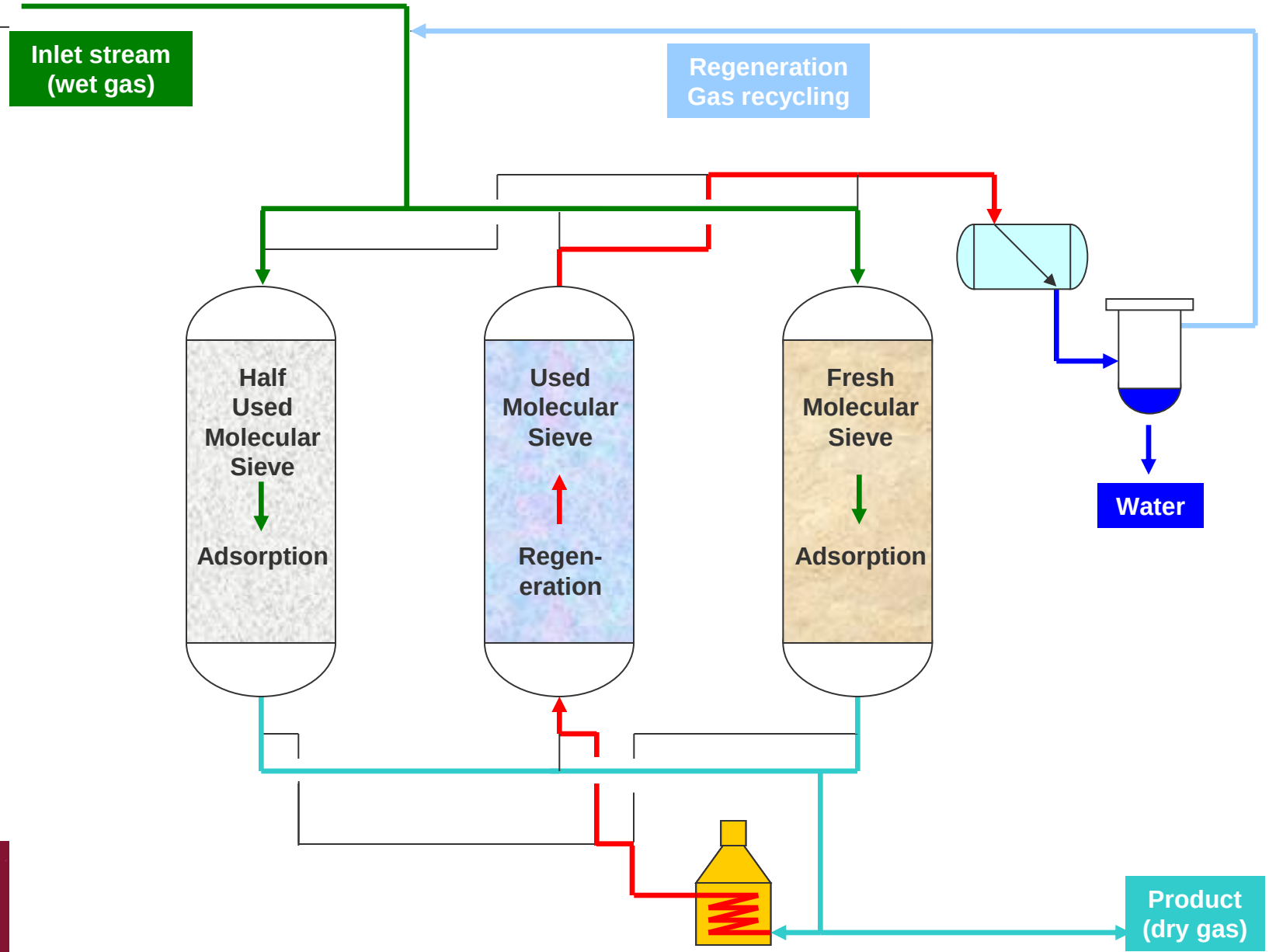
→ Molecular sieves are loaded in fixed beds

