

Attachment #1

LHC III Ethylene Small Volume Raw Materials

	Chemical Name	Tank	Purpose	Vendor Name	Storage Cap. (Max. LBS)	Reorder Quantity (LBS)	Annual Usage (LBS)	Delivery Mode
1	Dimethyl Sulfide	D-5	Prevent Coke	Gaylord Chemical Co.	140000	45000	230000	LPG Truck
2	Control 778P	T-4069	Boiler feed water	Betz Chemical	15960	13000	68000	Truck
3	BP5206A	T-4091	Boiler feed water	Betz Chemical	38400	28800	210000	Truck
4	BP6702A	T-8048	Boiler feed water	Betz Chemical	58240	27300	86000	Truck
5	BP6703A	T-4066	Boiler feed water	Betz Chemical	17800	13350	78000	Truck
6	NA-7	T-4092	Dilution Steam	Betz Chemical	17000	12750	48000	Truck
7	Optimeen 80358	T-891052/3	GT scrubbers	Betz Chemical	8100	12150	72000	Truck
8	38K	T-8365	Cooling Tower	Betz Chemical	18000	13500	138000	Truck
9	2023	T-8364	Cooling Tower	Betz Chemical	18600	13950	81000	Truck
10	445	T-6366	Cooling Tower	Betz Chemical	4760	3400	6500	Truck
11	C-68	T-8661	Cooling Tower	Betz Chemical	2410	2410	2400	Semi-Bulk
12	Foamtrol	T-870458	Cooling Tower	Betz Chemical	3500	280	700	Truck
13	Corshield 736	-	ARU System	Betz Chemical	2120	2120	2100	Drums
14	6% Caustic	T-4059	Caustic Scrubber	Dowell	12500	10000	100000	Truck
15	BP20Y15	T-880810	Caustic Scrubber	Betz Chemical	8000	6000	90000	Truck
16	BP20Y8	T-880620	Depropanizer	Betz Chemical	14000	12000	60000	Truck
17	Sodium bisulfite	T-55	Carbonyl Wash	TriChem	36700	32000	880000	Truck
18	Tertiary Butyl Catechol	-	Polymer Inhibitor	Van Waters & Rogers		4000	4000	Drums
19	methanol	T-1650	dehydrator	Hoechst celanese	135000	30000	5000	Truck
--	Methanol	T-50	dehydrator	Van Waters & Rogers	17000	15000	2000	Truck
	Lube Oil	T-48	Turboexpanders		3000	2700	2700	Truck
24								
23								
24								
25								

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Attachment #2

LHC III ETHYLENE PROCESS ANALYZERS

	Analyzer	Location	Cycle time (seconds)	Computer Control	COMPONENT MEASURED (L/D)																		OTHER
					O2	H2	CO	CO2	C3H4	C2H2	C2H4	C2H6	C2H8	C3H6	C3H8	C3H8	C3H8	I-But	N-But	Butene	c-Butene	1,3-Buta	
1	AX-1001	TLE-1A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
2	AX-1001	TLE-1B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
3	AX-1001	TLE-7A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
4	AX-1001	TLE-7B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
5	AX-1002	TLE-2A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
6	AX-1002	TLE-2B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
7	AX-1002	TLE-3A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
8	AX-1002	TLE-3B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
9	AX-1003	TLE-4A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
10	AX-1003	TLE-4B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
11	AX-1003	TLE-5A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
12	AX-1003	TLE-5B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
13	AX-1004	TLE-6A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
14	AX-1004	TLE-6B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
15	AX-1004	TLE-12A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
16	AX-1004	TLE-12B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
17	AX-1005	TLE-8A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
18	AX-1005	TLE-8B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
19	AX-1005	TLE-9A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
20	AX-1005	TLE-9B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
21	AX-1006	TLE-10A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
22	AX-1006	TLE-10B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
23	AX-1006	TLE-11A	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
24	AX-1006	TLE-11B	660	No		0.1%		0.1%	0.1%	0.1%	0.1%			0.1%	0.1%								
25	AX-1034	C2H6 From LHC II	900	No				0.1%	0.1%	0.1%	0.1%	0.1%		0.1%	0.1%			0.1%	0.1%				
26	AX-1016	C-19 Bottoms	320	Yes								100ppm		0.1%	0.1%								
27	AX-1007	C-18/C-55 Bottoms	500	Yes														200ppm	200ppm	200ppm	200ppm	200ppm	200ppm
28	AX-1115	P-23 to T-1701	600																				
29	AX-1013	D-50D,D-51011, Poly Rec		No				0.1%			200ppm	200ppm											.1% Naphthalene Btu, Density, and Mol Wt.
30	AX-1013	C3H6 to E-145		Yes																			
31	AX-1017	C-52 Bottoms	300	Yes								50ppm											
32	AX-1014	C-55 Overhead	960	Yes														0.1%				0.1%	.1% Heavies
33	AX-2117A	C-57 Bottoms	500	Yes										0.1%	0.1%						0.1%		.1% MA and PPD
34	AX-1014A	C-54 Bottoms	360	Yes										0.1%	0.1%								.1% PPD

