

Interoffice Communication

To P. C. Gowan
 From G. D. Johnson
 Date May 31, 1977
 Subject Ethylene Unit Vent Collection System
 Design No. 744-ETH-477-GDJ
 Final Issue

Attached is a class "A" design for an extension to the vent collection header in the Ethylene Unit. This design is a sequel to the benzene sampling systems design and includes all tie-ins to the vent collection system as required to vent the proposed sampling manifolds. Additionally, this design incorporates some of the ideas of vent collection of hydrocarbon releases from various process equipment originally planned in 1974².

Hydrocarbon vented to the collection header is depressured to the quench water settler (at 12-18 psig) and from there compressed by the charge gas compressor and subsequently recovered in the ethylene cold train. Recovering hydrocarbons via vent collection increases plant yields and reduces flaring.

The design also includes planning for thirteen (13) additional process equipment tie-ins to be installed in the future. As planned, other designs will specify further details and justifications for recovery of these potential hydrocarbon products.

Note that items with an asterisk in the work list were done in the April turnaround of the Ethylene Unit.

By copy of this design to Mr. Walt Miller, a cost estimate is requested. Anyone having questions concerning the design, please advise.

G. D. Johnson

G. D. Johnson
 Environmental Health Engineer

GDJ/psm

APPROVED BY:

W. D. Ritter

W. D. Ritter
 Chief Process Engineer

cc: RDG, RAC, RHG, WJR, BRD, RLP, WAM, SMF, HGH, WWC, GDO, KJB, JEC, PCH,
 SPT, DHS, PEC

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- (1) G. D. Johnson, Closed Benzene Sampling Systems, design No. 734-ETH-177-GDJ, 1977.
- (2) H. D. Garrison, Ethylene Unit Vent Collection, design No. 540-ETH-674-RDG, 1974.

ENERGY IMPACT STATEMENT

ETHYLENE UNIT VENT COLLECTION SYSTEM

With the tie-in of the sampling manifolds to the vent collection system, only small amounts of hydrocarbons will be recovered with sampling. Additional product savings will be achieved as each process tie-in is made in the near future.

ENVIRONMENTAL & HEALTH IMPACT STATEMENT

ETHYLENE UNIT VENT COLLECTION SYSTEM

There will be a very significant environmental improvement with the installation of closed sampling systems and vent recovery designs. With closed sampling manifolds, the Ethylene Unit will achieve the occupational standard of 1 ppm with 8-hour exposure. With vent collection, the recovery of hydrocarbons will reduce flaring proportionately.

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JUSTIFICATION FOR CHECK VALVES IN VENT COLLECTION SYSTEM

Note that part of the metallurgy in the vent collection header is stainless steel while other parts will be carbon steel. Stainless steel must be used for hydrocarbons at low temperature, e.g., demethanizer reflux at -150°F. To protect the carbon steel sections of piping from low temperature exposure, stainless steel check valves have been specified herein where the transition from stainless to carbon steel metallurgy occurs. This is a cost savings feature of the design which allows the use of carbon steel in a large part of the vent collection system.

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TIE-IN CHECK LIST FOR VENT COLLECTION SYSTEM

Existing Tie-ins

1. Ethane Feed Dryers, FA-409A and FA-409B.

New Tie-ins With The Present Design

1. Demethanizer Bottoms Sample Manifold.
2. Deethanizer Bottoms Sample Manifold.
3. Caustic Tower Overhead Sample Manifold.
4. Depropanizer Bottoms Sample Manifold.
5. Demethanizer Reflux Pumps, GA-401 and GA-401S.
6. Deethanizer Reboilers, EA-404 and EA-404S.
7. Ethane Feed Vaporizers, EA-303 and EA-316.
8. Debutanizer Reflux Pumps, GA-409 and GA-409S.
9. Depropanizer Reboilers, EA-414 and EA-414S.
10. Debutanizer Reboilers, EA-423 and EA-423S.
11. Light Aromatics Product Pumps, GA-413 and GA-413S.

