

Advanced Equipment Manufacturing

Fangzhou Hu UOP LLC, A Honeywell Company

US-China Oil & Gas Industry Forum September 16-18, 2015 Chongqing, China



A Century of Innovation in the Oil and Gas Industry

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UOP creates knowledge through invention and innovation and applies it to the energy industry



More Than 60 Percent of the World's Gasoline and 90 Percent of Biodegradable Detergents Use UOP Technology

Gas Processing & Hydrogen Technology



Processing for single-unit to large integrated technology facilities Broad portfolio of technologies

- Wellhead treating
- Sulfur & liquids recovery
- Upgrade of natural gas liquids to olefins, aromatics & more...
- Hydrogen purification from steam reforming
- Hydrogen recovery from many processes

Key Processes

- Polybed[™] PSA hydrogen purification & recovery
- Polysep[™] Membranes hydrogen purification & recovery
- UOP Separex[™] bulk CO₂ removal
- UOP Selexol[™] acid gas removal
- UOP Amine Guard[™] Process acid gas removal
- UOP Merox[™] mercaptan sulfur removal

Process Equipment



Fabricated Plants

- UOP Gas Processing Plants
- Polybed[™] PSA Systems
- Separex[™] Membrane Systems
- Modular Refining Units
- Sinco SSP Technology

Process Equipment

- Separations & Heat Transfer
- Key Mechanical Equipment
- Process Information & Controls

Callidus

- Burners
- Flares
- Thermal Oxidizers
- Selective Catalytic Reduction Units (SCRs)



Challenges in Natural Gas Value Chain





Gas Processing Challenges Exist but Can Be Overcome with the Right Packaged Technology Solutions



Quality and

The advantages of skid-mounting are many:

and Schedule Cost



Train Sizes up to 10 MCM/D can be easily Modularized

What to Modularize?



Process Plants		
	Μ	F
Condensate Stabilizer	\checkmark	
Acid Gas Removal	✓	
NGL Recovery with Refrigeration Loop(s)	 Image: A start of the start of	
Dehydration	✓	
NGL Fractionation	✓	
LPG Fractionation	✓	
Heating Medium Oil System	\checkmark	
Sulfur Recovery	\checkmark	√ *

Infrastructure		
	M	F
Roads		✓
Buildings	✓	✓
Power Generation / Power Supply	✓	
Area Lighting		✓
Security Systems		✓
Plant water systems	\checkmark	\checkmark
Fire water systems		✓
Storm water system		✓
Storage tanks		\checkmark
Pipeline infrastructure		\checkmark

Balance of Plant		
	Μ	F
Inlet Separation	>	√ *
Inlet Compression	>	
Pipe Racks and associated structures	>	<
Residue Gas Compression	>	
Produced Water Treatment	\checkmark	√ *
Flare		✓
Thermal Oxidizer	\checkmark	√ *
Heating Medium Oil System	✓	√ *
Motor Control Center (MCC)	~	\checkmark
Gas Metering	\checkmark	
Instrument Air System	\checkmark	
N2 System	\checkmark	
Fuel Gas Network		<
Cooling Water System	\checkmark	√ *
Chemical Injection Systems	\checkmark	✓
Lube Oil System(s)	\checkmark	 Image: A set of the set of the
Plant Control System	\checkmark	\checkmark
Fire & Gas Detection	\checkmark	\checkmark
Process drains		\checkmark

M = Suited for Modular

F = Field Fabrication more appropriate

* Suitable for Multi-Train Facilities

How We Modularize





LPG Recovery Unit Inlet Filter Skids



How We Modularize





LPG Recovery Process Skids



LPG Recovery Major Offskid Items





UOP Modular Plant Capabilities





Modular process technology as skid-mounted, shop-fabricated packages for:

- Lower cost fabrication versus on-site construction
- Faster installation
- Trusted process and mechanical performance
- High on-stream efficiency
- Lower risk of safety incidents due to less in field fabrication

Ideal candidates for packaged units:

- Individual units sized for 1.2 10 MCM/D each
- Remote locations
- Plants with multiple trains for up to 25 MCM/D

UOP Technology Solutions (CO₂ Removal, Dew Pointing and NGL Recovery) Delivered as Pre-engineered Modules

UOP Natural Gas Modular Products



SEGMENT



GAS PRETREATMENT



Dehydration

- Mol Sieve Adsorption
- Glycol (TEG) Absorption

Acid Gas Treatment

- Amine Units (100-1000 gpm¹)
- Membrane Units (1+ BCFD)

Sulfur Recovery

- Modular Claus (10-100+ LTPD)
- Sulfur Scavengers

Hg Removal Units

¹gpm = gallons of amine per minute

NGL RECOVERY





²GPM = gallons of NGL per thousand SCF of natural gas

NGL SEPARATION



Fractionation Deethanizer / Depropanizer / Debutanizer



Complete Modular Equipment Solutions: Pre-engineered or Custom

UOP Global Equipment Experience



Technology	# of Units	55
PSA Units	>1000	A Global Modular Leader
Gas Processing/NGL Units	230	with Experience dating
Membrane Systems	200	
CCR Regenerator Sections	65	
Merox Units	55	
Recovery Plus Units	37	
Isomerization Units	17	
Naphtha Block Units	3	

Advanced Technology, Faster , Better Total Installed Costs

Pre-Engineered Cryo Plant





Pre-Engineered Cryo + Supplemental Refrigeration (SR)





Cryo + SR + Pre-Engineered Amine





Cryo + SR + Amine + Fractionation





Type of Membranes and Membrane Assembly



Membrane Type



Asymmetric membrane:

Same polymer materials for selective layer (top) and supporting layer

Type of Membrane Assembly



Spiral-Wound Membrane Element



Hollow Fiber Membrane Element



Composite membrane:

Different polymer materials for selective layer (top) and supporting layer

UOP Separex Membrane System





From Membrane to Modular Equipment

Fundamentals of Membrane Process







UOP Separex Membrane

UOP Separex[™] Membrane Technology

Installation Type	No. of Units	
 Natural Gas 		52
 Enhanced Oil Recover 	y (EOR)	5
 Hybrids 		5
 Offshore 		7+12
 Landfill Gas 		7
 Digester Gas 		1
 H₂ Purification 		<u>94</u>
Total		>170







What is the UOP SeparALL Process?



Next generation solution of UOP SelexolTM process Selective removal of H_2S , COS, & CO₂ via absorption/ regeneration process Offered as licensed technology

- Uses a "next generation" physical solvent (SELEXOL™ MAX Solvent) from DOW Chemicals
- Uses a typical solvent-extraction flow-scheme
- Loading directly proportional to partial pressure

Product Quality

- Can be essentially sulfur free
- Project specific CO2 capture and quality
- Project specific acid gas H2S concentration





High Pressure is advantageous

Contact



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