ESTIMATED MANFACTURING COST
FOR ADDED PRODUCTION, ANNUAL BASIS PACO 613A

APPROPRIATION NUMBER: 6-30-75

Mobil Nitration Proposal

		*Fixed Cost @ Full Rate Reduced 1/2	Full Fixed Cost %	Full Fixed Cost %
1.	PLANT PRODUCTION			
	RATE, ____ OF ____ /			
	RATE, IN % OF NEW TOTAL CAPACITY			
	ADDED, IN ____ OF ____ / lbs/mo. →	100,000	250,000	500,000
	ADDED, IN % OF ADDED CAPACITY	20 %	50 %	100 %
2.	RAW MATERIAL & FUEL COST			
	TYPE / UNITS / UNIT COST / USAGE	$	$	$
	SUBTOTAL, RAW MATERIALS & FUEL	$ —	$ —	$ —
3.	UTILITIES			
	TYPE / UNITS / UNIT COST / USAGE	$	$	$
	ELECTRICITY 600 kwh @ 2.5¢/kwh			
	STEAM 17,000# @ 8¢/m#			
	WATER 10,000 gal @ 10¢/mgal			
	Refrig. 1.5×10⁶ Btu @ .033¢/m Btu			
	SUBTOTAL, UTILITIES	$ .008	$ .008	$ .008
*4.	OPERATING LABOR $ 2 men/shift	$ .043	$ .035	$ .017
5.	ROYALITIES & RENTALS $ ____ /	—	$ —	$ —
6.	BURDEN			
	A. REPAIR LABOR	$ .028	$ .022	$ .011
	*B. REPAIR SUPPLIES (incl. O.H.)			
	C. OPERATING SUPPLIES	.065	.026	.013
	D. SUPERVISION — #135			
	E. INDIRECT PAYROLL @ ____ Included above	—	—	—
	SUBTOTAL, BURDEN	$ .093	$ .048	$ .024
7.	FIXED AND SERVICE COSTS			
	*A. GENERAL WORKS EXPENSE, INCL. TAXES & INS. #85.62	$ .020	$ .016	$ .008
	B. DEPRECIATION #3500M — 5 yr. S.L. — #74.91	.035	.014	.007
	*C. LABORATORY — #26/month	.005	.004	.002
	D. Interest #71.26	.035	.014	.007
	SUBTOTAL, FIXED & SERVICE COSTS	$ .095	$ .048	$ .024
8.	TOTAL BULK COST	$ .239	$ .139	$ .073
9.	LOADING, PACKING & SHIPPING			
	A. ____			
	B. ____			
	SUBTOTAL, L.P. & S.	$	$	$
10.	CONTINGENCIES @ 10% #77.73	$ .028	$ .014	$ .007
11.	TOTAL MFG. COST FOR ADDED PROD. ANNUAL BASIS	$ .267	$ .153	$ .08
12.	UNIT MANUFACTURING COST FOR ADDED PRODUCTION	$	$	$
	Tolling Chg →	.120	.100	.08
	Total Prod. Cost	.387	.253	.16

NOTES:

Note: To get cost per lbs, John Miles batch cost figures were divided by 10,417 lbs per batch @ 500M lbs/mo.; Batch size for 250M lbs/mo. is one-half of above.

PREPARED BY: ____ CHECKED BY: ____ DATE: ____

9352121

ATTACHMENT #1

OUTLINE OF VERTAC POSITION FOR MOBIL NITRATION

PROPOSAL:

1. $200M capital is required to achieve 330M #/mo. rate applicable during 1st 6 mos.; this "front-end" money must be pre-paid. → Applied to initial production (≈ 1M lbs) @ 19¢/#

2. Total investment required for Mobil needs @ 500M #/mo. is $350M; we must recover $200M of this within 1-2 years (after taxes); also, "take or pay" arrangement must insure that we at least recover this amount.

3. We must be covered for our actual manufacturing cost incurred regardless of monthly production rate - see attached estimated manufacturing costs for various production levels.

4. Toll charge (Manufacturing cost + profit) must be adequate to pay-back $200M investment within 1-2 years regardless of monthly production rate:

Monthly Capacity	Mfg. Costs	Profit	Toll Charge
100M#/mo	.27¢	.12¢	.39¢
250M#/mo	.15¢	.10¢	.25¢
330M#/mo	.12¢	.09¢	.21¢
500M#/mo	.08¢	.08¢	.16¢

(See plot for actual production brackets.)

5. The following production schedules would insure items #2 & #4 above (take 18 mos. period):

a) Assume first 6 mos. @ 2.0$\overline{M}$ lbs/mo & subsequent 12 mos. @ 500M lbs/mo ea.
B.T. Profit = 2.0$\overline{M}$ ($.09) + [12 x 0.5$\overline{M}$ ($.08)]
= $180M + $480M = $660M
A.T. Profit = $330M (OK)

b) Assume first 6 mos. @ 2.0$\overline{M}$ lbs/mo. & subsequent 12 mos. @ 250M lbs/mo. ea.
B.T. Profit = $180M + [12 x .25 $\overline{M}$ (.10)]
= $180M + $300M = $480M
A.T. Profit = $240M (OK)

c) Assume first 6 mos. @ 2.0$\overline{M}$ lbs/mo & subsequent 12 mos. @ 100M lbs/mo. ea.
B.T. Profit = $180M + [12 x 100M (.12)]
= $180M + $144M = $324M
A.T. Profit = $162M (somewhat short)

Note: $\overline{M}$ = Million
M = Thousand

What is pay-back period?

Monthly gross profit A.T. = \$6M

Additional mos. to pay-back $= \frac{(200M - 90M)}{6M}$

$= 18.3$

Total pay-back period = 6 + 18.3 = 24 + mos. (Acceptable)

d) If a total cash flow (in excess of contractual manufacturing cost) of \$400M has not occurred to Vertac within 24 mos. of initial product delivery, Mobil shall make up the difference and Vertac has the option to cancel the contract.

6. The toll charge of 21¢ shall apply during the first 3 mos. of the contract; manufacturing cost for billing purposes subsequently will be determined quarterly based on actual average monthly shipments for preceding three mos. Since a graph such as attached is not practical for accounting use, production brackets of 50M #/mo. increments could be established.

7. Mobil will retain ownership of all chemicals used in the manufacture of this product.

   a) Vertac will provide raw material consumptions on monthly basis.
   b) Vertac will notify Mobil within 48 hrs. of any unusual loss, spill, etc..
   c) Vertac will bill Mobil directly for any acids, EDC, or ammonia (either anhydrous or aqua) which Vertac purchases.
   d) Both parties will examine yields every 90 days and adjust standards per mutual agreement.

D Lockhart

VERTAC
INCORPORATED
Building 4—Suite 412 • Shreve City Office Park • Shreveport, Louisiana 71105 • Phone 318-869-3434

July 8, 1975

Mr. Don Faggert
Mobil Chemical Company
Phosphorus Division - Crop Chemicals Group
P. O. Box 26683
Richmond, Virginia 23261

Subject: Proposal for CBE Nitration

Dear Don:

Confirming our telecon, the following toll charge basis is mutually agreed upon:

First 2MM lbs.	- 19¢ per lb.
Subsequent production	- 16¢ per lb.

To compliment the above, you agreed to the following:

1) Pre-payment of $200,000 to be applied against initial production @ 19¢ per lb. rate.
2) Firm "take-or-pay" for 5MM lbs.
3) Production schedule as follows to be included in the contract:

   a) First 6 months - 2MM lbs.
   b) 500,000 lbs/mo thru January, 1978

You stated that your lawyers would be reviewing the contract draft on July 10th. If it appears there will be a delay of a week or more, please send a letter of intent by July 15, 1975. This is a must if we are to meet the following schedule:

October 1, 1975	- Mechanical completion
October 15, 1975	- Plant Start-up

Continued . . . . . .

Don, we are pleased that Mobil and Vertac have reached this agreement. I'm sure it will prove to be beneficial to both parties.

Best regards,

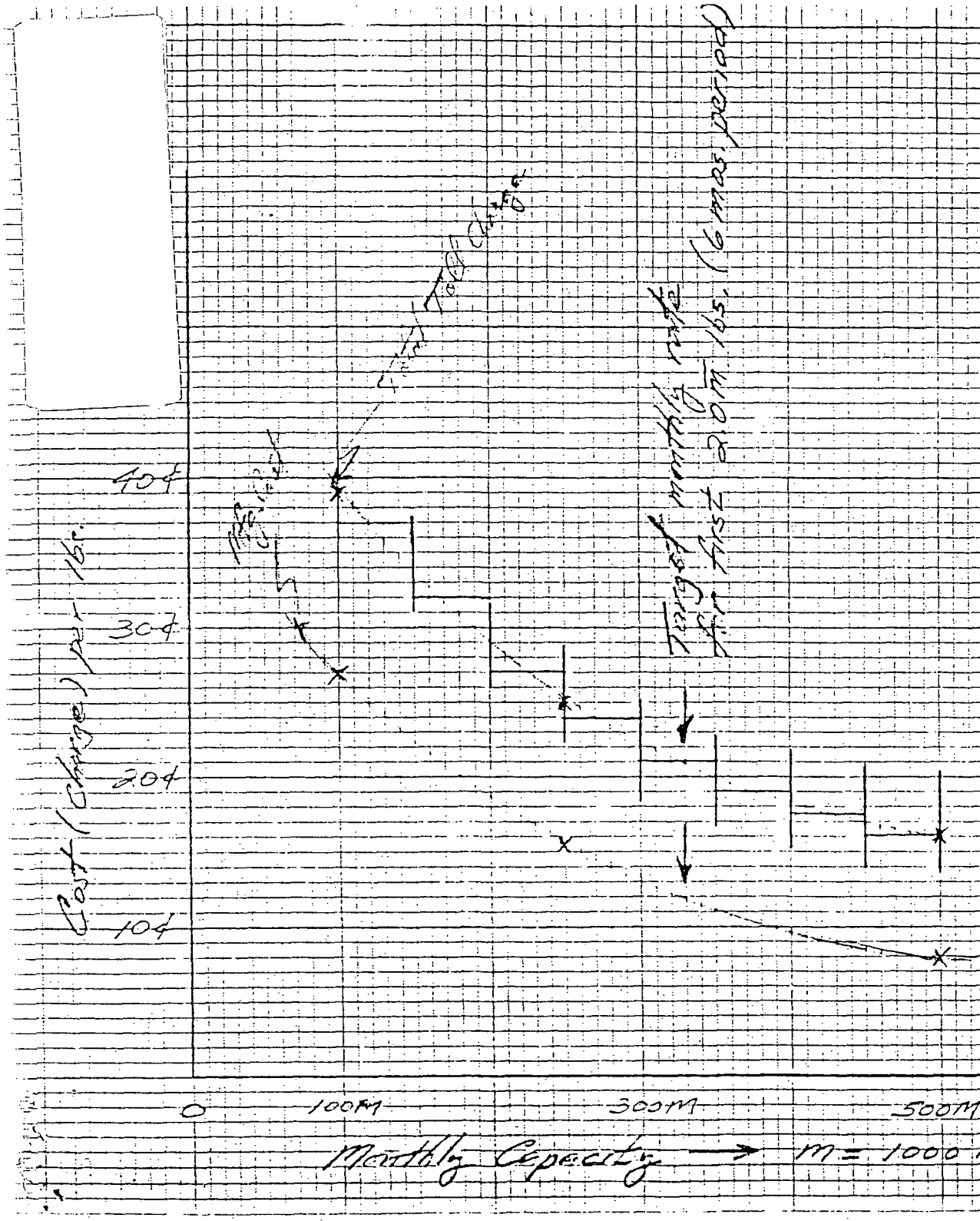
R. M. Fabian
Business Development Manager

RMF-el

cc: N. D. Morgan
R. A. Guidi
J. W. Shackelford
J. Miles
G. Mather

Mobil Histation Proposal

R. Fabian 6/30/75



Monthly Capacity M#	Total Toll Cha.
100-149	37¢
150-199	32¢
200-249	27¢
250-299	24¢
300-349	21¢
350-399	19¢
400-499	17.5¢
450-500	16¢

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR • MEMPHIS, TN 38137 • 901-767-6851 • TELEX 53927

March 17, 1976

MEMO

TO: Bill Shackelford

FROM: Bob Fabian RMF

Subject: Mobil Nitration Manufacturing Costs

Per our conversation, please submit to this office actual Mobil Nitration manufacturing costs on a monthly basis covering the production from start-up through March 31, 1976. As discussed with John Miles, it would be best if this were done on the format for manufacturing costs elements presented in our capital management program. This information is for our internal review and use, and will hopefully produce better estimates in the future. Can you complete this by April 15?

Also regarding Mobil Nitration, Don Faggert asked me today if Tuesday, March 23 would be acceptable for him to visit Eagle River and review operation to date per the contract. I told him this would be okay since I feel we must complete this item.

RMF/gn

cc: R. A. Guidi
Vertac Consolidated

J. Miles
Eagle River Chemical Co.

ESTIMATED MANUFACTURING COST

1. PLANT PRODUCTION (ALL COST ARE ON UNIT BASIS)

	PLANT CAPACITY		
BASIS:	_____ %	_____ %	_____ %

2. RAW MATERIAL & FUEL COST

Type	Units	Unit Cost	Usage / _____	$	$	$
Subtotal, Raw Materials & Fuel				$	$	$

3. UTILITIES

Type	Units	Unit Cost	Usage / _____	$	$	$
Electricity						
Steam						
Water						
Subtotal, Utilities				$	$	$

4.	OPERATING LABOR $ _____	$	$	$
5.	ROYALTIES & RENTALS $		$	$
6.	BURDEN			
	A. Repair Labor	$	$	$
	B. Repair Supplies	$	$	$
	C. Operating Supplies			
	D. Supervision			
	E. Indirect Payroll	$	$	$
	Subtotal, Burden			
7.	FIXED AND SERVICE COSTS			
	A. General Works Expense	$	$	$
	B. Depreciation			
	C. Laboratory			
	D. _____			
	Subtotal, Fixed & Service Costs	$	$	$
8.	TOTAL BULK COST	$	$	$
9.	LOADING, PACKING & SHIPPING			
	A. _____			
	B. _____	$	$	$
10.	CONTINGENCIES	$	$	$
11.	TOTAL MFG. COST	$	$	$

NOTES:

Form VAFE 6

Prepared by _____ Checked by _____ Date _____

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR
MEMPHIS, TN 38137

INTER-OFFICE CORRESPONDENCE

DATE: JUNE 29, 1976

TO: RAY GUIDI

FROM: BOB FABIAN

SUBJECT: NBE EXPANSION FOR MOBIL

REPLY REQUESTED BY (DATE)

Per Don Faggert, Mobil is interested in doubling the NBE capacity at Eagle River effective about one year from now. They are currently negotiating for a second CBE supplier (in addition to Velsicol), but don't want to reveal their CBE process to us since we most likely would not be competitive regarding disposal of by-products. Since their process is based on the chlorination of toluene, I agree with their position. Don repeated that we would produce 350 M lbs. NBE in June, 400 M in July and be close to 500 M lbs./mo. for the rest of 1976. This would result in about 4.6 MM lbs. for 1976 based on having produced 1.4 MM lbs. thru May. According to Faggert, Velsicol now has all their start-up problems behind them and we should be getting ample CBE during the last half of 1976.

Our original economics were based on making 5 MM lbs. by 1/1/77, so we are still on target regarding overall pay-out. However, this assumes that our manufacturing cost will be at 8¢/lbs. when producing 450-500 M lbs./mo. Since our toll charge drops to 16¢/lbs. after 2.0 MM lbs. production (will occur during July), it is imperative that we achieve good cost control. By copy of this memo, I am asking Bill Shackelford to project a unit production cost for the last six months of 1976 based on past performance and monthly capacity levels of 400 M and 500 M lbs. respectively.

Also, I have asked George Mather to develop appropriation grade capital and manufacturing cost estimates to achieve the following capacities:

(1) Whatever capacity results from a minimum capital debottlenecking of the existing unit. We may want to schedule a 1-2 weeks plant test to determine the current maximum capacity.

(2) Capacity of 1,000,000 lbs./month.

BOB FABIAN

/et

CC: Mr. Bill Shackelford
Mr. J. C. Blue
Mr. George Mather
Mr. John J. O'Neill

Phone: (501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

June 30, 1976

To: Bob Fabian

Subject: MOBIL NBE & CBE

Attached memo of telecon John Miles & Don Faggert on 6/22/76, regarding Mobil NBE & CBE prospects. Also attached is a "quickie" ball park estimate of cases for Mobil expansion generated by myself for Ray Guidi on 1/15/76. John Miles & I still feel the 1/15/76 estimate is representative of today's Mobil NBE operation. My only hedge today is that of "logistics" in handling raw materials & product at higher volumes. Even here, however, our experience has been quite good with Mobil & our other suppliers. Additionally the NBE storage tank was recently enlarged from 6m gals to 12m gals. Then as stated in the 1/15/76 note, Eagle River Chemical should have NBE capability to +7 million lbs/yr NBE with the existing facility. Also as indicated in the note, by the addition of a separate phase separation & neutralization vessel & additional tankage, +9.5 million lbs/yr of NBE could be produced. The separate vessel removes a substantial portion of the "critical batch cycle time" from the nitration reactor while the additional tankage is again for logistics. As noted ballpark cost is in the $100m range. Further refinements are possible in the Mobil Unit in the area of increased acid addition rate, marginal payload increases, etc.. In summary, Eagle River has the capability of taking on additional NBE production

In the area of CBE production, Eagle River would enthusiastically entertain the possibility of producing CBE in conjunction with NBE. As everyone is aware, lack of CBE is our biggest problem for effective operation & profitability on our investment. Hopefully, with past experience and a joint effort with Mobil, Eagle River could improve on past CBE performance. Several comments on CBE manufacture

(a) The NBE plant was laidout for the possibility of CBE facility. The plot area south of NBE has been "reserved" for such a facility with pipe racks & utility lines sized to meet such a contingency.

(b) The Basalin plant may in fact meet many of the CBE requirements (multiple storage tanks, chlorination ability, etc.) should this facility be available on a part or full time basis.

In short, Eagle River feels that it has something to offer Mobil for increased NBE offtakes and/or alternate CBE manufacture.

Lastly, Eagle River proposes two additions to the present Mobil NBE unit that should show good payback & improved operation:

(1) pH control of ammonium hydroxide neutralization
(2) Ethylene dichloride storage facilities

pH control revisions would involve the addition of a flow thru pH cell with proper auxiliary equipment such as a filter, flow indicator, associated piping, etc.. The cell would be located in a slip stream of the circulating crude NBE/EDC to be neutralized. The pH element would transmit a signal to a controller & then a control valve in the aqua ammonia feed line. Based on a scope installation cost of $5m, we would estimate a ballpark payback of 4 to 6 mts. assuming a 10 to 15% reduction in ammonium sulfate volume versus the present mode of "manual" neutralization. Ammonium sulfate is now trucked offsite for disposal at a rate estimated at 500,000 gals/yr & an estimated fee of 20¢/gal.

An EDC storage tank would allow tank truck or tank car shipments of EDC versus drums. The estimated cost for a 20m gal carbon steel storage tank, a pump, level instrumentation & all associated piping, concrete/foundations, etc. is $20,000. Based on a 4¢ per lb savings on bulk versus drums, payback of 12 mts. is estimated. Payback calculation assumes 500,000 lbs/year of EDC consumed. Both these revision improve overall NBE "logistics" as discussed in the opening paragraph.

We would appreciate your review & carry through of these comments to Mobil Chemical.

Your truly,

George F. Mather

George F. Mather

GFM/br

attachments

cc: ✓Bill Shackelford
Larry Conaway/Joe Porter
Dicky Hill
John Holcomb
John Miles
Ray Guidi

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR • MEMPHIS, TN 38137 • 901-767-6851 • TELEX 53927

July 29, 1976

Mr. Don Faggert
Mobil Chemical Company
Post Office Box 26683
Richmond, Virginia 23261

Dear Don:

Reference our recent discussions, we are very concerned about our NBE cost structure at Eagle River. As you will recall, we originally proposed a "sliding-scale" toll conversion charge based on monthly capacity. Since Mobil would not, at the time, agree to such an arrangement, we accepted 16¢/lbs. based on expectations of sustained operation at 400-500m lbs./mo. In fact, we have averaged only 280m lbs./mo. thru June, with February being the peak month at 367m lbs. We cannot make any profit under the current circumstances! Also, there doesn't appear to be real hope that your CBE supply will improve greatly in the near future.

Accordingly, we must ask for relief in some form to cover our monthly fixed costs, which comprise almost entirely the manufacturing cost. The only "truly, mostly" variable cost involved is utilities, which is relatively minor. Don, what approach do you recommend? Two alternatives come to my mind:

(1) Mobil agrees to pay a certain total fixed cost each month regardless of production rate. In addition, Mobil would pay either a fixed or "sliding-scale" amount per lbs. to provide our profit.

(2) Mobil agrees to pay a "sliding-scale" toll conversion charge, with some minimum guaranteed take. If you didn't actually take the minimum amount, we would still receive a payment per lbs. to cover our fixed costs.

Regarding your request to increase our capacity, we are certainly interested in doing this under the right circumstances. We estimate our existing capacity to be about 7 mm lbs./yr. With the expenditure of only about $100 m, we anticipate being able to go to 9-10 mm lbs./yr. We are currently defining what would be involved to achieve 12 mm lbs./yr. We must ask that Mobil provide the capital, hopefully with an extended pay-back period based on some ¢/lbs. discount.

As a separate item, we would like to propose two additions to the present unit which promise good payback and improved operation:

(1) pH control of ammonium hydroxide neutralization

(2) Ethylene dichloride storage facilities

The pH control revisions would involve the addition of a flow-thru pH cell with proper auxiliary equipment such as a filter, flow indicater, associated piping, etc. The cell would be located in a slip stream of the circulating crude NBE/EDC to be neutralized. The pH element would transmit a signal to a controller and then a control valve in the aqua ammonia feed line. Based on a scope installation cost of $5m, we would estimate a ballpark payback of 4 to 6 months assuming a 10 to 15% reduction in ammonium sulfate volume versus the present mode of "manual" neutralization. Ammonium sulfate is now trucked offsite for disposal at a rate estimated at 500,000 gals./yr. and an estimated fee of 20¢/gallon.

An EDC storage tank would allow tank truck or tank car shipments of EDC versus drums. The estimated cost for a 20m gallon carbon steel storage tank, a pump, level instrumentation and all associated piping, concrete/foundations, etc. is $20,000. Based on a 4¢ per lb. savings on bulk versus drums, payback of 12 months is estimated. Payback calculation assumes 500,000 lbs./year of EDC consumed. Both these revisions improve overall NBE "logistics" in relation to an expanded plant. If Mobil provides the capital, we would show evidence of actually installing the equipment and "good faith" operation to achieve the savings.

Don, if you will give me some guidance regarding the best approach to renegotiating a toll conversion basis, we will make a specific proposal. We need relief quickly, independently of what develops regarding the proposed expanion.

Best regards,

VERTAC CONSOLIDATED

Robert M. Fabian
Business Development Manager

/et

CC: R. A. Guidi
J. J. O'Neill
J. W. Shackelford

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR
MEMPHIS, TN 38137

INTER-OFFICE CORRESPONDENCE

DATE: August 4, 1976

TO: Mr. J. W. Shackleford

FROM: J. O'Neill

SUBJECT: 1977 BUDGET

REPLY REQUESTED BY (DATE):

Mr. Guidi requested that I obtain Production Planning figures for your 1977 budget from Mobil and Du Pont.

Mr. Faggert advises that starting in October of 1976 and in each month of 1977, we should plan for an output of 500,000 pounds of NBE.

Mr. Maderich has instructed the production department to comply with the conditions of our agreement which will give you Du Pont's forecast at least thru the first three quarters of 1977. I have asked Burman for "planning" figures for the entire year.

John O'Neill
John O'Neill
Vice President of Planning & Development

JO/cm

cc: R. Guidi
D. Palmer

MADE IN U.S.A.

Phone: (501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

OCTOBER 14, 1976

TO: MR. SIL LUTKEWITTE
FROM: BILL SHACKELFORD

SUBJECT: NBE-EAGLE RIVER

MONTH	PRODUCTION (LBS)			SHIPMENT (LBS)		UNIT COST TO PRODUCE
NOV. 75	437,356			401,580		.121
DEC. 75						
JAN. 76	299,468			309,240		.180
FEB. 76	366,746			331,880		.187
MAR. 76	87,110			121,580		.614
APR. 76	328,327			219,560		.119
MAY. 76	287,325	.861	.344	~~323,260~~	282,860	.146
JUNE 76	293,459	.866	.338	352,920		.232
JULY 76	267,831	1.08	.432	243,020		.248
AUG. 76	348,350	.861	.347	365,160		.175
SEPT 76	448,468	.715	.286	365,160		.103
TOTAL	3,164,440			3,033,360		

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR
MEMPHIS, TN 38137

copy for
Mike
John M
George

INTER-OFFICE CORRESPONDENCE

DATE: October 19, 1976

TO: J. W. Shackleford

FROM: J. J. O'Neill

SUBJECT: MOBIL NBE CONTRACT

REPLY REQUESTED BY (DATE):

Don Faggert of Mobil agreed to consider amending the NBE contract of 9/1/75 as follows:

1. Renew for three years, effective January 1, 1977.

2. Establish new fee based on Eagle River's costs including a reasonable return on investment.

1.7¢

3. Establish a basis for compensation when output is "low" not due to Eagle River's performance.

4. Provide a temporary adjustment to the on-going fee to reimburse Eagle River for losses under the present contract (1975 and 1976), for which it is mutually agreed that such loss was caused by Mobil, or is otherwise unreasonable.

Mobil has requested that we submit a proposal by October 29. To do so we must have the following information from you by October 25.

1. The fee requested by Eagle River for manufacture of 400,000 to 500,000 pounds per month. This should include all applicable costs and the profit required to provide a reasonable return on the investment. Please provide cost calculation to support your recommendation.