Future Tie-ins To Vent Collection Header

1. Acetylene Converters, FA-403A and FA-403B.
2. Ethylene Fractionator Reflux Pumps, GA-403 and GA-403S.
3. Ethylene Product Vaporizers, EA-412 and EA-424.
4. Ethylene Product Pumps, GA-404 and GA-404S.
5. Deethanizer Reflux Pumps, GA-402 and GA-402S.
6. Wet Flare Drum, FA-801.
7. Dry Flare Drum, FA-802.
8. Methanator Reactors, FA-306A, FA-306B, and FA-306C.
9. Depropanizer Reflux Pumps, GA-405 and GA-405S.

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10. Light Aromatic Distillate Sample Manifold. This manifold is required if a bomb-type sample is used.
11. Propadiene Reactors, D7-420 and D7-421.
12. Propane-Propylene Product Pumps, P7-419 and P7-420.
13. Casinghead Tailgas Vaporizer, X7-430.

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WORK LIST

1. Install a stainless steel vent collection (V.C.) header, line 2"-HM-20-N-A13-4M in the cold train of the fractionation section. Tie in this line with the existing V.C. header (2"-HM-1240-N-A13-4M) in the E-W pipe rack north of the depropanizer reflux pumps. From there run line 2"-HM-20 northward and terminate above exchanger EA-307. Provide a 2" flanged stainless steel valve at the tie-in with line 2"-HM-1240. Along the new V.C. header provide eight (8) 3/4" welded thread-o-let connections, one (1) 1" welded thread-o-let connector, and one (1) 2" flange as indicated in the drawings.
2. Tie in line 3/4"-HM-11-N-B2-2 from the sample manifold for the caustic tower overhead sample. Provide a 3/4" stainless steel check valve at the tie-in with the new V.C. header. Note that this item supplements item No. 32 of the Closed Benzene Sampling System design, design No. 734.
- *3. Provide a 3/4" valve on the methane off gas line from exchanger EA-505, line 4"-P-584-A2A, in the N-S pipe rack just west of the fuel gas drum. Tie in line 3/4"-FG-18-N-B2-2 at this valve and run this line to the sample manifold. Provide a 3/4" globe valve and a pressure gauge at the tie-in with the manifold. Note that this item supplements item No. 31 of design No. 734.
4. Install line 3/4"-HM-28-B2-2 from the deethanizer reboilers, EA-404 and EA-404S, to the 2" vent collection header. Provide a 3/4" stainless steel check valve at the tie-in point.
5. Install line 3/4"-HM-09-P-B2-2 between the deethanizer bottoms sample manifold and line 3/4"-HM-28 mentioned above. Note that this work list item replaces item No. 28 of design No. 734.
- *6. Provide a 3/4" valve on the methane off gas line from EA-301, line 4"-P-325-A2 A, near the outlet of exchanger EA-301. At the valve tie in line 3/4"-FG-16-N-B2-2 from the deethanizer bottoms sample manifold and line 3/4"-FG-14-N-B2-10 from the demethanizer bottoms sample manifold. Provide a 3/4" globe valve and pressure gauge, PG-8 at the tie-in of line No. 18 with demethanizer bottoms sample manifold. Provide a 3/4" globe valve and pressure gauge, PG-9, at the tie-in of line No. 16 with the deethanizer bottoms sample manifold. Note that this item supplements item No. 27 of the benzene sampling design.
7. Install line 3/4"-HM-27-N-A13-4 from the ethane vaporizer's 3/4" dry flare line to the 2" vent collection header.
8. Tie in line 3/4"-HM-06-P-B2-10 from the demethanizer bottoms sample manifold with the 2" vent collection header. This item supplements item No. 23 in design No. 734.

