GAS TECHNOLOGY PORTFOLIO

Global experience with over 100 gas projects delivered, coupled with innovative proprietary technologies for gas sweetening and dehydration.
WHO WE ARE

Integrated process separation technology solutions provider for oil, gas and produced water streams to the global oil and gas industry

ProSep has a wide range of capabilities including crude dehydration and desalting, gas treatment and dehydration as well as a full lifecycle produced water treatment offering. ProSep Energy Services provides a diverse range of rental skids designed for the temporary treatment of a wide variety produced water streams.

ProSep is headquartered in Houston, TX, USA which is also the location of our state of the art laboratory and manufacturing/fabrication facility. ProSep has regional offices in Aberdeen, UK, Abu Dhabi, UAE and Kuala Lumpur, Malaysia.

WHY PROSEP

- Global presence with over 200 projects delivered worldwide. On average we have delivered a new project every 15 days since 2005.
- Well-documented global reputation, and track record for performance, value and safety.
- Flexible & dynamic team offering custom solutions to customers.
- Comprehensive solutions across oil, gas, and produced water streams.
- Innovative proprietary technologies proven to reduce OPEX & CAPEX.

WHAT WE DO

Our patented portfolio of onshore and offshore solutions for the treatment of oil, gas, and produced water offer innovative technologies packaged with global project management and execution expertise.

ProSep provides technologies & solutions for:

- PRIMARY SEPARATION
- CHEMICAL INJECTION
- THIRD PARTY MANUFACTURING
- RENTAL/LEASE OPTIONS
- GAS DEHYDRATION
- CO₂ SWEETENING
- H₂S SCAVENGING
- FUEL GAS CONDITIONING
- HCDP REDUCTION
- DEMULSIFIER OPTIMIZATION
- DECREASED WASH WATER CONSUMPTION
- DEHYDRATION & DESALTING
- CRUDE BLENDING
- PRODUCED WATER TREATMENT
- OIL IN WATER POLISHING
- OIL COALESCEENCE
- SEAWATER TREATMENT
**PROSCAV™**

ProScav™ is a system for injecting, and mixing H$_2$S scavenger in the pipeline to remove moderate amount of H$_2$S from gas or liquids.

ProScav™ utilizes the scavenger chemical more efficiently than conventional injection systems such as atomizing nozzles, quills, and static mixers due to it’s mixer component’s efficient mass transfer capabilities.

It’s internal geometry provides extremely efficient mixing with a low pressure drop, typically below 0.3 bar. Scavenger consumption is reduced by 30 – 40% due to improved utility, and mass transfer. Other typical OPEX expenditure is also reduced, such as transportation, storage, handling, and disposal.

The award winning ProScav system’s compact size, low-maintenance, and tolerance to flow variations make it ideal on offshore installations, where the spent scavenger can be discharged to sea or disposal wells.

Compared to other offshore gas sweetening methods for H$_2$S-polishing, ProScav is extremely cost-efficient, particularly compared to solid scavengers.

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**FEATURES**

- Easy to install compact inline system
- Option for simultaneous flow metering & mixing
- Robust design for low maintenance

**BENEFITS**

- Exceptionally efficient mixing with low pressure drop (0.03 to 0.3 bar)
- 30 – 40% reduction in scavenger consumption
- High turndown ratio in scavenger injection rate
- Low to zero maintenance if the required 50 micron filter is equipped in the scavenger injection line

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**30 - 40% REDUCTION IN SCAVENGER CONSUMPTION**

**LOWER YOUR OPEX COSTS**

**EXCEPTIONAL MIXING EFFICIENCY WITH LOW PRESSURE DROP**

**HIGH TURN DOWN RATIO**

prosep.com
NATURAL GAS MEMBRANES

ProSep’s membrane technology and packaging capabilities provide customers with cost effective CO$_2$ removal/separation, H$_2$S removal, N$_2$ removal, dehydration, and hydrocarbon dew point control solutions.

EXPERIENCE

ProSep has designed, engineered, fabricated, installed, and commissioned over 200 membrane separation skids for natural gas applications in 15 countries worldwide.

We have extensive experience with gas separation membrane performance characterization and the potential contamination effects that may occur. ProSep can provide turnkey solutions from project design through fabrication, commissioning & start-up to post-installation service, including parts replacement.

CO$_2$ SEPARATION

Historically, CO$_2$ removal in natural gas streams has been conducted using amine systems. However, over the past thirty years membrane systems have gained notable traction in this market segment with ProSep leading in innovation and system design.

Ease of operation, flexibility, and lower capital requirements routinely make membranes the system of choice for CO$_2$ removal from natural gas streams. ProSep’s membrane systems successfully treat feed gas at a wide range (between 3% - 88%) of inlet pressures and feed gas concentrations.

BENEFITS

- Wide range of feed gas pressure, compositions, and flow rate (high turndown)
- Low weight & space requirements
- Flexible to fit special footprint configurations particularly important for offshore applications
- Reduced environmental impact
- Can interchange with conventional membrane elements

LONGER LIFE THAN CELLULOSE ACETATE MEMBRANES

INCREASE HYDROCARBON RECOVERY BY 10%

RESISTANCE TO LIQUID HYDROCARBON & WATER EXPOSURE

60% HIGHER SELECTIVITY THAN CONVENTIONAL ELEMENTS
The same CO$_2$ membrane systems used to sweeten our customers’ natural gas sales line can also be used to concentrate CO$_2$ for injection for EOR applications. With our partners at FujiFilm, ProSep now offers an enhanced line of CO$_2$ membranes for separation and removal called the Apura. They utilize a new, innovative polymer and thin film coating technology to provide new levels of performance with excellent resistance to contaminants.