2. Your recommendations as to what compensation adjustment should be made to protect us from incurring losses due to failure on Mobil's part to take anticipated amount of NBE. This could be a "floor" payment for fixed expenses when production is interrupted for causes not due to Eagle River's failure and/or for low production. I believe that Mobil would prefer that we set the fee to provide a reasonable profit over a range of probable outputs with provision for some type of base fee to protect us from disaster.

Possibly an approach that we might consider is a sliding fee based on output, but I do not believe this is a mechanism that Mobil would agree to. It is worth trying, however.

3. Mobil is willing to hear how we incurred losses or low profitability on the existing contract. They do not want us to suffer for problems they have caused, or in fact, for errors in judgement made by Eagle River in establishing the compensation rate for the existing contract. This requires a very carefully documented statement. It should analyze our contract as to exceptions and results. I believe Mobil will be willing to give where unusual circumstances created by them caused a loss, such as, last March when production fell below 100,000 pounds. I believe they will listen to problems we created by miscalculating the capital investment or other significant costs. If they agree to share some of the burden we will get a temporary rate for 1977 to permit us to recoup the loss.

A key to getting consideration from them is the fact that Eagle River has performed well and that it has a capability of providing expansion to 12,000,000 pounds for an investment less than $500,000.

J. O'Neill

J. J. O'Neill

JJO/gn

cc: R. A. Guidi
L. E. Harcrow

Phone: (501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

JANUARY 26, 1977

MR. FLOYD LATTIRE
MOBIL CHEMICAL CORP.
P.O. BOX 26683
RICHMOND, VA 23261

RE: AMMONIUM SULFATE WASTE

DEAR FLOYD:

ATTACHED IS A COPY OF THE LETTER FROM THE OKLAHOMA DEPARTMENT OF HEALTH, WHICH I TALKED WITH YOU ABOUT TODAY. PLEASE CLARIFY THIS SITUATION AND KEEP US ADVISED. CALL ME IF I CAN BE OF ANY ASSISTANCE.

THANK YOU,

JOHN H. MILES

JHM/RVK

CC: J.W. SHACKELFORD
BARNEY MCAVOY W/ATTACHMENT
RAY GUIDI

State Board of Health

OTHO R. WHITENECK, D.D.S., PRESIDENT
ROBERT D. McCULLOUGH, VICE PRESIDENT
THOMAS DONICA, M.D., SECRETARY
GLEN L. BERKENBILE, M.D.
WALLACE BYRD, M.D.
ARNOLD HELVEY
EUGENE A. OWENS, M.D.
W. A. "TATE" TAYLOR
HAROLD A. TOAZ

Oklahoma
State Department of Health

Northeast 10th Street & Stonewall
Post Office Box 53551
Oklahoma City, Oklahoma 73105

Acting Commissioner
WALTER D. ATKINS, D.D.S., M.P.H.

January 20, 1977

Eagle River Chemical Corporation
Highway 242
P.O. Box 2648
West Helena, Arkansas 72390

CERTIFIED MAIL

Dear Sirs:

It has come to our attention that a chemical compound resulting from your industrial process of manufacturing herbicides is being shipped into Oklahoma. The compound generally consists of water (64%), Ammonium Sulfate (34%), and Ethylene Di-Chloride (2%). It is being shipped by McCullough Corporation and/or Wheeling Pipeline to Devol, Oklahoma.

Pursuant to the Oklahoma Controlled Industrial Waste Disposal Act enacted September 1976, we must therefore, request the following:

- A complete chemical analysis of the compound.
- The chemical name of the herbicide being manufactured when the compound is produced.
- A classification of the compound as to its economic value (i.e., is it considered a waste or a marketable product?)

If the compound is considered as an industrial waste your industry will be required to file a disposal plan with this Department at a later date. If on the other hand, you consider it to be a marketable product, we would like to know why it is not being marketed in Arkansas.

If you have any questions, please feel free to contact us at AC405, 271-5338.

Very truly yours,

H. A. Caves

H. A. Caves, Director
Industrial/Solid Waste Division

HAC/DAJ/dk

cc: Charlie McCullough
M & E Soil Service

Phone: (501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

JULY 26, 1977

MOBIL CHEMICAL COMPANY
P.O. BOX 26683
RICHMOND, VA 23261

ATTN: MR. FLOYD LATTIRE,
MANAGER OF PRODUCT CONTROL

SUBJECT: MOBIL NITRATION UNIT

WITH REGARD TO YOUR VISIT OF JULY 14TH, WE SUBMIT THE FOLLOWING FOR YOUR CONSIDERATION:

1) AS REQUESTED, THE ATTACHED INVOICE LISTS ACCUMULATED CHARGES FOR INSTALLING A WINTERIZED STAINLESS STEEL SPENT ACID TRANSFER LINE TO TANK CARS. THIS REVISION WAS INSTALLED FOR MOBIL CHEMICAL'S BENEFIT TO ACCOMODATE RAILCAR SHIPMENTS. FURTHER, THIS REVISION ELIMINATED TANK TRUCK RENTAL CHARGES FOR INTRA-PLANT TRANSFERS OF SPENT ACID FROM STORAGE TO RAILCARS ON OUR HOLD TRACK.

2) AS REQUESTED, WE HAVE UPDATED OUR EARLIER PROPOSAL FOR AN ETHYLENE DICHLORIDE (EDC) STORAGE TANK. THE ESTIMATED COST FOR A 20M GAL. CARBON STEEL STORAGE TANK; A PUMP; LEVEL INSTRUMENTATION & ALL ASSOCIATED PIPING, CONCRETE, FOUNDATIONS, ETC. IS $22,000. BASED ON A 4¢ PER LB SAVINGS ON BULK VERSUS DRUM EDC, PAYBACK OF NINETEEN MONTHS IS ESTIMATED. PAYBACK CALCULATION ASSUMES 350,000 LBS / YEAR OF EDC CONSUMED. PAYBACK PERIOD HAS INCREASED SINCE OUR EARLIER EDC STORAGE PROPOSAL PRIMARILY DUE TO LOWER EDC CONSUMPTIONS.

3) A THIRD AREA FOR YOUR CONSIDERATION ARE EXTRAORDINARY REPLACEMENTS TO THE MOBIL NITRATION UNIT. SPECIFICALLY, IN TWO AREAS; THE EDC RECYCLE TANK, T-M103, & THE NITRATION REACTOR COOLER, E-M101 ARE CONTINUING MAINTENANCE PROBLEMS DUE TO PROCESS CORROSION. ALTHOUGH EAGLE RIVER CAN CONTINUE TO SPEND MAINTENANCE DOLLARS ON THESE ITEMS, WE FEEL A BETTER SOLUTION FOR MAINTAINING LONG TERM MANUFACTURING POSITION & PLANT SAFETY IS A CAPITAL REPLACEMENT OF THESE ITEMS. BOTH THE REPLACEMENT EDC RECYCLE TANK AND THE NITRATION COOLER HAVE IMPROVED MATERIALS OF CONSTRUCTION. AN AUTHORIZATION REQUEST FOR THESE REPLACEMENTS HAS BEEN SUBMITTED TO VERTAC MANAGEMENT. PAT BOMAR OF THAT OFFICE COULD BEST DISCUSS OUR INTERESTS FOR EITHER THE EDC STORAGE TANK OR THE MOBIL EQUIPMENT REPLACEMENTS.

LET US KNOW IF YOU HAVE ANY FURTHER QUESTIONS.

GEORGE MATHER

ATTACHMENT

CC: BILL SHACKELFORD
PAT BOMAR
RAY GUIDI
JOHN MILES
DON FAGGERT
JOHN ELLINGTON
RICHARD JOHNS
DICKY HILL
JOE PORTER
BARNEY MCAVOY

AMENDMENT TO AGREEMENT

AGREEMENT, made as of January 1, 1977, by and between Mobil Chemical Company, a Division of Mobil Oil Corporation, a New York corporation, hereinafter called "Mobil", Vertac, Inc., a Texas corporation, hereinafter called "Vertac" and Eagle River Chemical Corporation, an Arkansas corporation, hereinafter called "Eagle River".

WITNESSETH:

WHEREAS, Vertac and Mobil entered into an Agreement dated as of September 1, 1975 (hereinafter the "Agreement") for the manufactured by Vertac for Mobil of NBE, as identified therein; and

WHEREAS, Vertac's obligations under said contract have been performed by Eagle River, its wholly owned subsidiary; and

WHEREAS, the parties desire to amend the period and terms of the Agreement and to subsitute Eagle River as a party to the Agreement in lieu of Vertac.

WHEREAS, Eagle River represents and warrants that its NBE facility at West Helena, Arkansas is capable of incremental expansion to a total capacity of about 12,000,000 pounds MORE OR LESS annually; and

WHEREAS, Mobil desires that Eagle River maintain the capability of said expansion and that Eagle River supplement its facility as required by Mobil to provide additional NBE capacity up to a total of 12,000,000 pounds MORE OR LESS annually.

APPROX.

NOW, THEREFORE, the Agreement is amended as follows:

1. Eagle River is substituted for Vertac as the "Contractor" identified in the Agreement.

2. (a) In consideration of the payment by Mobil to Eagle River of the sum of Seventy Five Thousand Dollar ($75,000), the receipt of which Eagle River hereby acknowledges, Eagle River hereby grants to Mobil the exclusive right and option during the term of this agreement to require Eagle River to expand Eagle River's NBE capacity in accordance with the terms and conditions as provided in this Section 2. up to an annual production capacity of NBE of 12,000,000 pounds more or less. Said option may be exercised by written notice from Mobil to Eagle River made no later than July 1, 1977, to expand its capacity to 7,000,000 pounds of NBE more or less per annum. Mobil may exercise its option as provided in ~~the~~ this Section 2. to require Eagle River to increase its capacity to 9,000,000 pounds more or less of NBE or to 12,000,000 pounds more or less of NBE per annum providing said option is exercised by written notice to Eagle River no later than December 31, 1977.

(b) Within 30 days of receipt of Mobil's written request for expansion of Eagle River's NBE facilities as provided in Section 2. (a) above, Eagle River shall provide Mobil with a proposed construction schedule and an estimate of the cost of making the expansion requested by Mobil. The parties shall negotiate in good faith to establish compensation for NBE to be produced in the expanded facility according to the procedure outlined in Appendix B, Revision of January 1, 1977, attached hereto. Eagle River will be under no obligation to undertake

the construction of the additional facilities until Mobil and Eagle River have reached an agreement on compensation to be paid by Mobil for each pound of NBE produced by Eagle River in the expanded facility as provided in Appendix B, Revision of January 1, 1976.

TWO NEW PAGES

1) INSERT - 2C
2) 3,4,5,6,7,8

REVISED MOBIL NITRATION

John Miles
May 28, 1975

INDEX

CAPITAL REQUIREMENTS 1

PRODUCTION CAPACITY 1

FLOW SHEET 2

MANUFACTURING COST 3

EQUIPMENT REQUIREMENTS 5

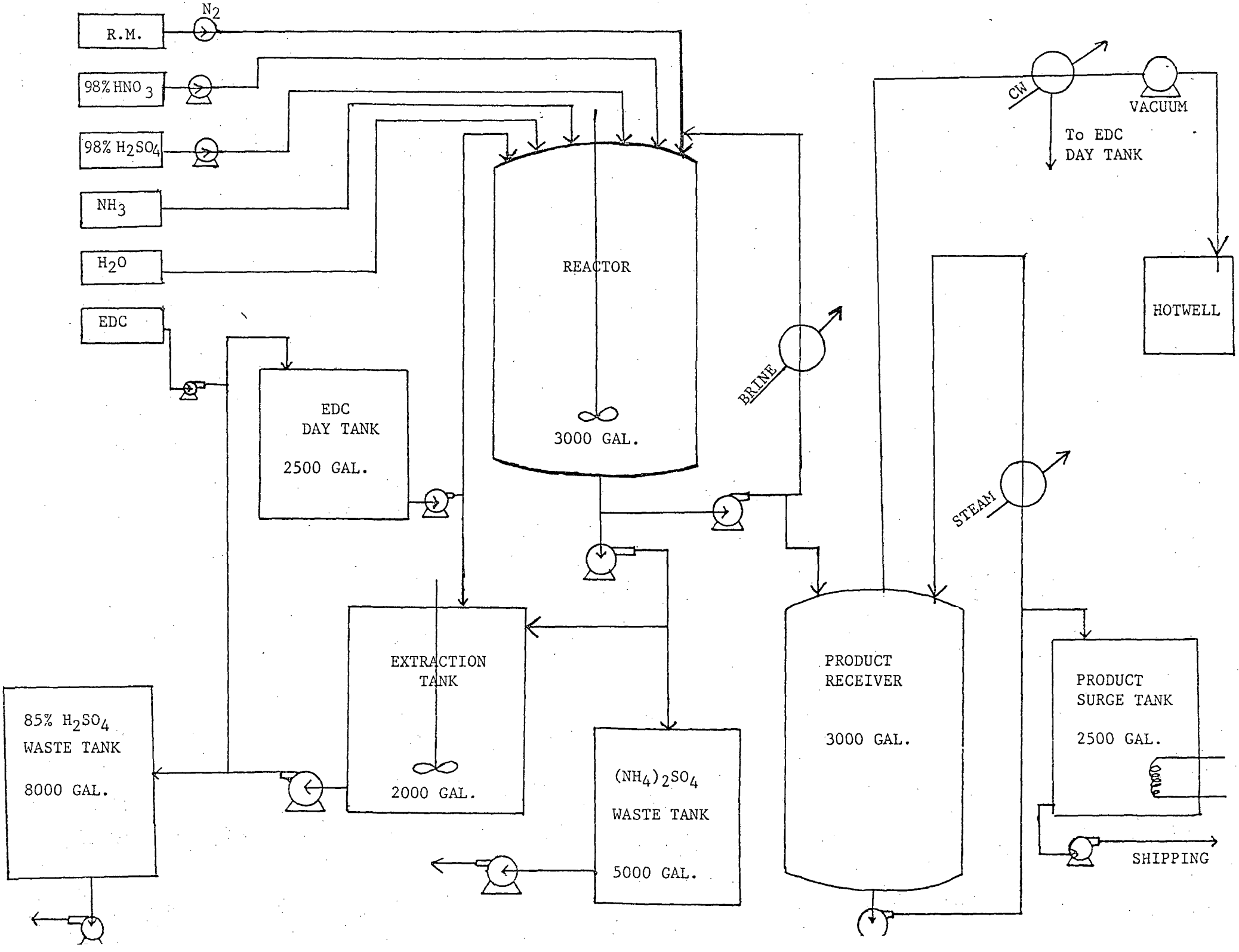
JOHN MILES' RECAP OF TECHNICAL EXCHANGE

CAPITAL REQUIREMENTS

A.	Purchased Equipment (28,500 in plant, 79,700 to be purchased)	$ 108,200
B.	Installation (Instruments, Piping, Electrical, Construction Expenses - Misc., Engineering Cost, etc.)	189,300
	TOTAL CAPITAL ...	$ 297,500
	CONTINGENCY 15% ...	52,500
		$ 350,000

PRODUCTION CAPACITY

500,000 lbs./month @ 80% Operating Factor = 10,417 lbs./batch.


R.M.
N_2
98% HNO_3
98% H_2SO_4
NH_3
H_2O
EDC
REACTOR
3000 GAL.
EDC
DAY TANK
2500 GAL.
BRINE
CW
VACUUM
To EDC
DAY TANK
HOTWELL
STEAM
EXTRACTION
TANK
2000 GAL.
85% H_2SO_4
WASTE TANK
8000 GAL.
$(NH_4)_2SO_4$
WASTE TANK
5000 GAL.
PRODUCT
RECEIVER
3000 GAL.
PRODUCT
SURGE TANK
2500 GAL.
SHIPPING

MANUFACTURING COSTS - MOBIL NITRATION - REVISED - 500,000 #/mo.

I. Raw Materials

All Raw Materials Supplied by Mobil.

II. Utilities - Per Batch

1.	Electricity 600 kwh @ 2.5¢/kwh	$15.00
2.	Steam 17,000# @ 1.00/m#	17.00
3.	Refrigeration 1.5×10^6 btu x .033¢/m btu	50.00
4.	Cooling Water 10,000 gals. @ 10¢/m	1.00
5.	Tempered Water	1.00
6.	Nitrogen	.50
7.	Total	$84.50

III. Operating Labor - Per Batch

2 men/shift @ 6.00/hr (includes burden) $180.00

IV. Maintenance (Routine)

Labor 8 man hr/batch	$ 48.00
Material $30,000/yr	51.00
Maintenance Overhead	13.00
	$112.00

V. Miscellaneous Operating Expenses

1.	Supervision and Clerical	$135.00
2.	Operating Materials	8.00
3.	Laboratory 0.5 Technician/Batch	26.00
		$169.00

VI. Administrative Overhead

1.	General Works Expense	$ 85.62
2.	Depreciation $350,000 - 8 year. S.L.	74.91
3.	Interest $350,000 - 18 mo @ 12%	71.26
		$231.79

VII. Contingency 10% $77.73

$855.02

VIII. Cost per # @ 500,000 #/mo & 80% Operating Factor (10,417 #/batch)

$$\$/\# = \frac{855.02}{10417} = 0.0821$$

EQUIPMENT REQUIREMENTS - MOBIL NITRATION - REVISED

I. Vessels

1. 97% Nitric Acid Day Tank..... $1,500
   300 gals. 304 ss
2. 98% Sulfuric Acid Day Tank..... 1,000
   600 gals. cs
3. EDC Day Tank 3,000
   2,500 gals. cs
4. Reactor 15,000
   3,000 gals. 316 ss Atmospheric
   w/ 15 hp Turbine Agitator
5. Extraction Tank 8,000
   2,000 gals. 316 ss
   w/ Agitator
6. Spent Acid Hold Tank 5,000
   8,000 gals. cs
7. $(NH4)_2 SO_4$ Waste Hold Tank..... 5,000
   5,000 gals. cs
8. Product Still/EDC Stripper 8,000
   3,000 gals. 316 ss Full Vacuum Rated

9. Ejector Hot Well ..... $ 1,000

500 gals. cs

10. Product Surge Tank 3,000

2,000 gals. cs w/Steam Coil or Jacket

$50,500

II. Heat Exchangers

1. Reactor Cooler $16,000

600 ft^2 316 ss Tube cs Shell

2. Still Heater 10,000

400 ft^2 304 ss 75 psig Shell Side

3. Still Condensers

A. 100 ft^2 cw condenser 3,000

cs Full Facuum Rated

B. 100 ft^2 Brine Tail Condenser..... 3,000

cs Full Vacuum Rated

$32,000

III. Pumps

0. Waste Pumps (2 - 100 gpm) ..... $ 3,000

1. 97% HNO_3 Feed Pump - Metering Type Pump - 0-2 gpm.. 1,200

2. 98% H_2SO_4 Feed Pump - Metering Type Pump - 0-3 gpm. 1,200

3.	EDC Day Tank Pump - 40 gpm @ 80' - 2x1 cs	$ 1,200
4.	Reactor Circulation Pump - 500 gpm @ 130' - 4x3 316 ss	4,000
5.	Reactor Phase Separation Pump - 20 gpm @ 60' - 1½x1 316 ss	1,500
6.	Extraction Tank Pump - 40 gpm @ 80' - 2x1 316 ss ..	1,600
7.	Still Circulation Pump - 250 gpm @ 120' - 3x2 316 ss	2,500
8.	Product Surge Tank Pump - 100 gpm @ 100' - 3x1½ cs	2,000
		$18,200

IV. Miscellaneous

1.	Vacuum System	$3,500
	2-Stage - Non-condensing Steam Ejector Set	
2.	In-Line Static Mixer	4,000
		$7,500

V. Total Equipment $108,200

May 26, 1975

TO: J. W. Shackelford

FROM: John Miles

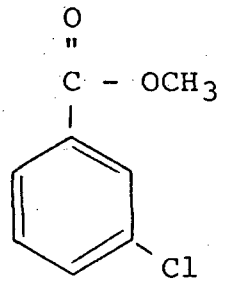
SUBJECT: Mobil Nitration Meeting - Richmond, Va. 5/20/75

Mobil:

John Ellington - Process Engineer - Mt. Pleasant, Tenn.
John Randall - Manager - Process Engineering - Phosphorous Divisio
Julien Wolfenbarger - Process Engineer - Phosphorous Division
Don Faggart - Manager - Crop Chemicals Formulation
T. Nichols - (Part-time)

Vertac:

Larry Graybill - Memphis
Larry Conoway - Eagle River
John Miles - Eagle River



I. Raw Material (Chloro Benzyl Ester)

1. Raw material is M-chloromethylbenzoate

2. Raw material will be shipped in T/C with steam coils. Steam will be needed at unloading spot to melt CBE. N_2 pressure unloading can be used.

3. Typical shipment analysis
   95% CBE
   0.5% MeOH
   0.5% Dichloro CBE
   Balance - para & ortho CBE isomers

4. Possible problem area - CBE with high acid number can cause chloride attack on stainless steel at temperatures in excess of 200°F. Acid number will need to be checked by lab on each T/C received.

5. CBE will be valued at $15-20,000 per batch.

II. Nitration Acid

1. HNO_3 - 97% +

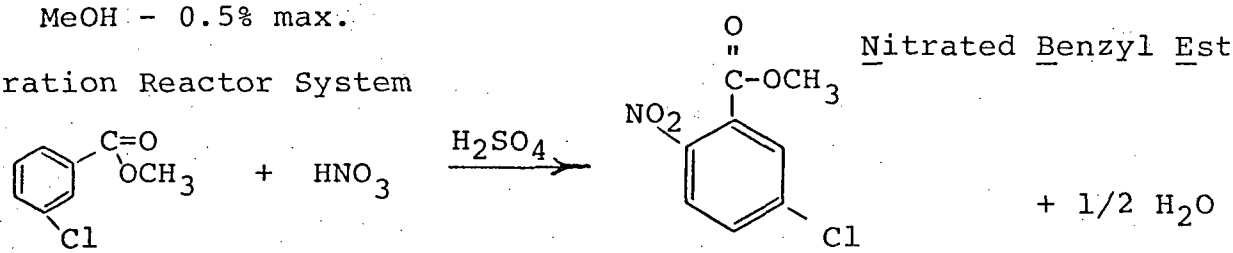
2. H_2SO_4 - 98% +

III. Solvent

1. Ethylene dichloride (EDC) - needs to be checked for MeOH - 0.5% max.

IV. Nitration Reactor System

Nitrated Benzyl Est

1. 

2-nitro, 5-chloromethylbenzoate

2. Reactor, reactor cooler, and associated pump and piping can be carbon steel if system is kept dry.

3. 97% HNO_3 system can be aluminum

4. Mobil recommends using calcium chloride brine in refrigeration system instead of ethylene glycol due to hazardous condition if organic refrigerant leaks into reaction mix.

5. Important reaction considerations

   A. Very intense agitation is required to prevent localized over concentration of nitrating acid and possibility of dinitro formation. Mobil will check or will supply information to check suitability of Pfaudler agitator we propose to use. Mobil has interlocks to stop acid feed and prevent acid feed and agitator restart in case of power failure or other agitator failure. Mobil recommends ammeter on agitator.

   B. Good reaction temperature control is necessary. Formation of the desired NBE isomer is favored by lower temperatures while increased reaction rate is favored by higher temperatures. Mobil recommends $32^{o}F$ operating temperature. They use dual electrical system with thermocouple for fast response of sensors and interlock which cuts off acid feed at $37^{o}F$. They also meter and control acid feed rate due to a tendency for reaction to take-off.

   C. 1% excess of HNO_3 over molar quantities is recommended which should leave about 1% unreacted CBE.

   D. Tempered water is recommended for heat up prior to phase separation.

   E. Poor reaction can cause phase separation problems due to poor interface formation.

V. Extraction System

1. After nitration, the bottom acid layer can be drained from the reactor to the extraction tank for extraction with recycled and makeup EDC.

2. For ambient temperatures extraction tank can be carbon steel.

3. Acid contains 10-12% NBE prior to extraction

4. Extracted acid contains 1-3% NBE, 1-2% EDC, and 80-83% H_2SO_4

5. Spent acid is returned to Mobil via T/T or T/C

6. Adequate separation time must be allowed in extraction to prevent spent acid recycle to reactor which can retard reaction rate and yield.

VI. Neutralization

1. Mobil recommends aqua ammonia rather than water plus gaseous ammonia sparge in order to minimize ammonia losses to vent.

2. Ammonia is recommended over caustic due to improved phase separation.

3. pH is checked with litmus or hydrion paper

4. Adequate water must be added to prevent formation of $(NH_4)_2SO_4$ crystals

5. Aqeous $(NH_4)_2SO_4$ waste is returned to Mobil via T/T or T/C. Eagle River will need a storage tank to hold waste.

6. $(NH_4)_2SO_4$ waste will contain 3-5% organics which can be minimized by good operating technique and equipment design.

VII. Distillation

1. Carbon steel is suitable material of construction

2. Column not necessary for distillation. Flash pot with overhead condenser is suitable.

3. Mobil recommends steam jets for vacuum. They have had unfavorable experience on this process with vacuum pumps.

4. Steam jet exhaust steam is condensed in hotwell and recycled to aqua ammonia wash step.

5. Mobil recommends two stage distillation - down to 150 mm Hg use cooling water on condenser; down to end point of 30 mm Hg & 275°F use refrigerated brine on condenser.

6. Mobil has experienced no product degradation for heating up to 300°F.

VIII. Product

1. Product Quality: 85-86% NBE
   2 - 3% CBE
   0.5% EDC (Max.)
   Balance other NBE isomers

2. NBE freezes at 118°F, therefore product storage tank and loading lines must be traced and insulated. Mobil will supply steam heated T/C for product shipment.

IX. Miscellaneous

1. Mobil approves of Eagle River preliminary flow sheet. We will supply them a more detailed flow sheet incorporating data from this meeting for their comment by June 1, 1975.

