

CLIENT : **GASSNOVA**
 PROJECT TITLE : **CO2 KARSTO PROJECT**
 JOB NUMBER : **25474**
 M.R. NUMBER : _____
 EQUIPMENT NUMBER : **MV-103 Internals**
 EQUIPMENT TITLE : **Stripper Internals**
 SERIAL NUMBER : _____
 CRITICALITY RATING : _____

COMMENTS:

1. Trays and Packing are for the new Amine Stripper
2. For drawing of column refer to 10112936-PB-P-DAS-0004
3. Vendor to rate packing and tray design and advise suitability.
4. Vendor to provide all internals including distributors and demisters.
5. Single stripper processes load from two absorbers.
6. Vendor to provide pressure drop for trayed and packed sections separately

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1	12-Nov-08	Issued For Information Including Comments P0040	MJC	HS	DM	ADB	BR		
0	7-Oct-08	Issued For Deliverable Milestone Schedule M2	HS	MJC	DM	ADB	BR		
REV	DATE	DESCRIPTION	Orig.	Chkd	Lead	Review	Proj		



PROCESS DATA SHEET TRAYS AND PACKING

JOB No	25474
Mechanical	DATA SHEET No.
BECHTEL :25474-000-M5D-CN-00052	OWNER : 10112936-PB-P-DAS-0005
SHEET	1 OF 4

REVISION

CLIENT & LOCATION : GASSNOVA,NORWAY	EQUIPMENT No : MV-103
PROJECT : CO2 Karsto	UNIT :
SERVICE OF UNIT : Stripper	VESSEL REFERENCE DRAWING : 10112936-PB-P-DAS-0004
SUPPLIER :	INTERNAL DETAILS REFERENCE DRAWING :

PROCESS DESIGN DATA

TRAY LOCATION				
TRAY SECTION		TOP		
TRAY NUMBERS FROM TOP		1-3		
TOTAL TRAYS IN SECTION		3		
CONDITIONS AT TRAY		1-3		

VAPOUR TO TRAY				
1 FLOW	kg/hr	*		
1 MOLECULAR WEIGHT		*		
1 TEMPERATURE	°C	*		
1 PRESSURE	Stripper kPa a	*		
1 DENSITY	kg/m³	*		
1 VOLUME FLOW	m³/hr	*		

LIQUID FROM TRAY				
1 FLOW	kg/hr	*		
1 MOLECULAR WEIGHT		*		
1 TEMPERATURE	°C	*		
1 DENSITY	kg/m³	*		
1 VOLUME FLOW (@ OPERATING TEMP & PRESS)	m³/hr	*		
1 VISCOSITY	cP	*		
1 SURFACE TENSION	Dynes/cm	*		

TRAY DESIGN SPECIFICATION

DESIGN RATE, % OF INDICATED L & V RATES		By Vendor		
MIN. OPER. RATE, % OF INDICATED L & V RATES (TURNDOWN)		50%		
TOTAL ALLOWABLE TOWER ΔP	kPa	25		
ΔP / TRAY, MAX ALLOWABLE	cm.H2O/mmHg			
1 FOAMING TENDENCY (NONE/MODERATE/HIGH/SEVERE)		Moderate-Note 2		
1 FOULING CONSIDERATION (NONE / SEE REMARK No.)		Low-Note 3		
MINIMUM TRAY EFFICIENCY				
TRAY MATERIAL OF CONSTRUCTION		SS-304L, Note 1		
VALVE MATERIAL OF CONSTRUCTION		SS-304L, Note 1		
MAX. EXPECTED DIFFERENTIAL PRESSURE	kPa	By Vendor		
MAX/MIN EXPECTED OPERATING TEMPERATURE	°C	160/10		
SPECIAL REMARKS (ALSO SEE REMARKS SECTION BELOW)				

TRAY DETAILS (TO BE VERIFIED BY VENDOR)

TRAY TYPE (VALVE, SIEVE BUBBLE CAP, OTHER)		Valve		
TYPE FLOW (NO FLOW PATHS)		By Vendor		
1 COLUMN DIAMETER	mm	6670		
TRAY SPACING	mm	600		
SYSTEM FACTOR		0.85		
SIZE OR STYLE OF VALVE / SIEVE / BUBBLE CAP		Note 4		
% OF FLOOD @ DESIGN, MAX. ALLOWABLE		80%		

TRAY DETAILS (BY VENDOR)