- Several beds in parallel in adsorption are common to treat large flow-rates

- Adsorption capacity is **limited**
- At end of adsorption, molecular sieves become saturated → must be regenerated with dry gas at high temperatures

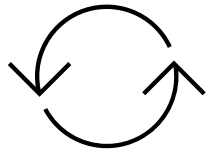


Example: Industrial Adsorption Cycle



Rising Demands on Midstream Treating Units

- Inherent Constraints:
  - Variable feed gas composition
  - Limited unit redundancy
  - Ultra-tight product specifications
  - High fuel & energy demand for regeneration

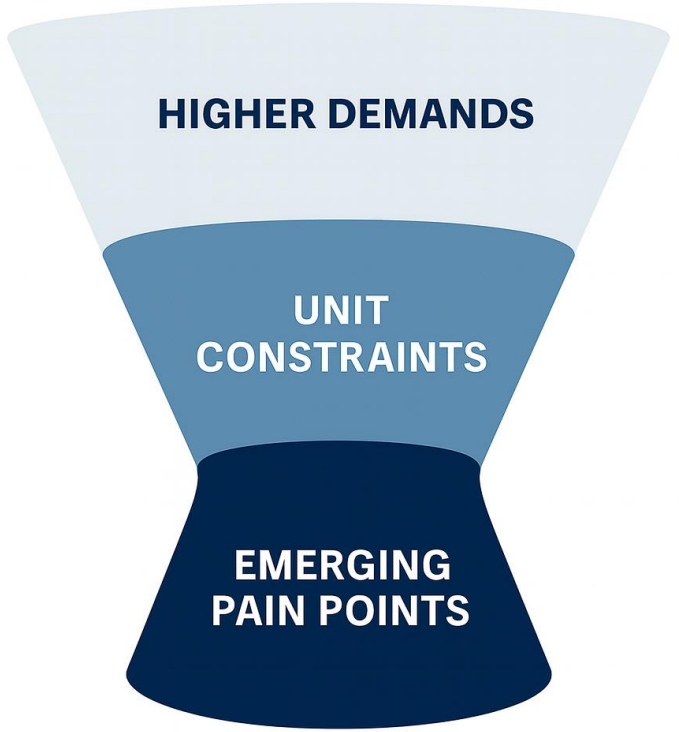


- What's Changing Now:
  - Higher throughputs
  - Tighter ESG requirements

- *Treating units must now balance performance, emissions, and uptime under tougher conditions*

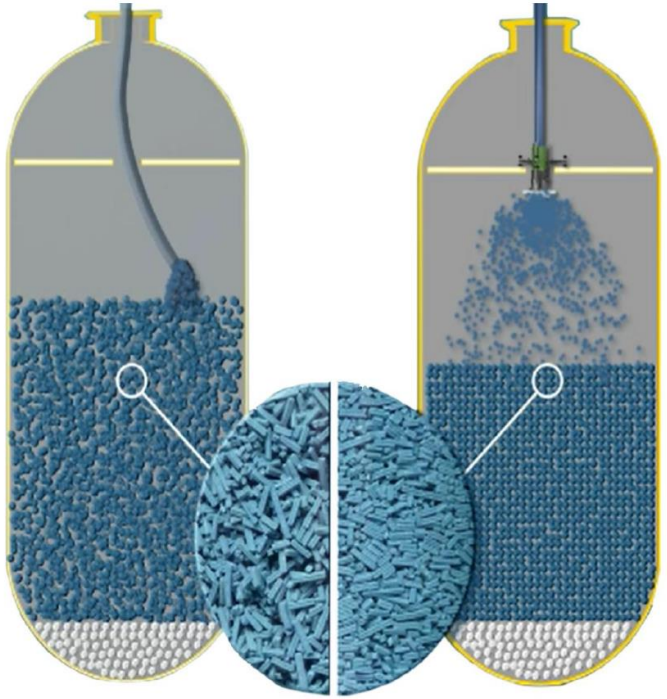
When Molecular Sieve Beds Become the Bottleneck