2. Mobil has supplied Eagle River with a quantity of physical property data per attachment "A".

3. Mobil has revised and increased quantities in their proposed production schedule.

Oct. 75	300,000
Nov-Dec., 75	240,000
Jan. 76	370,000
Feb-Mar.76	430,000
Apr-Jan. 78	500,000

Total 13,010,000 lbs.

Eagle River will supply Mobil a revised operating cost and capital expenditures estimate based on the quantities by June 6, 1975.

cc: Larry Graybill - Vertac, Memphis
Ray Guidi - Vertac, Shreveport
Larry Conoway - Eagle River
Don Faggart - Mobil, Richmond

CAPITAL REQUIREMENTS

A.	Purchased Equipment (28,500 in plant, 79,700 to be purchased)	$ 108,200
B.	Installation (Instruments, Piping, Electrical, Construction Expenses - Misc., Engineering Cost, etc.)	189,300
	TOTAL CAPITAL ...	$ 297,500
	CONTINGENCY 15% ...	52,500
		$ 350,000

PRODUCTION CAPACITY

500,000 lbs./month @ 80% Operating Factor = 10,417 lbs./batch.

VERTAC INCORPORATED
Suite 3200 — Clark Tower
5100 Poplar Avenue
Memphis, Tennessee 38137

INTER-OFFICE CORRESPONDENCE

May 28, 1975

TO: Niven Morgan

FROM: Larry Graybill

SUBJECT: Mobil Nitration Proposal.

REPLY REQUESTED BY (DATE)

Attached is the preliminary engineering proposal for the Mobil nitration as envisioned by John Miles. It will be most difficult to get the increased quantities that Mobil has requested in the existing DCNB plant. Therefore, John is suggesting that we extend the present structure and custom-design this unit for Mobil's nitration load. The plant design is still a very multi-purpose unit and could be readily adapted to other processes after the Mobil contract.

The economics of this project look very attractive. John Miles is estimating $ 350,000 for the complete custom installation of this facility for Mobil. Mobil will sign a contract for 13,000,000 pounds of product to be delivered during twenty-seven months period of October, 1975 through January, 1978. Current negotiations are for a gross profit of 20 - 30¢/Lb. which would yield somewhere between $ 2,600,000 and $ 3,900,000 during the life of the contract. This compares quite favorably, for example with the Product 10 plant which will be $ 1,250,000 investment for a return of $ 450,000 per year gross profit. An additional consideration is that Mobil will supply all raw materials and will take all waste product from the plant.

As indicated earlier this product is being nitrated outside, so that Mobil can increase their own plant efficiencies and Modown production. Successful completion of this project could lead to the manufacture of other Mobil pesticide or intermediates and could improve the existing Mobil supplier relationship with our Vertac group as well as Helena Chemical.

Sincerely,

Larry

Larry Graybill

LLG/bc

cc: Bill Shackelford
John Miles
Larry Connaway
Ray Guidi

P. S. Also, attached is John Miles' Recap of Technical Exchange during the May 20, 1975 Mobil meeting at Richmond, Virginia.

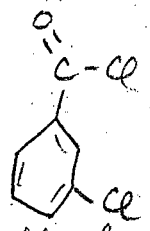
Mobil Chemical Company

CROP CHEMICALS GROUP

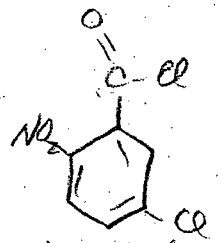
P.O. BOX [illegible]
RICHMOND, VIRGINIA [illegible]
TELEPHONE (804) [illegible]

February 28, 1975

Helena Chemical Company
Suite 3900 - Clark Tower
5100 Poplar Avenue
Memphis, Tennessee 38137



m-chlorobenzoyl chloride



2-nitro, 5-chlorobenzoyl chloride

Gentlemen:

We are considering your company as a possible manufacturer of nitrated meta-chlorobenzoyl chloride (NBE) using a Mobil proprietary process. In this connection, we must disclose to you certain proprietary information on a confidential basis. You agree to accept and treat any such proprietary information as may be disclosed to you by Mobil Chemical on the following basis:

(1) As used herein, the term "Proprietary Information" shall include all technical information which we disclose to you directly include relating to the manufacture of nitrated meta-chlorobenzoyl chloride (NBE).

(2) You agree not to disclose any Proprietary Information to any third person and you agree not to use such Proprietary Information except on behalf of Mobil Chemical, until such information becomes public knowledge except through a breach of this agreement by you, or unless such information was known to you prior to disclosure by Mobil Chemical, or unless such information is disclosed to you by a third party without binder of secrecy.

(3) You agree that all specifications, flow sheets, operating data and other written material furnished to you by Mobil, and copies thereof embodying Proprietary Information shall remain the property of Mobil and shall be returned to Mobil upon written request.

(4) Nothing herein shall be construed as granting you any right or license under any Mobil patents, except to the extent provided herein.

2/6/75
D. P. Pulley

MANUFACTURING PROCEDURES
NITRATION OF MOBIL RAW MATERIAL A

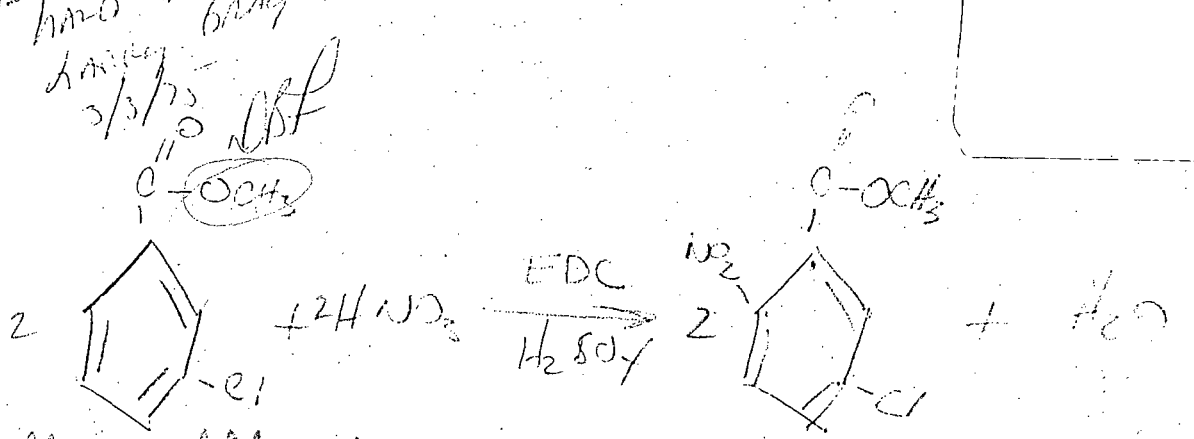
SPECIAL EQUIPMENT/UTILITIES/FACILITIES

- Refrigeration is required at a brine temperature 0-5°F. 70 tons/hr
- 316SS is Mobil's construction material for vessels, piping, etc. throughout the process, but glass lined steel or carbon steel reactor, tanks, etc. would be equally suitable.
- Reactant A would be supplied by Mobil in heated tank trucks or in tankcars. Remaining reactants are commercially available and may be purchased and handled in the most convenient manner. The product may be shipped in tanktrucks or tankcars (heated).
- Raw material A solidifies at 21°C (70°F) The product solidifies at 25°C (77°F).
- The waste materials from the process are : ? (check vs. 53% ammonium sulfate)
  (1) ca 35% ammonium sulfate and 60% water, with miscellaneous organics not exceeding 5% (~~200~~ 240 gallons per batch)
  (2) Spent sulfuric acid containing ca 85% H_2SO_4, 0-1% HNO_3, 12-13% water and 2% organics (~~480~~ 510 gallons/batch)

Heavy Phase

18
21/78
36/78
32/69.8

Attached to HAZO Given to Gary 6.11 Larry 3/3/75



PROCESS DESCRIPTION

680 gallons of raw material A is charged concurrently with 900 gallons of ethylene dichloride to a 2,200 gallon, 316 SS jacketed reactor with cooling coils (484 sq. feet cooling area). Agitation and cooling are started while charging raw material A and ethylene dichloride. When the temperature falls below 65°F, 15% of 98% nitric acid (220 gallons) is added to the reactor. When the reactor temperature reaches 32°F, the addition of 98% sulfuric acid (430 gallons) and remaining nitric acid is started. The remaining nitric acid addition time is two (2) hours and the sulfuric acid addition time is four (4) hours or longer if required to maintain temperature. The reaction temperature is maintained at 32°F during nitric acid/sulfuric acid addition and for 15 minutes after the addition is completed. The reactor contents are then heated to 75°F and held at this temperature for one (1) hour.

The agitator is stopped to allow the heavier (waste) phase (510 gallons) to separate and be drained into a 316 SS receiving tank from which the product material in the waste phase will be extracted with ethylene dichloride (960 gallons) in a 316 SS mixing tank. The ethylene dichloride extraction phase is used in subsequent reaction batches. The residue waste phase from the extraction is disposed of via truck as approximately 85% sulfuric acid.

The product phase remaining in the reactor is then washed with 200 gallons of water and neutralized with 240 pounds of gaseous ammonia. Phases are then allowed to separate and the heavier product phase ~~(660~~ 1660 gallons) is drained to a 316 SS receiver for product recovery. The lighter phase (240 gallons) is drained to 316 SS receiver and is collected for disposal by truck.

The product phase is batched stripped to 15MM and 250°F to reduce the ethylene dichloride content in the product to .45% by weight. 780 gallons (8,850 pounds) of product per batch is obtained. 11.35#/gal

CYCLE TIME

Reaction

	Description	Time in Hours
A.	Charge Raw Material A/Ethylene Dichloride.	1/2 Hour
B.	Cool to 65°F.	1/4 Hour
C.	Add 15% of Nitric Acid.	1/4 Hour
D.	Add Balance of Nitric Acid & Sulfuric Acid	4 Hours
E.	Hold Reaction Content at 32°F.	3/4 Hour
F.	Heat to 70°F.	1 Hour
G.	Stop Agitation & Allow Phases to Separate.	1/2 Hour
H.	Drain Heavier Phase.	1/2 Hour
I.	Start Agitation & Water	1/2 Hour
J.	Add Gaseous Ammonia to Neutralize Product Phase.	1/2 Hour
K.	Agitate	1/2 Hour
L.	Stop Agitation & Separate Phases.	1/2 Hour
M.	Drain Product Phase to Stripper Feed Tank.	1/2 Hour
N.	Drain Light Phase from Reactor.	1/2 Hour
O.	Rinse	1/4 Hour
		11 Hours Total

Extraction (Batch)

A.	Charge Material.	1/2 Hour
B.	Agitate	1/2 Hour
C.	Separate Phases	1/2 Hour
D.	Drain Phases	1 Hour
		2 1/2 Hours Total

Stripping (Batch)

Description	Time in Hours
A. Charge Evaporator	1 Hour
B. Stripp to 15 MM at 250°F	4 Hours
C. Discharge Product	1 Hour
	6 Hours Total

Bill Shackelford

VERTAC INCORPORATED Suite 2900—Clark Tower • 5100 Poplar Avenue • Memphis, Tennessee 38137 • 901-761-0050

182

March 10, 1975

Mr. Dan P. Pulley
Manager-Engineering Services
Mobil Chemical Company
Phosphorus Division
P. O. Box 26683
Richmond, Virginia 23261

Dear Dan:

It was a pleasure showing you and Don some of our facilities. Thanks for your prompt effort in responding to our interest in the nitration project.

Per our conversation, we can see no problem in meeting your target date of July for initial production. Based on your plant visit and the information supplied to us at this point, we will make a preliminary economic proposal to you by mid March. This proposal will be in the form of a tolling arrangement whereby we convert your raw materials into the nitrated product. We will include the operating cost and the toll charge along with a preliminary flow sheet and our estimates of production capability. Based on our response by mid March, we would hope to have some indication from you by the first of April on the economic viability of the project.

Sincerely,

Larry Graybill
Manager
Business Development

LLG:cj

cc: Bill Shackelford

TO - JOHN MILES	CALCULATIONS AND DESIGN DATA	PREPARED BY GFI/JHC
SUBJECT MOBIL PLANT TEST — INCRESED BATCH SIZE for INCREASED PRODUCTION		DATE 7/11/77 SHEET 1 OF 2

DETAILED BELOW ARE RECOMMENDED CHARGES FOR AN INCREASED MOBIL BATCH SIZE. SINCE R-M101 is approaching ITS UPPER LIMIT, LESS CRITICAL CHARGES (EDC & H_2SO_4) ARE NOT INCREASED quite as MUCH as CBE and HNO_3. REVIEWING PAST DATA, I do NOT SEE a PROBLEM WITH SLIGHTLY smaller EDC & H_2SO_4 charges (yields may IMPROVE SLIGHTLY in fact). HOWEVER, as WITH any PLANT change Operators, Supervisors, & the LAB need to BE on the lookout for PROBLEMS. Possible PROBLEMS altho NOT EXPECTED include OVERFILLING reactor, NBE parity PROBLEMS, & CBE or NBE CRYSTALS formed in R-M101.

IT IS recommended that we operate MOBIL in this manner (should PROBLEMS not develop) UNTIL CURRENT HIGH CBE inventory is reduced to normal. At that time the results of the larger Batch can BE REVIEWED and if successful NEW standard operating conditions WILL BE ISSUED.

Please do HESITATE to have the operators or SUPERVISORS to call me. Thanks

CALCULATIONS AND DESIGN DATA

PREPARED BY SF 1 19 Ho1

SUBJECT MOBIL PLANT TEST —

DATE 1/14/77

INCREASED BATCH SIZE for INCREASED PRODUCTION

SHEET 2 OF 2

MATERIAL	PRESENT UNIT DATA SHEET	PROPOSED INCREASE e/
EDC	13,200 LBS	13,860 LBS a/
CBE	8,790 LBS	9,405 LBS B/
HNO_3 TOTAL	286 gals	306 gals. c/
H_2SO_4	575 gals	594 gals d/

a/ REPRESENTS 5% INCREASE IN EDC / (NEW change 1319 gals.)

B/ REPRESENTS 7% INCREASE IN CBE. CBE % IN EDC calculated as 40.4% / CONTINUE to MONITOR & adjust for OUT of Range CBE concentration / (NEW change 943 gals).

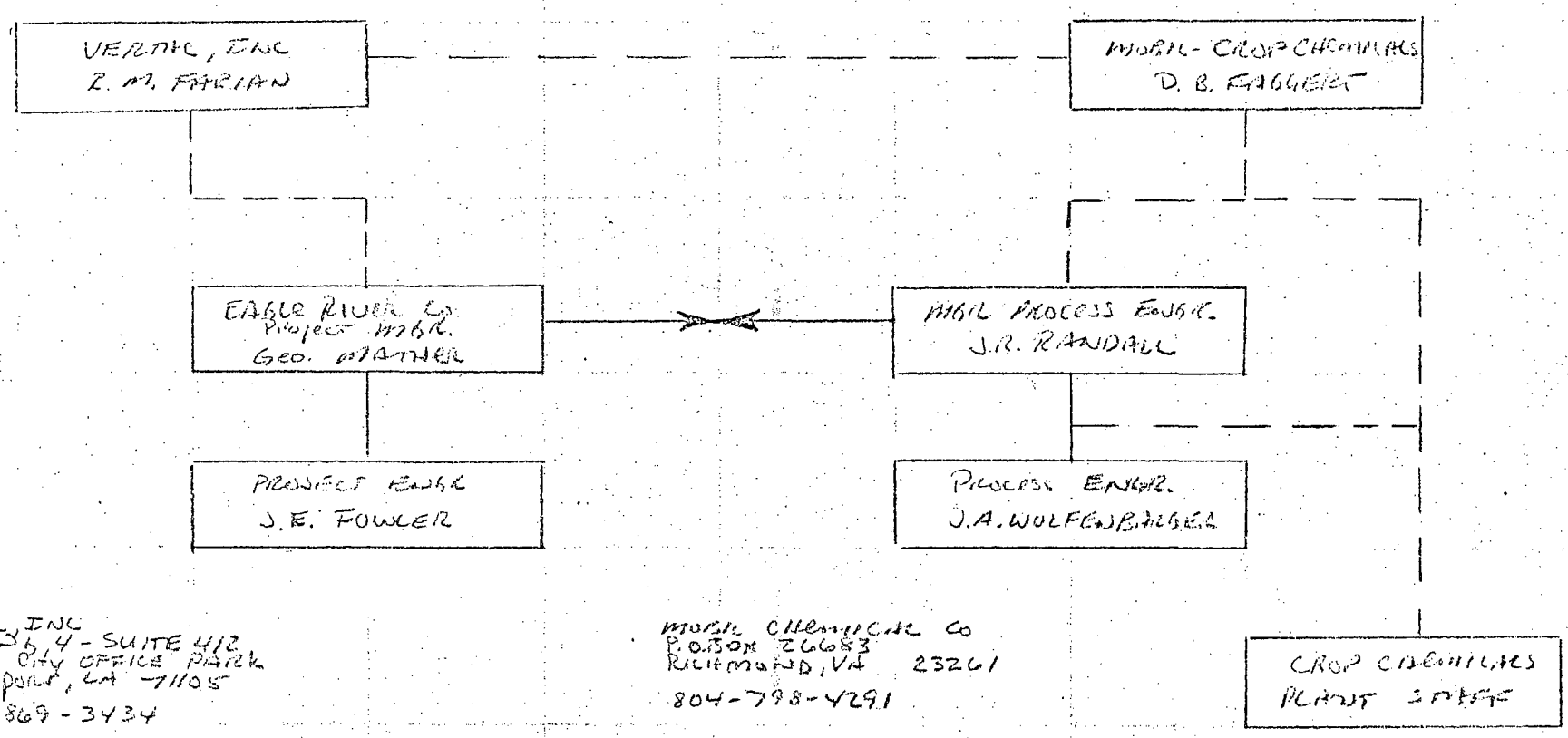
c/ REPRESENTS 7% increase in HNO_3 / (NEW change 3840 LBS)

d/ REPRESENTS 3% increase in H_2SO_4 per data sheet (7% increase over commonly charged quantity of 555 gals). / (NEW change 9091 LBS)

e/ TOTAL NEW gallons 3162 gals.
VERSUS present gallons 2999 gals.
My BEST info indicates R-1-1101 WILL STILL Have adequate dome space.
PRODUCTION NBE NEW 12400# vs 11,600# / Batch.

cc— BILL S.
Larry C.
JOE P.
Richard J. (2 COPIES)
DICK H

NBE TOLL MANUFACTURE
EAGLE RIVER Co.
COORDINATION CHART



VERTAC, INC
BUILDING 4 - SUITE 412
SHREVE CITY OFFICE PARK
SHREVEPORT, LA 71105
318 - 869 - 3434

EAGLE RIVER CHEM. Co.
HIGHWAY 242
WEST HELENA, ARKANSAS
72390
501 - 572 - 3701

MOBIL CHEMICAL Co
P.O. BOX 26683
RICHMOND, VA 23261
804 - 798 - 4291

MOBIL CHEMICAL Co.
P.O. BOX 352
MT PLEASANT, TENN. 38474
615 - 379 - 3208

BY _____ DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____
SHEET NO. _____ OF _____
JOB NO. _____

To: JW Shackelford 5/26/75

From: John Miles

Subj: Mobil Nitration Meeting - Richmond Va, 5/20/75

Mobil:

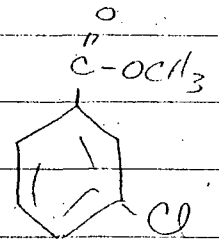
John Ellington - Process Engr - Mt. Pleasant, Tenn
John Randolph - Mgr - Process Engr - Phosphorus Div
Julian Wolfenbarger - Process Engr - Phosphorus Div
Don Taggart - Mgr - Crop Chemical formulation
T. Nichols - (part time)

Vertac

Larry Graybill - Memphis
Larry Conoway - Eagle River
John Miles - Eagle River

I. Raw Material

Chloro Benzyl Ester



1. Raw material is m-chloromethylbenzoate

2. Raw material will be shipped in T/C with steam coils. Steam will be needed at unloading spot to melt CBE. N_2 pressure unloading can be used

3. Typical shipment analysis.

95% CBE
0.5% MeOH
0.5% Dichloro CBE
Balance - para & ortho CBE isomers

4. Possible problem area - CBE with high acid number can cause chloride attack on stainless steel at temperatures in excess of 200°F. Acid number will need to be checked by lab on each T/C received.

5. CBE will be valued at $15-20,000 per batch.

II. Nitration acid -

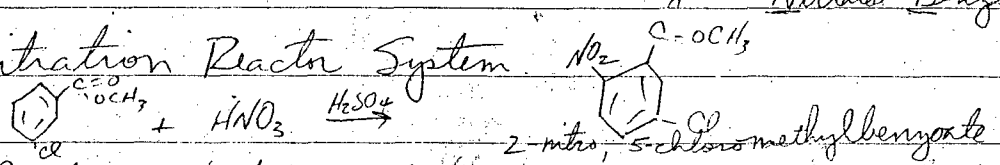
1. HNO_3 - 97%+
2. H_2SO_4 - 98%+

III. Solvent

1. Ethylene dichloride (EDC) - needs to be checked for MeOH - 0.5% max.

IV. Nitration Reactor System

Nitrated Benzyl Ester

1. 

2. Reactor, reactor cooler, and associated pump & piping can be carbon steel if system is kept dry.

3. 97% HNO_3 system can be aluminum

4. Mobil recommends using calcium chloride brine in refrigeration system instead of ethylene glycol due to hazardous condition if refrigerant leaks into reaction mix.

5. Important reaction considerations

A. Very intense agitation is required to prevent localized over concentration of nitrating acid & possibility of dinitro formation. Mobil will check or will supply information to check suitability of Pfaudler agitator we propose to use. Mobil has interlocks to stop acid feed & prevent acid feed and agitator restart in case of power failure or other agitator failure. Mobil recommends ammeter on agitator

B. Good reaction temperature control is necessary. Formation of the desired NBE isomer is favored by lower temperatures while increased reaction rate is favored by higher temperatures. Mobil recommends 32°F operating temperature. They use dual electrical system with thermocouple sensors for fast response and interlock which cuts off acid feed at 37°F. They also meter and control acid feed rate due to a tendency for reaction to take-off.

C. 1% excess of HNO_3 over molar quantities is recommended which should leave about 1% unreacted CBE

D. Tempered water is recommended for heat up prior to phase separation

E. Poor reaction can cause phase separation problems due to poor interface formation

V. Extraction System

1. after nitration the bottom acid layer can be drained from the reactor to the extraction tank for extraction with recycled & makeup EDC

2. For ambient temperatures extraction tank can be carbon steel

3. Acid contains 10-12% NBE prior to extraction

4. Extracted acid contains 1-3% NBE ; 1-2% EDC, and 80-83% H_2SO_4

5. Spent acid is returned to Mobil via T/T or T/C

6. Adequate separation time must be allowed in extraction to prevent spent acid recycle to reactor which can retard reaction rate & yield

VI. Neutralization

1. Mobil recommends agua ammonia rather than water plus gaseous ammonia sparge in order to minimize ammonia losses to vent.

2. Ammonia is recommended over caustic due to improved phase separation

3. pH is checked with litmus or hydrion paper

4. Adequate water must be added to prevent formation of $(NH_4)_2SO_4$ crystals

5. Aqueous $(NH_4)_2SO_4$ waste is returned to Mobil via T/T or T/C. Eagle River will need a storage tank to hold waste.

6. $(NH_4)_2SO_4$ waste will contain 3-5% organics which can be minimized by good operating technique & equipment design.

VII Distillation

1. Carbon steel is suitable material of construction.

2. Column not necessary for distillation. Flash pot with overhead condenser is suitable.

3. Mobil recommends steam jets for vacuum. They have had unfavorable experience on this process with vacuum pumps

4. Steam jet exhaust steam is condensed in a hotwell & recycled to aqua ammonia wash step.

5. Mobil recommends two stage distillation - down to 150 mm Hg use cooling water on condenser; down to end point of 30 mm Hg & 275°F use refrigerated brine on condenser.

6. Mobil has experienced no product degradation for heating up to 300°F

VIII Product

1. Product quality: 85-86% NBE
2-3% CBE
0.5% EDC (MAX)
Balance other NBE isomers

2. NBE freezes at 118°F, therefore product storage tank and loading lines must be traced & insulated. Mobil will supply steam heated T/C for product shipment.