% OF FLOOD DESIGN, CALCULATED				
ΔP /TRAY ACTUAL	cm.H2O/mmHg			
CALCULATED DOWNCOMER BACK - UP CLEAR LIQUID	m			
DOWNCOMER WIDTH	m			
DOWNCOMER AREA	m²			
ACTIVE AREA	m²			
OUTLET WEIR LENGTH	m			
OUTLET WEIR HEIGHT	mm			
DOWNCOMER CLEARANCE	m			
No OF VALVES / HOLES / BUBBLE CAPS PER TRAY				
FLOW PATH LENGTH	m			

NOTES

- * Refer to sheet 4 for Vapour/Liquid Profile and Properties
- 1) Vendor to confirm material suitability for Amine Solutions.
- 2) System factor is 0.85
- 3) Vendor to recommend measures taken to avoid fouling in amine service based on amine service experience.
- 4) Vendor to consider reduced bubbling area in order to assure good liquid/vapor contact.



**PROCESS DATA SHEET
TRAYS**

JOB No	25474		
DRAWING No		REV	
BECHTEL :25474-000-M5D-CN-00052 OWNER : 10112936-PB-P-DAS-0005		1	
SHEET No.	2	OF	4

CLIENT & LOCATION : GASSNOVA NORWAY	EQUIPMENT No : MV-103
PROJECT : CO2 KARSTO	UNIT :
SERVICE OF UNIT : Stripper	VESSEL REFERENCE DRAWING : 10112936-PB-P-DAS-0004
SUPPLIER :	INTERNAL DETAILS REFERENCE DRAWING :

PROCESS DESIGN DATA

PACKED BED LOCATION				
BED DESCRIPTION / LOCATION		CO2 Stripping		
THEORETICAL STAGES FROM TOP		2-11		
CONDITIONS AT STAGE		10		
VAPOUR TO STAGE				
1 FLOW	kg/hr	*		
1 MOLECULAR WEIGHT		*		
1 TEMPERATURE	°C	*		
1 PRESSURE	kPa (a)	*		
1 DENSITY	Stripper kg/m ³	*		
1 VOLUME FLOW	m ³ /hr	*		
LIQUID FROM STAGE				
1 FLOW	kg/hr	*		
1 MOLECULAR WEIGHT		*		
1 TEMPERATURE	°C	*		
1 DENSITY	kg/m ³	*		
1 VOLUME FLOW (@ OPERATING TEMP & PRESS)	m ³ /hr	*		
1 VISCOSITY	cP	*		
1 SURFACE TENSION	Dynes/cm	*		

PACKED BED DESIGN SPECIFICATION

DESIGN RATE, % OF INDICATED L & V RATES		By Vendor		
MIN. OPER. RATE, % OF INDICATED L & V RATES (TURNDOWN)		50		
TOTAL ALLOWABLE TOWER ΔP	kPa	25		
ΔP /METRE PACKING, MAX ALLOWABLE	cm.H2O/mmHg			
1 FOAMING TENDENCY (NONE/MODERATE/HIGH/SEVERE)		Moderate-Note 2		
1 FOULING CONSIDERATION (NONE / SEE REMARK No.)		Low-Note 3		
REQUIRED NUMBER OF THEORETICAL STAGES		10		
1 PACKING MATERIAL OF CONSTRUCTION		SS 304L - Note 1		
PACKED BED MATERIAL OF CONSTRUCTION				
MAX. EXPECTED DIFFERENTIAL PRESSURE	kPa	By Vendor		
MAX/MIN EXPECTED OPERATING TEMPERATURE	°C	160/10		
SPECIAL REMARKS (ALSO SEE REMARKS SECTION BELOW)				

PACKED BED DETAILS (TO BE VERIFIED BY VENDOR)

COLUMN DIAMETER	mm	6670		
PACKING TYPE		Structured		
ESTIMATED BED HEIGHT (EXISTING)	mm			
DISTRIBUTOR TYPE				
BED SUPPORT TYPE	m			
BED HOLDOWN TYPE				
OTHER INTERNAL TYPE				

PACKED BED DETAILS (BY VENDOR)

MAXIMUM % OF FLOOD ALLOWABLE		80%		
% OF FLOOD @ DESIGN, CALCULATED				
ΔP /METRE, ACTUAL	cm.H2O/mmHg			
PACKING EFFICIENCY - HETP	m			
ACTUAL BED HEIGHT	m			
PACKING STYLE IDENTIFIED				
DISTRIBUTOR STYLE IDENTIFIED				
BED SUPPORT STYLE IDENTIFIED				
BED HOLDOWN STYLE IDENTIFIED				
OTHER INTERNAL STYLE IDENTIFIED				
PACKING BULK DENSITY	kg/m ³			

NOTES

* Refer to sheet 4 for Vapour/Liquid Profile and Properties

1) Vendor to confirm material suitability for Amine Solutions.

