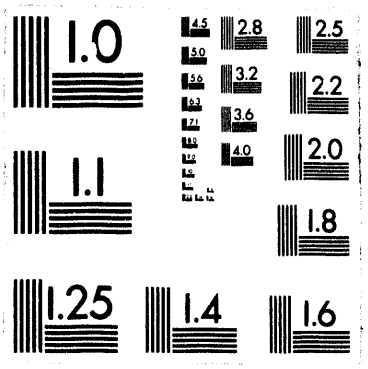
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1.25
1.4
1.6
1.8
2.0
2.2
2.5
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8.0
9.0

1 of 1

DOE/MC/28178-3698
(DE94004095)

Evaluation of High-Efficiency Gas-Liquid Contactors for Natural Gas Processing

Semi-Annual Report

December 1993

Work Performed Under Contract No.: DE-FC21-92MC28178

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Institute of Gas Technology
Chicago, Illinois

DISCLAIMER

Technical Progress Report (2nd Semi-Annual)
Cooperative Agreement No. DE-FC21-92MC28178
Reporting Period: 4/01/93 - 09/30/93

PROJECT OBJECTIVE

The objective of this proposed program is to evaluate the potential of rotating gas-liquid contactors for natural gas processing by expanding the currently available database. This expansion will focus on application of this technology to environments representative of those typically encountered in natural gas processing plants. Operational and reliability concerns will be addressed while generating pertinent engineering data relating to the mass-transfer process.

WORK TO BE PERFORMED THIS REPORTING PERIOD

- Complete all negotiations and processing of agreements.
- Complete assembly, modifications, shakedown, and conduct fluid dynamic studies using the plastic rotary contactor unit.
- Confirmation of project test matrix.
- Locate, and transport an amine plant and dehydration plant.

WORK ACCOMPLISHED THIS REPORTING PERIOD

Task 1. National Environmental Policy Act

This task was completed.

Task 2. Field Experimental Site Selection

Mr. L. Upshaw of Northern Illinois Gas Company was contacted as part of our effort to locate a potential field test site for the high pressure Higee^{TM} Unit (China unit). Mr. Upshaw indicated that they might be interested in providing a site for dehydration testing, either a slip stream or a small well. Their aquifer natural gas storage facility produces 70 to 80 MMSCFD at an inlet pressure of 250 to 340 psia and temperature from 40° to 50°F. Individual wells range from 1 to 2 MMSCFD flow rates. Northern Illinois Gas's involvement in the program depends on the results of IGT's studies, the fit of this technology to their operating conditions, the fit of this application to our research program, and ultimately the approval of the Technical Management Committee.

IGT has also contacted Marathon and Texaco and will continue to search for other potential site hosts. The final decision will be made by the project Technical Management Committee which consists of DOE/METC, GRI, site host, Glitsch, and IGT. Glitsch and IGT are the non-voting members of this committee.

Task 3. Field Experimental Skid Unit Design And Preliminary Economic Evaluations

This task was inactive.

Task 4. Project Review

This task was inactive.

Task 5. Information Required for NEPA, Field Site

This task was inactive.

Task 6. Fluid Dynamic Studies

Preparation of the facilities (electrical, heating, and plumbing) is continuing. During this period, assembly of the plastic rotary contactor unit was initiated. The unit is approximately 95% complete. IGT has requested and received approval to issue purchase orders for the variable frequency drive and blower required to complete the mechanical assembly of the plastic rotating contactor. When this equipment is received and the data acquisition system arrives from Glitsch, shake down and calibration of this unit will be conducted.

Task 7. Mass-Transfer Coefficient Studies

The mass-transfer coefficient experiments to be conducted under this program will be done using a high pressure Higee^{TM} rotary contactor known as the "China Unit". Different sized rotors are used in this unit to change the flow capacities. General information on this unit is given in Table 1.

Table 1. GENERAL INFORMATION ON GLITSCH'S "CHINA UNIT"

Maximum Operating Pressure	1000 psig
Potential Gas Compositions	Natural gas with sulphur compounds
Large Rotor	
Maximum Gas Flows	1.0 MMSCFD (41,667 SCFH)
Minimum Gas Flows	0.25 MMSCFD (10,042 SCFH)
Smallest Rotor	
Maximum Gas Flows	0.024 MMSCFD (1,000 SCFH)
Minimum Gas Flows	360 SCFD (15 SCFH)

This unit has been operated at minimum gas flow for the smallest rotor, i.e. 15 SCFH, however operation at this level is not recommended. We anticipate designing our experiments to operate at or above 25% of minimum capacity for the rotor size used.