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9. Install line 3/4"-HM-26-C-B10-1 from the demethanizer reflux pumps, GA-401 and GA-401S, to the 2" vent collection header. This item supplements work list items 35 and 36 of design No. 734.
10. Install a 2" carbon steel vent collection header from the 1½" flange on line 2"-HM-20 to the south end of the fractionation section terminating above the casinghead tailgas vaporizer. Provide a 1½" S.S. gate valve and check valve at tie-in with line 2"-HM-20. Also provide five (5) 3/4" welded thread-o-let connector, one (1) 1" flange connection, and one (1) 2" flange as shown in the drawings.
11. Tie in line 3/4"-HM-03-P-A2-1 from the depropanizer bottoms sample manifold. This item supplements work list item No. 5 of the benzene sampling design.
12. Install line 3/4"-HM-29-N-A2-1 from the debutanizer reflux pumps, GA-409 and GA-409S, to the 2" V.C. header, line 2"-HM-21. Tie in the line at the 3/4" drain valve at each pump. Provide a 3/4" gate valve and an alternate 3/4" drain valve at each tie-in.
13. Install relief valve SV-1 downstream of pressure regulator PCi-400. Run line 3/4"-HM-30-N-A2-1 from the relief valve outlet to a tie-in with vent line 3/4"-HM-03-P-A2-1. This item supplements item No. 6 of the benzene sampling design.
14. Install line 1"-HM-31-P-A2-1 from the depropanizer reboilers, EA-414 and EA-414S, to the 2" vent collection header.
15. Install line 3/4"-HM-32-P-A2-1 from the debutanizer reboilers, EA-423 and EA-423S, to the 2" vent collection header.
16. Install line 3/4"-HM-33-P-A2-1 from the light aromatic product pumps, GA-413 and GA-413S, to a tie-in with line 3/4"-HM-03 located at the 2" vent collection header.

*This item was installed during the April turnaround of the Ethylene Unit.

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PIPING SCHEDULE

DESIGNATION	Flowing Fluid	SERVICE		NORMAL		DESIGN		Phase	PSI
		From	To	Temp. °F.	Press. PSIG	Temp. °F.	Press. PSIG		
14"-HM-01-P-12-1	DEAETHANIZER BOTTOMS	LCV-416 BLEEDER VALVE	SAMPLE BOMB MANIFOLD	205	150	400	180	—	—
14"-HM-02-P-12-1	"	SAMPLE BOMB MANIFOLD	3/4" VALVE - SAMPLE 16.10.20	205	150	400	180	—	—
3/4"-HM-03-P-12-1	"	SAMPLE BOMB MANIFOLD	2" V.C. HEADER LINE 2"-HM-21	205	ATMOS.	400	180	—	—
14"-HM-04-C-82-10	DEAETHANIZER BOTTOMS	LCV-401 BLEEDER VALVE	SAMPLE BOMB MANIFOLD	29	415	429 ± 20	720	—	—
14"-HM-05-C-82-10	"	SAMPLE BOMB MANIFOLD	3/4" VALVE - SAMPLE 6P412	29	420	429 ± 20	720	—	—
14"-HM-07-P-12-2	DEAETHANIZER BOTTOMS	LCV-403 BLEEDER VALVE	SAMPLE BOMB MANIFOLD	185	395	200	720	—	—
14"-HM-08-F-12-2	"	SAMPLE BOMB MANIFOLD	LCV-403 DUNSTON BLEEDER VALVE	185	200	200	720	—	—
3/4"-HM-09-P-12-2	"	SAMPLE BOMB MANIFOLD	2" V.C. HEADER LINE 2"-HM-20	185	ATMOS.	200	720	—	—
14"-HM-10-N-82-2	CRUSTIC AM. OVERHEAD	SAMPLE 1A.1	SAMPLE BOMB MANIFOLD	60	515	200	720	—	—
3/4"-HM-11-N-82-2	"	SAMPLE BOMB MANIFOLD	2" V.C. HEADER LINE 2"-HM-20	60	ATMOS.	200	720	—	—
3/4"-FG-12-N-82-1	GLAUS METHANE	3/4" NAT. GAS LINE OPPOSITE DEBITUMINE	SAMPLE BOMB MANIFOLD	90	325	100	720	—	—
14"-FG-13-N-82-1	"	PCI-400	SAMPLE BOMB MANIFOLD	90	45 ± 50	100	275	—	—
3/4"-FG-14-N-82-10	METHANE OFF-GAS	FM 41-301 LINE 41-325	DEAETHANIZER 11 SAMPLE BOMB MANIFOLD	30	100	429 ± 20	720	—	—
14"-FG-15-N-82-10	"	LINE 3/4"-FG-14	SAMPLE BOMB MANIFOLD	30	100	429 ± 20	720	—	—
3/4"-FG-16-N-82-2	"	LINE 3/4"-FG-14	DEAETHANIZER 11 SAMPLE BOMB MANIFOLD	30	100	200	720	—	—
14"-FG-17-N-82-2	"	LINE 3/4"-FG-16	SAMPLE BOMB	30	100	200	720	—	—
3/4"-FG-18-N-82-2	"	LINE	SAMPLE 16.10.20	70	85	200	720	—	—
14"-FG-19-N-82-2	"	LINE 3/4"-FG-18	SAMPLE 16.10.20	70	85	200	720	—	—