IX. Miscellaneous

1. Mobil approves of Eagle River's preliminary flow sheet. We will supply them a more detailed flow sheet incorporating data from this meeting for their comment by June 1, 1975

2. Mobil has supplied Eagle River with a quantity of physical property data per attachment "A".

3. Mobil has revised & increased quantities in their proposed production schedule

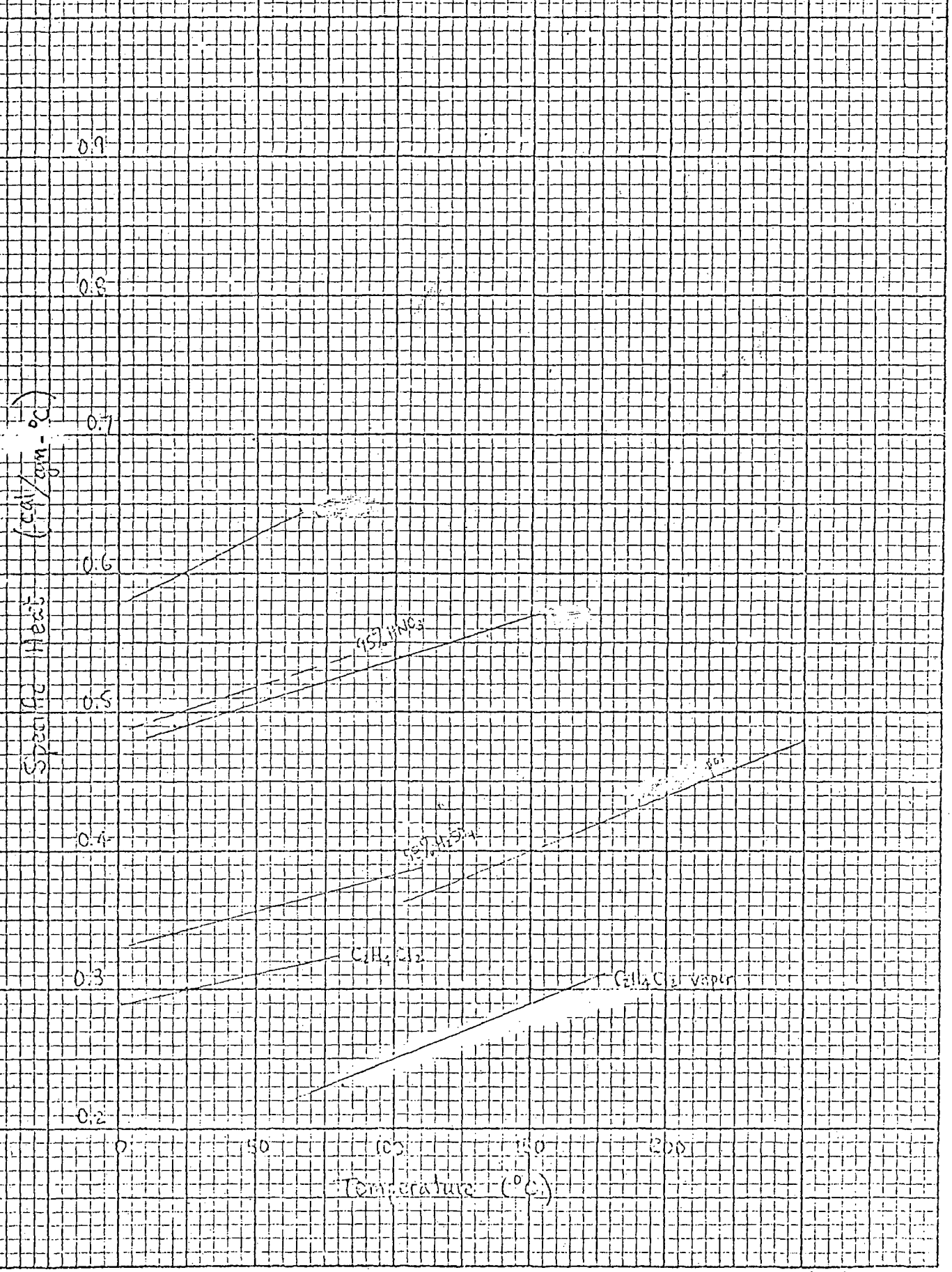
	#/mo
Oct 75	300,000
Nov-Dec 75	240,000
Jan 76	370,000
Feb-Mar 76	430,000
Apr-Dec 76	500,000

Eagle River will supply Mobil a revised operating cost and capital expenditure estimate based on the quantities by June 6, 1975

cc: Larry Graybill - Vertac, Memphis
Ray Guidi - Vertac, Shreveport
Larry Conoway - Eagle River
Don Taggart - Mobil, Richmond

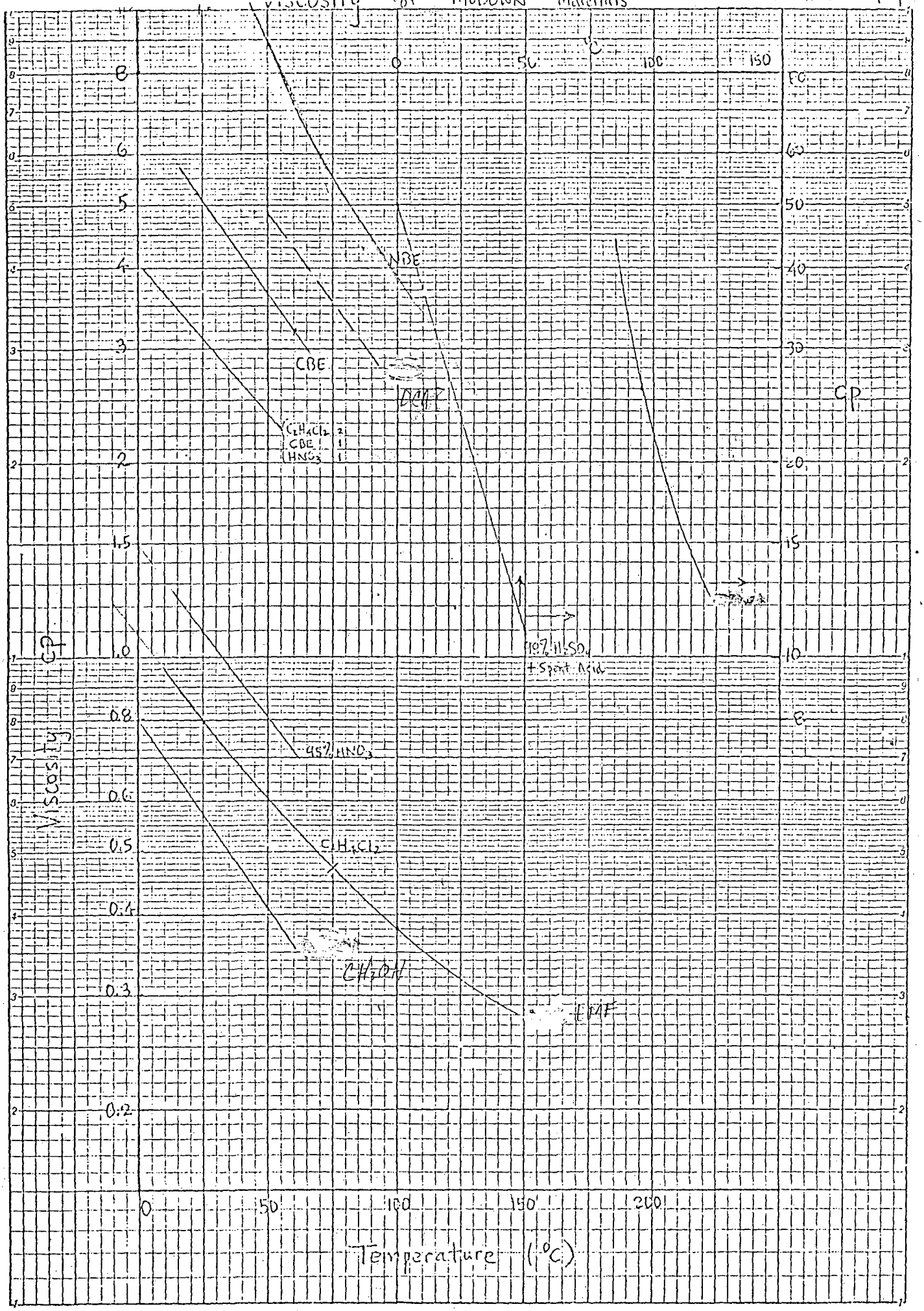
C.E. Hunt 4/12/73

Liquid Specific Heats — Mobbion

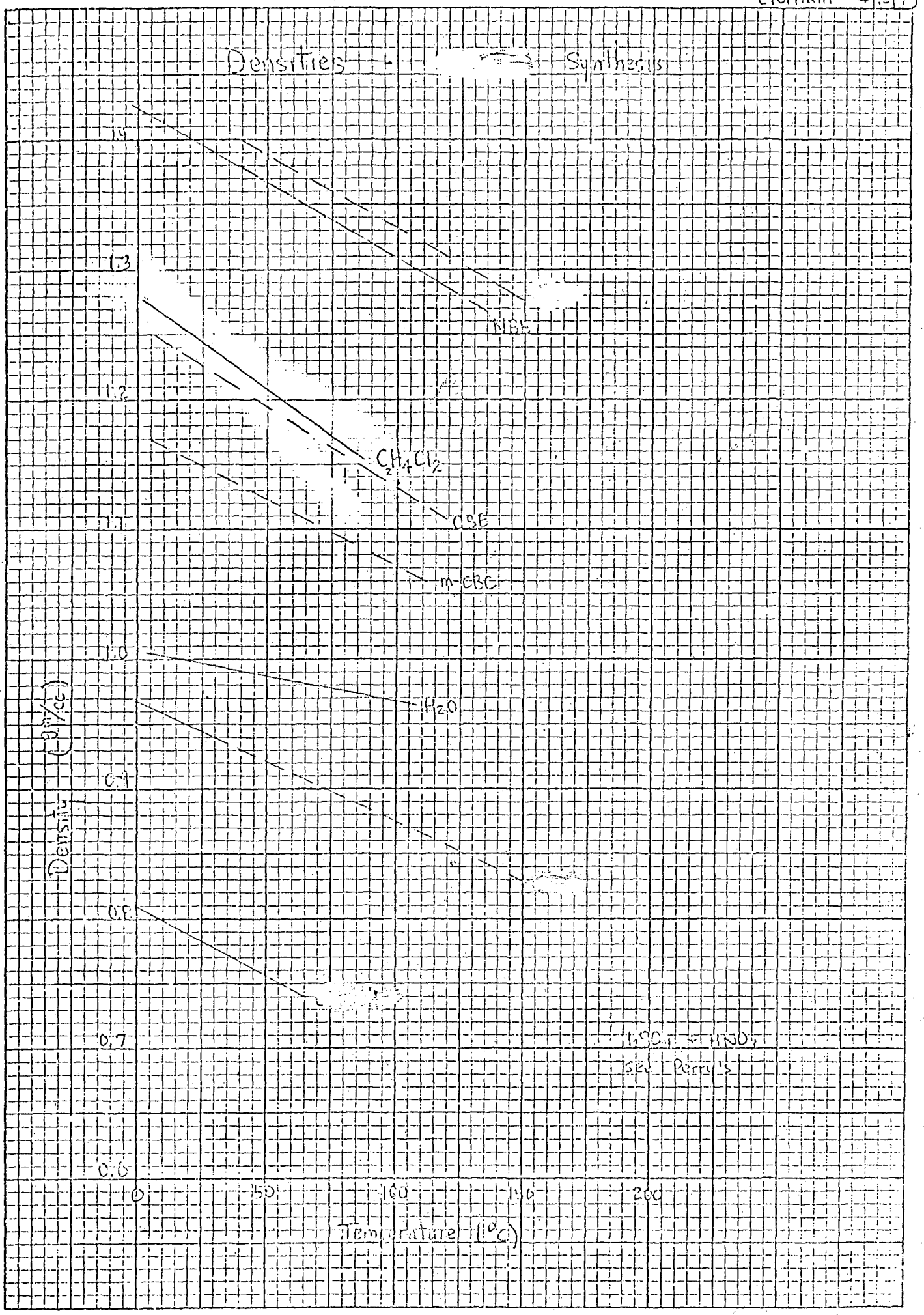


PRINTED IN U.S.A.

Viscosity of MODOWN Materials C.G. Hunt 4/12/7



C.E. Hunt 4/12/73



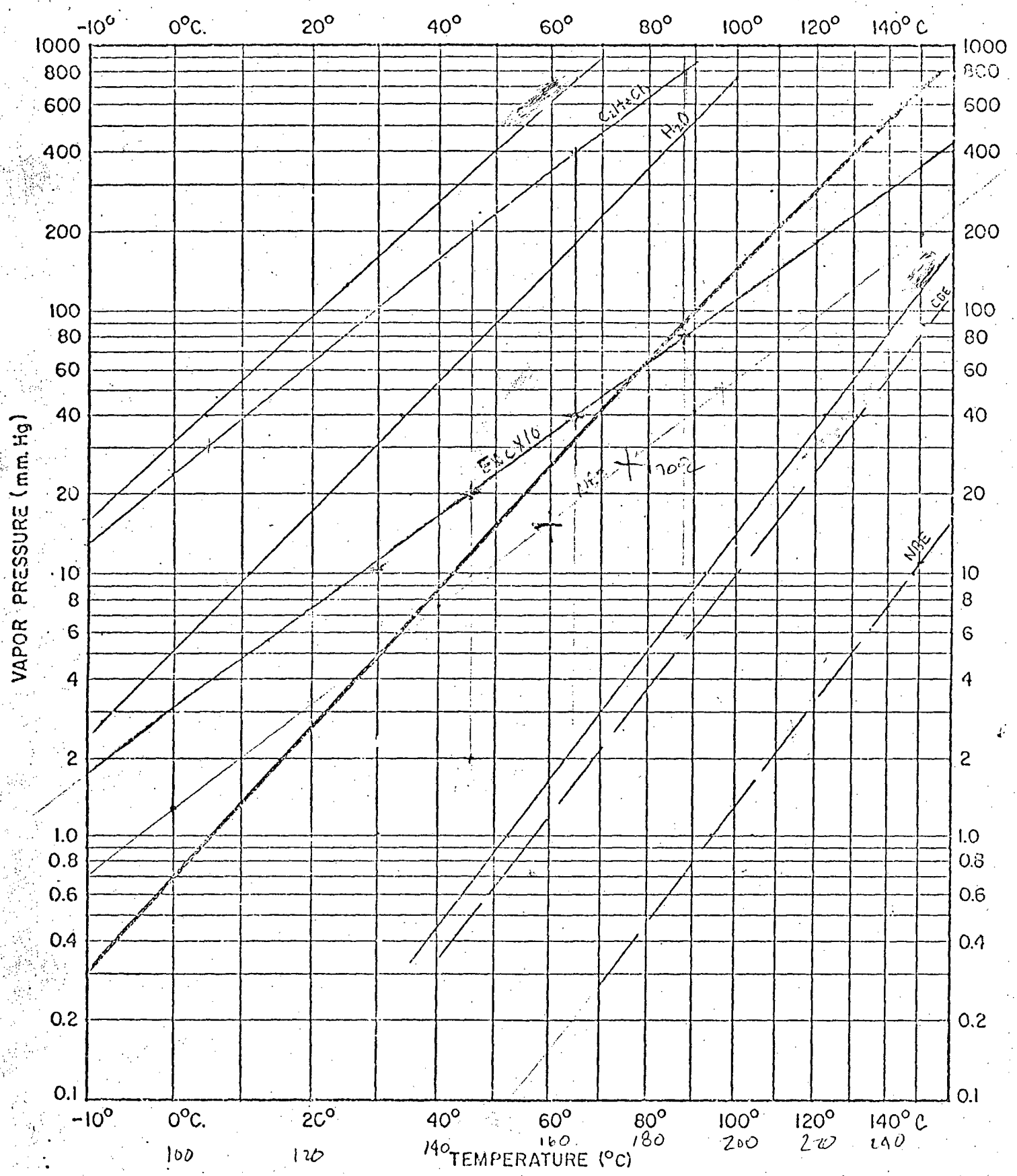
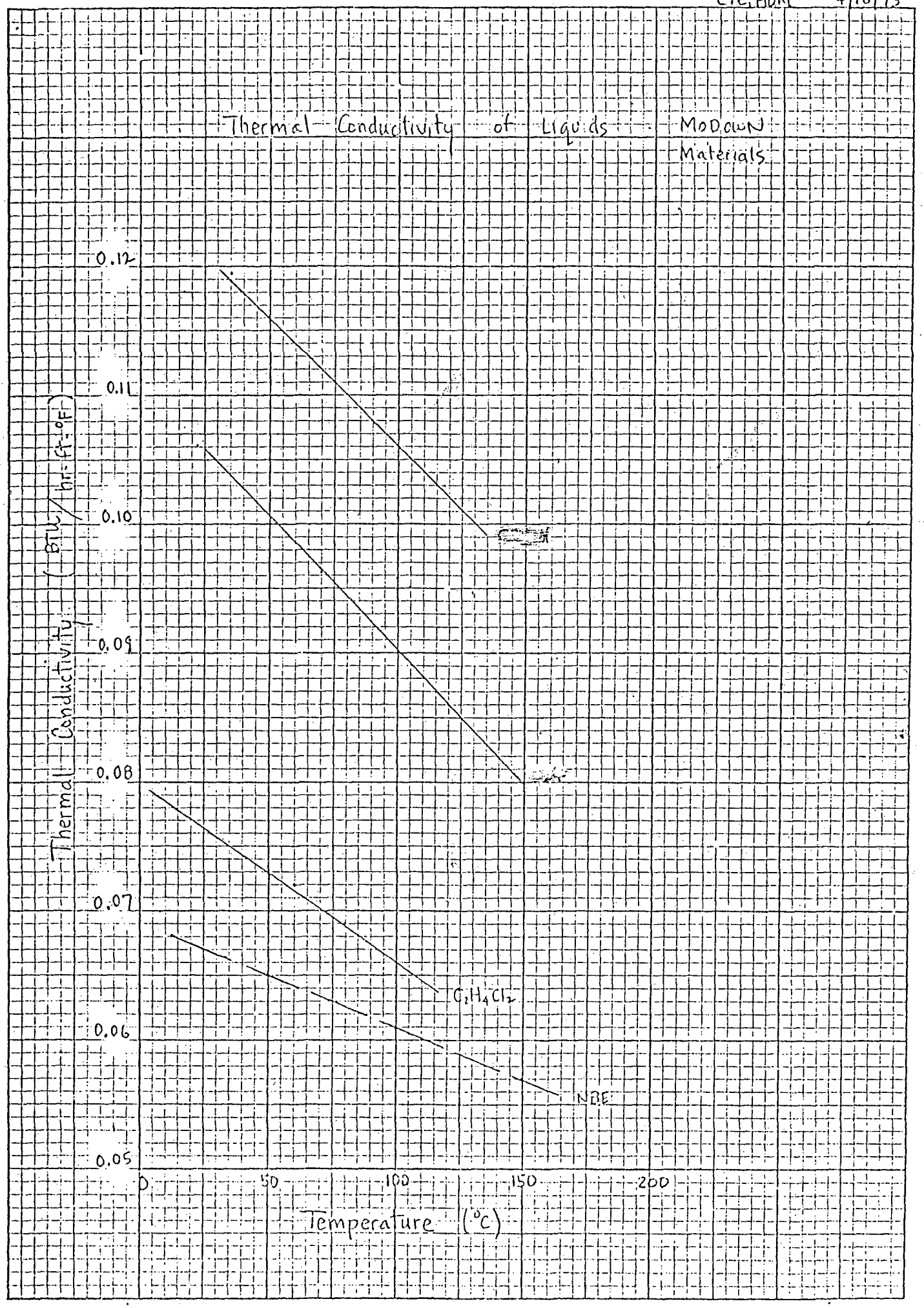


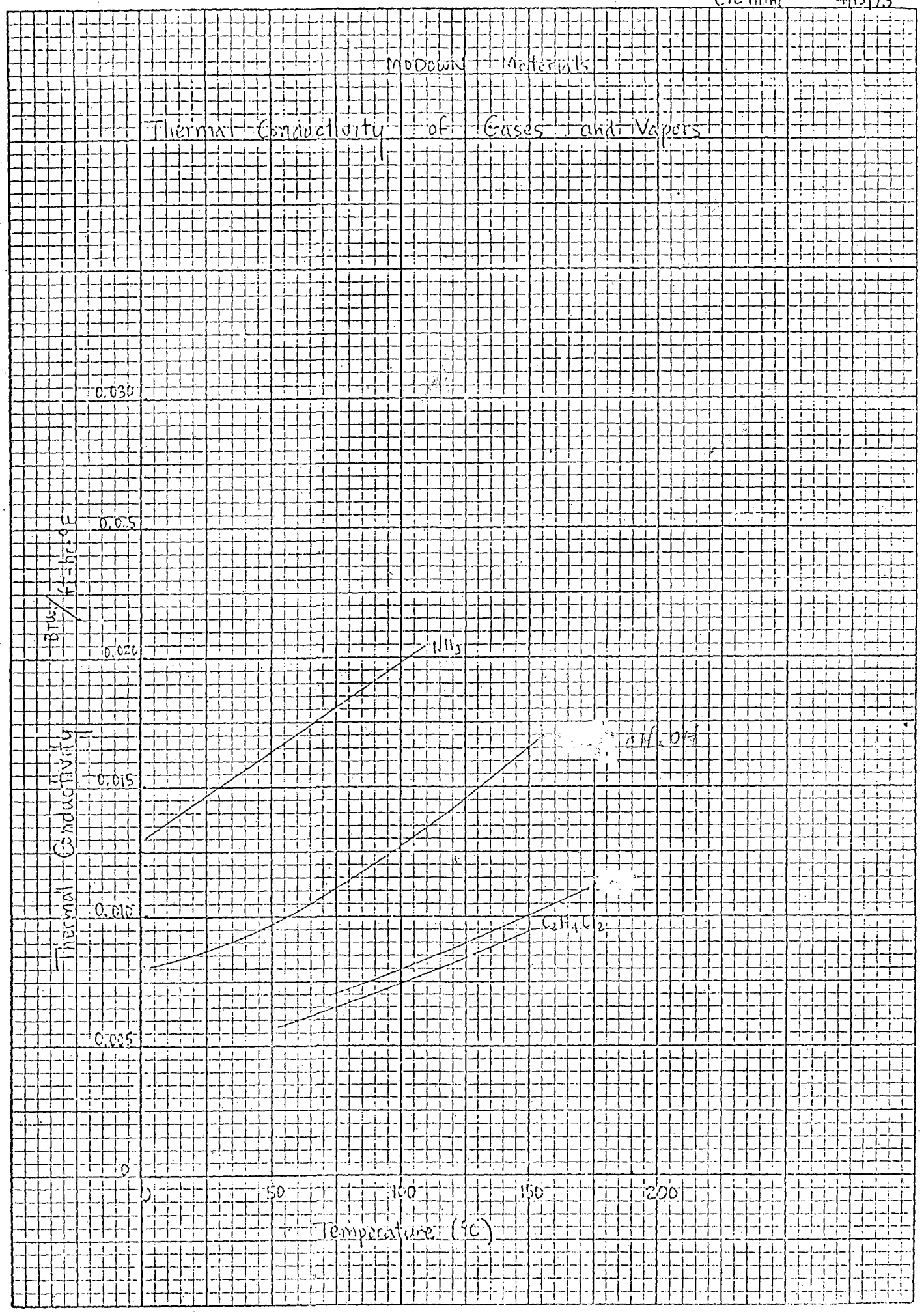
Figure III—Vapor pressure of DMF MODOWN Materials

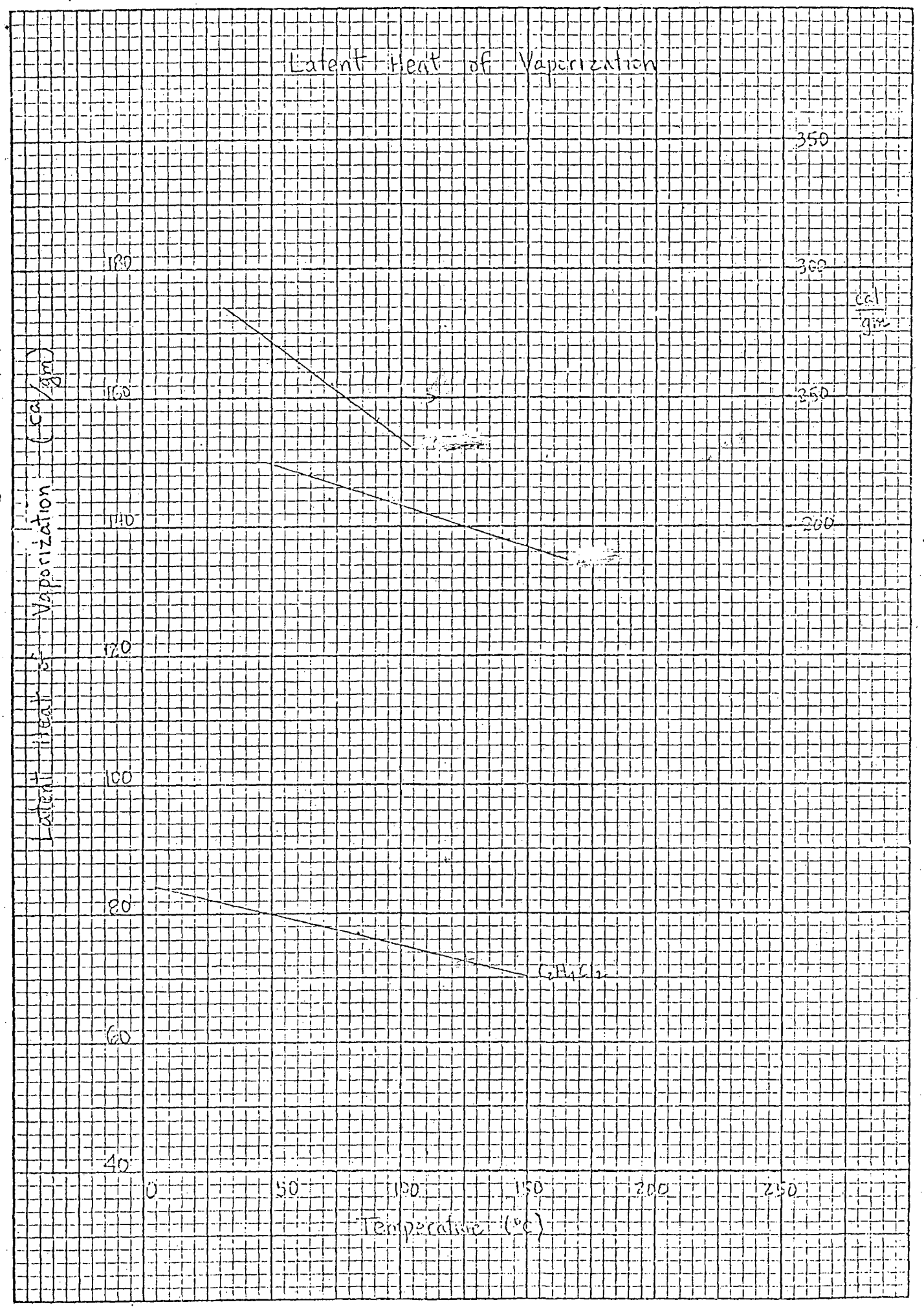
C.E. Hunt 4/16/73



KEUFFEL & ESSER CO.

