OIL TECHNOLOGY PORTFOLIO

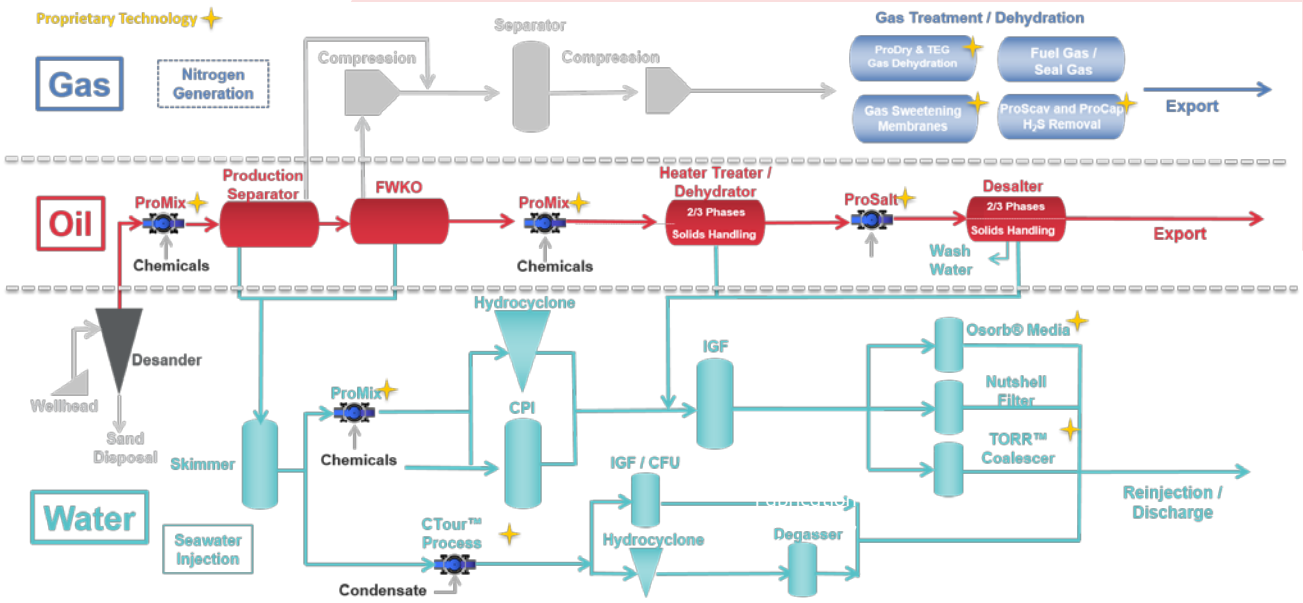
Innovative proprietary mixing technologies coupled with a primary separation, desalting and dehydration technology portfolio.

Crude desalter in ProSep Manufacturing facility

ProSep

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.

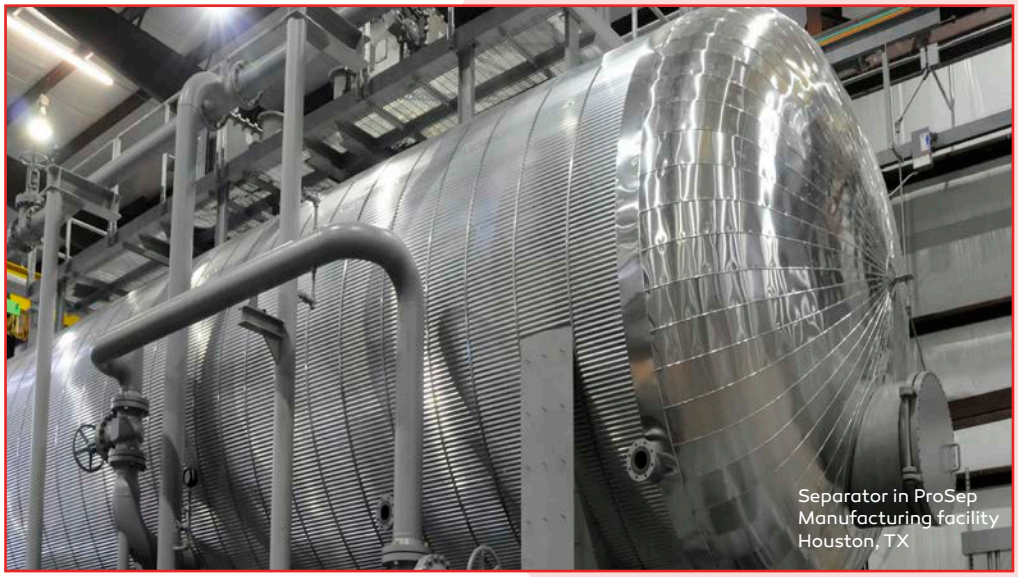
ProSep provides technologies & solutions for:

- PRIMARY SEPARATION
- CHEMICAL INJECTION
- THIRD PARTY MANUFACTURING
- RENTAL/LEASE OPTIONS
- GAS DEHYDRATION
- CO_2 SWEETENING
- H_2S SCAVENGING
- FUEL GAS CONDITIONING
- HCDP REDUCTION
- DEMULSIFIER OPTIMIZATION
- DECREASED WASH WATER CONSUMPTION
- DEHYDRATION & DESALTING
- CRUDE BLENDING
- PRODUCED WATER TREATMENT
- OIL IN WATER POLISHING
- OIL COALESCENCE
- SEAWATER TREATMENT

PRIMARY SEPARATION

2/3 PHASE SEPARATORS & FWKO

Primary separation is the first stage of the oil treatment process. This is where the bulk of water and gas is removed from the oil. Typical equipment which is utilized during this stage includes production separators, degassers and Free Water Knockouts.



Separator in ProSep Manufacturing facility Houston, TX

WHAT IS FREE WATER?

+ Free water is either water existing as the continuous phase, or water existing as relatively large dispersed droplets, both of which separate quickly from the oil phase.

2/3 PHASE SEPARATOR

ProSep can provide two-phase (gas/liquid) or three-phase (gas/oil/water) separators depending on the client's particular needs.

The separator's designs are based on gravity separation as outlined in API 14J utilizing mechanical aids with their primary focus being on gas removal.

Generally, separator sizing is based on gas quality performance, neither addressing oil nor water quality.

FREE WATER KNOCKOUTS (FWKO'S)

ProSep's FWKO designs are based on empirical data developed over 50 years of practical experience. ProSep provides two-phase (oil-water) and three-phase (oil/gas/water) FWKO designs. The primary focus of a FWKO is to remove free water from the production inlet stream.

The FWKO leaves emulsified water in the outlet oil stream. This requirement requires operating at a particular treating viscosity combined with a calculated residence time.

ILLUSTRATION OF 3 PHASE DOUBLE ENDED SEPARATOR DESIGN FOR LIGHT SOLID LOADING

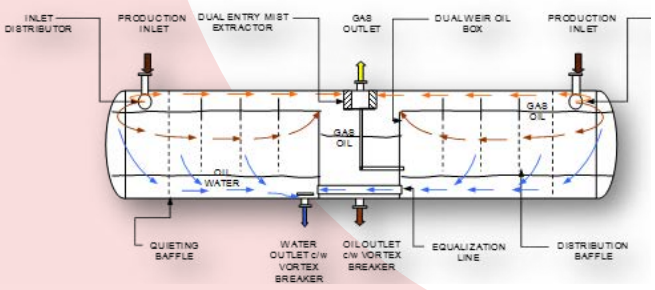
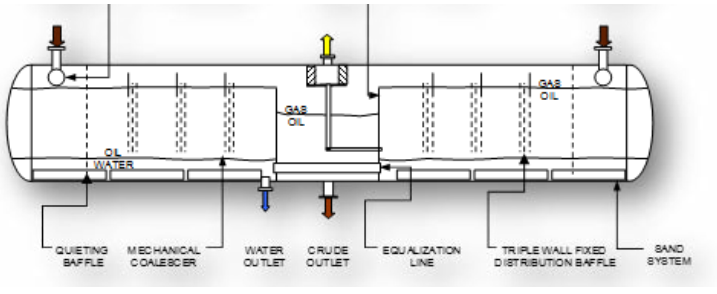


ILLUSTRATION OF 3 PHASE DOUBLE ENDED FWKO DESIGN FOR HEAVY SOLID LOADING



PROMIX™

ProMix™ is a novel inline injection/mixer assembly that can be used for any liquid-liquid mixing and/or extraction process. The innovative technology can be used in both the primary separation and dehydration stages of crude oil treatment.

FEATURES

+ Independent of upstream piping arrangement
+ Automated online adjustability to meet variable process flow condition (high turndown ratio)
+ Provisions for online de-plugging are available
+ Robust design for low maintenance

BENEFITS

+ Homogeneous high shear force condition leads to high mixing efficiency (usually 90%) and less emulsion
+ Capable of high mixing efficiencies with a low pressure drop (0.1 to 0.3 bar)
+ Very high droplet breakup results in increased contact surface

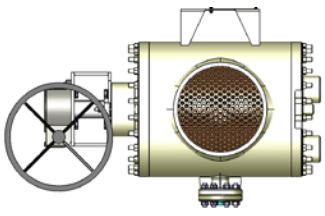
ProSep's mixing technologies differ from traditional inline mixing, as they utilize main stream momentum by reducing open flow area and increase flow velocity, resulting in a high mixing driving force.