Dehydration Studies. It is anticipated that these experiments will be conducted using TEG and NFM solvents. Bids were requested for both a 0.5 and 1.0 MMSCFD glycol dehydration units from Glitsch Package Plants, Sivalls, Inc., B. S. & B. Engineering Company, Inc, Petrofab, and Smith Industries. Bids received thus far for new plants range from $10,000 to $ 35,000 depending on solvent regeneration requirements. The higher the purity of solvent the greater the cost. These bids are being evaluated based suitability of the equipment to this program as well as cost.

Bulk Acid-Gas Removal. It is anticipated that a chemical and a physical solvent will be tested in the China Unit under this subtask. Table 2 shows a comparison of some of the properties of MEA, DEA, DGA, and MDEA. Gas processing simulations were conducted for MDEA, DEA, and MEA using Texaco Chemical Company's "QuickTreat^{TM}: Gas Treating Preliminary Evaluation Program." This is not a rigorous equilibrium model for detailed design of a plant, however it does provide useful information for determining gas processing strategies. The subquality gas processing system IGT is developing will be designed to handle gas containing up to 15% CO_2 and 5% H_2S for a maximum total of 20% acid-gas in the feed. This composition is higher then the typical range for use of chemical solvents but for research flexibility we want to cover the compositions of the majority of the reserves in the U.S. containing acid gases. Figure 1 shows QuickTreat^{TM}'s estimation of solvent flow rate versus sour gas flow rate for a plant operating at 1,000 psia with the above gas composition. Figure 2 shows estimation of reboiler duty under the same conditions. From Table 2 and Figures 1 and 2 it is apparent why MDEA is becoming popular for gas processing. Compared to the other amines, MDEA has many favorable properties including better corrosion characteristics, lower solvent circulation rates and lower reboiler duty. We anticipate using MDEA as the chemical solvent and NFM as the physical solvent in the bulk acid gas removal studies with the China Unit. Appendix A contains inputs used for QuickTreat^{TM}. Appendix B contains some a summary of calculations and Appendix C has the output from the program.

Another request for information on availability of amine and dehydration plants was made to seven GRI advisors. Mr. Pat Knight of Texaco located a 10 gpm amine plant. Mr. Knight is currently investigating the condition and availability of that plant.

Table 2. TYPICAL OPERATING CONDITIONS AND DATA FOR AMINES

Amine	MEA	DEA	DGA	MDEA
Molecular Weight	61.08	105.14	105.14	119.16
Boiling Point,°F	338.9	516.2	430	477
Freezing Point, °F	50.9	82.4	9.5	-9.3
Density, lb/gal @ 60°F	8.48	9.09	8.82	8.68
Specific Heat @ 60°F Btu/lb/°F	0.608	0.600	0.571	0.535
Thermal Conductivity, Btu/[(h-sq ft-°F)/ft] @ 68°F	0.148	0.127	0.121	0.159
Latent Heat of Vaporization, Btu/lb	355	288	219	204
Viscosity, cp	24.1 @ 68°F	350 @ 68°F	40 @ 60°F	1.3 @ 50°F
Solution Strength, wt %	15-20	25-35	40-60	30-50
pH Number	High	Medium	High	Medium
Acid Gas Loading, mole/mole	0.3-0.4	0.3-0.4	0.3-0.4	Unlimited
ΔH_r^* for H_2S, Btu/lb	550	511	674	522
ΔH_r^* for CO_2, Btu/lb	825	653	850	600
Ability to Preferentially Absorb H_2S	No	Under Some Conditions	No	Under Most Conditions
Ability to Preferentially Absorb CO_2	No	No	Yes	No
COS, CS_2, SO_2 and SO_3				
Deactivation of Solvent	Yes	Yes	No	No
Corrosivity of Degradation	Very			Very
Products	High	Medium	Low	Low
Oxygen Reacts With Solvent	High	High	Medium	Low
Requiring Reclaimer	Yes	No	Yes	No