2) System factor is 0.85

3) Vendor to recommend measures taken to avoid fouling in amine service based on amine service experience.



**PROCESS DATA SHEET
PACKED BED**

JOB No 25474

DRAWING No

REV

BECHTEL :25474-000-M5D-CN-00052

OWNER : 10112936-PB-P-DAS-0005

1

SHEET No.

3

OF

4

CLIENT & LOCATION : GASSNOVA NORWAY	EQUIPMENT No : MV-103
PROJECT : CO2 KARSTO	UNIT :
SERVICE OF UNIT : Stripper	VESSEL REFERENCE DRAWING : 10112936-PB-P-DAS-0004
SUPPLIER :	INTERNAL DETAILS REFERENCE DRAWING :

PROCESS DESIGN DATA

Stage Report Vapor Phase

Vapor Phase Properties

Stage	Temperature °C	Pressure kPa	Molecular Weight kg/kmol	Mass Density kg/m ³	Mass Flow kg/h	Mass Cp kJ/(kg°C)	Dynamic Viscosity cP	Thermal Conductivity W/(m°C)
1	104.873	196.543	28.3404	1.78997	207236	1.31363	0.0165420	0.0239560
2	109.232	199.99	28.3863	1.80327	207866	1.32058	0.0167108	0.0243128
3	109.537	203.437	28.4899	1.83976	170041	1.31703	0.0167500	0.0243290
4	110.186	206.885	28.4082	1.86271	171163	1.32096	0.0167559	0.0243919
5	111.375	210.332	28.0374	1.86375	163344	1.33688	0.0167068	0.0245264
6	113.181	213.780	27.3216	1.83807	166757	1.36819	0.0165836	0.0247480
7	115.583	217.227	26.2412	1.78384	171743	1.41836	0.0163626	0.0250634
8	118.379	220.674	24.8726	1.70669	178153	1.48817	0.0160334	0.0254578
9	121.285	224.122	23.3599	1.61743	185290	1.57532	0.0156072	0.0259014
10	124.122	227.569	21.8194	1.52460	192199	1.67783	0.0151027	0.0263721
11	127.543	231.016	20.3039	1.42946	198429	1.80464	0.0145327	0.0269383

Stage Report Light Liquid Phase

Light Liquid Phase Properties

Stage	Temperature °C	Pressure kPa	Molecular Weight kg/kmol	Mass Density kg/m ³	Mass Flow kg/h	Mass Cp kJ/(kg°C)	Dynamic Viscosity cP	Surface Tension dyne/cm
1	104.873	196.543	19.0763	964.541	8230.23	4.34453	0.286181	56.12
2	109.232	199.99	25.9927	1126.37	2.19798E+06	3.75470	0.755425	88.31
3	109.537	203.437	25.9885	1126.19	2.19910E+06	3.75764	0.751113	88.25
4	110.186	206.885	25.9690	1125.11	2.20109E+06	3.76328	0.739817	87.99
5	111.375	210.332	25.9243	1122.52	2.20451E+06	3.77321	0.717993	87.39
6	113.181	213.780	25.8488	1118.02	2.20949E+06	3.78809	0.685141	86.37
7	115.583	217.227	25.7378	1111.12	2.21590E+06	3.80798	0.642896	84.84
8	118.379	220.674	25.5920	1101.61	2.22304E+06	3.83171	0.595752	82.75
9	121.285	224.122	25.4150	1089.31	2.22995E+06	3.85781	0.548322	47.33
10	124.122	227.569	25.2090	1073.48	2.23618E+06	3.88601	0.502652	47.18
11	127.543	231.016	25.7862	1067.02	3.40544E+06	3.87726	0.509974	46.42

NOTES

- 3) Vapour flow and properties are for Vapour From Stage
- 4) Liquid flow and properties are for Liquid From Stage
- 5) Liquid is 35%wt MEA aqueous solution
- 6) Stage 1 is trayed section, Stages 2-11 are packed sections



**PROCESS DATA SHEET
TRAYS AND PACKING**

JOB No 25474

DRAWING No

BECHTEL :25474-000-MSD-CN-00052
OWNER : 10112936-PB-P-DAS-0005

SHEET No.

4

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1

4