

**Technip**

PROJECT TITLE KHARG ETHYLENE PLANT

PROJECT SUB-TITLE KHARG OLEFIN COMPLEX

DATA SHEET FOR  
COLUMN

Project N°	Unit	Document Code	Serial N°	Rev.	Page
7273F	000	PDS	T 301	1	1 / 9

Service CAUSTIC WASH TOWER

Item T 301

CONDITIONS

Temperature  
°CPressure  
bar(g)

MR

Operating

Top

50

17.2

Btm

50

17.4

Design

Top

65 (11)

int. 21.5 bar(g)

ext. bar(g)

Btm

65 (11)

int. 21.5 bar(g)

ext. (15) bar(g)

Fluid CAUSTIC + HYDROCARBONS

Density (2) kg/m³

Postweld Heat Treatment for process (yes or no) Yes

MATERIALS

C.A. mm

Shell

CS + PWHT

3.0

Heads

Top

Btm

CS + PWHT

3.0

CS + PWHT

3.0

Lining

(19)

Insulation (yes or no) Yes

Heat Conservation (cold or hot) Hot

Fire Protection ☐ Personnel Protection ☐

Steam Tracing (yes or no) No

NOZZLES

Item	No.	Size	in	Rat. & Fac.	Service
A1	1	24			Cracked gas inlet
A2	1	6			Circul. caust. inlet
A3	1	24			Gas inlet
A4	1	6			Circul. caust. inlet
A5	1	2			Wash water inlet
M	2	16			Packing removal
D1, D3	2	3			Drains
E	2	3			Vent
F1	1	8			Circ. caust. outlet
F2	1	8			Circ. caust. outlet
F3	1	2			Wash water outlet
H	8	(22)			Manhole
N	6	2			Cleaning nozzle
S	2	2			Skimming
T1	1	24			Gas outlet
T2	1	20			Gas outlet
LC	(3)	(3)			Level controller
LG	(3)	(3)			Level gauge
A7	1	2			Fresh caust. inlet
A6	1	1 1/2			(16)
D2, D4	2	2			Spent caust. outlet

Diam.: 2.75 m Length: 37.85 (5) m

NOTES: (1) Total tray pressure drop (max.)

For other notes refer to page 7

FOR THE SKETCH REFER TO PAGE 8

1	Re-issue	20-06-05	DMP	JFF						
0	Issue for design	16-04-04	FB	YS	YS					
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Service CAUSTIC WASH TOWER PACKING

Item

Number Required

MR

Manufacturer

Weight

## PROCESS DATA

Loading at Bed No.

/ Top

/ Bottom

/ Top

/ Bottom

Fluid

CRACKED GAS

CRACKED GAS

Vapor: Design Rate (4) kg/h

141228

141053

Density kg/m³

13.2

13.4

Mol. Weight

18.76

18.76

Compr. Factor

0.96

0.96

Viscosity

cP 0.012

0.013

Liquid: Design Rate (4) kg/h

77975

77975

Density kg/m³

1094

1094

Viscosity

cP 1

1

Surf. Tension dyne/cm

73

73

Operating Temperature:

Vapor

°C

50

50

Liquid

°C

50

50

Operating Pressure

bar(g)

17.2

17.4

System (foam) Factor

0.8 (7)

Max. Flooding Factor

%

75

## MECHANICAL DATA

Equipment Diameter

m

2.75

Type of Packing

IMTP 50 (random) or equival.

Material

CS (20)(21)

Packing Dimensions

m

Packing Arrangement

Packing Bed height

m

(9)

Apparent Volumic Mass

kg/m³

Active Area

m²/m³

Void Fraction

%

Packing Volume

m³

Increased Volume

m³

Pressure Drop (Allowable/Calculated)

bar

(7)

/

/

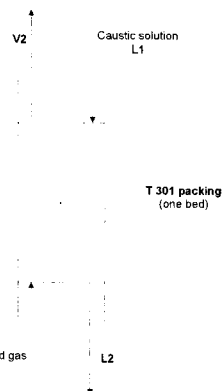
Equipment Item

T 301

T 301

Equipment Spec. Sheet

No.



## NOTES:

For notes refer to page 7

1	Re-issue	20-06-05	DMP	DMP	JFF						
0	Issue for design	16-04-04	FB	YS	YS						
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DATA SHEET OF TRAYS  
FOR INTERNAL LOADINGProject N° Unit Document Code Serial N° Rev. Page  
7273F 000 PDS T 301 1 3 / 9

Service CAUSTIC WASH TOWER TRAYS

Item T 301

MR

Trays Numbered From (Top or Bottom):

TOP

Number of Tray/Section

5

## PROCESS DATA

Loading at Tray No.