PIPL SCHEDULE

SIGNATION	Flowing Fluid	SERVICE		NORMAL		DESIGN		Flow Lb./Hr.	Phase	PSI ΔP/L
		From	To	Temp. °F.	Press. PSIG	Temp. °F.	Press. PSIG			
2"-HM-20-N-A13-4M	LT. H'CARBON	LINE 2"-HM-1240-N-A13-4M	NORTH END OF FRACTIONATION SEC.	-113 TO 175	12	-151	275	-	-	
2"-HM-21-N-A2-1	C3+ H'CARBON	LINE 2"-HM-1240-N-A13-4M	SOUTH END OF FRACTIONATION SEC.	105 TO 205	12	100	275	-	-	
1/4"-HM-22-P-A2-1	DEETHANIZER BOTTOMS	SAMPLING MANIFOLD	LINE 3/4"-HM-03	205	160	100	275	-	-	
1/4"-HM-23-P-B2-1	DEETHANIZER BOTTOMS	SAMPLING MANIFOLD	LINE 3/4"-HM-06	29	445	+29 TO -20	720	-	-	
1/4"-HM-24-P-B2-2	DEETHANIZER BOTTOMS	SAMPLING MANIFOLD	LINE 3/4"-HM-09	185	395	200	720	-	-	
1/4"-HM-25-N-B2-2	CAUSTIC TUR. OVHD	SAMPLING MANIFOLD	LINE 3/4"-HM-11	60	515	200	720	-	-	
3/4"-HM-26-C-310-1	DEETHANIZER REFLUX	GA-4012 LOTS	LINE 2"-HM-20	-113	440	-150	720	-	-	
3/4"-HM-26-P-B2-10	DEETHANIZER BOTTOM	SAMPLING MANIFOLD	LINE 2"-HM-20	29	445	+29 TO -20	720	-	-	
3/4"-HM-27-N-A13-1	PROPANE PROPYLENE	FEED VAPORIZER EA-303 FEA-316	LINE 2"-HM-20	-12	175	-151	275	-	-	
3/4"-HM-28-P-B2-2	DEETHAN. BOTTOMS	DEETH. REBOILERS EA-404 FEA-404S	LINE 2"-HM-20	175	395	200	720	-	-	
3/4"-HM-29-N-A2-1	DEBUTAN. REFLUX	REFLUX PUMPS GA-409 FGA-409S	LINE 2"-HM-21	105	55	100	275	-	-	
3/4"-HM-30-N-A2-1	GILLIS METHANE	SV-1	LINE 3/4"-HM-03	90	12 TO 18	100	275	-	-	

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P. NO SCHEDULE

ESIGNATION	Flowing Fluid	SERVICE		NORMAL		DESIGN		Flow lb./hr.	Phase
		From	To	Temp. °F.	Press. PSIG	Temp. °F.	Press. PSIG		
1"-HM-31-P-A2-1	DISPERGIZER BOTTOMS	DEPROP. REBOILERS EA-414 & EA-414S	LINE 2"-HM-21	205	160	100	275		
3/4"-HM-32-P-A2-1	DEBUTAN. BOTTOMS	DEBUTAN. REBOILERS EA-423 & EA-423S	LINE 2"-HM-21	249	65	100	275		
3/4"-HM-33-P-A2-1	Lt. AROM. PRODUCT	GA-413 & GA-413S	LINE 3/4"-HM-03	249	65	100	275		
NOTES:									
(1) The Flow, Phase, and DP data have not been tabulated because these values vary with Venting (depressuring) operations.									
(2) Specification A13-AM above is a modification of Conoco Specification A13-A. It is the same specification, except extended valve stem bonnets are not required.									

