Molecular Sieve Systems for Gas Sweetening

Physical binding on a regenerable adsorbent sieve
The heart of the Frames process is the regenerable adsorbent or molecular sieve. As the sour gas flows through the sieve, the associated CO₂, H₂S and other sulfur compounds physically bind to the molecular adsorbent to produce a sweet, dry gas ready for downstream processing. We work with leading suppliers to specify the best possible molecular sieve system for your unique operating environment.

Two-vessel system for peak performance
Frames’ units typically use a two-vessel system, with each vessel automatically alternating between an adsorption and a regeneration phase. Our engineers are highly experienced in system operations, and will design a switching cycle that optimizes the lifetime of the adsorbent beds while conserving energy costs.

Fully integrates into your production system
Designed and installed as a complete modular package, Frames’ Molecular Sieve Systems come complete with all the equipment, piping, instruments and valves required for safe and efficient gas sweetening. This includes options for optimizing the sweetening process by pre-filtering or cooling the sour gas stream, using particle filters to protect downstream equipment and a vessel design resulting in crucial uniform distribution of the gas.

Product Definition
Frames’ Molecular Sieve Systems efficiently sweeten and dry gas streams by removing water, carbon dioxide, hydrogen sulfide, mercaptans and other sulfur compounds. Using the latest molecular sieve technology, Frames delivers a regenerable and cost-effective solution that increases the value of gas resources.

Product Description
At Frames, we work to optimize resource value while tightly controlling installation and operating costs. Incorporating the best possible technology for your operating environment, Frames’ Molecular Sieve Systems efficiently sweeten gas streams by removing contaminants in both the gaseous and liquid phases. Ideal for working with low concentrations of sour components, or where deep removal is required, Frames’ Molecular Sieves are flexible solutions for both onshore and offshore applications.
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Process Description

Feed gas enters the top of the Frames Molecular Sieve System and flows downwards through the molecular sieve material to remove contaminants. The sweetened gas then exits the bottom of the unit, ready for downstream processing.

In a two-vessel system, one adsorber is in use while the other is being regenerated for reuse, with flow automatically switched between the two units to optimize system performance.

In the regeneration phase, the molecular sieve is gradually heated by a regeneration gas to remove the sour components from the molecular sieve. In gas applications, regeneration is typically performed by the sweetened product gas. We also have options for using alternative regenerating gases, such as nitrogen. In liquid applications, fuel gas is used. When the sour components have been removed, the beds are gas-cooled, ready for the next adsorption phase.

Depending on the outlet specifications for residual contaminants, a bypass over the system can be installed to optimize bed lifetime.

Gas Sweetening - Molecular Sieve System - typical scheme
Molecular Sieve Systems for Gas Sweetening

Project Management

At Frames, we look at the bigger picture. Our team of in-house experts works with our clients to understand their business, and challenge them to examine better solutions that give them the competitive edge.

From optimizing production to cutting operating costs, we work to fully integrate our Frames solutions into your production system within budget, on time, and in spec for years of trouble-free operation.

We understand your expectations for high performance, and use industry-leading project management and document control to design, construct, and commission quality products where and when you need them. Our centralized engineering and construction teams in the Netherlands work together to find effective answers to each unique project, with our global network of offices, suppliers, and trusted service providers giving us the global reach to fully accomplish the most challenging projects.

Technical Details

• Ideal for deep H₂S and CO₂ removal as well as gas drying
• Selective H₂S removal to very low levels
• Regenerable solid, fixed adsorbent bed
• Simple operation
• Low capital expenses

Added Value Frames

• Modularized design that minimizes the amount of interfaces during project execution and cuts installation time and costs.
• Complete module with small footprint for offshore applications
• We work with leading suppliers to deliver the optimum technology for your unique operating environment
• Robust and reliable units designed with 3D engineering methods
• Full design, build and install service for single-point accountability
• Process and mechanical guarantees for the complete package
• Worldwide fabrication capabilities

References

• Q16 Field Development – Oranje Nassau Energy, the Netherlands

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## Frames Family Tree

### Onshore

- **Multiphase Separation**
  - Production Separators (High & Low Pressure)
  - Test Separator
  - Degasser & Knock-Out Drum
  - Water Oil Separator (WOGEP)
  - Compact Inline Separation

- **Electrostatic Coalescers**
  - Dehydrator
  - Desalter

- **Produced Water Treatment**
  - Deoiling & Desanding Hydrocyclones
  - Gas Floateration
  - Media Filtration
  - Sand Cleaning

- **Separation Internals**

- **Heat Exchangers**

### Offshore

- **Gas Separation**
  - Demisting
  - Scrubbers
  - Filters

- **Heat Exchangers**
  - Shell & Tube Heat Exchangers

- **Air-Cooled Coolers**

- **Gas Sweetening (H₂S & CO₂)**
  - Amines
  - Thiopaq
  - Solid Bed Scavenger
  - Membrane
  - Molecular Sieve

- **Gas Dehydration**
  - Glycol (TEG)
  - Molecular Sieve

- **Dew Point Control**
  - Low Temperature Separation (LTS)
  - Solid Desiccant

- **Hydrate Inhibition**
  - MEG/DEG Recovery
  - Methanol Recovery
  - MEG/DEG Desalination

- **Light Hydrocarbon Recovery**
  - Condensate Stabilization
  - Fractionation

- **Fuel Gas Treatment**

### Floaters

- **Flow Control & Safeguarding**
  - Wellhead Control
  - Subsea Hydraulic Power Units
  - Hydraulic Power Units
  - IWOCs (Intervention Workover Control Systems)
  - TUTU (Topside Umbilical Termination Unit)
  - Cargo Ballasting Systems

- **Safety Instrumented Systems**
  - High Integrity Protection Systems (HIPPS)

- **Chemical Injection**
  - Chemical & Methanol Injection Systems
  - Chemical Distribution Systems

- **Valve Automation Center**
  - Actuators and Actuated Valve Packages
  - Control Systems

- **Automation**
  - Buoy Control
  - Tank Farm Control & Safeguarding

### Services

- **Asset Life Cycle Management**
- **Maintenance & Field Services**
- **Spare Parts**
- **Operator Training**
- **Engineering Studies**
  - Conceptual
  - FEED and Basic

### Integrated Solutions

- Total Plant Solutions
- Industrial CO₂ Modules
- Early Production Facilities
- Wellsite Packages
- Biogas

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Frames
a family of oil & gas solutions