The injection section of the ProMix™ can inject multiple chemicals and provides evenly distributed feed to its downstream intensive mixing section. This along with the ability to adjust the open area of the mixing section, produces a high mixing efficiency throughout the operating range.

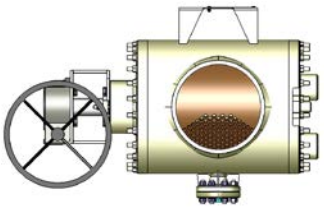
Due to its high mixing efficiency, the ProMix™ mixer can reduce chemical usage. This is based on producing a more homogeneous blend between components providing high fluid exposure. This reduces not only operating costs, but the possible negative effects these chemicals (flocculants, emulsion breakers, scavengers and inhibitors) can have on the overall process stream and the environment.

UP TO 60% REDUCTION IN CHEMICAL CONSUMPTION

BETTER SOLVENT UTILIZATION



Mixer low dP 0° position



Mixer high dP 60° position

DEHYDRATION & DESALTING

The dehydration/desalting stage meets the final oil phase specification requirement of the client. The equipment is also designed to provide an oil in water content that is acceptable to the water treatment facility located downstream.

THERMAL TREATER

ProSep's thermal treaters combine both heating and coalescing capabilities in one efficient process unit.

The purpose is to efficiently heat oil in order to enhance separation of the oil and water while meeting or exceeding oil specification requirements.

ProSep provide two-phase (oil/water) or three-phase (gas/oil/water) designs which are available with either mechanical or electrostatic coalescing elements.

By selectively heating the oil without unnecessarily heating the water, ProSep's systems reduces the total heat load required and thereby operating expenses.

ProSep's modular concepts allow placement of firetubes in various positions to accommodate client's needs.

DEHYDRATOR

Our dehydrators are used to remove gas, water and solids out of the process stream. ProSep's unique vertical grid design allows us to employ a horizontal flow pattern that can be operated either as a two-phase (oil/water) or three-phase (gas/oil/water) unit. In addition, ProSep can combine our mechanical coalescer elements with our vertical grid system to meet or exceed product specifications (typically 1.0 to 0.1% BS&W).

DESALTER

A desalter is a dehydrator with dilution water injections to reduce the overall salt content. Depending on the salt content at the beginning of production and the outlet oil specification, crude desalting can be accomplished by various methods.

Most of the salt (99.99%) is in solution within the water, so removing the water associated with the oil also removes the salt at the same time.

If the salt concentration is very high then removing the water may not meet the oil specifications. The salt concentration can be reduced by adding dilution water (fresh water or brackish water).

FEATURES & BENEFITS

+ Fire tubes can be arranged either horizontally or vertically
+ Utilizes burners (natural draft, force draft and low NOx)
+ Reduces overall footprint by combining heating & coalescing in one vessel
+ Reduced CAPEX and OPEX

HORIZONTAL FLOW

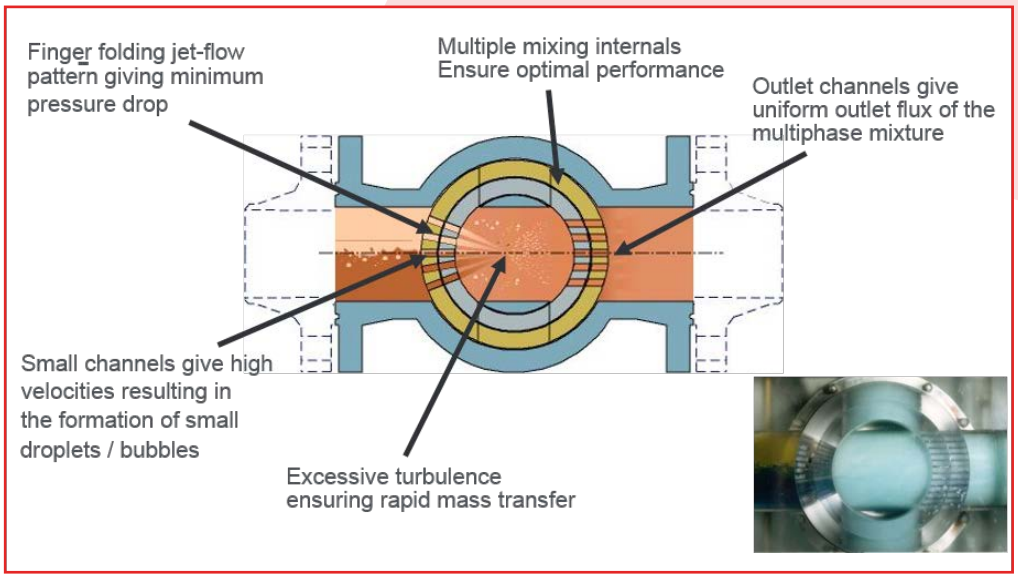
+ Produces a velocity perpendicular to the vertical terminal settling
+ Avoids counter current flow as produced by upflow designs

DOUBLE ENDED DESIGN

+ Splits the production fluid flow evenly with two inlets
+ This design enables a reduction in the vessel diameter
+ Ideal for offshore installations

PROSALT™

The ProSalt™ system's efficient injection and mixing technology holds the key to effective crude oil desalting, efficient utilization of wash water & chemicals and improved crude-water separability.