(10)

Fluid

(10)

Vapor: Design Rate

kg/h

141228

Density

kg/m³

13.2

Mol. Weight

18.76

Viscosity

cP

0.012

Compr. Factor

0.96

Liquid: Design Rate

kg/h

2646

Density

kg/m³

992

Mol. Weight

18

Viscosity

cP

0.59

Surf. Tension

dyne/cm

68.6

Operating Temperature:

Vapor

°C

50

Liquid

°C

50

Operating Pressure

bar(g)

17.2

System (foam) Factor

0.6

Max. Flooding Factor

%

85

Max. Dp/Tray

mbar

10

Min. Downc. Residence Time

h

Min./Max. Rate (1)

%

40

/ 110

Fouling

°C m²/W

## MECHANICAL DATA

Tray Diameter

m

2.75

Tray Type

Valve

Tray Spacing

mm

800

Number of Passes (preferred) (2)

1

## MATERIALS

Tray Deck : mat'l/C.A.

11/13 Cr / 0.0

Downcomer : mat'l/C.A.

11/13 Cr / 0.0

Valves : mat'l/C.A.

11/13 Cr / 0.0

NOTES: (1) Min. and max rates are given as percent of design rates.

The tray performance shall be guaranteed within the specified range (at constant L/V).

If not specified, the operation at 50% of the design loads shall be guaranteed.

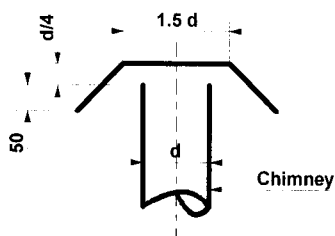
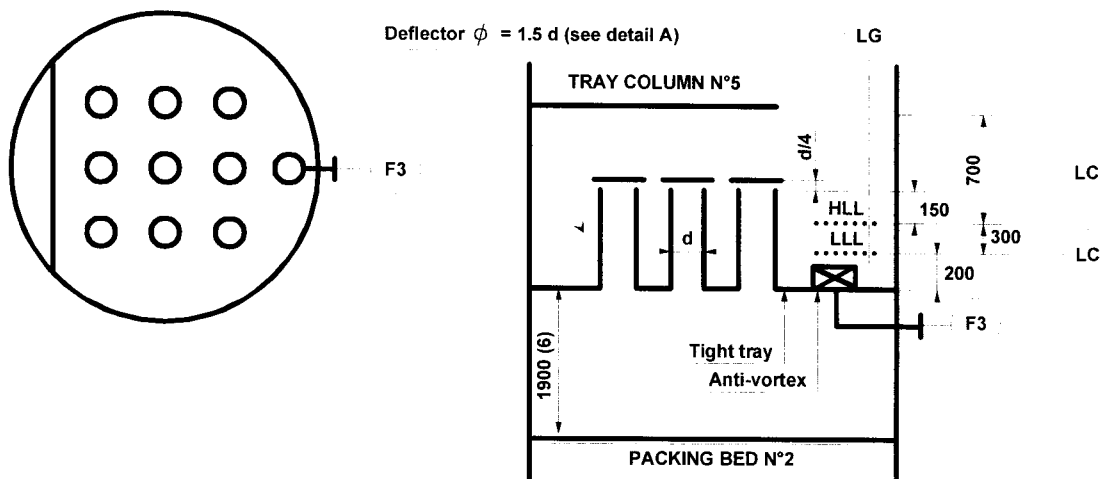
(2) The specified No. of passes is not mandatory.

Tray manufacturer can consider alternate solution, if more attractive.

For other notes refer to page 7

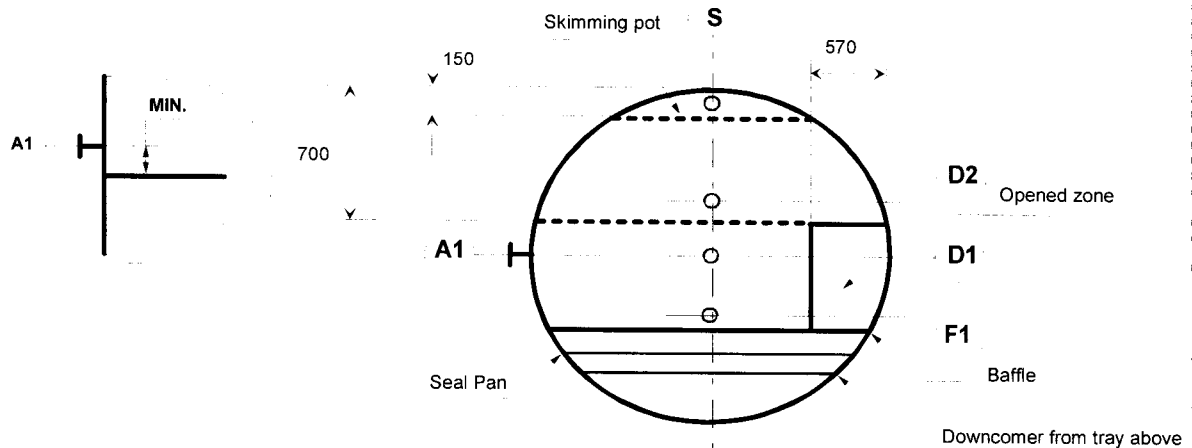
1	Re-issue	20-06-05	DMP	DMP	JFF						
0	Issue for design	16-04-04	FB	YS	YS						
Rev.	Status	Date	Wrt	Verif	App	Rev.	Status	Date	Wrt	Verif	App

