



UNION CARBIDE CORPORATION
LINDE DIVISION

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MOLECULAR SIEVE
DEPARTMENT

February 5, 1969

Mr. R. H. Gerlach
Continental Oil Company
Post Office Box 605
West Lake, Louisiana 70669

Dear Mr. Gerlach:

Attached is the preliminary design for the removal of acetylene from anhydrous hydrogen chloride with Union Carbide "Columbia" Activated Carbon. This should be satisfactory for costing purposes. However, if you have further comments or questions at this stage, please contact Greg Hales or me.

Should the project appear to be economically attractive, there are several degrees of freedom to work from in designing the final system for your plant. Greg or I can go into the details with you at that time. However, some comments now may provide a basis to work from later:

1. If the hydrogen chloride must remain dry at all times, the regeneration gas must be dry. Other than this any acetylene, free or other contaminant free inert gas will suffice.
2. The direction of flow rate, pressure and temperature all have a bearing on the precise regeneration conditions.
3. Adsorption time, carbon particle size, bed geometry and other features can be modified to meet such conditions as ΔP requirements, use of existing vessels, etc.

Best wishes on your project.

Very truly yours,

Kenneth J. Gustafson
Southwestern Region Sales Manager

KJG/ear
Att.

P. S. Drying ethylene dichloride with LINDE Molecular Sieves is very reliable and economical. When it is only small quantities of water involved, I believe a LINDE Molecular Sieve dryer would be more economical on both an investment and operating cost basis than other means of buying, such as distillation. Please let us know if your interest is renewed in this subject.

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LINDE Molecular Sieve Design Summary

DESIGN BASIS

OPERATING CONDITION	FEED	PRODUCT	PURGE GAS (HEATING)*	PURGE GAS (COOLING)*
Flow Rate ()	100T/Day			
Pressure (psig)	70-80 PSIG		<100	<100
Temperature (°F)	30°F		600 Inlet	Ambient
Other:				
Composition:			Dry inert gas	(N ₂ , natural gas, etc)
Anhydrous HCl	~ 100%			
C ₂ H ₂	2300-3000 PPM	100 PPM Max		
Vinyl Chloride	Trace			

PROCESS DESIGN

	ADSORPTION	HEATING	COOLING
Time (Hours)	24	<-----24----->	
Flow Direction	Down		
Type of Cycle			
Flow Rate ()		20,000 SCFH	20,000 SCFH
Temperature (°F)		600 Inlet	Ambient
Pressure (psig)	70-80	< 100	< 100

LINDE Molecular Sieve Recommendations:

Two bed system: ~12,000 pounds/bed Union Carbide Activated Carbon Type SG-10829.

A suggested bed dimension: 6Ft I. D. X 14 Ft.

It is requested that this process design and the design basis be reconfirmed by contacting this office prior to fabrication of equipment.

* Temperatures are minimum adsorbent temperatures at end of heating and/or cooling and purge gas flows are those required to heat and/or cool the Molecular Sieve adsorbent only--no allowance is made for equipment metal, surface losses, etc.

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ADSORBENTS
& CATALYSTS

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Carbon Absorbers for HCl + Acetylene

2/7/69

0.025(2000)
50x50

2000 to 3000 ppm - assume 2500

25% of HCl is acetylene - at 50T/day = 250 lbs/day C_2H_2
Carbon will take loading of 0.1 lb/lb. = 2500 lbs/day carbon used.

Regenerate every 5 days at 50 Tons/day.
after 6 regeneration carbon is gone -
Capacity is 100% - 5 days to 90% after regeneration
" 90% - 4 days to 81% "
" 81% - 4 days to 73% "
" 73% - 3 days to 66% "
" 66% - 3 days to 59% "
" 59% - 3 days to 53% "
" 53% - 2 days to 48% "
" 48% - 2 days to 43% "
" 43% - 2 days to 39% "
" 39% - 2 days to 35% "
35% - 1 day to scrap.

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31 days total - Assume 1 month bed.

Must buy 12,000 lbs/month of carbon at 33¢/lb. = \$4,000/month
\$4,000 x 12 = \$48,000/yr. of carbon cost.

~~9,000 lbs~~

50 Tons/day x 335 days
17,750 tons

$\frac{48,000}{17,750} = \$2.71 \text{ ton/HCl/carbon cost.}$

With steam costs - 105 ft³/lb. of 600 psig steam at 760°F

11.02 ft³/lb. at 50 psig steam at 760°F

6.65 " " " " at 298°F

Need 1500 to 2000* / hr steam = 38¢ x 175 = 66.4¢/hr. assume 12 lb.
800 x 10 = 8000 x 12 = 96000
\$8.00 / regeneration