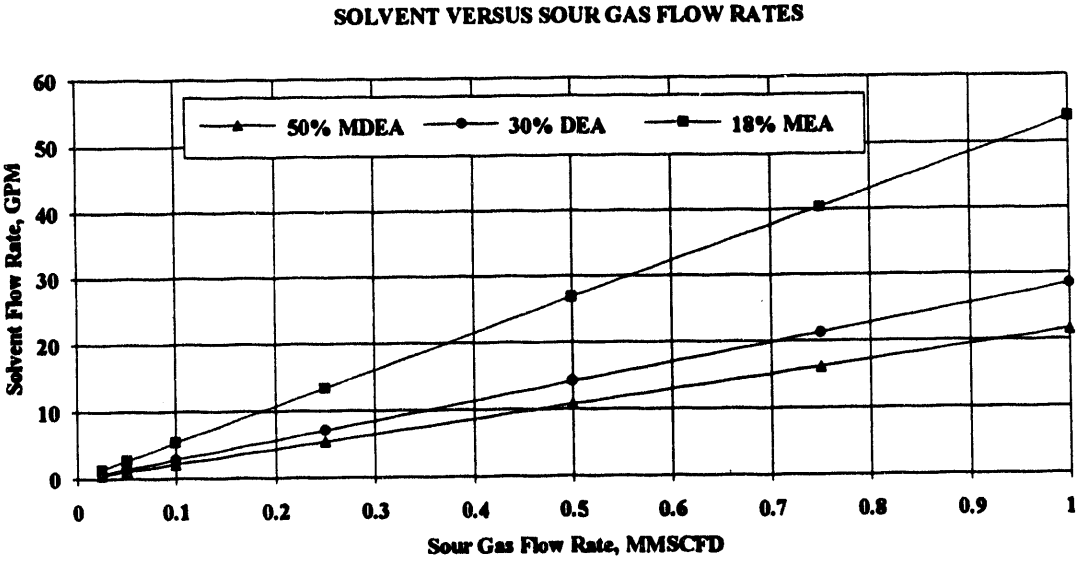

Figure 1. ESTIMATED AMINE SOLVENT FLOWS VERSUS SOUR GAS FLOW FOR A FEED GAS OF 15% CO_2 AND H_2S AT 1000 PSIA AND 70°F

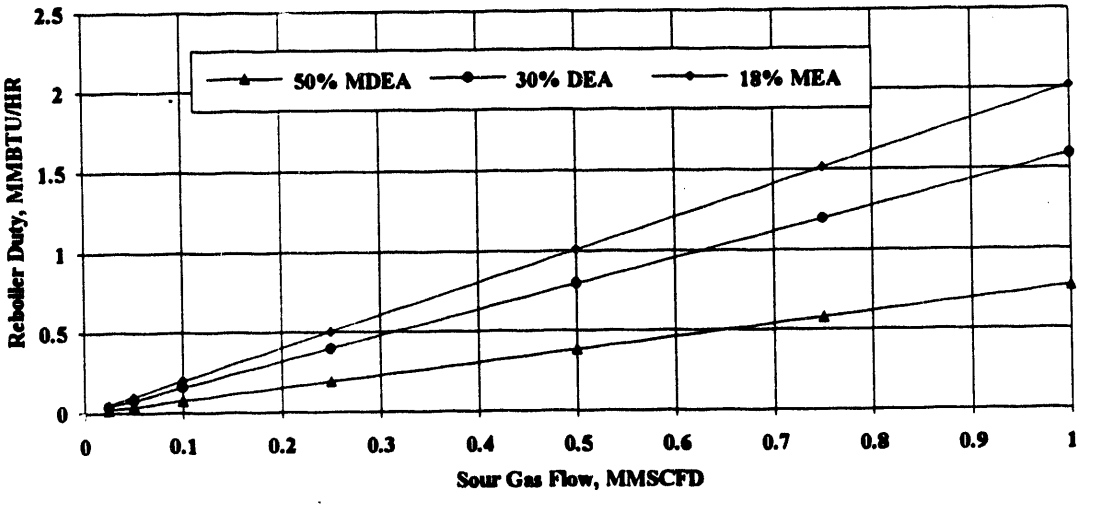

Figure 2. ESTIMATED REBOILER DUTY VERSUS SOUR GAS FLOW FOR A FEED GAS OF 15% CO_2 AND H_2S AT 1000 PSIA AND 70°F

Overall Gas System Design and Construction

A meeting was held with Mr. Jim Fraizer and Mr. Tom Kresse of Natural Gas Pipeline in Lombard, Illinois. These gentlemen have had extensive experience in designing gas processing plants. An

agreement has been put in place where by, at no cost to the project, they will review and comment on the design and construction of the gas processing systems that the China Higee^{TM} unit will be attached to.

Also a consulting agreement is been established with Mr. Jerry Warner to assist in the designing of a gas recycling system to supply mixed gases to this gas processing system. The key components of the recycle system will be the compressors since they will be circulating large volumes of mixed gases (including CO_2, H_2O, and H_2S) at high pressures (from atmospheric to 1,200 psia). Mr. Warner has been a member of the A.G.A. compressor committee for 8 years and has had 35 years experience in operating and managing underground gas storage facilities and a synthetic gas plant.

Figures 3 and 4 show the current strategies for gas recycle and solvent storage systems being explored. These plans are being used to generate cost estimates. Details of this analysis will be presented in future reports. This information will be summarized and distributed to GRI, DOE, and Glitsch for their review. Plant options with costing estimates for dehydration and acid gas removal have been summarized and will be discussed with GRI, DOE and IGT's Sustaining Membership Program (SMP) during October. The analysis thus far indicates that design and construction of a stationary gas processing plant would not be cost effective when compared to purchasing a skid amine plant.