C.E Hunt 4/13/73




Latent Heat of Vaporization
Latent Heat of Vaporization (cal/gm)
180
160
140
120
100
80
60
40
350
300
250
200
cal/gm
0
50
100
150
200
250
Temperature (°C)
CH_4Cl_2

From the desk of

R. M. FABIAN

To Bill Shackelford

7/29/75

I would like to respond to Mobil by about Aug 15.

Please give me your comments.

My principal concerns are:

① page 6 - Delivery penalty

② App. B, page 2 - Mobil not taking enough product.

③ Front-end money - p. 1 of App. B.

Would like $100M @ time of contract signing (Oct 1 @ latest) + $100M @ start-up.

Bob F.

VERTAC INCORPORATED

Building 4—Suite 412 • Shreve City Office Park
Shreveport, Louisiana 71105 • Phone 318-869-3434

DRAFT

copy Geo
John M
John H
Larry Con
Jim Fowler
return to JWS
7/16/75

AGREEMENT

AGREEMENT, made as of _____, 1975 by and between Mobil Chemical Company, a Division of Mobil Oil Corporation, a New York corporation, hereinafter called Mobil, and VERTAC Incorporated, a _____ corporation hereinafter called Contractor.

W I T N E S S E T H :

WHEREAS, Mobil has developed and currently possesses a process for the manufacture of 2-nitro, 5-chloro methylbenzoate, hereinafter called NBE, and is desirous of having NBE manufactured for it according to such process; and

WHEREAS, Contractor possesses personnel and equipment necessary for the manufacture of NBE and is desirous of manufacturing NBE for Mobil in accordance with said process developed by Mobil.

NOW, THEREFORE, it is agreed as follows:

1. Mobil shall furnish Contractor with or cause it to be furnished with methyl meta chlorobenzoate, anhydrous ammonia, ethylene dichloride, nitric acid, and sulfuric acid meeting the specifications set forth in Appendix A attached hereto. Said raw materials hereinafter shall be called the "Materials". Contractor will inspect all Materials tendered by Mobil and promptly shall advise Mobil of any defects in such Materials or failure of the Materials to conform with said specifications.

2. In accordance with the terms of this agreement, Contractor shall manufacture such amounts of NBE as Mobil from time to time may request to be manufactured from Materials delivered to Contractor. In manufacturing NBE, Contractor shall:

a. use Materials which Mobil supplies or causes to be supplied.

b. use the process and procedures specified by Mobil and follow such instructions concerning manufacturing of NBE as Mobil may give from time to time;

c. ship NBE as directed by Mobil in rail tank cars supplied by Mobil. Contractor shall refrain from using rail cars supplied by Mobil for any purpose other than the storage and shipping of NBE manufactured hereunder.

3. Contractor shall draw two 2-oz. samples from each batch of NBE manufactured hereunder. Each of said samples shall be marked with Contractor's name and the batch number. Contractor shall seal one sample and hold same for one (1) year at which time it may be disposed of unless otherwise advised by Mobil. Contractor shall ship one of the samples to Mobil at the following address:

Mobil Chemical Company
Arrow Mines Road
Mt. Pleasant, Tennessee 38474

All samples will be placed in bottles supplied by Mobil and will be drawn in accordance with procedures specified by Mobil.

4. Contractor shall supply Mobil with production reports on forms provided by Mobil and such reports shall be sent to Mobil at time intervals established by Mobil.

5. Contractor shall receive, handle and store raw materials and shall store, handle and ship NBE as provided in this Section 5. Contractor shall:

a. provide and maintain at West Helena, Arkansas sufficient facilities for the safe storage of Materials and NBE required by Mobil to be stored pursuant hereto.

b. preserve and protect Materials and NBE from contamination, loss, theft, damage or destruction;

c. segregate Materials and NBE from other materials and goods and take such steps, including the filing of documents and the posting of signs, as Mobil may request to protect Mobil's title to Materials and NBE.

d. in accordance with Mobil's production schedules, deliver NBE manufactured hereunder to Mobil. In connection with each such shipment, Contractor shall prepare a bill of lading in a form approved by Mobil and immediately after a shipment is made Contractor will send a copy of such bill of lading to Mobil.

6. Title to all Materials delivered to Contractor, all work in process incorporating Materials and all NBE shall remain in Mobil.

7. Contractor shall fully account for all Materials, work in process and NBE and shall keep such records relating thereto as Mobil reasonably may request. Contractor shall be responsible for and shall reimburse Mobil for all Materials, work in process and NBE contaminated, lost, stolen, destroyed, damaged or unaccounted for after delivery of Materials to Contractor and before delivery to Mobil of such Materials or NBE. Contractor's obligation in the event of contamination, loss, theft, destruction or damage of or inability to account for Materials or NBE shall be as follows: With respect to NBE Contractor shall pay Mobil its then current purchase price plus transportation costs for such NBE and with respect to Materials and work in process Contractor shall reimburse Mobil for Mobil's cost in obtaining same and transporting same to Contractor's facilities. Mobil shall have the right to make or have its auditors make a stock audit (either physical or book inventory or both) from time to time and at such times as it may elect and Mobil shall have access to Contractor's books and records for this purpose. Losses reported by Contractor or computed on the basis of Mobil audits shall be the difference between (1) the original inventory or the inventory as of the preceding audit plus deliveries to Contractor less deliveries by Contractor on Mobil's order, and (2) the inventory as of the date of the current audit. Any payments for shortages shall be within 30 days of Mobil's notification to Contractor.

8. Mobil and Contractor will mutually agree to acceptable Material yield rates after the first ninety (90) days of operation in Contractor's NBE manufacturing facilities. If Mobil is not satisfied with the yields achieved, Mobil has the right to assume direct supervision of the Contractor's manufacture of NBE hereunder and Contractor shall accept and perform in accordance with such supervision. In the event that Mobil and Contractor are unable to agree on an acceptable yield, Mobil may terminate this agreement on written notice to Contractor.

9. Contractor shall keep Mobil fully and currently informed with respect to NBE production and on reasonable advance notice shall permit Mobil's personnel to observe the NBE production operation. Mobil shall hold Contractor harmless from and indemnify it against all claims and liability on account of personal injury suffered by such Mobil personnel while in Contractor's facility except to the extent that such injury results from the negligent or willful acts of Contractor's employees or agents.

10. Information directly related to carrying out of Mobil's manufacturing process, including, but not limited to, reaction conditions, process sequences, materials, and equipment arrangements shall be made available to Mobil's personnel, and Mobil shall have the right to inspect, review, and use such information. This shall not prevent Contractor from filing patent applications on possible

patentable developments by Contractor, provided that Contractor shall grant Mobil and its affiliates a non-exclusive, royalty-free, world-wide license to use such inventions in their manufacturing operations.

11. Contractor will tender to Mobil or its designee and at reasonable times Mobil will accept or cause its designee to accept all waste effluents generated in the manufacture of NBE. Contractor shall maintain suitable storage isolated from other constituents to separately hold such effluents (aqueous and weak acid) until such time as they can be reasonably hauled away at Mobil's expense.

12. To the extent that Mobil makes available Materials in accordance with the terms of this Agreement, Contractor shall manufacture NBE and shall deliver NBE to Mobil as follows:

November 15, 1975 to February 28, 1976	250,000-300,000 lbs/mo.
March 1, 1976 to March 31, 1978	400,000-500,000 lbs/mo.

* In the event that Mobil has not received by December 8, 1975 a tank car (100,000 lbs.) of NBE conforming to the specifications set forth in Appendix B, Mobil shall be relieved of its obligation to take the first 5,000,000 lbs. on a take or pay basis.

13. Mobil shall pay Contractor according to the schedule outlined in Appendix B as full compensation for the services rendered, the expense incurred, the facilities provided and the obligations assumed by Contractor hereunder.

* [illegible] 3 [illegible] then: Dec 4 - [illegible] Feb 2, '76 - Shipped 2.5 [illegible] # [illegible]

14. Mobil shall be responsible for and will pay, upon notification by Contractor, all personal property taxes levied on Mobil's property while in the custody of Contractor. Contractor shall pay all other taxes and fees in respect to or measured by the manufacture of NBE or the storage or delivery of Mobil's property. Contractor will provide Mobil with receipts for taxes paid by it hereunder for Mobil's account.

15. If a batch of NBE manufactured hereunder does not conform with the specifications set forth in Appendix C, Contractor immediately by telephone shall notify the Mobil employee designated by Mobil and follow Mobil's instructions as to how to proceed. If such failure to conform with specifications does not result from defects in Mobil's process or in Materials, Contractor at its expense and without charge to Mobil will produce from Materials supplied by Mobil a replacement batch that does conform with said specifications.

16. All Materials and NBE remaining in Contractor's possession on the date of termination of this contract shall be shipped to Mobil or its designee at Mobil's expense.

17. Contractor acknowledges that it has been made aware of the nature of the Materials and Contractor represents and warrants that it is knowledgeable and experienced in working with such Materials. In performing its services hereunder Contractor shall comply with all relevant laws, regulations and governmental orders. Contractor agrees to hold Mobil harmless from and to indemnify Mobil against all loss, cost, damages, liability and expense (including reasonable

attorney's fees) on account of all personal injury or property damage that results from or is related to Contractor's handling or storage of Materials or Contractor's manufacture, handling or storage of NBE.

18. No liability shall result from non-performance hereunder caused by circumstances beyond the control of the affected party. Any party whose performance is prevented or impeded by such circumstances promptly shall notify the other party.

19. All notices required herein shall be deemed to be properly served if sent by first class mail with postage fully prepaid thereon or by telegram, with telegraph charges prepaid, and addressed to the party for whom intended at the following addresses:

Mobil:
Phosphorus Division
Crop Chemicals Group
Mobil Chemical Company
Division of Mobil Oil Corporation
P. O. Box 26683
Richmond, Virginia 23261

Contractor:

20. Mobil may terminate this agreement in accordance with Section 21 and Appendix B and in addition either party can terminate this agreement on sixty (60) days written notice after the production and receipt by Mobil of the first 5,000,000 lbs. of NBE.

21. Anything elsewhere in this agreement to the contrary notwithstanding, if Contractor breaches any of its obligations hereunder, becomes insolvent or commits an act of bankruptcy or takes advantage of any law for the benefit of debtors or Contractor's creditors or if

a receiver is appointed for Contractor or any of Contractor's property or if Contractor in any respect is in default hereunder, then in any of such events, Mobil forthwith may terminate this contract by written notice to Contractor. Any such termination shall be without prejudice to any other rights or remedies available to Mobil. On any such termination Contractor shall deliver to Mobil all property of Mobil. The provisions of Sections 6 and 7 above shall survive any termination of this contract.

22. Neither Contractor nor any employees of Contractor are employees of Mobil, it being understood that Contractor is an independent contractor and is solely responsible for the employment, control and conduct of Contractor's employees and for injury of such employees or to others through such employees.

23. The parties further agree as follows:

a. This contract shall be governed by the laws of the State of New York.

b. This contract constitutes the entire agreement between the parties with regard to the matters contained herein and there are no understandings or agreements, express or implied, not expressly set forth herein. No modification of this contract or waiver of any of its provisions shall be effective unless it is in writing and signed by the party to be bound thereby. Neither party's waiver of any breach of any of the provisions of this agreement

shall be deemed to be a waiver of any subsequent breach of the same nature or any breach of a different nature.

c. This contract shall bind the successors and assigns of the parties hereto but neither party may assign its interest in this agreement without the prior written consent of the other party, providing, however, Mobil may assign its interest in this agreement to another subsidiary of Mobil Oil Corporation or to a successor in interest to Mobil's crop chemicals business.

24. The secrecy agreement between Mobil and the Contractor dated February 28, 1975, is hereby incorporated herein and made a part hereof.

25. The term of this contract shall commence on the date first above written and shall terminate on March 31, 1978 unless earlier terminated pursuant to Section 20 or 21 hereof.

26. Any controversy or claim relating to this agreement shall be resolved by arbitration in New York, New York in accordance with the rules of the American Arbitration Association and judgment upon the award of the arbitrator may be entered in any court having jurisdiction.

IN WITNESS WHEREOF, Mobil and Contractor have hereunder executed this contract,

MOBIL CHEMICAL COMPANY	VERTAC INCORPORATED
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____

APPENDIX A
To Agreement
Between Mobil Chemical Company
And
VERTAC, Incorporated
Made as of

_____

SPECIFICATIONS - RAW MATERIALS

Methyl meta chlorobenzoate (CBE)

Assay	95% min.
Methanol	0.1% max.
Dichlorobenzoate	0.5% max.
Color APHA	200 max.

Anhydrous Ammonia (NH_3)

Assay	99.8% min.

Nitric Acid (HNO_3)

Assay	97.5% min.
Sulfate (as H_2SO_4)	0.07% max.
Chloride (as HCl)	5 PPM max.
Nitrobodies	none
Iron (as Fe)	15 PPM max.

Sulphuric Acid (H_2SO_4)

Assay	Virgin 98% min.

Ethylene Dichloride (EDC)

Assay	Technical grade 99% purity less than 1% water

APPENDIX B
to Agreement
Between Mobil Chemical Company
And
VERTAC Incorporated

Made as of

_____

1. Contractor's only compensation hereunder shall be as follows:

   (a) For the first 2,000,000 lbs. of NBE, delivered hereunder: $0.19 per pound. For all additional NBE delivered hereunder: $0.16 per pound.

   (b) Contractor shall invoice Mobil for each shipment of NBE made on an individual shipment basis. Prices are F.O.B., West Helena, Arkansas.

2. To offset revamping charges by Contractor to adapt its plant to the manufacture of NBE:

   (a) Mobil, subject to the provisions of Section 21 in the contract and Section 3 below, will prepay for 500,000 pounds of NBE on start-up of Contractor's facilities for the manufacture of NBE.

   Only 1/2 what is asked C

   (b) Subject to the provisions of Section 21 in the contract and Section 3 below, the first 5,000,000 pounds of NBE will be on a firm take or pay basis, provided, however,

* 4/9514 194/lb.

that if in Mobil's reasonable business judgment the continued performance of this contract becomes economically undesirable for it, Mobil may terminate said take or pay obligation by payment to the Contractor of the difference between $250,000.00 and $0.05 per pound multiplied by the number of pounds of NBE theretofore delivered to Mobil.

3. The foregoing to the contrary notwithstanding:

(a) In the event that Contractor has not delivered to Mobil by January 31, 1976 at least 500,000 pounds of NBE conforming to the specifications set forth in Appendix C and if such failure to deliver is not a result of defects in Mobil's process or Mobil's failure to supply sufficient Materials conforming with the specifications set forth in Appendix A, Mobil may terminate this agreement on written notice to Contractor. In the event of such a termination or a termination pursuant to Section 21, Contractor promptly shall refund to Mobil the prepayment described in Section 2 (a) above less $0.19 per pound for the quantity of NBE delivered that does conform with the specifications set forth in Appendix C.

(b) In the event that Contractor has not delivered to Mobil by January 1, 1977 at least 5,000,000 pounds of NBE conforming to the specifications set forth in Appendix C and if such failure to deliver is not a result of defects in Mobil's process or Mobil's failure to supply sufficient Materials conforming with the specifications set forth in Appendix A, Mobil shall thereafter be relieved of the take or pay obligation set forth in Section 2 (~~b~~ a) above.

MOBIL NITRATION

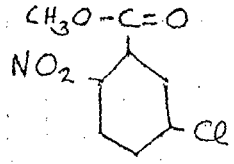
SUMMARY—

(1) THE PRODUCT —

(a) A HERBICIDE INTERMEDIATE CALLED NBE USED to MAKE MODOWIN. MODOWIN IS A PRE-EMERGENCE HERBICIDE for SOY-BEAN & COTTON.

(B) common name— NBE

(C) STRUCTURE —



NITRATED BENZOATE ESTER (NBE)

(D) SHIPPED AS BULK LIQUID PRODUCT IN T/C's OR T/T's to MOBIL CHEMICAL for CONVERSION to MODOWIN.

(2) PROPERTIES —

(a) LIGHT BROWN CLEAR COLOR

(B) LIQUID OR SOLID at ROOM TEMPERATURE. MELTING POINT IS 118 °F BUT NBE SUBCOOLS.

(C) FLAMMABLE (341°F flash POINT). SPECIFIC gravity = 1.38.

(D) CHARACTERISTIC ODOR

(3) CHEMISTRY —

(a) Nitration

$$CBE + HNO_3 \xrightarrow[EDC]{H_2SO_4} NBE + H_2O$$

- H_2SO_4 removes H_2O that is formed in RXN.
- EDC is the RXN solvent.
- 45 °F HNO_3 addition TEMP.
- ∅ SEPARATE SPENT ACID

(B) NEUTRALIZATION

$$H_2SO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + 2H_2O$$

RESIDUAL ACID IN the NBE IS NEUTRALIZED WITH Ammonium hydroxide.

(4) THE PROCESS DESIGN —

(a) THE NBE process is a commercial one that has been in operation by MOBIL.

(B) Information on NBE plan confidential.

(C) Engineering for project by Shreeve Engr. & Eagle Riv.

(d) DESIGN RATE 500 MLBS PER MONTH. 80% OPERATING RATE.

(E) BATCH CYCLE TIME 12 HR. — 10 MLBS / BATCH.

(5) THE OPERATION —

- 2 OPERATORS/SHIFT
- 50 MAJOR EQUIPMENT ITEMS — 16 pumps
- 5 RAW MATERIALS

PROCESS INCLUDES one REACTIVE NEUTRALIZATION, STRIPPING operation, & an EXTRACTION STEP

(6) THE RAW MATERIALS —

(a) CBE, CHLORINATED BENZOATE ESTER — STARTING MATERIAL — flammable, 70 F freeze pt.

(B) EDC, ethylene dichloride very flammable, process SOLVENT

(C) HNO_3, Nitric ACID, very strong acid, EXTREME hazard.

(d) H_2SO_4, SULFURIC ACID, VERY strong acid, EXTREME hazard.

(E) NH_3, ammonia, a compressed gas.

Mobil
- John Ellington - Process Engr - Mt Pleasant
- John Rendall - Mgr - Process Engr - Phosphorus
- Julien Wolfenbarger - Process Engr Phosphorus
- Don Taggert
- Ted Nichols

Vertac Inc.
- Larry Graybill
- Larry Conoway
- John Stokes

Raw Mtl
15-20,000 CBE per batch

Steam - needed for thawing
Over 200°F SS - some chloride problems if high acid #
95% CBE 1.5% MeOH .5% Dichloro
para & ortho remainder
O.K. N_2 unloading

Will supply ~~for~~ ZDC need check for MeOH
Slow hydrolysis of NBE to MeOH
Use Teflon gaskets on ZDC D.T.

Need to

Brine cooln - CS o.k. if system kept dry
Recommend $CaCl_2$ brine - no ethylene glycol

10.15 cp
wgt 1.6 sp gr.

Need very good agitation. If agitation stops during ~~equal~~ HNO_3 addition - need to separate acid layer 30 cp
System di-nitro formation possibility

ΔH_{mix}
$+ \Delta H_r = 430$ BTU/# rDF

1% Excess over molar quantities HNO_3

finished mtl ~1% CBE
Rx goes to completion fairly well

Can use aluminum piping for 98% HNO_3 also tank

32°F needed for yield of correct isomer
lower temp better for isomer dist

possible higher temp or heat up for more speed → Use tempered H_2O for heat up

Poor reaction can cause phase separation problem

Can use C.S. or 304 S.S. on extraction tank
for ambient temp 10-12% NBE in acid
Extraction dependent on EDC recycle - 8%
NBE is what Mobil uses.
Acid bottom layer - goes to Mobil
Actual 80-83% H_2SO_4
1-3% NBE in acid is good
1-2% EDC

Neutralization - use aqua ammonia to reduce
NH_3 loss to vent
NH_3 used to improve phase separation over NaOH
Check pH with paper

3-5

~~2-4%~~ organic in aqueous waste

aqueous on top

NBE not readily biodegradeable

Major organic source is sloppy operation on phase separation

Possibly use small side tank for fine separation

C.S. ok.

Need storage tank for aqueous phase

Mobil has vacuum pumps Kinney

30mm Hg 275°F

Use H_2O cooling to 150mm Hg

Use Brine for cooling to end point

Recommend steam jets due to problems from EDC carryover

No product degradation up to 300°F

Strip to 0.5% EDC - shipping spec.

recycle steam as wash water

typical product analysis

85-86% NBE

2-3% CBE

.5 % EDC

Remainder other NBE isomer

NBE freezes 178°F

Need good tracing on NBE lines

Proposed production schedule

(4)

OCT 75

NBC 300

NOV DEC 75

240

JAN 76

370

Feb Mar 76

430000

Apr - Jan 76

500,000

Interlocks & Process control

Cleaning circulation line back to Rx ?

Rx — Interface recognition - need decreased velocity
perhaps smaller pump

Refrig — 28% $CaCl_2$ 8-9 pH N_2 blanket Chromate inhibitor

dual Electrical TI 37° interlock to cut off acid flow
Possibly use TI - Need fast response electric insts

Geo — Need to think about using Viking pump for controlled acid feed rate
Possible Rx takeoff after about 1/3 HNO_3 added

Agitation rate essential to yield
- Stop HNO_3 acid flow if agitator stops
- Neither will restart if power goes off for 75 sec
- Add acid to circulating line

About 10 HP motor
Turbine type
need ammeter

Need to prevent H_2O in acid - use selector switch

If good phase separation not allowed in extraction step, acid can be recycled to Rx & retard reaction and yield

Check for H_2O in EDC tank - perhaps high side take off nozzle

Add NH_4OH to circulating line - bypass xchgr
Watch for NH_4SO_4 in EDC tank - use strainer

$ 2
Mitchell equipment

(1) 2500 Gal 316SS Jacketed side & bottom

7'-6" ϕ x 7'-6" . Use as extractor

(2) 2000 Gal 304SS $\boxed{140 \text{ psi @ } 320°F}$ Need to check for vacuum should be OK.
Dish top & bott
.35 shell .65 top head .59 bottom head

7'-0" ϕ x 5'-6 7/8" straight side

Use as still pot for NBE receiver

(3) Model RA78-1500-100 jacketed closed RC - 158 ft²

78"ϕ x 65"

A = πDH =

3.14
6.5
1570
1884
20.410
5.5
1020
1020
112.20 ft²

State Board of Health
OTHO R. WHITENECK, D.D.S., PRESIDENT
ROBERT D. McCULLOUGH, VICE PRESIDENT
THOMAS DONICA, M.D., SECRETARY
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W. A. "TATE" TAYLOR
HAROLD A. TOAZ

Oklahoma
State Department of Health

Northeast 10th Street & Stonewall
Post Office Box 53551
Oklahoma City, Oklahoma 73105

Acting Commissioner
WALTER D. ATKINS, D.D.S., M.P.H.

January 20, 1977

Eagle River Chemical Corporation
Highway 242
P.O. Box 2648
West Helena, Arkansas 72390

CERTIFIED MAIL

Dear Sirs:

It has come to our attention that a chemical compound resulting from your industrial process of manufacturing herbicides is being shipped into Oklahoma. The compound generally consists of water (64%), Ammonium Sulfate (34%), and Ethylene Di-Chloride (2%). It is being shipped by McCullough Corporation and/or Wheeling Pipeline to Devol, Oklahoma.

Pursuant to the Oklahoma Controlled Industrial Waste Disposal Act enacted September 1976, we must therefore, request the following:

- A complete chemical analysis of the compound.
- The chemical name of the herbicide being manufactured when the compound is produced.
- A classification of the compound as to its economic value (i.e., is it considered a waste or a marketable product?)

If the compound is considered as an industrial waste your industry will be required to file a disposal plan with this Department at a later date. If on the other hand, you consider it to be a marketable product, we would like to know why it is not being marketed in Arkansas.

If you have any questions, please feel free to contact us at AC405, 271-5338.

Very truly yours,

H. A. Caves

H. A. Caves, Director
Industrial/Solid Waste Division

HAC/DAJ/dk

cc: Charlie McCullough
M & E Soil Service

SECTION VIII A John

MOBIL NITRATION – Sample Schedule

(Refer to posted copy for most current schedule)

10/31/75
page 1

CODE	ORIGIN	FREQUENCY	TYPE of Analysis	EXPECTED RESULTS
TC-1	Tank Car	Each Car	(1) % CBE (2) Acid Number	(1) 93% minimum CBE (2) 1.5 maximum Acid
R-M101-A	R-M101 Initial Reactant Charge	Each Batch	% CBE % H_2O	35-40% CBE 1% Normal H_2O
R-M101-B	R-M101 End of HNO_3 addition	Each Batch	% unreacted CBE	Less than 10% CBE
R-M101-C	R-M101 After Warmup to 75°F	Each Batch (may be several)	% unreacted CBE	Less than 1% CBE
R-M101-D	R-M101 After* NH_4OH Wash	Each Batch (may be several)	PH *	Greater than 7*
T-M104	T-M104 Acid Extraction Tank	As necessary	% NBE in acid after extraction	Less than 2% NBE
V-M101-A	V-M101 End of Stripping	Each Batch	% EDC	Less than 0.5% EDC
V-M101-B	V-M101 After Stripping	Each Batch	% NBE	Greater than 85% NBE
V-M102	V-M102 Product Surge	Before each transfer to tank car or truck	% NBE	Greater than 85% NBE
T-M107	T-M107 NH_4OH Blend Tank	Each Batch	% NH_4OH	12-14%
T-M108	Nitric Acid Storage & Each Tank Truck	Storage as necessary & each tank truck	% HNO_3	97.5% min. HNO_3
T-M110	Sulfuric Acid Storage & Each Tank Truck	Storage as necessary & each tank truck	% H_2SO_4	98% min. H_2SO_4

* Operators will run PH test by paper.