- Higher demand on units can lead to the following:
  - Poor loading practices → uneven distribution
  - Shorter cycles → higher OPEX & emissions)
  - Premature changeouts → lost capacity, downtime
  - Breakthrough risk → product spec violations, downtime
  - Increased burden on operators → more monitoring and troubleshooting



Upgrading Molecular Sieve Units: Our Approach

- Advanced Adsorbent: Siliporite® SRA-LR



- Homogeneous Dense Loading: CALYDENS®

- Internal Optimization: Shaped Support Grid™

Siliporite® SRA-LR: Next-Gen 4A Media

- **+15%** Water Adsorption Capacity → higher throughput
- **+7%** Bulk Density → more adsorbent per vessel
- **Together:** extended cycle times and longer run lengths

- Drop-In Replacement
  - Fits directly into existing vessels
- Perfect for Constrained Assets
  - Brownfield or throughput-limited systems

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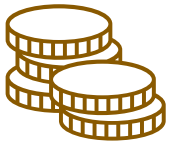
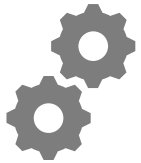
Cut Fuel Use and Regen Costs Without Redesign

- Siliporite® SRA-LR provides the following benefits:

- Longer Cycle Times and Run Lengths → Fewer regenerations



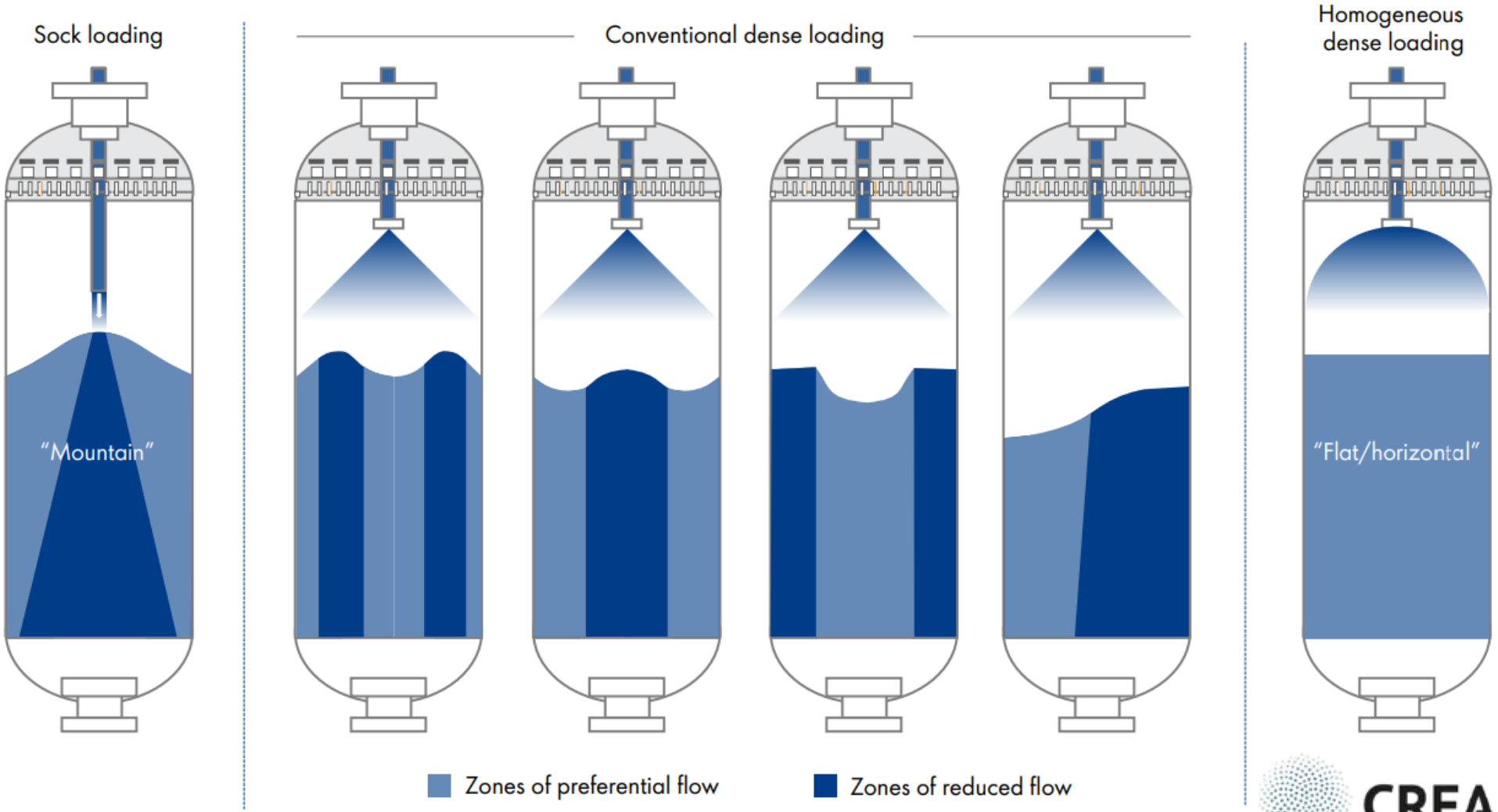
- Economic: Lower fuel & power use



- Operational: Greater flexibility, fewer interruptions, less frequent changeouts

- Sustainability: Reduced emissions and direct CO_2 savings

CALYDENS®: Eliminating Loading Problems



- Uniform loading → eliminates dead zones