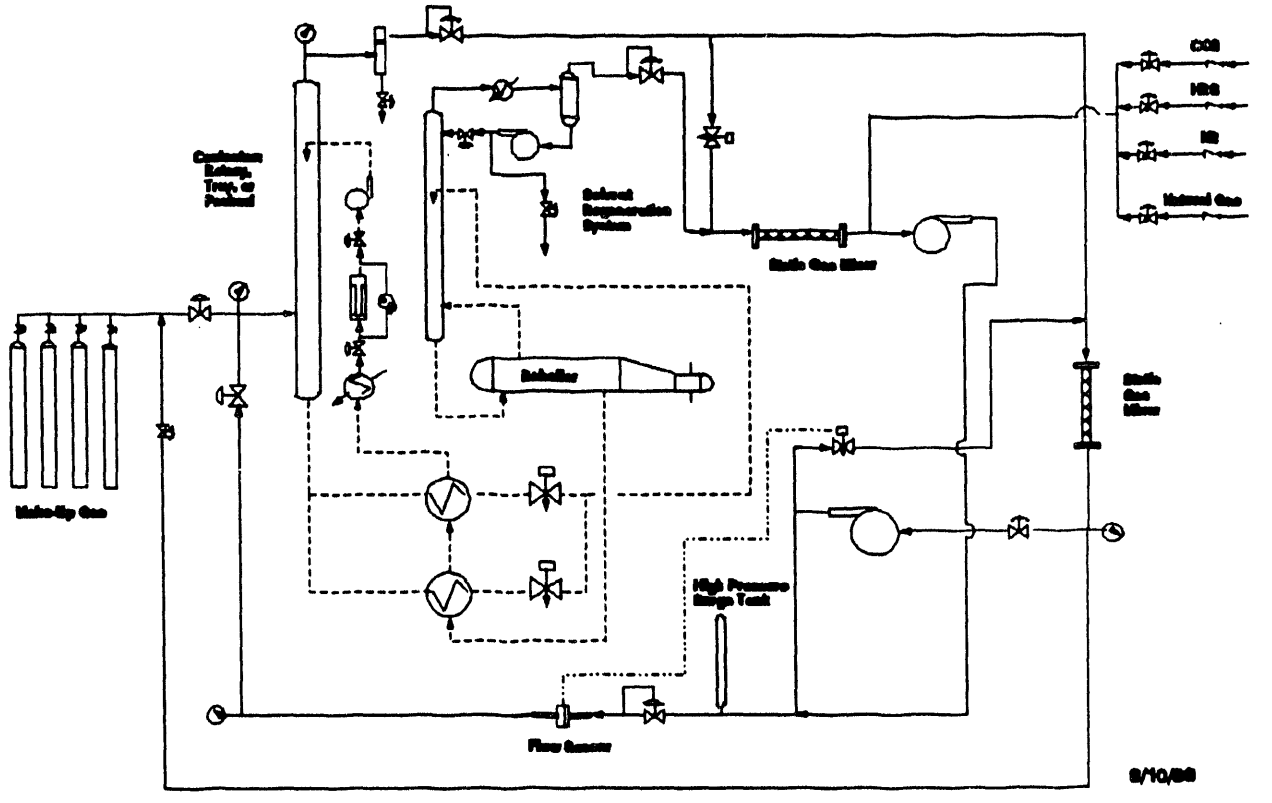

Figure 3. GAS PROCESSING RECYCLE SYSTEM

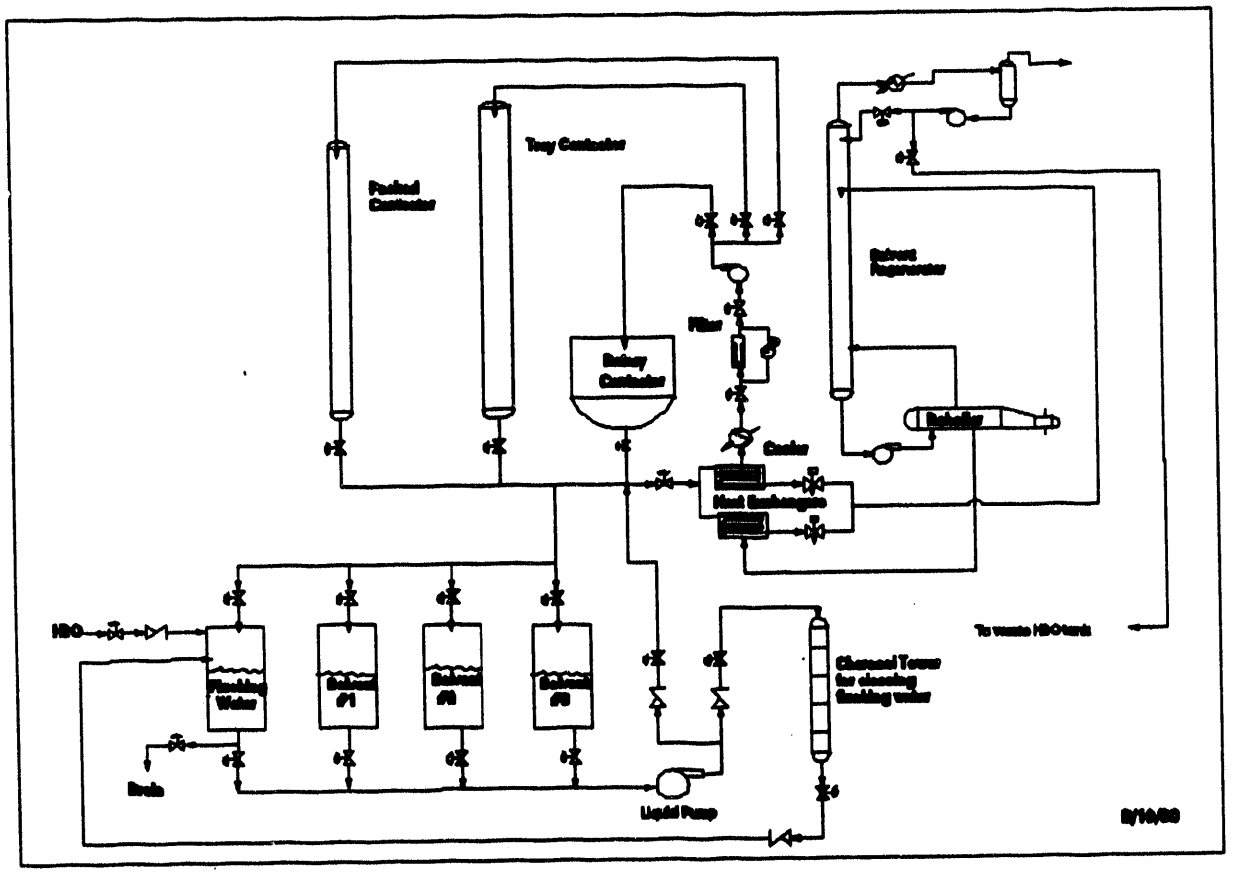

Figure 4. ACID GAS REMOVAL SYSTEM WITH SOLVENT STORAGE.

Task 8. Field Experimental Studies

This task was inactive.

Task 9. Data Analysis and Reports

A stop work order was issued by GRI on this project on February 10th, 1993, pending the results of negotiations between GRI and Glitsch, Inc. In response, IGT limited its efforts on this project to only items that were considered on the critical path and were given specific approval by GRI and DOE. This stop work order was lifted as of June 17th. On June 21, 1993 the following items were sent to Glitsch, Inc. for their review:

- IGT-DOE Contract
- IGT-GRI Contract
- IGT-GRI Licensing Agreement

A consultant/subcontract agreement between IGT and Glitsch concerning the involvement of Paul Platko, Ray Fowler, and Jim Spalding, has also been sent to Glitsch for review. Mr. Platko is an engineer

at Glitsch with extensive Higee™ operation experience. Mr. Ray Fowler is Glitsch's theoretical expert in Higee™ Technology. Mr. James C. Spalding is the Director of Commercial Affairs at Glitsch and will represent Glitsch's interest, provide licensing and contractual input, and assist in project direction.

A written request for information on the availability of the China Unit was sent to Mr. Spalding of Glitsch on August 11th.

The following action items are still pending:

Glitsch is to provide IGT:

- Royalty-free use of Higee™ Technology.
- No cost loan of the "China Unit".
- Computer and data collection software for the plastic unit.
- Piping diagram of the China Unit.
- Completed subcontract for Mr. Platko, Mr. Fowler, and Mr. Spalding.

During this period the following presentation were made on this project:

- To IGT's SMP Technical Guidance Committee on July 21st .
- To IGT's SMP Proposal Review Committee on September 15th .
- To IGT's SMP's Review Committee on September 30th .

Presentations planned through the end of 1993 include:

- IGT's SMP semi-annual meeting on October 28th
- DOE's Contractor review meeting on November 16th.

WORK TO BE PERFORMED NEXT PERIOD

- Complete all negotiations and processing of agreements.
- Complete assembly, modifications, shakedown, and conduct fluid dynamic studies using the plastic rotary contactor unit.
- Confirmation of project test matrix.
- Finalize dehydration and gas sweetening program strategies.
- Locate, and transport an amine plant and dehydration plant.