MOBIL Nitration - Sample Schedule

CODE	ORIGIN	frequency	analysis	RESULTS
T-M105	Spent acid Storage T-M105	Before each tank truck or tank car shipment	retain sample for MOBIL (expect 85% H_2SO_4 & .2% NBE)	
T-M106	Am. Sulfate Waste T-M106	Before each tank truck or tank car shipment	retain sample for MOBIL (% $(NH_4)_2SO_4$)	
Brine	Prod. 10 Brine Storage	1st day of each Month & as necessary	% $CaCl_2$ freeze pt PH	 Less than 0°F 8-10
T-M103-A	EDC Day tank T-M103	as necessary	% NBE	
T-M103-B	new EDC from tank cars, trucks, or drums	as necessary	% EDC % H_2O % Light Ends (methanol)	99% EDC <1% H_2O

MOBIL NITRATION Startup Status

Date 11/10/75

Status – Percent Complete

0 25 50 75 100

	REMARKS
(I) Training →	4 day training class 10/29/75 THRU 11/1/75. Operators now working in Mobil unit.
(II) Operating Instructions, etc. →	Complete 11/10/75. Reviewed by J. Ellington & J. Woltenbarger in rough draft form.
(III) Raw Materials	Reviewed raw materials & procedures with Floyd Lathire of Mobil on 11/6/75
(IV) Maintenance, other misc. items. →	Operations punch list of over 80 items. Majority of items complete.
(V) Safety →	Safety orientation given to operators & supervisors. Fire extinguishers & most safety gear on hand
(VI) Preoperation →	Most equipment items & utilities demonstrated individually. Coordinated water batching to start this week. Ditto solvent checkout.
(VII) Lab →	Sample schedule complete. Lab runs complete.

H_2SO_4	~7500 gals on Hand
HNO_3	~7000 gals on Hand 2 T/Ts RECIEVED 11/6 & 11/7
EDC	≈1500 gal T/T received 11/7
CBE	~ 112 MLB on hand T/C # UTLX 95668 – 2nd car shipped
NH_3	1000 gal NURSE tank on hand

TARGET Startup Date 11/17/75

MOBIL NITRATION

OPERATION SUMMARY Date 11/10/75

BATCH # completed

(1) R-M101 NITRATION — Batch # in progress

Summary current operation:

- Weigh cells tested
- INTERLOCKS completed
- Reactor BEING CLEANED currently

% CBE in charge

% CBE in final product

(2) V-M101 Stripping — Batch # in progress

- JETS BEING tested. Vacuum @ design levels has not BEEN established.

% EDC final

% NBE

(3) T-M104 Extraction — Batch # in progress

(4) Significant PRODUCT & RAW Material movements — SEE Page 1 status.

(5) Significant Maintenance PROBLEM.

cc: Ray GUIDI
R. FABIAN (TELECOPY)
GEORGE Mathes
J. FOWLER
J. Shackelford
D. Faggert
L. Conawach

Mobil Chemical Company

CROP CHEMICALS GROUP

P.O. BOX 26683
RICHMOND, VIRGINIA 23261
TELEPHONE (804) 798-4291

GFM

July 29, 1975

all Confidential
Copy to
John Miles
Larry C
Jim Fowler
Bill S
Return to GFM

Mr. George Mather
Eagle River Chemical Company
Highway 242
West Helena, Arkansas

Dear George:

Enclosed you will find the following items -

1. Process flow diagrams for NBE
2. P & I diagrams for NBE
3. Standard operating conditions for NBE
4. Standard operating procedures for NBE which contain safety data sheets, physical properties of raw materials, and process description as well as specific procedures for NBE manufacture.

The analytical data will be forwarded to you from our plant chemist in Mt. Pleasant, Tennessee.

I trust this data will be handled in accordance with our secrecy agreement dated February 28, 1975.

Please advise if I can provide any additional data.

Very truly yours

D. B. Faggett
Manager, Formulations

DBF/bf
Enclosures

2/11/76

Hi George:

In accordance with your note of 1/26/76 I am attaching a set of final copies of Level Transmitter calculations for Mobil Nitration including a revised calculation for T-M106 Waste Heat Unit based on the new Lp Sp of 1.105 which you sent me. Please make copies of these and distribute to the interested parties.

If you need anything else call or write.

Steve H. Perrik

COPY TO

JOHN MILES ✓
ROBERT WOOTEN
HOMER FOX
JOHN HOLCOMB
BILL STRICKLAND

ORIGINAL to LJM

CALCULATIONS AND DESIGN DATA

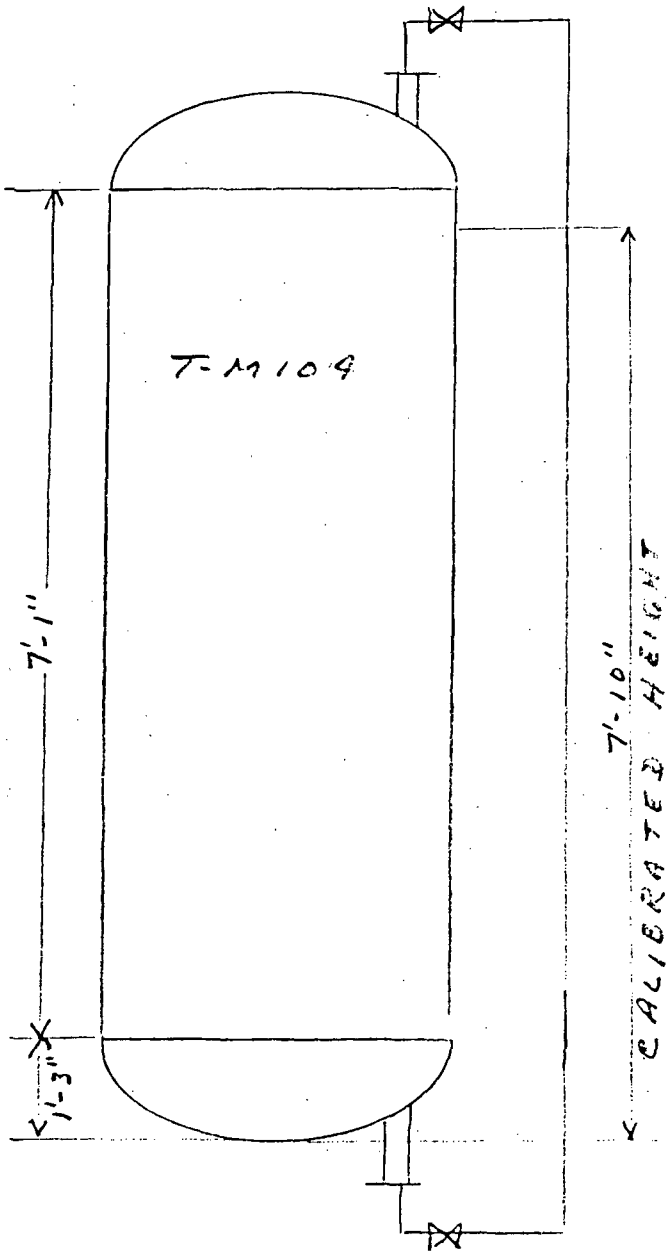
PREPARED BY S.P.P.

SUBJECT LT-M106 - T-M104 MOBIL NITRATION

T-M104 EXTRACTION TANK

DATE 11/1/75

SHEET OF



LT-M106 LEVEL TRANSMITTER CALCULATION

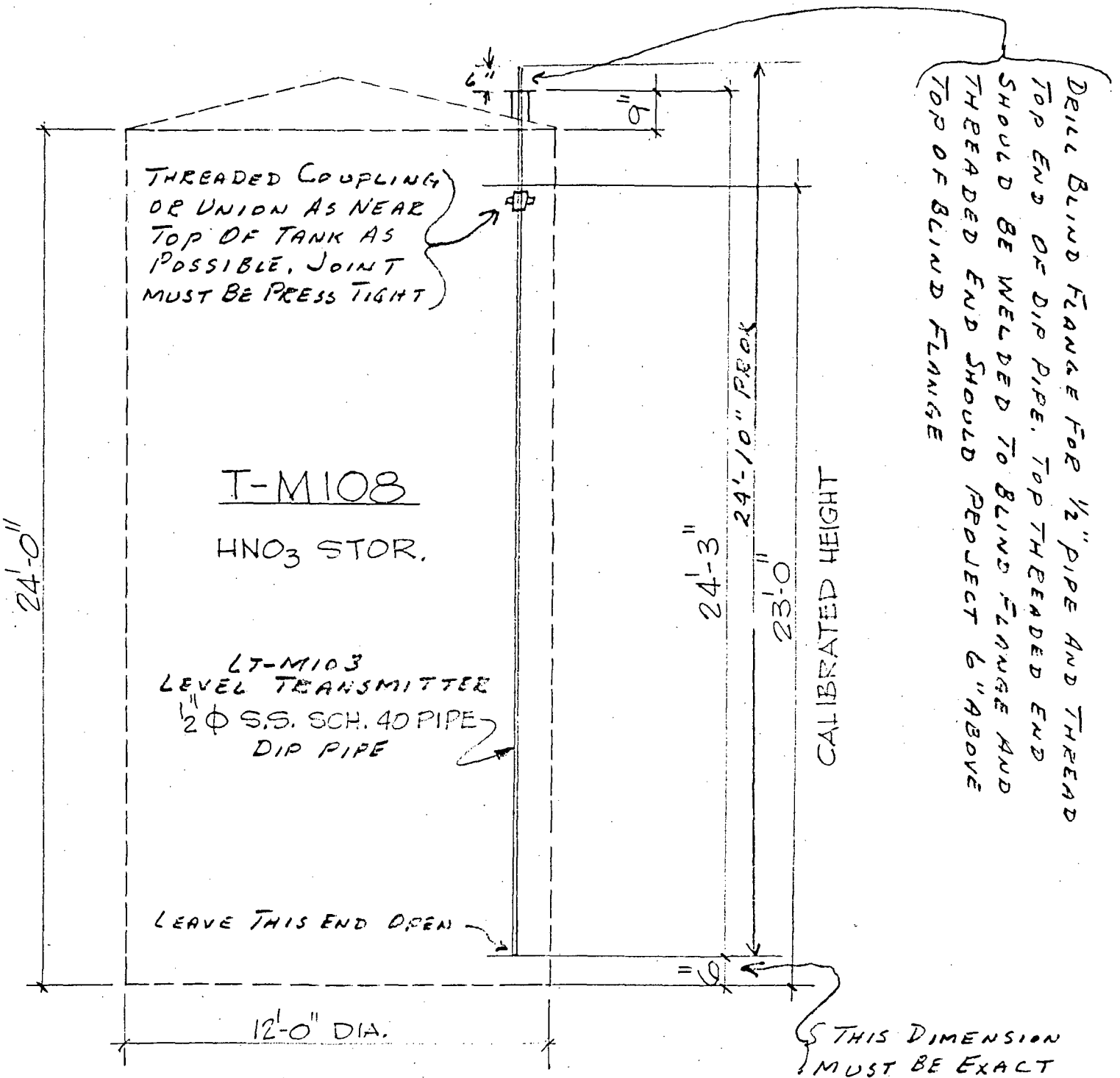
AVERAGE FLUID = 11.94#/GAL = 1.433 SP.GR.

(94") (1.433) = 134.7" H_2O ← CALIBRATE VALUE

0-100 LIN RCVR GAUGE WILL READ % OF 7'-10" LEVEL

TOTAL TANK CONTENTS OF 1.433 SP.GR. LIQUID

CALCULATIONS AND DESIGN DATA	S.K.P.
SUBJECT: LT-M103 - T-M108 MOBIL NITRATION	DATE: 9/19/75
T-M108 HNO_3 STORAGE TANK	SHEET OF



CALIBRATION CALCULATION FOR INST DEPT

22'-6 = 270"

6" ELEVATED ZERO = 9" H_2O = 3.27 psi

HNO_3 = 12.535 #/GAL = 1.505 SpGr.

270 x 1.505 = = 406.4" H_2O = 14.67 psi

AFTER CALIBRATION ADJUST ZERO WITH ZERO SCREW TO 3.27 psi = 6" ELEVATED ZERO

0-100 LIN RCVR GAUGE WILL READ % OF 23'-0 LEVEL TOTAL TANK CONTENTS OF 1.505 SpGr LIQUID

NOTE: PURGE SUPPLY 40 psi REQ'D

CALCULATIONS AND DESIGN DATA

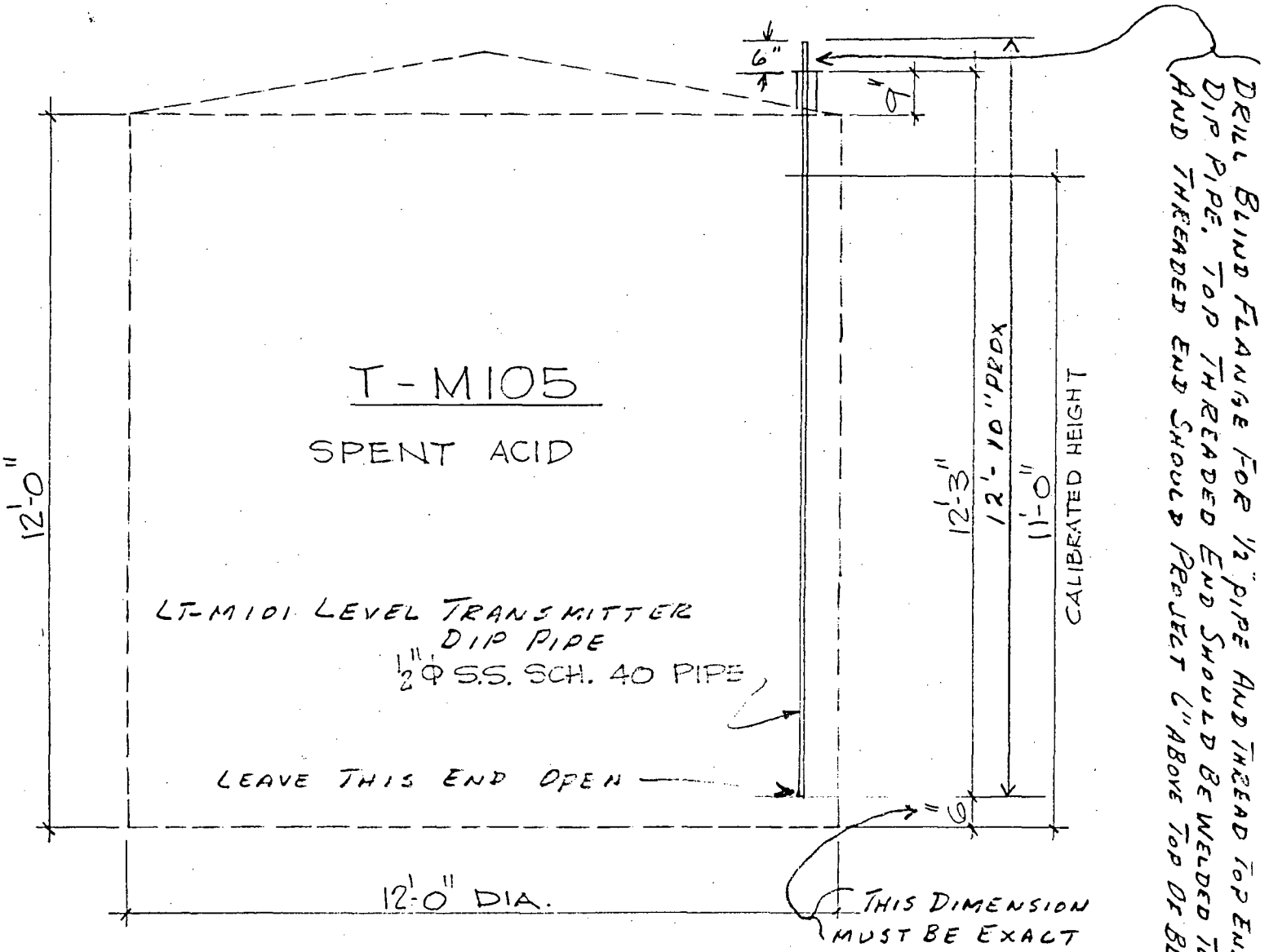
SJP

SUBJECT: LT-M101 - T-M105 MOBIL NITRATION

T-M105 SPENT ACID TANK

DATE: 9/19/75

SHEET OF



CALIBRATION CALCULATION FOR INST DEPT

10'-6 = 126"

6" ELEVATED ZERO = 10.3 " H_2O = 3.56 psi

14.36 #/GAL = 1.723 SP GR.

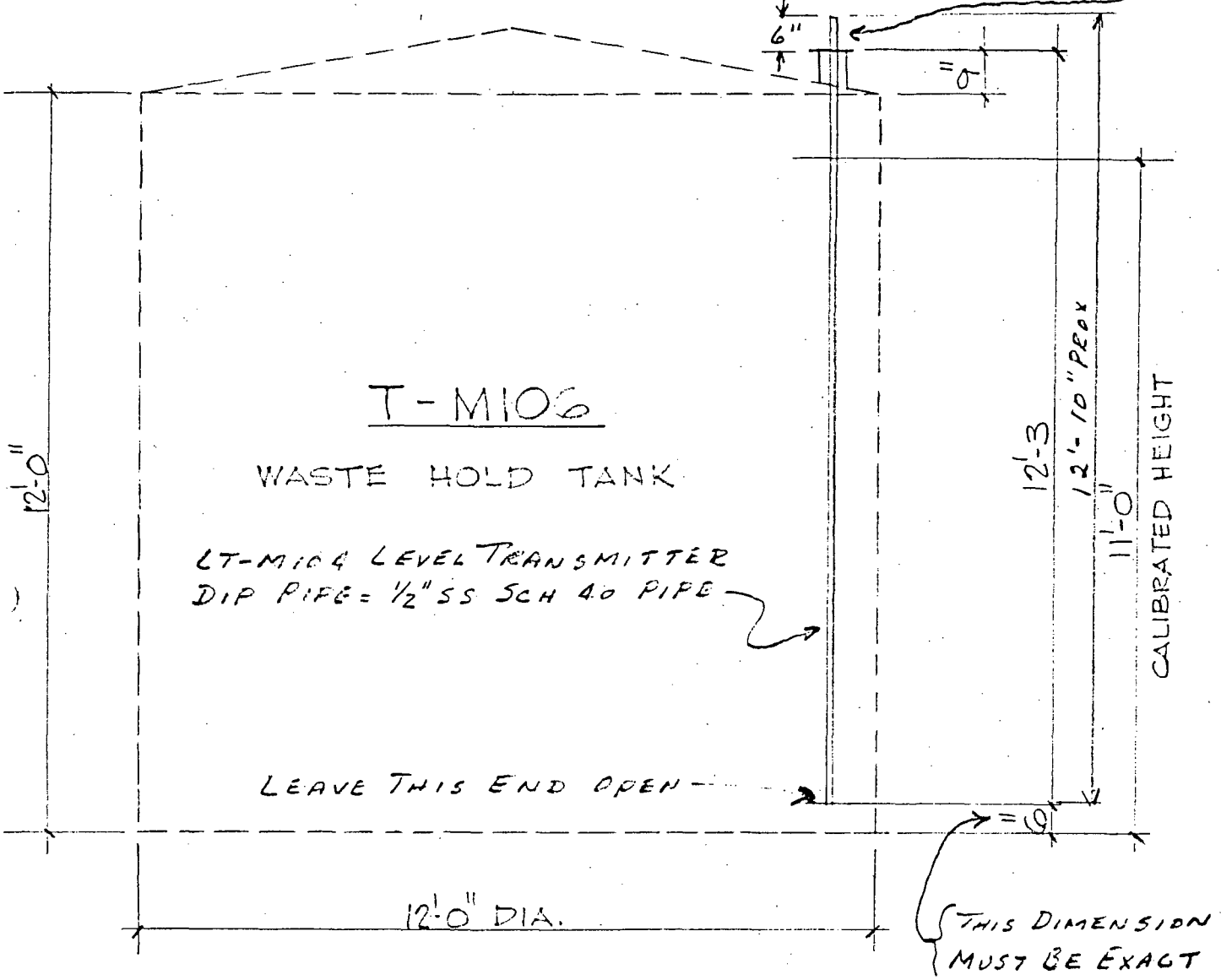
126 X 1.723 = 217.1 " H_2O CALIBRATE VALUE

AFTER CALIBRATION ADJUST ZERO WITH ZERO SCREW TO 3.56 psi = 6" ELEVATED ZERO

0-100 LIN RCVR GAUGE WILL READ % OF 11'-0 LEVEL TOTAL TANK CONTENTS OF 1.723 SP GR LIQUID

	CALCULATIONS AND DESIGN DATA	PREPARED BY SPP
SUBJECT LT-M104 - T-M106 MOBIL NITEATION		DATE 9/18/75
T-M106 WASTE HOLD TANK		SHEET OF

DRILL BLIND FLANGE FOR 1/2" PIPE AND THREAD TOP END OF DIP PIPE. TOP THREADED END SHOULD BE WELDED TO BLIND FLANGE AND THREADED END SHOULD PROJECT 6" ABOVE TOP OF BLIND FLANGE



~~CALIBRATION CALCULATION FOR INST DEPT~~
~~10'-6" = 126"~~
~~6" ELEVATED ZERO = 7.8" H_2O = 3.57 psi~~
~~10.850 #/GAL = 1.30 SP GR~~
~~126 X 1.30 = 163.8" H_2O CALBRATE VALUE~~
~~AFTER CALIBRATION ADJUST ZERO WITH ZERO SCREW TO 3.57 psi = 6" ELEVATED ZERO~~
~~0-100 LIN RCVR GAUGE WILL READ % OF 11'-0 LEVEL~~
~~TOTAL TANK CONTENTS OF 1.3 SP GR. LIQUID~~

REVISED - SEE NEW CALC NEXT PAGE

	CALCULATIONS AND DESIGN DATA	PREPARED BY SPP
SUBJECT MOBIL NITRATION T-M10L REVISED LEVEL TRANSMITTER CALCULATION		DATE 1/28/76
		SHEET OF

REVISED CALC

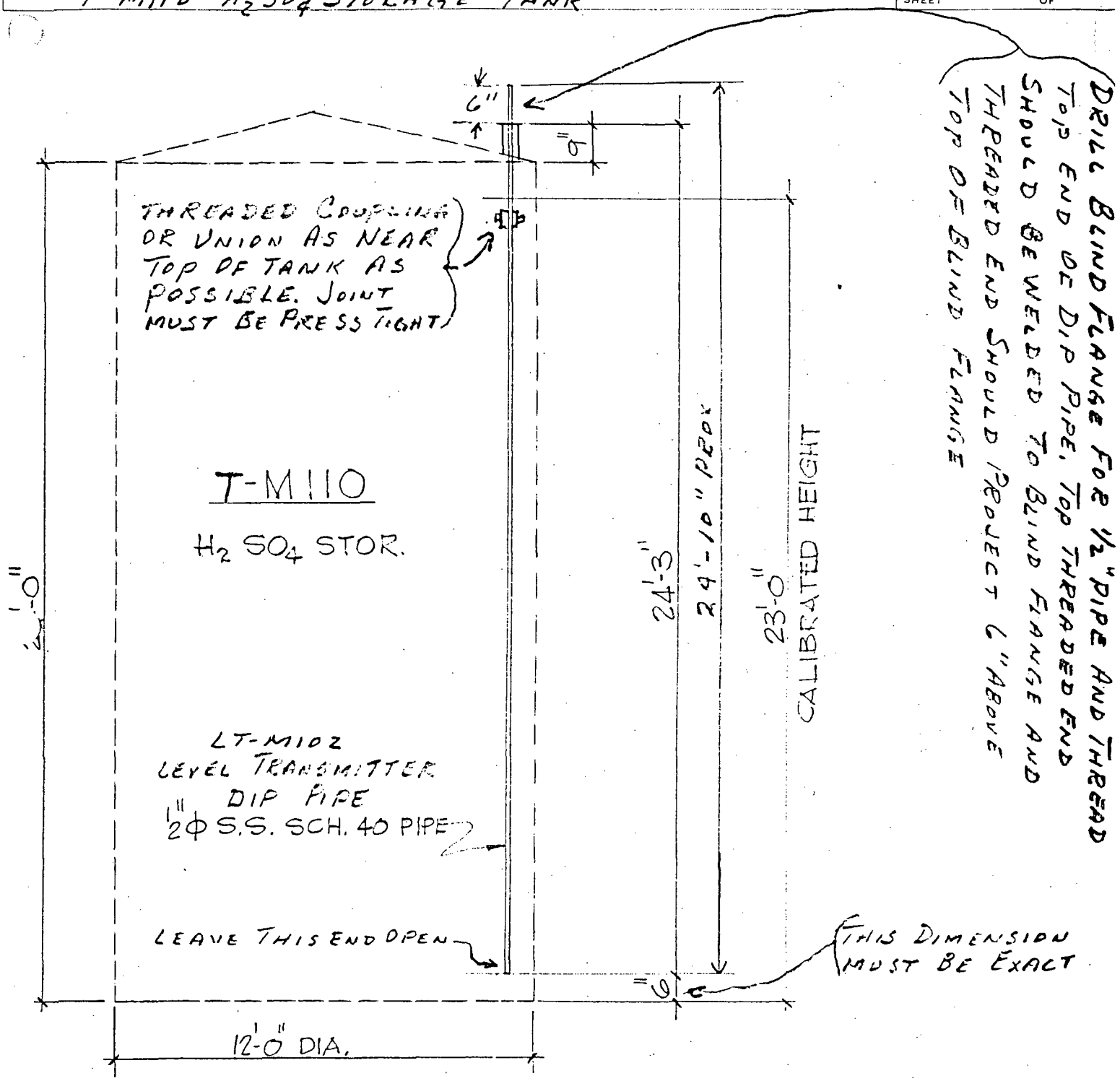
T-M10L WASTE HOLD TANK
LT-M104 LEVEL TRANSMITTER CALCULATION
REVISED 1/28/76

10'-6 = 126"
6" ELEVATED ZERO = 7.12" H_2O = 3.57 PSI
NEW CALC GEAV = 1.188
126 X 1.188 = 149.68" H_2O NEW CALIB VALUE ←

AFTER CALIBRATION ADJUST ZERO WITH ZERO SCREW TO 3.57 PSI = 6" ELEVATED ZERO

0-100 LIN RCVR GAUGE WILL READ % OF 11'-0 LEVEL TOTAL TANK CONTENTS OF 1.188 SPGR LIQ

CALCULATIONS AND DESIGN DATA	PREPARED BY SPP
SUBJECT LT-M102 - T-M110 MOBIL NITRATION	DATE 9/16/75
T-M110 H_2SO_4 STORAGE TANK	SHEET OF