# TRAY DETAILS (Notes 12, 14)

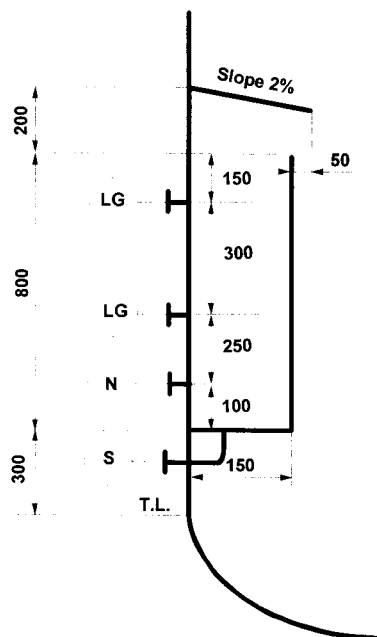


DETAIL A

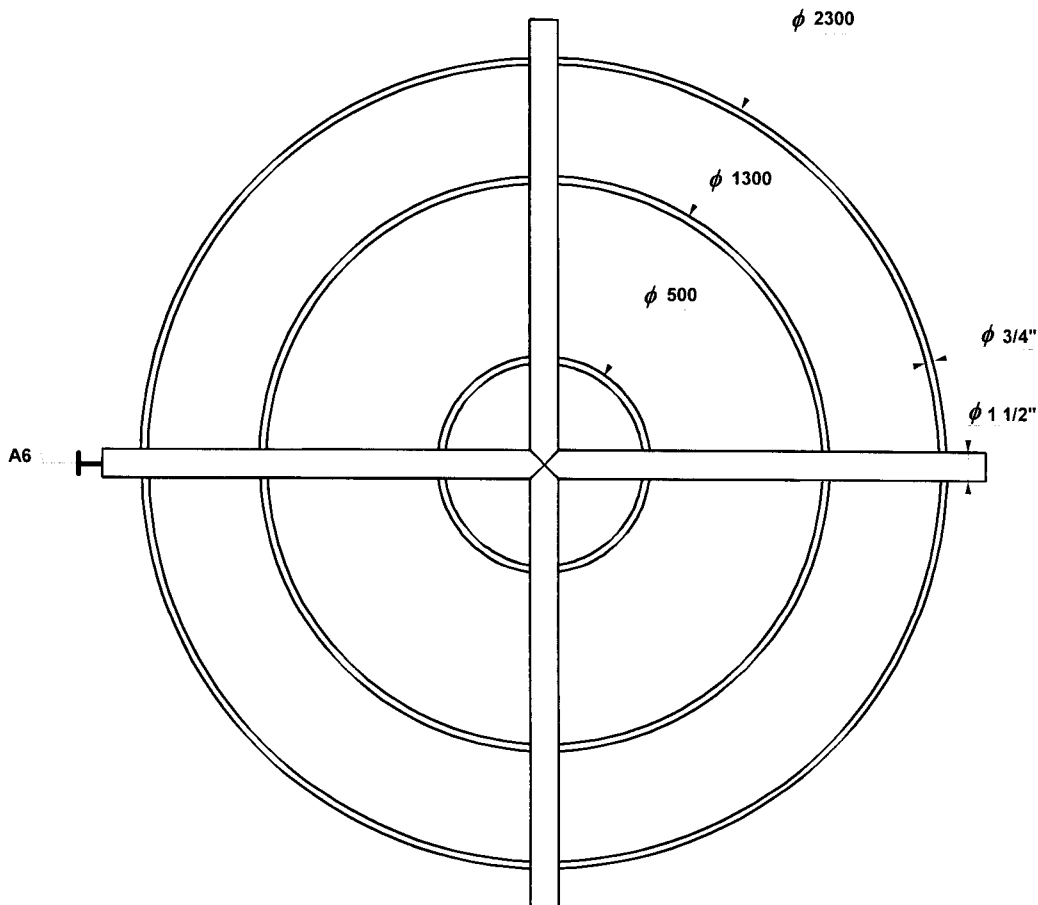
## DETAIL OF GAS INLET



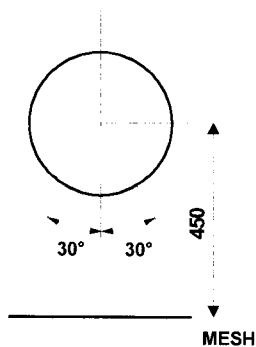
## DETAIL OF SKIMMING POT



## DETAIL OF ANNULAR DISTRIBUTOR



### DISTRIBUTOR SECTION



3 mm holes on annular distributors to be uniformly distributed and directed 30° down.  
Holes area: 2 X section of nozzle "A6" minimum

