



Honeywell
UOP



UOP Gas Processing

Single Source Supplier for Technology,
Service and Performance Assurance

**Proven gas treating solutions for
offshore floating or fixed platforms**

UOP proven offshore gas processing solutions offer significant reductions in space and weight along with the reliability and economics to meet your project goals.

Natural gas streams contain a variety of contaminants at levels that can damage or cause blockage to your process equipment and make your gas stream unacceptable. Whether you need to extract CO₂, H₂S, mercury and water prior to liquefaction, or remove mercaptans and other sulfur compounds from your feed gas to meet final product specifications, UOP offers single-source, integrated solutions designed to meet your exact needs for weight, space and economics.

Where water depths are moderate and platforms can be located within (economical) pipeline distance from shore, fixed platforms are being installed with gas processing equipment to meet pipeline specifications and provide re-injection of acid gases. Where water depths make fixed platforms impractical, Floating Production Storage and Offloading (FPSO) or Floating Liquefied Natural Gas (FLNG) vessels are used to achieve the same processing goals.

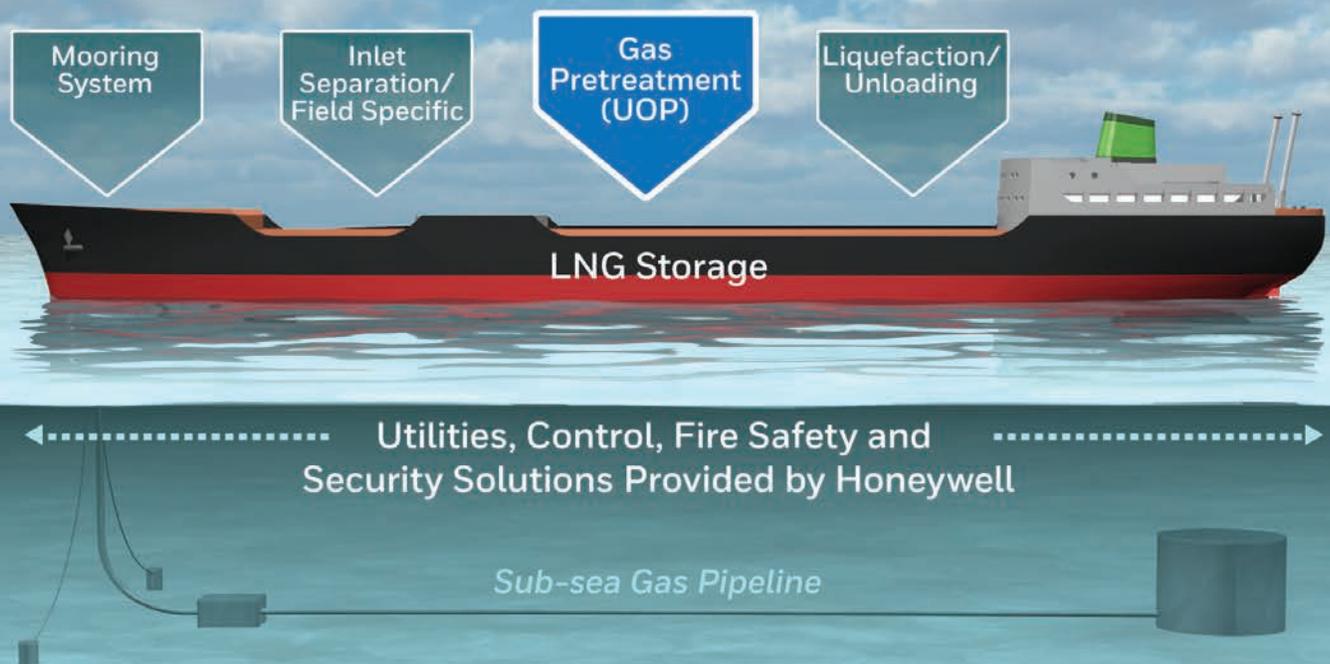
UOP technology and know-how has been utilized in the design, fabrication and operation of several offshore gas processing systems,

whether on a platform or an FPSO. In particular, UOP MOLSITM adsorbents, UOP GB adsorbents and UOP SeparexTM membrane systems have been successfully employed to remove water, contaminants and acid gases offshore.

UOP Integrated Solutions for LNG

As a premier supplier of natural gas treatment solutions for over 60 years, UOP has accumulated an impressive resume in providing proprietary and technology advancements and processes for integrated, single-source pre-treatment of LNG at facilities in all parts of the world. Our unique offering includes solvent, adsorption, and membrane technologies and can be custom designed to fit the levels of acid gas in the feed stream including a processor's preference for a solvent-free scheme. Applying LNG offshore, UOP provides:

- A complete portfolio of proven gas treating processes into a single system
- Single technology to avoid handoffs to eliminate schedule delays
- Consistent engineering design work between all technologies provided by UOP
- Key technology for global LNG and NGL plants
- Operator training, commissioning and startup support from one source
- Continuing technical support to operations for entire facility lifecycle
- OVERALL Performance Guarantee



Mercury Removal - In addition to MOLSIV technology, UOP has the unique advantage of providing full coverage for removal of mercury with two dedicated solutions. Used in tandem, UOP's non-regenerative guard bed technology and regenerative HgSIV™ adsorbent process ensure that mercury can be totally sequestered.

UOP Separex™ Membrane Systems -

UOP membranes have been proven in multiple offshore applications. With a semi-permeable film of polymer, they utilize a solution-diffusion based separation process to selectively dissolve CO₂ and H₂S into its surface and diffuse them through the polymer into a low-pressure permeate stream. They are easy to start-up and operate, with minimum weight and compactness for space efficiency.