Tony

A. L. Lee
Associate Director, Gas Processing
and Catalyst Research
312/949-3714

Jim Semrau
Manager, Gas Processing Research
312/949-3674

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Reference to trade names or specific commercial products, commodities, or services in this report does not represent or constitute an endorsement, recommendation, or opinion of suitability by GRI or IGT of the specific commercial product, commodity, or service.

This is an interim report; hence, the data, conclusions, and calculations are preliminary and should not be construed as final.

APPENDIX A

Inputs for calculating amine solvent flows

	Reference				
Amine		MDEA	MEA	DEA	
Wt % Amine		50	15	30	
	Texaco	40-50	15-18	25-30	
	Eng. Data Book		15-25	25-35	
	NGPL	50	15	30	
Lean Amine Temp, F		80	80	80	
	Texaco	Inlet Gas Temp + 10 F			
Acid Gas Pickup, mol/mol		0.264	0.275	0.5285	
	Eng. Data Book		0.33-0.4	0.35-0.65	
	NGPL	0.22-0.307	0.15-0.40	0.35-0.707	
Stripper Pressure, psia		14	14	14	
	NGPL	6 (5-14)	6 (5-14)	6 (5-14)	
Regen Feed Temp, F		200	200	200	
	Texaco	190-220	190-220	190-220	
	NGPL	190-205	190-205	190-205	
Reflux Temp, F		120	120	120	
	Texaco	100-135	100-135	100-135	
	NGPL	120	120	120	
Reflux Ratio, mole/mole		1	1.5	1.5	
	Texaco	1-3	1-3	1-3	
	NGPL	1	1.5	1.5	
Lean Amine Load, mol/mol		0.015	0.11	0.05	
	NGPL	0.01-0.015	0.1-0.12	0.02-0.08	
Normal Lean Load			0.12	0.08	
Target % CO2 Slip		60	None	None	
	NGPL	60-70	None	None	
Reboiler Pressure		16	16	16	
	Texaco	Stripper Overhead Pressure + 2 to 3 psia			
	NGPL	9 (8-17)	9 (8-17)	9 (8-17)	
Note:					
Texaco refers to QuickTreat User Manual					
Eng. Data Book refers to GPSA Engineering Data Book, 1972 ed					
NGPL refers to experiences of engineers at NGPL who design gas processing plants					

APPENDIX B

Summary of Calculations

FEED CONDITIONS										
Gas Composition, mole %										
CH4	0.8		Specific Gravity =		(.8(12+4)+.05(2+32)+.15(12+2*16))/(.79*2*14)+.21(2*16))					
CO2	0.15			=	0.731623					
H2S	0.05									
System Pressure, psia	1000									
Inlet Gas Temp, F	70									
Inlet Gas Gravity	0.732									
ESTIMATED PROCESS RESULTS										
	MDEA	50% - MD	MDEA	DEA	30% - DE	DEA	MEA	18% - ME	MEA	
Sour Gas Volume	Sweet Ga	Solvent R	Reboiler	Sweet Ga	Solvent R	Reboiler	Sweet Ga	Solvent R	Reboiler	
Gas	Gas	Rate	Duty	Gas	Rate	Duty	Gas	Rate	Duty	
MMSCFD	MMSCFD	GPM	MMBTU/	MMSCFD	GPM	MMBTU/	MMSCFD	GPM	MMBTU/hr	
1	0.89	21.6	0.771	0.8	26.43	1.591	0.8	53.8	2.016	
0.75	0.6675	16.2	0.578	0.6	21.32	1.194	0.6	40.35	1.512	
0.5	0.445	10.8	0.385	0.4	14.21	0.796	0.4	26.9	1.008	
0.25	0.2225	5.4	0.193	0.2	7.1	0.398	0.2	13.45	0.504	
0.1	0.089	2.16	0.0771	0.08	2.84	0.159	0.08	5.38	0.202	
0.05	0.0445	1.08	0.0385	0.04	1.42	0.0796	0.04	2.67	0.101	
0.025	0.02225	0.54	0.0193	0.02	0.7107	0.03978	0.02	1.35	0.0504	
Outlet Gas Temp, F	83			80			80			
Reboiler Temp, F	224.2			220.4			219.7			

APPENDIX C

Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	1
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.89
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT (MDEA)
Circulation Rate	(GPM)	21.6068
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	12.034
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.993879
Lean Cooler Duty	(MMBtu/hr)	0.43366
Condenser Duty	(MMBtu/hr)	0.27015
Reboiler Duty	(MMBtu/hr)	0.770993

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THIS PROGRAM IS NOT A RIGOROUS EQUILIBRIUM MODEL. The data presented by these calculations does NOT GUARANTEE that the treated gas will meet the required product specifications nor that any requested level of CO2 slippage can be achieved. Please contact your TEXACO CHEMICAL representative for actual equilibrium verification.

Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.75
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.6675
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	16.2051
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	9.0255
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.745409
Lean Cooler Duty	(MMBtu/hr)	0.325245
Condenser Duty	(MMBtu/hr)	0.202612
Reboiler Duty	(MMBtu/hr)	0.578245

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.5
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.445
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	10.8034
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	6.017
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.49694
Lean Cooler Duty	(MMBtu/hr)	0.21683
Condenser Duty	(MMBtu/hr)	0.135075
Reboiler Duty	(MMBtu/hr)	0.385496

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.25
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.2225
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	5.40169
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	3.0085
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.24847
Lean Cooler Duty	(MMBtu/hr)	0.108415
Condenser Duty	(MMBtu/hr)	0.0675375
Reboiler Duty	(MMBtu/hr)	0.192748

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.1
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.089
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	2.16068
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	1.2034
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0993879
Lean Cooler Duty	(MMBtu/hr)	0.043366
Condenser Duty	(MMBtu/hr)	0.027015
Reboiler Duty	(MMBtu/hr)	0.0770993

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.05
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.0445
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	1.08034
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.6017
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.049694
Lean Cooler Duty	(MMBtu/hr)	0.021683
Condenser Duty	(MMBtu/hr)	0.0135075
Reboiler Duty	(MMBtu/hr)	0.0385496

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.025
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.02225
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	0.540169
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.30085
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.024847
Lean Cooler Duty	(MMBtu/hr)	0.0108415
Condenser Duty	(MMBtu/hr)	0.00675375
Reboiler Duty	(MMBtu/hr)	0.0192748

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.024
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.02136
Outlet Gas Temp	(Deg F)	82.9255
* CO2 in Sweet Target Slippage	(%)	60
CO2 in Sweet, NOT guaranteed	(Mole %)	10.1124
Lean Amine Data		
Type of Amine Utilized		TEXTREAT
Circulation Rate	(GPM)	0.518562
Weight Percent Amine	(Wt. %)	50
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.015
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.288816
Rich Amine Loading	(Mol/Mol)	0.275
Rich Amine Temp	(Deg F)	103.521
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	182.345
Reboiler Temp	(Deg F)	224.205
Warm Lean Amine Temp	(Deg F)	126.249
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0238531
Lean Cooler Duty	(MMBtu/hr)	0.0104079
Condenser Duty	(MMBtu/hr)	0.0064836
Reboiler Duty	(MMBtu/hr)	0.0185038

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	1
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.8
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	53.8067
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	21.88
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	2.67998
Lean Cooler Duty	(MMBtu/hr)	1.10713
Condenser Duty	(MMBtu/hr)	0.73371
Reboiler Duty	(MMBtu/hr)	2.01579

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.75
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.6
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	40.355
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	16.41
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	2.00998
Lean Cooler Duty	(MMBtu/hr)	0.830351
Condenser Duty	(MMBtu/hr)	0.550283
Reboiler Duty	(MMBtu/hr)	1.51184

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.5
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.4
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	26.9033
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	10.94
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	1.33999
Lean Cooler Duty	(MMBtu/hr)	0.553567
Condenser Duty	(MMBtu/hr)	0.366855
Reboiler Duty	(MMBtu/hr)	1.00789

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.25
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.2
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	13.4517
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	5.47
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.669995
Lean Cooler Duty	(MMBtu/hr)	0.276784
Condenser Duty	(MMBtu/hr)	0.183428
Reboiler Duty	(MMBtu/hr)	0.503947

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.1
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.08
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	5.38067
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	2.188
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.267998
Lean Cooler Duty	(MMBtu/hr)	0.110713
Condenser Duty	(MMBtu/hr)	0.073371
Reboiler Duty	(MMBtu/hr)	0.201579

Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.075
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.06
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	4.0355
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	1.641
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.200998
Lean Cooler Duty	(MMBtu/hr)	0.0830351
Condenser Duty	(MMBtu/hr)	0.0550283
Reboiler Duty	(MMBtu/hr)	0.151184

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.025
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.02
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	1.34517
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.547
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0669995
Lean Cooler Duty	(MMBtu/hr)	0.0276784
Condenser Duty	(MMBtu/hr)	0.0183428
Reboiler Duty	(MMBtu/hr)	0.0503947

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.024
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.0192
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	1.29136
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.52512
Rich Amine Loading	(Mol/Mol)	0.385
Rich Amine Temp	(Deg F)	104.288
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.624
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0643195
Lean Cooler Duty	(MMBtu/hr)	0.0265712
Condenser Duty	(MMBtu/hr)	0.017609
Reboiler Duty	(MMBtu/hr)	0.0483789