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ENGINEERING CENTER

TONKA CITY, OKLAHOMA

SPECIFICATION SHEET

RELIEF VALVES

API NO.

DATE 4-20-77

W. O. NO.

MADE BY GDU

ING. NO.

APPROVED BY WJR

REQ. NO.

E. M. NO.

P. O. NO.

ANT LAKE CHARLES CHEM. PLANT PROJECT C-2 UNIT VENT COLLECTION SYSTEM

1	GENERAL		SV-1					
2	RELIEVES EQUIPMENT NO.		DEPROPANIZER BTMS 11/10					
3	MANUFACTURER		CONSOLIDATED (1)					
4	MODEL NO.		3/4" 1975C					
5								
6	SERVICE CONDITIONS							
7	FLUID		METHANE					
8	STATE		GAS					
9	REQUIRED CAPACITY LB./HR.		79.2					
10	MOL. WT.		16.0		0.7316			
11	VISCOSITY @ T, CP.		0.013					
12	COMPRESSIBILITY FACTOR		1.0					
13	DESIGN PRESS OF EQUIPMENT		275					
14	PRESS. OPERATING		50		250			
15	TEMP. FLOWING		90		90			
16	BACK PRESSURE		13					
17	DIFFERENTIAL SET PRESSURE		232					
18	ACCUMULATION		N/A					
19	BLOW-DOWN PRESSURE		10					
20	RELIEVES TO		QUENCH VTR SETTLER					
21	BASIS OF SELECTION							
22	CODE REQUIREMENT							
23	EXPOSED AREA							
24	INSULATION THICKNESS							
25	OTHER BASIS		PCI-400 FAILURE					
26								
27	DESIGN DETAILS							
28	DESIGN TYPE							
29	SEAT TYPE							
30	BONNET (OPEN OR CLOSED)							
31	INLET SIZE, RATING, FACING		3/4" MALE SCWD.					
32	OUTLET SIZE, RATING, FACING		1" FEMALE SCWD.					
33	CALCULATED AREA		0.005					
34	ORIFICE LETTER		ACTUAL AREA		0.06			
35	MATERIALS							
36	BODY		C.S.		C.S.			
37	SEAT & DISK		C.S.					
38	GUIDE & RING		S.S.					
39	SPRING		C.S.					
40	BELLOWS		N/A					
41	ACCESSORIES							
42	LIFTING LEVER (PLAIN OR PACKED)							
43	CAG							
44	CODE STAMP							
45	CAP (SCREWED OR BOLTED)							
46	OTHER							

NOTES: (1) OR EQUIVALENT (2) AT RELIEVING PRESS. & TEMP.
MANUFACTURER SHALL VERIFY SELECTION OF ORIFICE SIZE AND MATERIALS.
VALVES SHALL MEET DIMENSION REQUIREMENTS OF API RP-526.
VALVES SHALL MEET TEST REQUIREMENTS OF API RP-527.

SUPPLIER TO COMPLETE FORM BY FURNISHING
INFORMATION FOR BLANK SPACES

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SHEET 4 OF 5 REV.



ENGINEERING CENTER
PONCA CITY, OKLAHOMA
SPECIFICATION SHEET
PRESSURE GAGES

A.F.E. NO. _____
DATE 4-21-77 W.O. NO. _____
MADE BY GDU INQ. NO. _____
APP'D BY WJR REQ. NO. _____
B.M. NO. _____ P.O. NO. _____

PLANT LAKE CHARLES CHEMICAL PLANT PROJECT ETHYLENE UNIT VENT COLLECTION SYSTEM

1	2	TAG NO.	REV	QUAN.	RANGE		MAX. OPER. PRESS	SERVICE	ACCESSORIES REMARKS	NOTES
					TUBE	DIAL				
4		PG-8		1		0-600	145	METHANE OFF-GAS	NORMAL PRESS: 100 PSIG	
5		PG-9		1		0-600	395	METHANE OFF-GAS	" " " "	
6		PG-10		1		0-600	515	METHANE OFF-GAS	NORMAL PRESS: 85 PSIG	
7		PG-11		1		0-300	165	GILLIS METHANE	NORMAL PRESS: 45-50 PSIG	
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NOTES

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SHEET 5 OF 5 REV _____