Operational Benefits of CALYDENS®

Higher Packing Density	15 – 30% more adsorbent per vessel
Gentle Loading	Sieve integrity preserved → Fewer fines generated, lower ΔP buildup
Improved Flow Distribution	Homogeneous Loading prevents channeling and bed inconsistencies
No Equipment Modifications	Seamless retrofit into existing vessels

Shaped Support Grid™ (SSG): How It Works

- Radial design → uniform flow distribution
- Increases usable bed volume by **15 – 30%**

Traditional Support Grid Configuration

Shaped Support Grid™

- Compared with flat screens:
  - Lower pressure drop
  - Stronger bed support
  - Fewer fines generated
- Retrofit compatible → no vessel modifications required

Operational Benefits of the SSG

Benefit	Impact	Value to Operator
Increased Bed Volume	15 – 30% more adsorbent per vessel	Extended cycle time and run length, fewer changeouts, reduced fuel use
Improved Flow Distribution	Reduces required regeneration gas flow	Lower OPEX, energy savings
Lower Fines Generation	Reduced ΔP buildup	Longer run length, Fewer downstream screen changes
Easy Installation	Facilitates retrofits	Hassle-free changeout

Johnson Screens
A brand of Aqseptence Group

Case Study: Remote O&G Terminal (EU)

Key Project Details	
Facility Type:	Remote O&G Terminal
Application:	Gas Dehydration
Equipment:	Molecular Sieve Dryers
Constraints:	Very remote site – downtime is extremely costly (contractors must be flown in, upstream shut-ins)

CLIENT OBJECTIVES:

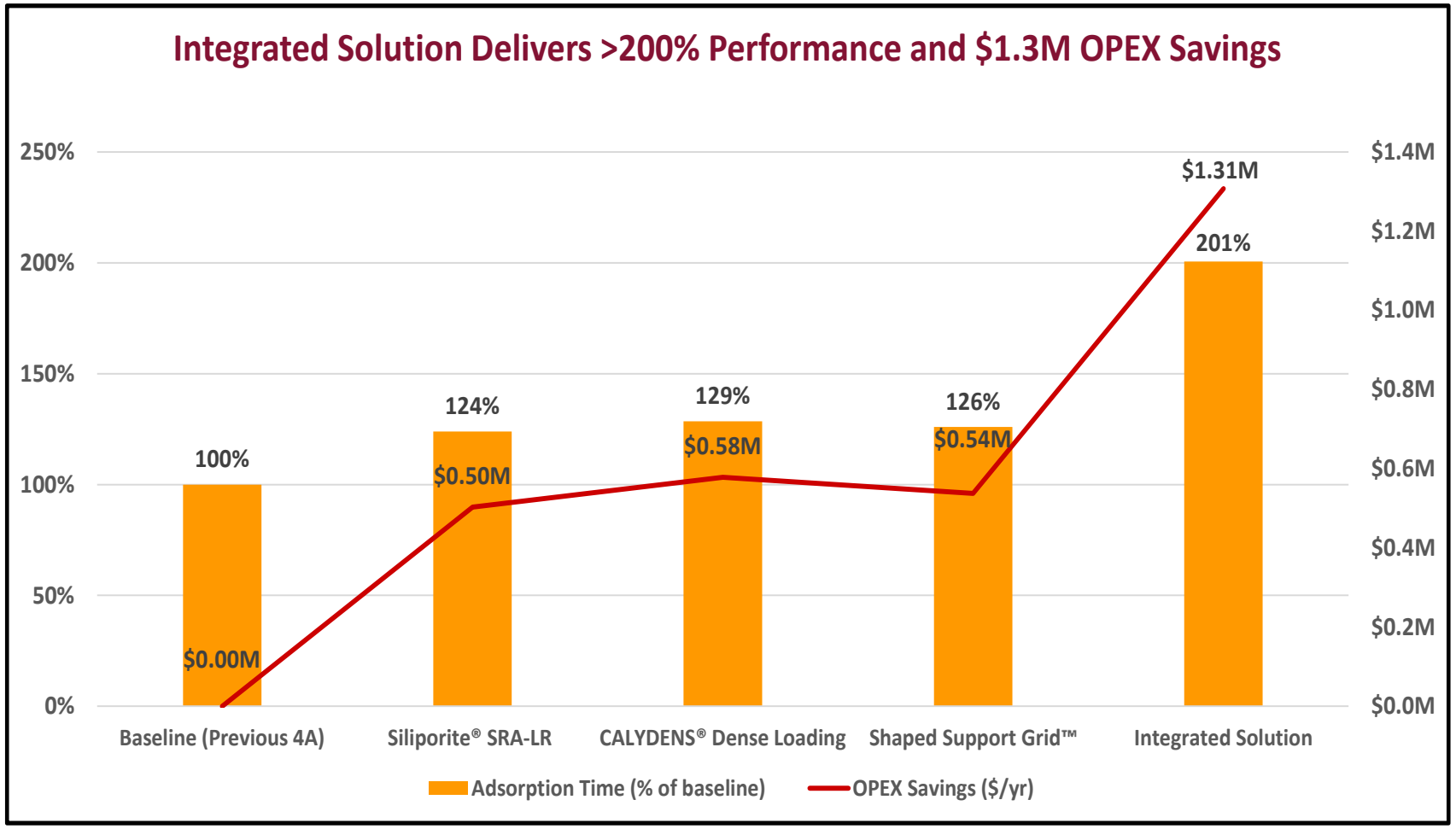
- Debottleneck unit to increase capacity and extend time cycle time
- Minimize costly OPEX associated with changeouts
- Avoid CAPEX or redesign

Scope & Execution

- What we did:

1. Discharged and discarded spent media from previous run
2. Installed Shaped Support Grid™ to maximize bed utilization
3. Switched to Siliporite® SRA-LR for improved capacity and uptake kinetics
4. Performed homogeneous dense loading with CALYDENS®