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LHC III ETHYLENE PROCESS ANALYZERS

	Analyzer	Location	Cycle time (seconds)	Computer Control	COMPONENT MEASURED (LDL)																	OTHER	
					O2	H2	CO	CO2	CH4	C2H2	C2H4	C2H6	C2's	C3H6	C3H8	C3's	1 But	N-But	Butene	c-Butene	1,3-Buta		C4's
35	AX-1039	C3H6 Product Hdr, Well	900	No							0.5ppm	0.5ppm			500ppm								1ppm MA and PPD
36	AX-1039	and Docks																					
37	AX-1015	C-54 Overhead	1200	Yes									100ppm		0.1%		0.1%	0.1%	0.1%		0.1%		1% MA and PPD
38	AX-1028	C2H4 to Vinyl, Poly C, and	400	No					1ppm	0.1ppm		1ppm											
39	AX-1028	to Well																					
40	AX-1032	C2H4 to Vinyl, Poly C, and	900	No																			1ppm E, P, and M Alcohol
41	AX-1032	to Well																					
42	AX-2087	Pygas from LHC II	700	No												0.1%	0.1%						1% heavies
43	AX-1024	C-57 Overhead	900	Yes							1ppm	1ppm			1ppm								1ppm
44	AX-2117B	C-57 feed from C-54	500	Yes										0.1%	0.1%						0.1%		1% MA and PPD
45	AX-2088	D-35B In/out	1000	No																			5 ppm Ace. and Acetald.
46	AX-1020	C-151 OH, D-151 OH	480	No					0.1%	0.1%	0.1%	0.1%		0.1%	0.1%								
47	AX-1020	C-51 Bims, C-52 OH		Yes																			
48	AX-1021	R-2A/B outlet	150	Yes						0.5ppm													
49	AX-1021A	R-2A/B outlet	150	Yes						0.5ppm													
50	AX-1022	C-152 OH	350	Yes					1ppm	0.5ppm		1ppm											
51	AX-1022	D-152 bims/overheads		No																			
52	AX-1023	C-152 overhead	200	Yes					1ppm	0.5ppm													
53	AX-1029	Fuel gas to Fur, Turb. Power	900	No		0.1%		0.1%	0.1%		0.1%	0.1%		0.1%	0.1%		0.1%	0.1%					Btu, Density, and Mol. Wt.
54	AX-1031	R-1A out, Tot. Rx out	200	Yes		20ppm																	
55	AX-1031A	R-1/2 in, C-152 bottoms	500	Yes					0.1%	0.1%	0.1%	0.1%											
56	AX-1031A	Total Rx out		No																			
57	AX-685-Z	C3H8 Feed to Furnaces	600	Yes				0.1%	0.1%		0.1%	0.1%		0.1%	0.1%		0.1%	0.1%					
58	AX-1030	Air monitor for Bz/Tol	200	No																			1 ppm Benzene an toluene
59	AX-1519-G	E-35 to Waste Treatment	500	No																			50 ppb benzene
60	AX-1037	C3H8 to Furnace	600	Yes				0.1%	0.1%		0.1%	0.1%		0.1%	0.1%		0.1%	0.1%					
61	AX-545A-M	F1-F12 Oxygen	Continuous	Yes	0.1%																		
62	AX-549A-M	F1-F12 Carbon Monoxide	Continuous	No			1ppm																
63	AX-547A-M	F1-F12 Combustibles	Continuous	No																			0.1% Combustibles
64	AX-1041A	B-1A Nitrous Oxides	Continuous	No																			1ppm NOX
65	AX-1041B	B-1A Carbon Monoxide	Continuous	No			1ppm																
66	AX-1041C	B-1A Oxygen	Continuous	No	0.1%																		
67	AX-1042A	B-1B Nitrous Oxides	Continuous	No																			1ppm NOX
68	AX-1042B	B-1B Carbon Monoxide	Continuous	No			1ppm																

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LHC III ETHYLENE PROCESS ANALYZERS