CALIBRATION CALCULATION FOR INST DEPT

22'-6" = 270"

6" ELEVATED ZERO = 11.02" H_2O = 3.27 psi

H_2SO_4 = 1.837 SpGR

270 x 1.837 = 496" H_2O = 17.9 psi CALIBRATE VALUE

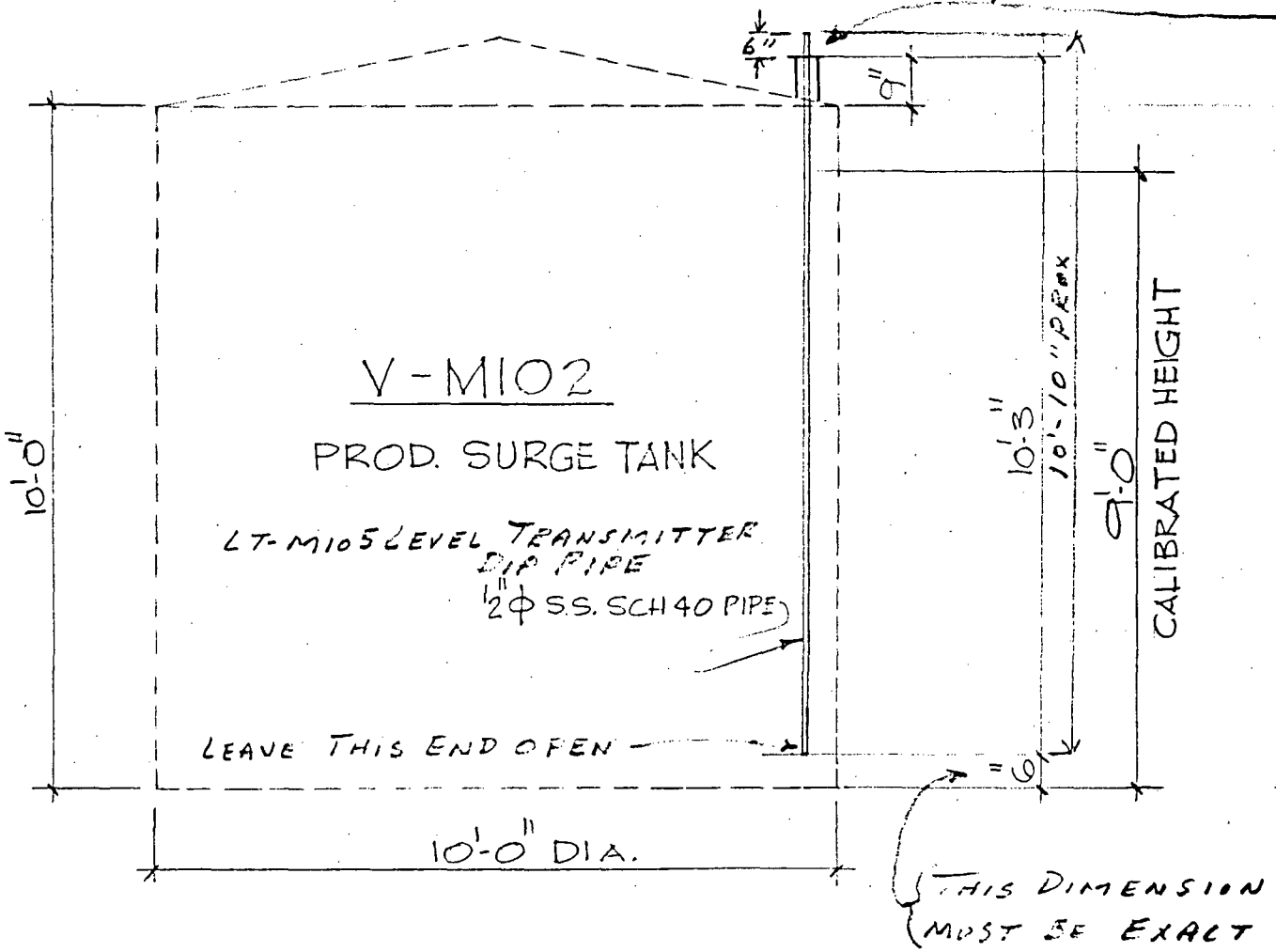
AFTER CALIBRATION ADJUST ZERO WITH ZERO SCREW TO 3.27 psi = 6" ELEVATED ZERO

0-100 LIN RCVR GAUGE WILL READ % OF 23'-0 LEVEL TOTAL TANK CONTENTS OF 1.837 SpGR LIQUID

NOTE - 40 psi PURGE SUPPLY REQ'D

CALCULATIONS AND DESIGN DATA	5 PP
SUBJECT LT-M105 - V-M102 MOBIL NITRATION	DATE 9/15/75
V-M102 PROD SURGE TANK	SHEET OF

DRILL BLIND FLANGE FOR 1/2" PIPE AND THREAD TOP END OF DIP PIPE. TOP THREADED END SHOULD BE WELDED TO BLIND FLANGE AND THREADED END SHOULD PROJECT 6" ABOVE TOP OF BLIND FLANGE



CALIBRATION CALCULATION FOR INST DEPT

8'-6" = 102"

6" ELEVATED ZERO = 8.17" H_2O = 3.7 psi

11.35 #/GAL = 1.362 SP. GE

102 x 1.362 = 138.9" H_2O CALIBRATE VALUE

AFTER CALIBRATION ADJUST ZERO WITH ZERO SCREW TO 3.7 psi = 6" ELEVATED ZERO
0-100 LIN RCVR GAUGE WILL READ % OF 9'-0 LEVEL TOTAL TANK CONTENTS OF 1.362 SP GE LIQUID

(501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

Mr. John Ellington
P.O. Box 352
Mt. Pleasant, Tenn 38474

Dear John;

A weekly process control graph for the NBE unit will be sent to you indicating NBE daily production, Molar yields, purity % NBE (V-M102), % EDC (V-M102), % CBE (R-M101), % NBE in spent acid, % NBE in ammonium sulfate. The graphs enclosed are from start up to December 13. Monthly, we will send a complete graph, for that month, on the yearly form you supplied us.

As you are aware, our NBE purity analysis has been a problem for us and the graph attached reflects our analytical variation. Larry Conaway and Joe Porter assure me that resolution is forthcoming.

Please let us know if we can be of further assistance.

Yours truly,

George Mather

George Mather

GFM/rvk
Enclosure (3)

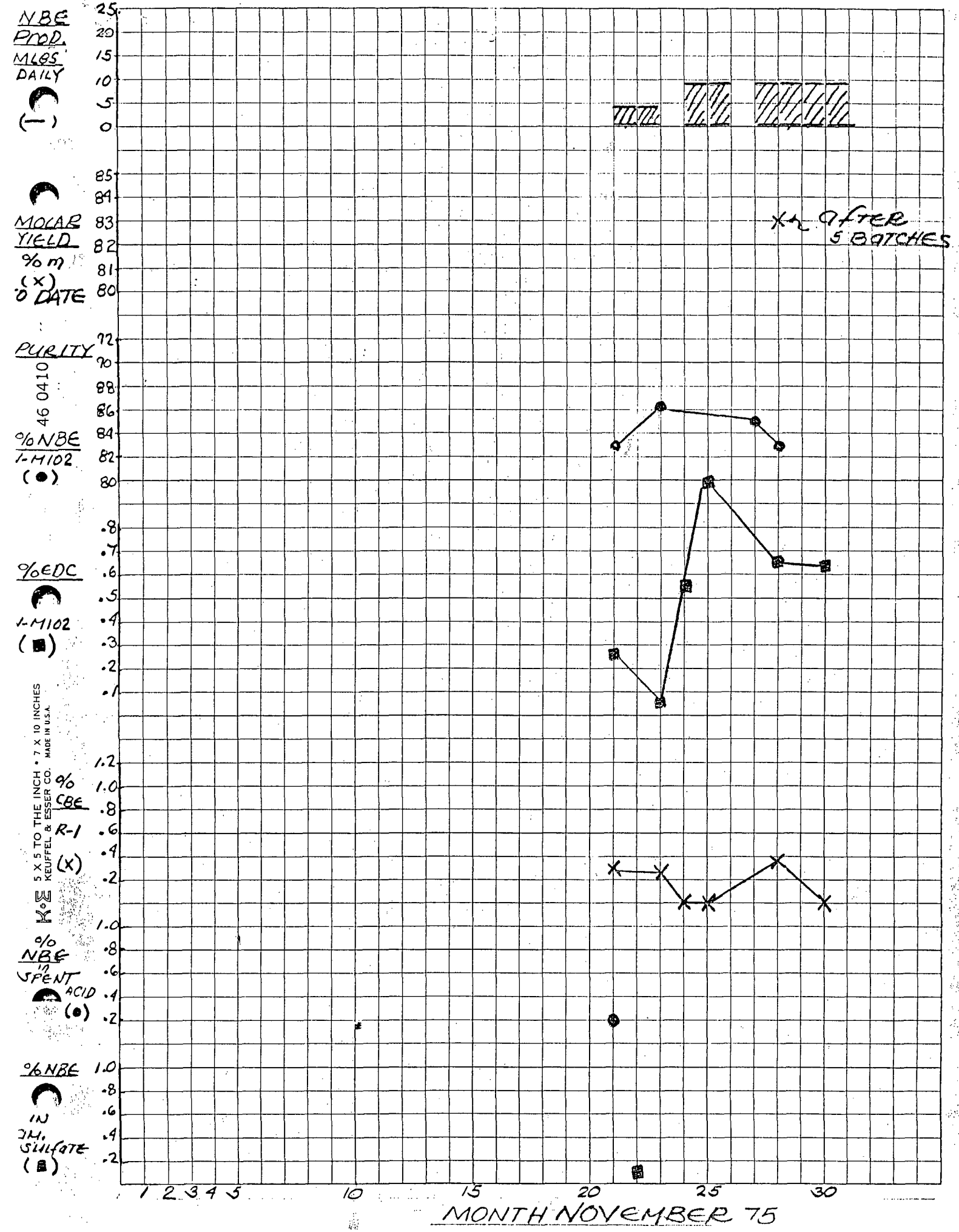
CC: Don Faggert
Bob Fabian
Larry Conaway
John Miles
George Mather
J.W. Shackelford
Jim Fowler

MOBIL OPERATING DATA
(1-31-76 thru 2-8-76)

	AVERAGE	RANGE	REMARKS
I. TOTAL CYCLE TIME, R-M101	13.67hrs.	11.17-21.33hrs.	
a. CBE & EDC Addition Time	.98hrs	.5 - 2.5hrs.	
b. Total Acid Add. Time	4.36hrs.	4.00-5.33hrs.	
c. Ø Separator Time (1st)	1.54hrs.	1.00-8.75hrs.	
d. Neutralization Time	.68hrs.	.17-1.25hrs.	
e. Ø Separator Time (2nd)	1.41hrs.	.67-5.00hrs.	
II. Total Extraction Cycle Time	3.07hrs.	2.08-5.08hrs.	
III. Total Stripper Cycle Time V-M101	8.17hrs.	4.75-18.50hrs.	

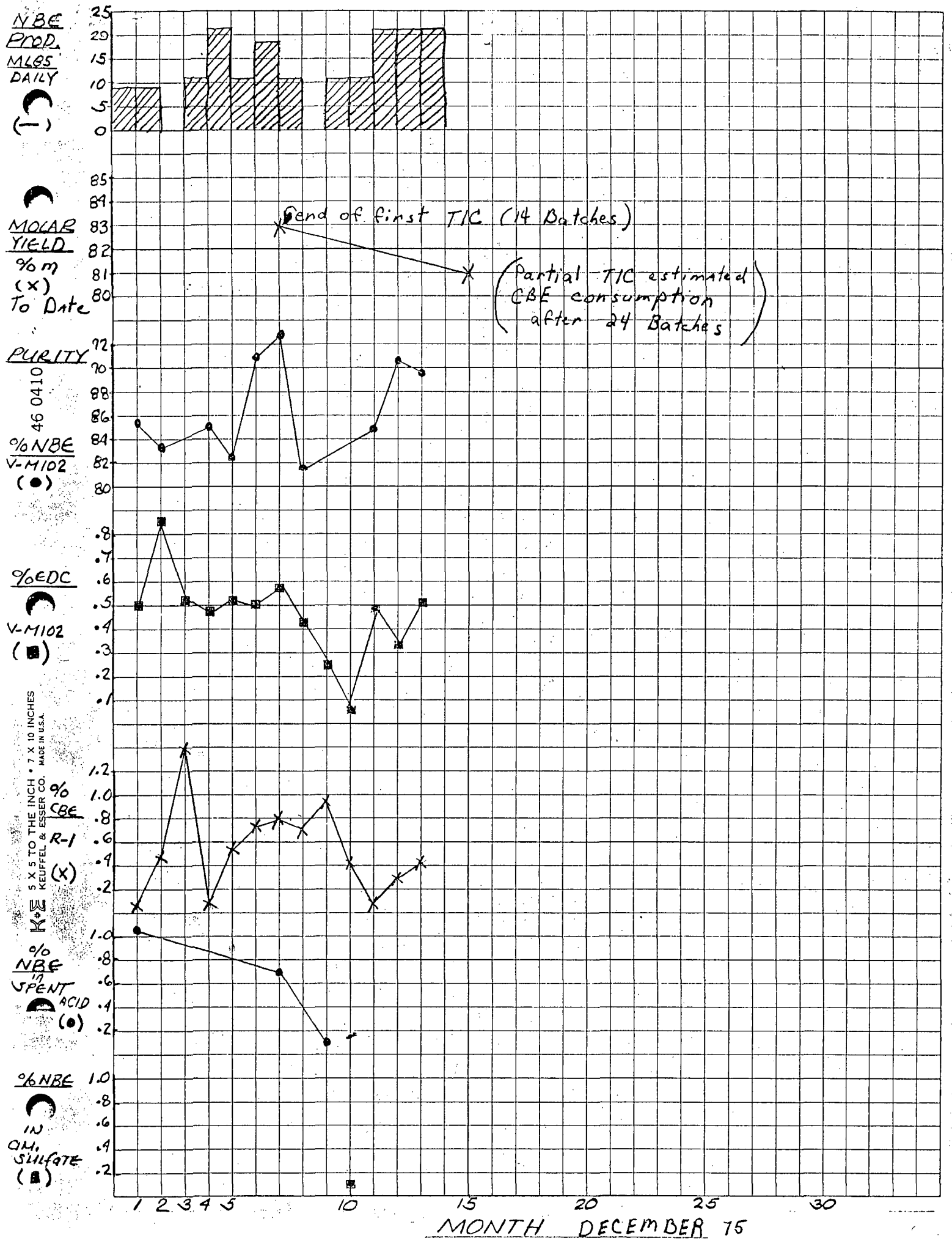
BATCH#	TOTAL CYCLE TIME	CBE & EDC ADD. TIME	TOTAL ACID ADD. TIME	Ø SEP. TIME (1st)	NEUTRA-LIZATION	Ø SEP TIME (2nd)	TOTAL EXTRA	TOTAL STRIPPER
	hrs. - min	hrs-min	hrs-min	hrs-min	hrs-min	hrs-min	hrs-min	hrs-min
26E	13-25	1-08	5-20	1-0	0-35	1-05	5-05	No Sheet
27E	21-20	0-45	4-55	8-45	0-40	1-00	2-10	12-25
28E	14-25	0-45	4-10	1-05	0-33	3-20	3-40	4-45
29E	12-30	2-30	4-10	1-00	0-35	0-40	2-30	8-25
30E	12-15	0-45	4-10	1-00	0-40	1-00	3-15	6-35
31E	12-10	0-55	4-15	1-00	0-25	1-00	2-05	5-45
32E	12-15	2-20	4-05	1-00	0-10	1-00	2-15	6-05
33E	12-00	0-30	4-30	1-10	0-55	1-00	3-10	5-30
34E	11-50	0-30	4-10	1-00	0-40	5-00	4-25	9-05
35E	21-20	0-40	4-0	1-00	0-40	0-55	2-45	18-30
36E	12-35	0-50	4-15	1-05	0-38	1-00	3-45	5-45
37E	13-35	1-20	4-35	1-00	1-10	1-00	2-45	8-30
38E	11-55	0-35	4-20	1-00	0-40	1-05	3-05	6-50
39E	12-15	0-30	4-05	1-00	1-15	1-00	2-50	9-25
40E	11-10	0-35	4-25	1-00	0-40	1-05	2-15	7-45
Average	13.67hr	.98hr	4.36hr	1.54hr	.68hr	1.41hr	3.07hr	8.17hr.

PROCESS CONTROL GRAPH NBE UNIT



K&E 5 X 5 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0410

PROCESS CONTROL GRAPH NBE UNIT



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K+E 5 X 5 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

MOBIL NITRATION

SUMMARY—

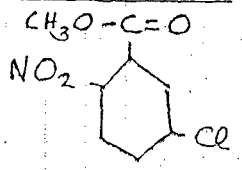
10/20/75

(1) THE PRODUCT —

(a) A HERBICIDE INTERMEDIATE CALLED NBE USED to MAKE MODOWIN. MODOWIN IS A PRE-EMERGENCE HERBICIDE for SOY-BEAN & COTTON.

(B) common name — NBE

(c) STRUCTURE —



NITRATED BENZOATE ESTER (NBE)

(D) SHIPPED AS BULK LIQUID PRODUCT IN T/C's OR T/T's to MOBIL CHEMICAL for CONVERSION to MODOWIN.

(2) PROPERTIES —

(a) LIGHT BROWN CLEAR COLOR

(B) LIQUID OR SOLID AT ROOM TEMPERATURE. MELTING POINT IS 118 °F BUT NBE SUBCOOLS.

(c) FLAMMABLE (341°F flash POINT). SPECIFIC gravity = 1.38.

(D) CHARACTERISTIC ODOR

(3) CHEMISTRY —

(a) Nitration

$$CBE + HNO_3 \xrightarrow[EDC]{H_2SO_4} NBE + H_2O$$

- H_2SO_4 removes H_2O that is formed in RXN.
- EDC is the RXN solvent.
- 45 °F HNO_3 addition TEMP.
- Ø SEPARATE SPENT ACID

(B) NEUTRALIZATION

$$H_2SO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + 2H_2O$$

- RESIDUAL ACID IN the NBE IS NEUTRALIZED WITH ammonium hydroxide.

(4) THE PROCESS DESIGN —

(a) THE NBE process is a commercial one that has BEEN in OPERATION by MOBIL.

(B) Information ON NBE plant IS confidential.

(c) Engineering for project By Shreeve Engr. & Eagle River.

(d) DESIGN RATE 500 MLBS PER MONTH. 80% OPERATING RATE.

(E) BATCH CYCLE TIME 12 HRS — 10 MLBS / BATCH.

(5) THE OPERATION —

- 2 OPERATORS / SHIFT
- 50 MAJOR EQUIPMENT ITEMS — 16 pumps
- 5 RAW MATERIALS

PROCESS INCLUDES one REACTION, one NEUTRALIZATION, STRIPPING operation, & an EXTRACTION STEP

(6) THE RAW MATERIALS —

(a) CBE, CHLORINATED BENZOATE ESTER — STARTING MATERIAL flammable, 70 F freeze pt.

(B) EDC, ethylene dichloride very flammable, process SOLVENT

(c) HNO_3, NITRIC ACID, very strong acid, EXTREME hazard.

(d) H_2SO_4, SULFURIC ACID, VERY strong acid, EXTREME hazard.

(E) NH_3, ammonia, a compressed gas.

MOBIL NITRATION UNIT

EAGLE RIVER CHEMICAL

STANDARD OPERATION SUMMARY

NOTE: REFER TO POSTED STANDARD OPERATING CONDITIONS FOR ALL CONDITIONS.

I. NITRATION REACTION

1. Charge 11,480 lbs. EDC and 7650 lbs. CBE to the reactor, R-M101.

2. After 3000 lbs. of EDC has been charged to the reactor, start the recirculation pump, P-M107. After 8000 lbs. has been added, start reactor agitator. Once agitation and recirculation are established, the CBE can be added.
NOTE: DOUBLE CHECK EDC DAY TANK T-M103 TO BE CERTAIN EDC NOT H2O IS BEING CHARGED TO R-M101. REMEMBER CBE HAS 70°F FREEZE POINT.

3. When all EDC and CBE is added, sample contents for analysis. The % CBE should be 35-40%. If CBE is high, add 190 lbs. of EDC for each 1% over 40%. If CBE is low, the batch may be run as is or 190 lbs, of CBE for each 1% below 35% may be added.
NOTE: DO NOT OVERFILL THE REACTOR INTO THE VENT SYSTEM. ALSO ANALYZE EDC/CBE FOR H2O. 1% WT H2O IS NORMAL WHILE 5% WT H2O CAN KILL REACTION.

which?

4. Cool reactor contents to 65°F and add 20 lbs. of HNO3 to satisfy interlocks. Note heat rise.

FIM101 FIM102 ?

5. Cool reactor contents to 32°F and add 3100 lbs. (247 gal) of HNO3 at 25 lbs. per minute (2 GPM). At the same time, add 7420 lbs. (485 gal) of H_2SO_4 at 45 lbs per minute (3 GPM).

OK TO ALLOW TEMP TO RISE?

6. Maintain temperature at 45°F (42-47°F) on the reactor until all HNO3 has been added and until 75% of the CBE has reacted.

Is it necessary TO EMPTY R-1 JACKET before adding BRINE. R is BRINE USED only FOR EMERGENCY COOLING?

7. When 75% of the CBE has reacted, allow reactor temperature to rise to 75°F in 10-15° increments by decreasing brine flow. If the heat of reaction is not enough to reach 75°F, add the remaining H_2SO_4 and then heat the reactor to 75°F using the reactor jacket and tempered water heater (E-M106). Do not heat tempered water over 160°F to avoid corrosion.

8. Hold the reactor at 75°F for 30 minutes after all H_2SO_4 is added and if 1% or more CBE remains. Terminate H_2SO_4 addition and proceed to settling if 1% CBE is reached before all H_2SO_4 is added.
NOTE: SAMPLE FOR CBE AT INCREASING FREQUENCY NEAR END POINT TO MINIMIZE H_2SO_4 CONSUMPTION.

ARE THERE NITROGEN HOOK-UPS TO BLOW LINES

9. When reaction is complete (1% CBE), stop agitator and recirculation pump. Blow recirculation loop back into reactor with nitrogen. Settle layers for one hour.

10. After one hour, pump the unextracted acid layer (bottom layer) to the extraction tank, T-M104.
NOTE: DOUBLE CHECK VALVE LINE UP AS A MISTAKE COULD RESULT IN SUBSTANTIAL LOSSES IN PRODUCT OR A POSSIBLE SAFETY PROBLEM,

11. After 7800 lbs. (540 gal) of unextracted acid has been pumped off, throttle the discharge of the interface pump (P-M111). When the layer separation point passes through the sight glass, close the block valve at the discharge of P-M111. a/

12. Start the reactor agitator and recirculate the reactor through the cooler bypass. Maintain 75°F (125°Fmax). Open the NH_4OH line to the recirculation pump discharge and add 1000 lbs. (126 gal). After 10 minutes is pH is less than 7, add 1000 lbs. more of NH_4OH. Resample after 10 minutes. Continue until pH is 7 or more. Stop agitation and recirculation pump. Close block valve at bottom of reactor. Blow recirculation loop back to reactor with nitrogen. Allow layers to settle for one hour. Bump agitator after 1/2 hour.

How close is the phase change from 16,000 lbs.?

13. Open the 4" block valve at the reactor bottom and line up to small transfer pump, P-M111. Open the valves in the recirculation manifold to the stripper vessel V-M101. Pump about 16000 lbs. of crude product to V-M101 (bottom layer).
NOTE: ONCE AGAIN PHASE ERROR IS VERY COSTLY.

14. Continue transfer but at a slower rate. a/ If phases become indisguishable, stop transfer. Then bump R-M101 agitator for 2 minutes and allow to resettle for 15 minutes, pull samples as needed to check phases. Appearance of product changes from light brown to dark pitch black before interface. At the aqueous interface a crud layer will appear which is a mixture NH_4OH, acid, EDC, and NBE. See section VI D. for special instructions.

SEE SECTION VI D.?

15. When the aqueous interface is finally indentified, pump the rest of the reactor contents to the ammonium sulfate waste tank (T-M106).
NOTE: IF PHASE BREAK CAN'T BE DISGUISHED, CONTACT OPERATIONS ENGINEER. IN ANY EVENT, A TRANSFER OF SALT WATER TO V-M101 OR PRODUCT TO T-M106 WILL REPRESENT A REAL MESS.

What is the pH check point for?

II. STRIPPING

1. Put cooling water on the overhead condenser and brine on the knockback condensers, (E-M102 and E-M103)

2. After transfer from R-M101, place V-M101 on circulation thru P-M110 and E-M104. Begin recirculation through the stripper heater (E-M104). Pinch back E-M104 to V-M101 recirculation valve for proper vaporization. Apply steam to the heater and slowly begin heating contents. Slowly reduce reactor pressure to about 400mm. with the jets J-M101.

Couldn't follow on blueprints

3. Continue slowly heating reactor and removing condensate to the EDC day tank T-M103 until 270°F at 400mm is reached.

* A/ Acid phase = light brown motor oil appearance
Product phase = hazy green to brown appearance product changes from light brown to dark pitch black before aqueous.

5. Continue opening up vent valve to the jets J-M101, until 40mm Hg @ 27°F in the vessel is reached.
NOTE: DO NOT OVERFILL THE STRIPPER INTO THE VENT SYSTEM. WATCH BOILUP RATES AND LEVELS TO DOUBLE CHECK.