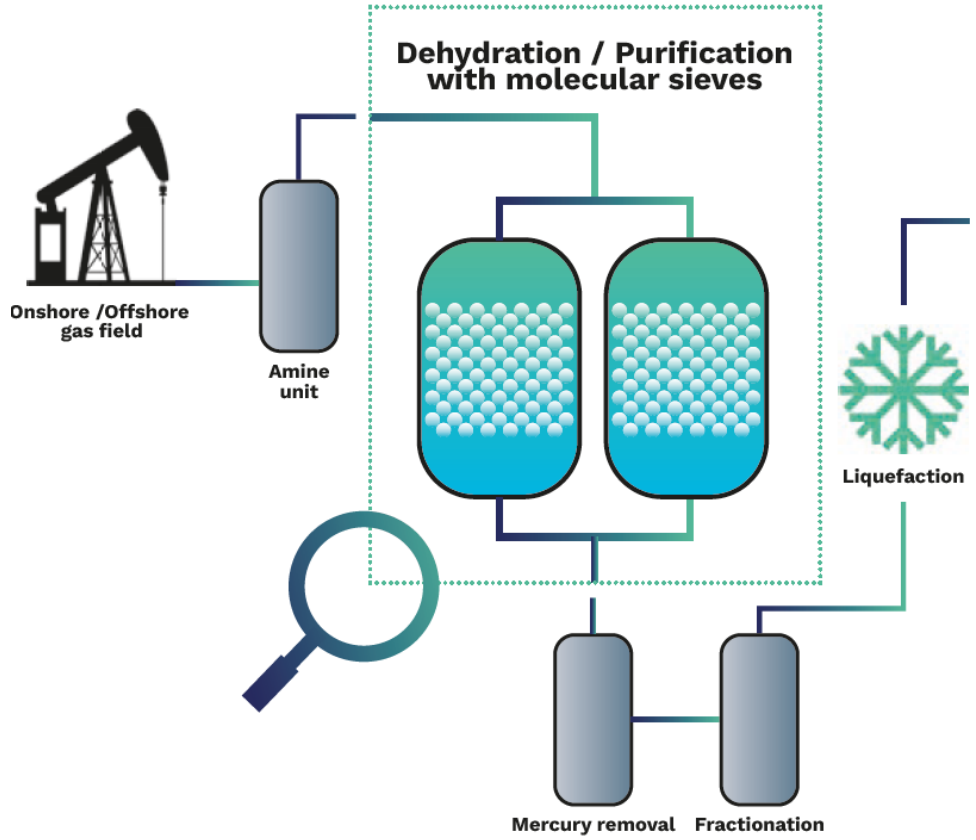
Results & Benefits



- Smooth startup & operation → no issues experienced
- **Doubled** cycle time → extended run length and saved **$1.31M** in OPEX annually
- **50% fewer changeouts** → higher uptime, less maintenance burden
- Retrofit-friendly → no CAPEX required