DATA SHEET FOR  
CAUSTIC WASH TOWER

1	Service CAUSTIC WASH TOWER						Item T 301			
2	Type						N° Req.		MR	
3										
4										
5	(2)									
6	- Caustic density : 1094 kg/m3									
7	- Cracked gas density : 13.4 kg/m3									
8	- BFW density : 992 kg/m3									
9										
10	(3) By instrument department									
11										
12	(4) Indicated flow rates are normal flow rates. Design vapor flow rate : 110% of normal flow rate. Turndown vapor flow rate : 40% of normal flow rate. Design liquid flow rate : 120% of normal flow rate. No turndown capacity required on liquid flow rate.									
13										
14										
15	(5) Dimensions to be confirmed by pressure vessel department									
16										
17	1 (6) Deleted.									
18										
19	(7) Severe foaming system, maximum pressure drop : 20 mm H2O/m									
20										
21	(8) Vendor to provide shop test of liquid distributors.									
22										
23	(9) Two beds : bed 1 : 9 m ; bed 2 : 9 m									
24										
25	(10) First tray : BFW , fifth tray : CRACKED GAS									
26										
27	(11) Steam out conditions : 110°C at atmospheric pressure.									
28										
29	(12) Tight chimney tray. Leak-test with water. Leakage prohibited.									
30										
31	(13) To put at the bottom of the skimming pot, see detail page 5									
32										
33	(14) Chimneys to be uniformly distributed. Total vapor area = 0.32 m2 min. considering a gas velocity of 10 m/s.									
34	Chimney internal diameter and number to be determined by tray vendor									
35	Final configuration shall be presented to TECHNIP Process division for approval.									
36										
37	(15) Top compartment may be operated with bottom part depressurised to atmospheric pressure. Design pressure to be applied to the intermediate elliptical head (internal pressure)									
38										
39										
40	(16) Mesh wash water inlet nozzle									
41										
42	(17) Provide an access door on the baffle									
43										
44	(18) To be located on caustic tower axis									
45										
46	(19) Tower to be painted externally with epoxy paint to prevent corrosion under insulation.									
47										
48	1 (20) CS stress relieved for distributors, trays and supports, except for trays 1 to 5 and below chimney tray.									
49										
50	(21) All removable parts in CS shall include a corrosion allowance of 0.75 mm on each side in contact with fluid, except for packing (no corrosion allowance).									
51										
52										
53	1 (22) By pressure vessel Dpt.									
54										
55										
56										
1	Re-issue	20-06-05	DMP	DMP	JFF					
0	Issue for design	16-04-04	FB	YS	YS					
Rev.	Status	Date	Wrt	Verif	App	Rev.	Status	Date	Wrt	Verif





Item T 301

MR

## 1. GENERAL DESCRIPTION

The duty of caustic wash tower is to remove H<sub>2</sub>S and CO<sub>2</sub> to meet the final product specifications. Two caustic wash zones are provided for this duty, each packing bed is dedicated to one caustic solution circulation loop (upper and lower).

## 2. BASIS OF DESIGN

2.1 The characteristics of the cracked gas to be washed are available in the packing data sheets (page 2)

### COMPOSITION (% wt)

Water	0.54
Hydrogen	3.59
CO	0.11
Methane	9.34
Acetylene	0.36
Ethylene	50.80
Ethane	31.09
MAPD	0.02
Propylene	1.01
Propane	0.22
C <sub>4</sub> 's	1.60
C <sub>5</sub> +	1.29

The maximum amount of CO<sub>2</sub> in the feed gas is 90.2 kg/h

The maximum amount of H<sub>2</sub>S in the feed gas is 31.5 kg/h

2.2 Fresh caustic is injected at a concentration of 10% wt NaOH in the upper circulation loop, at a rate of 3007 kg/h (bed 2)

An equivalent amount of caustic cascades to the lower circulation loop (bed 1)

Caustic circulation flowrate in the packing are indicated on the packing data sheets (page 2)

Spent caustic is removed from the lower circulation at a residual NaOH concentration of 2 % wt

## 3. PRODUCT SPECIFICATION

The requested residual amount of CO<sub>2</sub> in the cracked gas at column outlet is less than 0.03 ppm vol

Vendor shall guarantee CO<sub>2</sub> residual amount at top of the column based on the above described basis of design