	Analyzer	Location	Cycle time (seconds)	Computer Control	COMPONENT MEASURED (1 DET)																		OTHER
					O2	H2	CO	CO2	C1H4	C2H2	C2H4	C2H6	C2's	C3H6	C3H8	C3's	1 But	N But	Butene	c Butene	1,3 Buta	C4's	
69	AX-1042C	B-1B Oxygen	Continuous	No	0.1%																		
70	AX-1038	Cracked GAs to C-30	Continuous	No				1ppm															
71	AX-1980	C-52 overhead	Continuous	No				1ppm															
72	AX-1653	Cracked Gas to K-71B	Continuous	No				1ppm															
73	AX-1848	Hydrogen to Reactors	Continuous	Yes				1ppm															
74	AX-1859	Hydrogen to R-2(50-100%)	Continuous	Yes		50.0%																	
75	AX-1858	Hydrogen to R-1(50-100%)	Continuous	Yes		50.0%																	
76	AX-1849	R-1 Diff Hydrogen(0-2%)	Continuous	Yes		0.1%																	
77	AX-1847	R-2 Diff Hydrogen(0-2%)	Continuous	Yes		0.1%																	
78	AX-1981	C-152 Overhead CO2	Continuous	No				1ppm															
79	AX-1949	C-152 Tray 65	Continuous	Yes								0.1%											
80	AX-1027	C2H4 to Vinyl/PolyC Well	Continuous	No				1ppm															
81	AX-1025	C-57 overhead H2O	Continuous	No																		0.1 ppm H2O	
82	AX-1011	C-150 in/out H2O	Continuous	No																		0.1 ppm H2O	
83	AX-1010	C-40's outlet H2O	Continuous	No																		0.1 ppm H2O	
84	AX-1569	C-40A/B/C H2O dewpoint	Continuous	No																		0.1 ppm H2O	
85	AX-1009	C-57K-19 Bins Dewpoint	Continuous	No																		0.1 ppm H2O	
86	AX-7351A	GT-71 NOX	Continuous	No																		1 ppm NOx	
87	AX-7351B	GT-71 CO	Continuous	No				1ppm															
88	AX-7351C	GT-71 O2	Continuous	No	0.1%																		
89	AX-7381A	GT-120 NOX	Continuous	No																		1 ppm NOx	
90	AX-7381B	GT-120 CO	Continuous	No				1ppm															
91	AX-7381C	GT-120 O2	Continuous	No	0.1%																		
92	AX-6201	Fuel Gas to Furnaces 112				0.5%																	



Quality
Performance
Means More Al Dow

INDIVIDUALS WITH MOVING RANGE CHART

ITEM	PLANT										YEAR										TARGET										CHART NO.									
CH4 INC-152 OH.	LHC #3										1991										105										342									
DATE	6/11										6/12										6/13																			
Time	9P										10										11										12									
X	100										114										189										70									
MOVING R	0										14										75										119									

INDIVIDUALS CHART

UNPL $\bar{X} + 2.66R$ = 130

$\bar{X}$ - AVERAGE OF $\bar{X}$ = 105

LNPL $\bar{X} - 2.66R$ = 89

MOVING RANGE CHART

UCL $R + 3.268R$ = 20

$\bar{R}$ - AVERAGE OF $\bar{R}$ = 10

LCL $R - 0.0(R)$ = 0.0

① Comput. not adjusting quick enough

② off Comput.

③ Furnace surge during

DO A 03

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THROUGH

PERSON(S) RESPONSIBLE FOR CHART (SIGNATURE):

DATE SIGNED:

NOTE: ABOVE FORMULAS ASSUME A 1 POINT MOVING RANGE

CONTROL LIMITS BASED ON

FOR

LA. STOCK #3571890 (REV. 6/89)

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THOUGHT

PERSON(S) RESPONSIBLE
FOR CHART (SIGNATURE):

**DATE
SIGNED:**



Quality Performance
Means More At Dow

INDIVIDUALS WITH MOVING RANGE CHART

[illegible]

LA. STOCK #3571800 (REV. 6/89)

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Attachment #5

LHC III ANALYTICAL LAB 5 YEAR QUALITY PLAN

YEAR	PRINCIPAL GOAL	EQUIPMENT REQUIRED
1990	Improve analyzer reliability, establish preventative maintenance program, clearly define operator troubleshooting procedures	Replace unreliable analyzers (distillation, sulfur, four GC's, install autosampler on 8 GC's)
1991	SQC for lab analyzers in place. Continue automating data acquisition and distribution	1) Computer upgrade \$30K 2) Continue to replace unreliable analyzers: two GC's \$50K 3) New analysis: BHT in RO \$20K MTBE in naphtha \$15K
1992	SQC for Benzene process analyzers in place, ISO-9000	1) Computer upgrade \$30K 2) Laser guns, intermec terminals \$20K 3) New lab \$1700K 4) GC / MS \$50K
1993	Credible benzene process analyzers Less routine sampling, More project work, Set up lab at tank farm	1) Computer upgrade \$30K 2) Equip small lab at tank farm: hood, GC, density meter, sulfur, chlorides, \$100K
1994	Redefine lab function to be the BACKUP for process analyzers, but to focus on engineering projects, env. projects, SQC, new method development	1) Computer Upgrade \$30K 2) New Methods \$50K 3) Replace unreliable analyzers \$50K

Anne Boussert
October 30, 1990

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