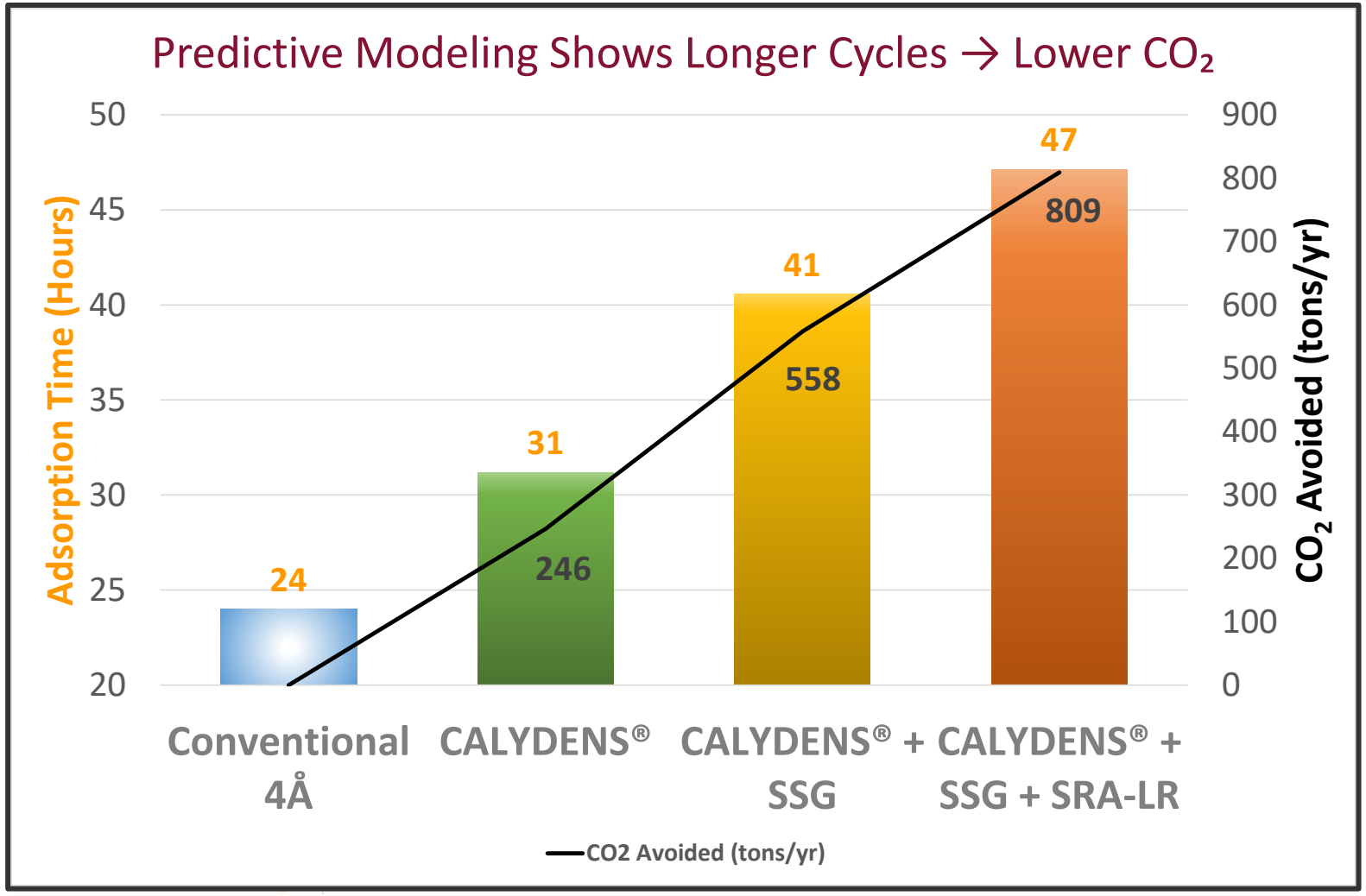
Case Study: LNG Pre-Treatment

Key Project Details	
Facility Type:	LNG liquefaction plant (existing)
Application:	Gas Dehydration
Equipment:	Molecular Sieve Dryers
Constraints:	Limited space, no extra utilities, uptime, turndown
Objective:	Show how upgrades can extend cycle life and cut regenerations to reduce OPEX and CO_2 emissions



**This case study is based on predictive modeling, not a live field deployment.*

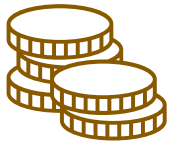
Predictive Results Validate Field Learnings



- Adsorption time **doubled** → consistent with field results
- **809 tons** CO_2 avoided annually → from reduced regeneration frequency

Summary & Next Steps

Key Takeaways from Field & Modeling Results

- **Economic** 
  - OPEX savings (fuel, energy, maintenance)
  - CAPEX avoidance
- **Operational** 
  - Higher uptime and reliability
  - Extended cycle lengths
  - Increased capacity to handle upsets
- **Sustainability** 
  - Lower fuel and energy demand
  - Reduced CO_2 emissions

Future Opportunities:

- Expand deployments to additional facilities
- Strengthen partnerships with Crealyst & Johnson Screens
- Validate data long-term with performance monitoring
- Support clients on ESG goals & CAPEX avoidance

Questions?


Oil
CREALYST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Thank you!