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.05
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.04
Outlet Gas Temp	(Deg F)	80
Lean Amine Data		
Type of Amine Utilized		MEA
Circulation Rate	(GPM)	2.67091
Weight Percent Amine	(Wt. %)	18
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.11
Rich Amine Data		
Total Acid Gas	(Moles/hr)	1.094
Rich Amine Loading	(Mol/Mol)	0.387
Rich Amine Temp	(Deg F)	104.46
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	219.699
Warm Lean Amine Temp	(Deg F)	121.778
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.132827
Lean Cooler Duty	(MMBtu/hr)	0.0551622
Condenser Duty	(MMBtu/hr)	0.0366855
Reboiler Duty	(MMBtu/hr)	0.100592

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	1
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.8
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	28.4288
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	21.88
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	1.2475
Lean Cooler Duty	(MMBtu/hr)	0.70462
Condenser Duty	(MMBtu/hr)	0.73371
Reboiler Duty	(MMBtu/hr)	1.59134

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.75
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.6
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	21.3216
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	16.41
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.935629
Lean Cooler Duty	(MMBtu/hr)	0.528465
Condenser Duty	(MMBtu/hr)	0.550283
Reboiler Duty	(MMBtu/hr)	1.19351

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.5
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.4
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	14.2144
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	10.94
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H20/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.623752
Lean Cooler Duty	(MMBtu/hr)	0.35231
Condenser Duty	(MMBtu/hr)	0.366855
Reboiler Duty	(MMBtu/hr)	0.795672

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.25
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.2
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	7.1072
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	5.47
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.311876
Lean Cooler Duty	(MMBtu/hr)	0.176155
Condenser Duty	(MMBtu/hr)	0.183428
Reboiler Duty	(MMBtu/hr)	0.397836

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.1
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.08
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	2.84288
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	2.188
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.12475
Lean Cooler Duty	(MMBtu/hr)	0.070462
Condenser Duty	(MMBtu/hr)	0.073371
Reboiler Duty	(MMBtu/hr)	0.159134

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.075
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.06
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	2.13216
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	1.641
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H20/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0935629
Lean Cooler Duty	(MMBtu/hr)	0.0528465
Condenser Duty	(MMBtu/hr)	0.0550283
Reboiler Duty	(MMBtu/hr)	0.119351

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.05
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.04
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	1.42144
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	1.094
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0623752
Lean Cooler Duty	(MMBtu/hr)	0.035231
Condenser Duty	(MMBtu/hr)	0.0366855
Reboiler Duty	(MMBtu/hr)	0.0795672

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.025
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.02
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	0.71072
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.547
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0311876
Lean Cooler Duty	(MMBtu/hr)	0.0176155
Condenser Duty	(MMBtu/hr)	0.0183428
Reboiler Duty	(MMBtu/hr)	0.0397836

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Quicktreat(tm) Basic Calculations
Estimated Performance

Sour Gas Inlet Data		
Sour Gas Volume	(MMSCFD)	0.024
System Pressure	(PSIA)	1000
Inlet Gas Temperature	(Deg F)	70
Inlet Mole % CO2	(Mole %)	15
Inlet Mole % H2S	(Mole %)	5
Inlet Gas Gravity	(Air = 1)	0.732
Treated Gas Outlet Data		
Sweet Gas Volume (est)	(MMSCFD)	0.0192
Outlet Gas Temp	(Deg F)	80.0001
Lean Amine Data		
Type of Amine Utilized		DEA
Circulation Rate	(GPM)	0.682291
Weight Percent Amine	(Wt. %)	30
Lean Amine Temperature	(Deg F)	80
Lean Amine Loading	(Mol/Mol)	0.05
Rich Amine Data		
Total Acid Gas	(Moles/hr)	0.52512
Rich Amine Loading	(Mol/Mol)	0.575
Rich Amine Temp	(Deg F)	115.814
Input Regeneration Data		
Stripper Overhead Pressure	(PSIA)	14
Stripper Feed Temperature	(Deg F)	200
Reflux Temperature	(Deg F)	120
Reflux Ratio	(Mol H2O/mol AG)	1.5
Reboiler Pressure	(PSIA)	16
General Process Temperatures		
Regen Overhead Temp	(Deg F)	188.96
Reboiler Temp	(Deg F)	220.409
Warm Lean Amine Temp	(Deg F)	132.219
Estimated Exchanger Duties		
Cross Exchanger Duty	(MMBtu/hr)	0.0299401
Lean Cooler Duty	(MMBtu/hr)	0.0169109
Condenser Duty	(MMBtu/hr)	0.017609
Reboiler Duty	(MMBtu/hr)	0.0381923

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DATE
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5/23/94
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