UOP AmineGuard™ FS - With more than 40 years experience and 230+ licensed units, this process reliably removes bulk or trace levels of acid gas components. Tailored to the offshore environment, Amine Guard FS can remove CO₂ and H₂S to acceptable levels regardless of gas composition.

UOP MOLSIV™ Adsorbents - UOP adsorbents combine to simultaneously remove water and contaminants from the gas stream and have for more than 60 years. With UOP-developed regenerative Zeolite technologies, multiple-layered adsorbent units have proven to be robust and long lasting with a high on-stream efficiency to dry gas to less than 0.1ppmv of H₂O and lower mercury to levels of less than 0.01 micrograms/Nm³. More than 100 MOLSIV units remove CO₂ to an LNG specification of <50 ppm and sulfur removal can also be achieved.

NGL/LPG Recovery - In alliance with Ortloff Engineers, a world-wide leader in the area of cryogenic gas liquids recovery, UOP provides a means of increasing the yield of high-value ethane, propane, and heavier hydrocarbon components of the natural gas stream prior to methane liquefaction. The process can accommodate a wide range of compositions and inlet pressures.

UOP-Twister® Supersonic Separation Systems -

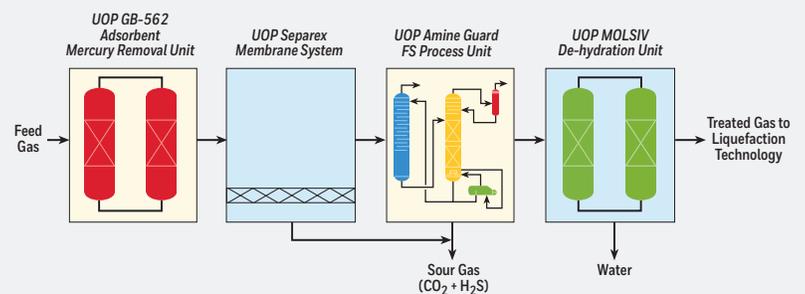
In alliance with Twister BV, UOP provides a proven, simple and robust solution to remove water and heavier hydrocarbon components (C₃+) from natural gas streams down to gas pipeline specifications. The system is compact and ideal for offshore applications by eliminating maintenance and chemical consumption.

Value added with UOP offshore FLNG/FPSO

UOP units on offshore projects offer many unique advantages to assist its customers in their pre-treatment facilities planning.

- Light-weight unit designs integrating all needed technologies in modularized units
- Small footprint to allow optimum process configurations and center of gravity
- Fewer upsets and longer operating periods between shutdowns
- Contaminant removal to protect downstream piping and process equipment
- Proven processes to increase revenue from gas streams
- Low acid gas removal costs

One of Three Potential Integrated FLNG Pre-treatment Schemes



Visit UOP.com/Gas Processing/FLNG to view the Solvent-free process scheme.

Value added with UOP offshore treating to pipeline specifications

UOP Separex membrane units on offshore platform or FPSO projects offer many unique advantages to assist its customers in their gas treatment facilities planning.

- Minimal weight unit designs with small footprint to lower the total installed cost of gas processing equipment
- All UOP technologies in modularized units
- Delivery of acid gases at elevated pressure to minimize re-injection compressor horsepower
- Consistently reliable operation with high on-stream time and minimal operator attention



Case Study

FPSO Membrane System

Situation

MODEC International was looking for a different approach to processing associated gas. The project objectives included a flexible design for variations in feed gas rates and CO₂ content while re-injecting CO₂ for reservoir pressure maintenance.

UOP Solution

The UOP Separex membrane system was selected for bulk CO₂ removal to pipeline specification. Flexible isolation of the membrane area was used to obtain optimized performance at any feed gas rate or CO₂ concentration within the operating envelope. The CO₂-rich permeate stream was delivered at elevated pressure (relative to an amine unit) for re-injection. Upstream of the CO₂ removal unit, UOP AW-500 adsorbent was selected to dehydrate the feed gas so that both the permeate and product gas streams would be free of water.

Customer Benefits

UOP worked with MODEC to optimize the dehydrator for utility savings, lowering both the capital and operating costs of the unit. A two-stage membrane system was installed to obtain maximum hydrocarbon recovery across the range of inlet gas conditions. The Separex membrane module (with all piping to skid-edge and instruments wired to junction boxes) was delivered on time for integration into the topsides processing scheme, keeping the overall project on schedule for early delivery. The Separex unit on the ship was successfully commissioned in July 2011. A second MODEC ship using UOP technology is expected to be commissioned in September 2012.



MODEC MV-22 FPSO offshore Brazil has a two-stage Separex membrane system.

Backed by experience and customer commitment

UOP provides processes, technologies and equipment for gas processing, refining and petrochemical industries. With five engineering centers and 11 manufacturing facilities in 16 countries, we are close to our customers wherever they are. Since 1914, UOP has developed more than 70 licensed processes for the industries we serve. We are the world's leading supplier of catalysts and molecular sieve adsorbents and provide a full range of technical services and support.

A Twister system for dew point control is installed in the South China Sea



For more information

For more information, please contact your UOP representative or visit us online at www.uop.com

UOP LLC, A Honeywell Company

25 East Algonquin Road
Des Plaines, IL 60017-5017, U.S.A.
Tel: +1-847-391-2000
www.uop.com



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