Our mixing technologies differ from traditional inline mixing technologies as they utilize main stream momentum by reducing open flow area and increase flow velocity, resulting in a high mixing driving force. The award winning ProSalt™ system has been primarily installed in upstream desalter applications, although the technology has been employed in downstream refineries.

The injector / mixer system generates a homogeneous wash water droplet flow over the pipe cross section in combination with a pressure drop that is lower than conventional mixing methods, while controlling shear forces. This achieves an improved oil-water separation with less emulsion.

The ProSalt system has also decreased client's emulsifer consumption by 48% saving them over $1 MM per year.

PROSALT™ VS. CONVENTIONAL

PROSALT™
+ Narrow water droplet size distribution & low pressure drop
+ Results in high efficiency separation

CONVENTIONAL
+ Broad water droplet size distribution & high pressure drop
+ Results in low efficiency separation

ACHIEVE EFFLUENT SALT SPECIFICATION WITH:

+ Reduced pressure drop
= Energy savings in reduced pumping requirements

+ Reduced content of oil in effluent water
= Energy savings in reduced water treatment

+ Reduced consumption of wash water
= Energy savings in reduced water transport and treatment

+ Reduced consumption of demulsifier chemical
= Energy savings in reduced chemical transport, storage, and production

+ Increased crude oil treatment capacity

+ Increased energy production capacity

UP TO 60% DEMULSIFIER SAVING

UP TO 60% REDUCED WATER USAGE

1 INSTALLATION SAVING 10,000,000 GALLONS OF WATER PER YEAR

NARROW WATER DROPLET SIZE DISTRIBUTION

CRUDE OIL REFERENCES

ProSep has delivered over 50 crude treatment projects since 2005 working with 25 different operators and service companies across 11 countries. Since 2005 we have treated over 2 million barrels of oil per day (BOPD) globally.

PROSALT™ MIXER

MIXING OF CRUDE & WASH WATER

LOCATION: NORWEGIAN SEA
EQUIPMENT: 14" ProSalt mixer
APPLICATION: Installed in parallel to a conventional globe mixing valve upstream of the 1st-stage desalter
PROCESS CONDITIONS:
CRUDE API: 37
CRUDE OIL FLOW RATE: 2.20 m lbm/hr

PERFORMANCE:
PRESSURE DROP: 3-12 psi
SALT SPEC: Typically below 2 mg/l; 0.70 ptb
BS&W SPEC: (0.10 – 0.15 vol %)

PROSALT™ MIXER

OPTIMIZATION OF CRUDE DESALTING

LOCATION:MIDDLE EAST
EQUIPMENT: 2 X 12" ProSalt Mixers
APPLICATION: Optimization of crude desalting

FACILITY: 120 MBOPD early production facility
FLOW RATE: 21,000 - 70,000 BWPD

FWKO & THERMAL TREATER

OIL SANDS

LOCATION: CANADA
EQUIPMENT: 3 x 15 ft S/S FWKO and 6 x 14 ft S/S mechanical treaters
APPLICATION: Bulk water oil removal and dehydration

FWKO/TREATER PER UNIT:
FEED OIL FLOW RATE: 72,557/36,440 BOPD
FEED WATER FLOW RATE: 99,326/3796 BOPD
API: 17

DEHYDRATOR & DESALTER

EARLY PRODUCTION FACILITY

LOCATION: MIDDLE EAST
EQUIPMENT: LP separator, electrostatic dehydrator and desalter
APPLICATION: Liquid stabilization, bulk water removal, oil dehydration and desalting
API: 28 - 32

PERFORMANCE:
BS&W %: 0.1
OIW OUTLET: < 100 PPM

THERMAL TREATER

FPSO

LOCATION: OFFSHORE BRAZIL
EQUIPMENT: Two phase double ended mechanical electrostatic treater & sand removal system
APPLICATION: Gas Stabilization, Bulk Water Removal and Oil Dehydration

15.2 API, 61,741 BOPD, 13,737 BWPD
19.1 API, 108,386 BOPD, 24,159 BWPD

DESALTER

REFINERY PROJECT

LOCATION: ALABAMA, USA
EQUIPMENT:Two Phase Mechanical Electrostatic Desalter skid mounted unit.
APPLICATION: Oil dehydration and desalting

PERFORMANCE:
BS&W %: 0.2
OIW OUTLET: < 200 PPM

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