ProSep and our partner FujiFilm membrane modules provide extended life expectancy over traditional cellulose acetate (CA) modules which are typically replaced at a rate of 20% per year - equivalent to complete replacement of modules every five years. The ProSep elements’ extended life expectancy is based on field performance but will depend on proper pretreatment and operation for which the modules have been designed to operate.

**PROSEP’S MEMBRANE SKID**

ProSep’s membrane skids are modular in design and construction lending themselves to easy scalability as production volumes and concentrations change. ProSep membrane skids are designed to allow seamless addition or removal of membrane elements to compensate for process changes.

Our 56,000 sq.ft. purpose built fabrication facility has the capabilities to undertake the manufacture of large structural fabrications, vessels and piping spools, as well as being able to fully manufacture packaged membrane equipment.

Depending on the design operating conditions, ProSep membrane systems are provided in one or two-stage designs.

+ One stage configuration
+ Two-stage configuration

In some instances a two-stage system may be required to achieve maximum undesirable component content in the permeate stream and maximum hydrocarbon recovery to the sales pipeline. Performance of two-stage systems can achieve up to 99% hydrocarbon recovery in the sales gas stream.

**LOW CAPITAL INVESTMENT FOR MEMBRANE SYSTEM**

**EASY START UP AND SHUTDOWN**

**MINIMAL UTILITIES REQUIRED**

**LOW MAINTENANCE AND OPEX**

**WHY PROSEP?**

+ Recognized as a global leader in the CO$_2$ membrane market as well as process application, and optimization
+ Experience with new, robust, top of the line FujiFilm Apura membranes as well as other sweetening membranes including flat sheet and hollow fiber designs
+ Global presence with over 200 membrane skids installed
+ Well-documented global reputation and track record for performance, value and safety
+ Offer design, fabrication, commissioning, maintenance, and lease options for membrane skids
+ Provide timely response to fulfill our customer needs globally
PRODRY™ & TEG

ProDry™ is primarily used in the glycol dehydration process for the removal of water from gas flows as a smaller alternative for conventional contact towers. ProSep also designs and fabricates gas dehydration systems triethylene glycol (TEG).

PRODRY™
The key component of the ProDry™ system is its injection mixer which achieves efficient mass transfer between glycol and gas containing H₂O.

The systems internal geometry provides extremely efficient mixing with a low pressure drop, typically below 0.3 bar. Optimal at high pressure and flow rate conditions, ProDry can reduce footprint, weight and operating expenditures.

PRODRY™ FEATURES:
+ Compact inline system; easy to install at any pipe angle
+ Small footprint and low installation weight
+ Feasible for high pressure applications (<100 barg)
+ De-bottlenecking of existing gas dehydration systems
+ Not sensitive to platform (wave or ship) motion

This compact technology is ideal to improve capacity of existing systems or as a new stand-alone system when moderate dew point reductions are required.

TEG - GAS DEHYDRATION
We design and build to site-specific requirements by engineering every gas dehydration system with the latest process simulation software. The detailed design of the equipment considers performance, operability, reliability and safety. Tailored system employs automatic control coupled with monitoring technologies local or integrated in the centralized control system of the plant.

Proprietary solutions for further increasing the efficiency/de-bottlenecking of existing units, by combining a co-current ProDry mixer in series with a conventional counter-current contactor.

HIGH EFFICIENCY MIXING WITH LOW PRESSURE DROP
INCREASED DEW POINT REDUCTION FOR EXISTING SYSTEMS
HIGH GAS FLOW RATE IN CO-CURRENT CONTACTOR
NO RISK FOR FLOODING OR FOAMING IN THE PRODRY™ CONTACTOR UNIT
ProSep has delivered over 100 gas projects since 2005 working with 55 different operators and service companies across 25 countries.

**CO₂ MEMBRANES**

**Co₂ Field Expansion**
- Location: West Texas, USA
- Equipment: 8 x 36 tube membrane skid packages
- Application: EOR CO₂ recovery
- Membrane type: Spiral bound
- Feed flow: 220 MMSCFD
- CO₂: 88.17%
- Residue CO₂: 10%

**Natural Gas Sweetening**
- Location: California, USA
- Equipment: 2 x Forced air draft coolers; 2 x Pretreatment skids; 2 x 42 tube membrane skids
- Membrane type: Spiral bound
- Application: CO₂ sweetening
- Feed flow: 150 MMSCFD
- CO₂: 3.0%
- Residue CO₂: <1.5%

**Fuel Gas Conditioning**

**Field Compression**
- Location: Malaysia
- Equipment: Fuel gas and seal gas package
- Fuel gas flow rate: 17 MMSCFD
- Outlet gas superheat: 400°C differential temperature above the dew point at all operating pressure levels
- Seal gas at a flow rate: 0.8 MMSCFD
- Outlet gas superheat: 400°C
- Performance: Dry fuel gas at superheat 280°C above its hydrocarbon dew point in all operating cases.

**Nitrogen Generation**

**TGT FPSO Field Development**
- Location: Offshore Vietnam
- Equipment: Nitrogen generator package
- Equipment size (LxWxH): 5.3m x 3.2m x 5.9m
- Performance: Nitrogen gas - higher purity ≥ 97% volume at 220 Sm³/hr

**H₂S Scavenging**

**H₂S Scavenging Project**
- Location: Norwegian sea
- Equipment: One 8” ProScav™ scavenger injection mixer. Length: 1250 mm
- Flow rate (KG/H): 0.25 – 2 (MIN-MAX)
- Inlet pressure (P) (BAR): 38
- Operating temperature (T) (°C): 60