6. After EDC boiloff has stopped at 270°F and 40mm, sample reactor for % EDC. The % EDC should be less than 0.5 (.2 to .4 is typical).

7. Using the recirculation pump P-M110 and manifold, pump the NBE to the NBE product tank V-M102. Product yield should be about 890 gals. Check operation of ammonium sulfate filter S-M102 before and during transfer.
NOTE: REMEMBER NBE HAS A 118°F FREEZE POINT.

III. ACID EXTRACTION

1. After all (about 600 gal) of unextracted spent acid is in T-M104, add 1000 gal. of EDC to the T-M104.

2. Start the agitator and agitate for 45 minutes using no recirculation.

3. Stop agitator and settle for 1 hour

4. Pump the extracted acid layer on the bottom to the extracted spent acid tank (T-M105) using the pump P-M104 and manifold.

5. Throttle P-M104 discharge to recognize the interface. Total extracted acid should be 550-650 gal.
NOTE: IF THE ACID INTERFACE RECOGNITION IS DIFFICULT, CONTACT OPERATIONS ENGINEER.

6. The EDC/NBE in T-M104 after interface recognition should be lined up and transferred back to the EDC day tank T-M103. Check ammonium sulfate strainer S-M101 before and during transfer.

MOBIL NITRATION UNIT

EAGLE RIVER CHEMICAL

TABLE I. STANDARD OPERATING CONDITIONS - NITRATION REACTION - R-M101

	PROCESS VARIABLE	DESIRED	MAX.	MIN.	
1.	CBE CHARGE, LBS.	7650			APPROX. 767 GAL.
2.	EDC CHARGE, LBS.	11480			APPROX. 1092 GAL.
3.	EDC/NBE CHARGE, LBS.	11480			APPROX. 1092 GAL.
4.	HNO_3 CHARGE - 650, LBS.	20			
5.	HNO_3 CHARGE - 32°, LBS	3100			APPROX. 249 GAL. TOT
6.	H_2SO_4 CHARGE - 32°, LBS	7420			APPROX. 485 GAL.
7.	LBS IN REACTOR TO START AGITATOR			8000	AVOID SHAFT WHIP.
8.	LBS IN REACTOR TO START RECIRCULATION			3000	NPSH LIMITED
9.	BATCH VOLUME, GAL.	2593	TOTAL WT=	29670	AVOIDS OVERFILLING STRIPPER V-M101
10.	UNEXTRACTED ACID/BATCH,GAL.	550	650	550	ORGANIC RECOVERED IN EXTRACTION.
11.	ORGANIC/BATCH, GAL.	1950	2000	1900	
12.	AQUEOUS WASTE/BATCH, GAL.	126	252	126	DEPENDS ON NH_4OH USE
13.	AQUEOUS INTERFACE/BATCH, GAL	0	100		AVOID IF POSSIBLE.
14.	EDC RINSE AFTER NEUTRALIZATION, GAL				NOT PLANNED
15.	TEMP - 1st 75% OF REACTION,°F	45	50	40	TOO COLD MAY REACT T SLOWLY OR CAUSE FREE UP.
16.	TEMP - last 25% OF REACTION,°F	75	90		TOO HIGH GIVES POOR PURITY AND YIELD.
17.	CBE TEMP., °F	90	125	80	FREEZE POINT - 70°F
18.	BRINE TEMP., °F	10	20	5	TOO COLD MAY CAUSE FREEZE UP.
19.	NEUTRALIZATION TEMP., °F	75	125		COOLER MAY BE NEEDED
20.	pH AFTER NEUTRALIZATION	7	10	7	
21.	H_2SO_4 TEMP., °F	100	125	90	HIGHER TEMP. INCREAS CORROSION.
22.	NH_4OH TEMP., °F	75	100		
23.	NH_3 PRESS. TO MIXER	50	75	35	MUST OVERCOME PUMP PRESSURE.
24.	HNO_3 ADDITION RATE, GPM	2	3		
25.	H_2SO_4, ADDITION RATE, GPM	3	4		
26.	SETTLING TIME- UNEX. ACID, MIN			60	
27.	AGING TIME AT 75°, MIN.	30			USE IF 1% CBE.
28.	ORGANIC REMOVAL RATE, GPM		70		
29.	AGITATOR DURING RXN	ON			MUST BE ON TO SATISF INTERLOCK
30.	TIME TO SAMPLE AFTER NH_4OH ADDITION, MIN.			10	ALLOWS MIXING.
31.	% CBE IN ORGANIC CHARGE	40	40	35	40 REQUIRES ADJUST MENT.
32.	% CBE IN ORGANIC TO HEAT TO 75°		10	8.4	0.25 OF CHARGE ANALY
33.	% CBE TO TERMINATE H_2SO_4 ADDITION	1.0	1.0		
34.	% NH_3 IN NH_4OH SOLUTION	13	14	12	25 can CAUSE TANK PRESSURIZATION

TABLE 1. CON'T.
PAGE 2

PROCESS VARIABLE	DISIRED	MAX.	MIN.	COMMENTS
35. SETTLING TIME-AQUEOUS WASTE, MIN.	60		30	
36. NH_4OH CHARGE, LBS.	1000	2000	1000	MUST HAVE ENOUGH TO DISSOLVE AMMONIUM SULFATE. 1000 LBS. EQUALS 126 GAL

MOBIL NITRATION UNIT

Eagle River CHemical

Table II. Standard Operating Conditions - Stripping V-M101

	Process Variable	Desired	Max.	Min.	Comment
1.	NBE product/batch,gal.	1950	2000	1900	Reactor 2250 gal. nomina capacity.
2.	EDC overhead/batch,gal.	1092	1100	1000	
3.	EDC rinse after stripping, gal				Not planned.
4.	Gal. in reactor to start recirculation			300	NPSH limited.
5.	Initial stripping range,F	120 to 270°F			Heat slowly in conjuncti with vacuum, No stabilit data over 300°F
6.	Terminal stripping temp,F	270	295	260	
7.	Initial stripping condition vacuum, mmHg, V-M101	400	500	400	
8.	Terminal stripping vacuum	40	60	30	Slowly decrease from 400 to 30.
9.	NBE temp., °F	130	150	120	Freezes at 118°F or less
10.	% EDC in NBE product	.4	0.5	.2	
11.	% NBE in EDC overhead	<2	4		
12.	Finished NBE per batch, gal	≥ 890			

MOBIL NITRATION UNIT

Eagle River Chemical

Table III. Standard Operating Conditions - Acid Extraction (T-M104)

	Process Variable	Desired	Max.	Min.	Comment
1.	Batch volume, gal.	1550	1650		Large batches unbalanceE
2.	Unextracted acid charge, gal	550	650	550	Usually charge all acid from E-M101
3.	EDC charge, gal.	1000			
4.	Extracted acid removed,gal	510	600	500	Depends on unextracted acid.
5.	EDC-Recycle batch, gal	1050			Volume increase a functi of NBE recovery
6.	Acid interface removed,gal	0	100		Avoid if possible.
7.	Extraction temp.,^{o}F.	75	125		Cooling normally not needed. Water from EDC may temp. & pressure ris
8.	Agitator	On during phase mixing			
9.	Settling time, min.			60	
10.	Agitation time, min.			45	
11.	%NBE in extracted spent acid	.2	2		
12.	%NBE in unextracted spent acid	5	10		
13.	%NBE in EDC	2			

TO BOB TABIAN 7/30/76

SUBJECT — MOBIL NBC

Attached revised MOBIL COST CURVE, manufacturing cost estimate, & supporting notes. As the notes indicate both historical and estimated parameters have been used for this estimate. Also attached is a MOBIL expansion table outlining our suggested approach. I would like to understand MOBIL'S business philosophy before committing a more detailed study on the expansion. A ballpark manf. cost for the 1MM LB/HT plant would be about 2¢/#. Again the cost curve would enter in with a cost of about 14¢/# at the .5MM LB/HT level with the larger plant. I believe the expanded plant would offer outstanding reliability & flexibility.

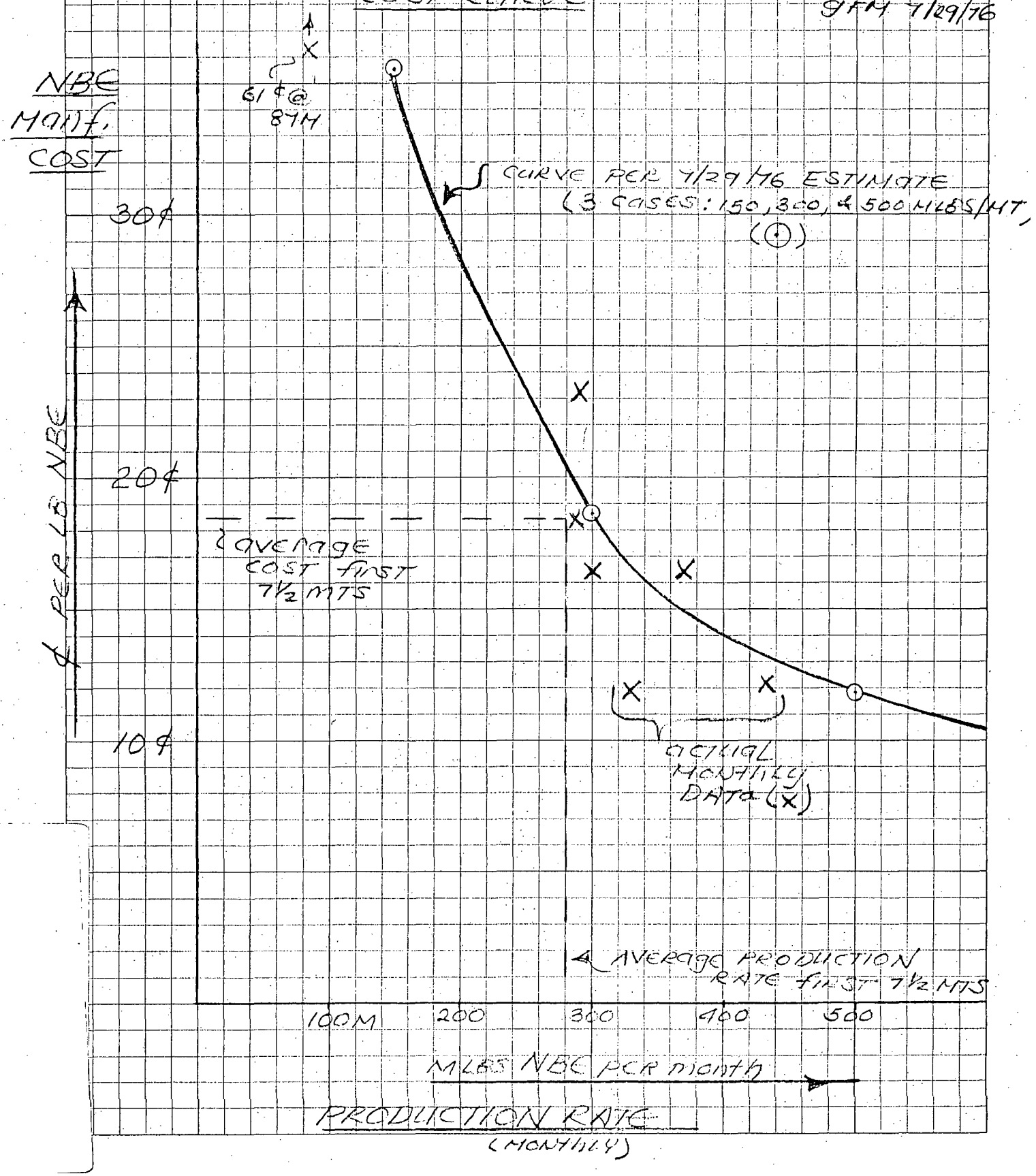
cc.

Lee

FIGURE 4

REVISED MOBIL NITRATION (NBE) COST CURVE

9FM 7/29/76



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5 X 5 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

ESTIMATED MANUFACTURING COST

REVISED MOBIL NITRATION (NBE) — SFM 7/29/76

* BASE CASE

1. PLANT PRODUCTION (ALL COST ARE ON UNIT BASIS)

BASIS: EXISTING FACILITY 500 MLBS PER MONTH NBE Capacity

PLANT CAPACITY	150 MLBS	300 MLBS	500 MLBS
	30 %	60 %	100 %

2. RAW MATERIAL & FUEL COST

Type	Units	Unit Cost	Usage /	$	$	$
TOLL CONVERSION						
MATERIALS BY						
MOBIL						
Subtotal, Raw Materials & Fuel				$	$	$

3. UTILITIES

Type	Units	Unit Cost	Usage / # NBE	Usage * $/MT *	$	$	$
Electricity	KWH	2.8¢	.46	3864	SEE NOTES #6	.0129	SEE NOTES #6
Steam	LBS	.2¢	2.00	1200		.0040	
Water	Mgal	40¢	.002	240		.0008	
Nitrogen	SCF	.36¢	2.00	2160		.0072	
Waste disposal:							
aqueous	LBS	.5¢	1.00	1500		.0250	
organic	LBS	6.0¢	.01	180		.0006	
Subtotal, Utilities					$ .0427	$ .0305	$ .0259

4. OPERATING LABOR $+10m (2 operating shifts)	$ .0704	$ .0352	$ .0211
5. ROYALTIES & RENTALS $		$	$
6. BURDEN			
A. Repair Labor $4.8m (4 MEN)	$ .0323	$ .0162	$ .0097
B. Repair Supplies 1.1 times R. LABOR	$ .0356	$ .0178	$ .0107
C. Operating Supplies 40% OPER. LABOR	.0282	.0141	.0084
D. Supervision 30% OPER LABOR	.0210	.0106	.0063
E. Indirect Payroll (IN LABOR)	$ —	$ —	$ —
Subtotal, Burden	.1171	.0587	.0351
7. FIXED AND SERVICE COSTS			
A. General Works Expense (+ $10M)	$ .0694	$ .0347	$ .0208
B. Depreciation $4300 per month	.0320	.0160	.0096
C. Laboratory ($3.4M)	.0228	.0114	.0069
D.			
Subtotal, Fixed & Service Costs	$ .1242	$ .0621	$ .0373
8. TOTAL BULK COST	$	$ —	$ —
9. LOADING, PACKING & SHIPPING			
A.			
B.	$ —	$ —	$ —
10. CONTINGENCIES	$	$ —	$ —
11. TOTAL MFG. COST	$ .3544	$ .1865	$ .1194

NOTES: * BASE ESTIMATE 300 MLBS/MT.

Form VAFE 6

Prepared by | Checked by | Date

MOBIL NITRATION
Manf. COST BASIS

①

ASSUMPTIONS

JFM 7/29/76

(1) BASE CASE 300 MLBS PER MONTH NBE PRODUCTION (60% CAPACITY).

(2) COSTS ARE DEVELOPED AS FORECAST OR BUDGET GRADE QUALITY BASED ON KNOWN OR ESTIMATED MANUFACTURING REQUIREMENTS.

(3) OUT of a total of four manufacturing PROCESS UNITS AT Eagle River Chemical, THREE are assumed to BE IN operation for this ESTIMATE. Because of more or less equivalent staffing in each UNIT, NBE THEN REQUIRES one third direct operating staff.

(4) ITEM 3 TO TAKE CARE of so called "idle plant" charges. In other words in a GIVEN MONTH WHERE JUST ONE or TWO UNITS would BE RUNNING, "idle plant" allocations would prevent distortation. However, Having THREE of four process units in operation would seem to BE fair RECOGNITION of THE RISKS & inefficiencies inherent WITH changeable TOLL OPERATIONS.

(5) THE FIRST 7½ MONTHS of NBE operation REPRESENT a fair GUIDE for predicting future costs. Cost reductions such as the completion of significant post startup changes, spare parts STOCKING, STAFF REDUCTIONS / REALLOCATIONS, etc. WILL BE

offset by increases in waste treatment (now zero) & continued maintenance in a corrosive nitration process. THUS HISTORICAL DATA IS USED WITH KNOWN & ESTIMATED PARAMETERS for the manfacturing COSTS. Propanil was operating or absorbing costs for almost all of this time period.

(6) UTILITIES

(a) A capacity factor exists for all UTILITIES. Base loading and/or a fixed portion is inherent with each UTILITY component. FOR THIS ESTIMATE @ 300 M LBS/MT Base this factor is estimated at:

	capacity factor
150 M LBS/MT	1.4
300 M LBS/MT	1.0
500 M LBS/MT	.85

(B) ELECTRICAL

EST. connected Horsepower is 469. At Base case of 300 M LBS NBE, estimated KW equals 188 (BATCH OPERATION). Price per KWH is from 7/25/76 BILLING for MOBIL transformer. The resulting estimate of $3864/MT ELECTRICAL compares reasonably for JUNE actual ($3510 @ 293 M LBS NBE).

(C) STEAM

EST. Steam consumption is based on STEAM JET CONSUMPTION, STEAM TRACING, & PLANT STEAM LOSSES. EST. STEAM COST compares with actual June natural gas cost ($1200 ESTIMATE vs. actual June $1145)

(D) Nitrogen based on plus 15 SCFM for purged dp cells, other instruments & purges requiring Nitrogen, and misc. losses & line blowing. N_2 price based on 7/13/76 billing and includes a proration of $100 N_2 tank rental. Estimated Nitrogen of $2160 compares with actual June figure of $1811.

(E) aqueous effluent quantity based on contaminated steam jet condensate less vapor loss plus washdowns and spills. Price of effluent treatment assumes minor activated carbon consumption, conventional biological treatment, & associated Eagle River treatment expenses. Organic wastes based on solids generated in process such as spent filter cartridges, etc. Neither cost is now recognized on current monthly cost page.

(7) <u>operators</u>

2 spots

(46.75 mn hrs/wk X 8 men X $5.22/hr X 1.25 Burden X 4.33 wks/mo)
= $10,567

(1/2 hr shower time + 42 hr week schedule for shift work and all @ straight time)

(8) <u>maintenance</u>

4 men allocated to HORL including instrumentation, electrical, machinist, pipefitter, & inefficiencies.

(43.75 mn hrs/wk X 4 X $5.12/hr X 1.25 Burden X 4.33 wks/mo)
= $4,848

(9) Maintenance supply factor (1.1) reflects process corrosivity. ④

(10) Operating supplies which includes safety equals $4227 versus $4300 for average of 7.5 mts. of operation

(11) General PINUT includes safety personnel, security, purchasing, stores, engineering, accounting, secretarial, & administrative.

(Head count of 25 people X $1M/MIT average salary X 1/3 allocation to MOBIL) = $8,333

General plant expenses such as supplies, rentals, etc. assumed as 25% of labor 2,083

$10,416

(12) Depreciation based on actual depreciation ($593 M capitalization).

(13) Laboratory. Direct technician labor estimated at 1/2 spot for MOBIL

(46.75 man hrs/WK X 2 MEN X $5.22/HR X 1.25 Burden X 4.33 wks = $2642

PLUS 30% for chemist support activity ($794).

Estimated Lab cost compares with actual average for 7½ months of $3200.

(14) BUDGET COSTS VERSUS ACTUAL COSTS FOR FIRST 7½ MONTHS

	EST. a/ COST	AVERAGE b/ 7.5 MTS
UTILITIES (W/O WASTE DISPOSAL)	$7464	$5160 (MORE DIRECT JUNE ALLOCATION, UTILITIES WERE $8682)
OPERATING LABOR (W BURDEN)	10567	8500 (EST. COST AT LATEST LABOR RATE & TOP OPERATOR WAGE CLASS)
MAINTENANCE	10180	10500
SUPPLIES	4227	1300
SUPERVISION & GEN. PLANT & ADMINS.	13586	14900
DEPRECIATION	4800	~4800
LABORATORY	3900	3200
	$54,224	$51,360
PLUS WASTE DISPOSAL	1,680	
TOTAL	$55,904	
UNIT COST	18.6 ¢/#	$18.34

a/ 300 MLBS NBE/MT

b/ 280 MLBS NBE/MT

MOBIL NITRATION (NBE)

9PM/7/29/76

EXPANSION

LEVEL of EXPANSION	Monthly capacity MLBS	annual capacity MMLBS	capital req'D $M	additional expenses	REMARKS
CURRENT	450	+5	NONE	NONE	Unit requires shakedown at higher production levels (sustained). Batch cycle times well documented.
I CURRENT ATTAINABLE	600	+7	0-25	add operator on days for tank trucks?	Requires slight increase in batch size and high stream factor. PH control of NH_3 & EDC storage recommended but not essential.
II	800	+9.5	100-150	add operator on days for tank trucks (if not above)	Requires additional 3.5 ugal SS reactor to allow separate phase separation & neutralization thus freeing nitration reactor. Add additional NBE storage.
III	1000	12	250-400	- add operator on swing shift for tank trucks - add day supervisor for MOBIL unit	Requires conversion of 3.5 ugal SS reactor (per above) to nitration service including two acid mixers. Bottles & their pumps, weigh cell & reactor interlocks, heat exchanger for reactor cooling etc. Add CBE storage tank, enlarge spent acid & am. sulfate storage all to 20 ugal. Add building structure & roof annex for reactor. Add 2nd refrigeration unit and 2nd cooling tower. Convert NBE storage (current) to crude NBE/EDC surge. Feed stripper semi-continous "ala" MOBIL NBE process from this converted tank

2/3/76

To: Bill Shackelford
From: John Miles

Per telephone conversation with Don Taggert this morning, NBE production for the balance of this year, based on projected CBE supply is:

Feb	300	M lbs.
March	150	
April	235	
May	295	
June	350	
July	410	
Aug	470	
Sept	470	
Oct	590	
Nov	590	
Dec	590	

cc: George Mather
Mike McKeller
Ray Guidi / Bob Fabian

	ACT	MTRL BAL
Am SO_4	0.468	0.1906
Spent Acid	0.846	0.8984

CBE	.84
EOC	.125
D	.88
N	.86
NH_3	.055

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR • MEMPHIS, TN 38137 • 901-767-6851 • TELEX 53927

March 17, 1976

MEMO

TO: Bill Shackelford

FROM: Bob Fabian

Subject: Mobil Nitration Manufacturing Costs

Per our conversation, please submit to this office actual Mobil Nitration manufacturing costs on a monthly basis covering the production from start-up through March 31, 1976. As discussed with John Miles, it would be best if this were done on the format for manufacturing costs elements presented in our capital management program. This information is for our internal review and use, and will hopefully produce better estimates in the future. Can you complete this by April 15?

Also regarding Mobil Nitration, Don Faggert asked me today if Tuesday, March 23 would be acceptable for him to visit Eagle River and review operation to date per the contract. I told him this would be okay since I feel we must complete this item.

RMF/gn

cc: R. A. Guidi
Vertac Consolidated

J. Miles
Eagle River Chemical Co.

ESTIMATED MANUFACTURING COST

1. PLANT PRODUCTION (ALL COST ARE ON UNIT BASIS)

	PLANT CAPACITY		
BASIS:	_____ %	_____ %	_____ %

2. RAW MATERIAL & FUEL COST

Type	Units	Unit Cost	Usage /			
				$	$	$
Subtotal, Raw Materials & Fuel				$	$	$

3. UTILITIES

Type	Units	Unit Cost	Usage /			
				$	$	$
Electricity						
Steam						
Water						
Subtotal, Utilities				$	$	$

4.	OPERATING LABOR $ _____	$	$	$
5.	ROYALTIES & RENTALS $		$	$
6.	BURDEN			
	A. Repair Labor	$	$	$
	B. Repair Supplies	$	$	$
	C. Operating Supplies			
	D. Supervision			
	E. Indirect Payroll	$	$	$
	Subtotal, Burden			
7.	FIXED AND SERVICE COSTS			
	A. General Works Expense	$	$	$
	B. Depreciation			
	C. Laboratory			
	D. _____			
	Subtotal, Fixed & Service Costs	$	$	$
8.	TOTAL BULK COST	$	$	$
9.	LOADING, PACKING & SHIPPING			
	A. _____			
	B. _____	$	$	$
10.	CONTINGENCIES	$	$	$
11.	TOTAL MFG. COST	$	$	$

NOTES:

Form VAFE 6

Prepared by Checked by Date

ESTIMATED MANUFACTURING COST

1. PLANT PRODUCTION (ALL COST ARE ON UNIT BASIS)

	PLANT CAPACITY		
BASIS:	_____ %	_____ %	_____ %

2. RAW MATERIAL & FUEL COST

Type	Units	Unit Cost	Usage /			
				$	$	$
Subtotal, Raw Materials & Fuel				$	$	$

3. UTILITIES

Type	Units	Unit Cost	Usage /			
				$	$	$
Electricity						
Steam						
Water						
Subtotal, Utilities				$	$	$

4.	OPERATING LABOR $	$	$	$
5.	ROYALTIES & RENTALS $		$	$
6.	BURDEN			
	A. Repair Labor	$	$	$
	B. Repair Supplies	$	$	$
	C. Operating Supplies			
	D. Supervision			
	E. Indirect Payroll	$	$	$
	Subtotal, Burden			
7.	FIXED AND SERVICE COSTS			
	A. General Works Expense	$	$	$
	B. Depreciation			
	C. Laboratory			
	D.			
	Subtotal, Fixed & Service Costs	$	$	$
8.	TOTAL BULK COST	$	$	$
9.	LOADING, PACKING & SHIPPING			
	A.			
	B.	$	$	$
10.	CONTINGENCIES	$	$	$
11.	TOTAL MFG. COST	$	$	$

NOTES:

Form VAFE 6

Prepared by Checked by Date

ESTIMATED MANUFACTURING COST

1. PLANT PRODUCTION (ALL COST ARE ON UNIT BASIS)

	PLANT CAPACITY		
BASIS:	_____ %	_____ %	_____ %

2. RAW MATERIAL & FUEL COST

Type	Units	Unit Cost	Usage / _____	$	$	$
Subtotal, Raw Materials & Fuel				$	$	$

3. UTILITIES

Type	Units	Unit Cost	Usage / _____	$	$	$
Electricity						
Steam						
Water						
Subtotal, Utilities				$	$	$

4.	OPERATING LABOR $ _____	$	$	$
5.	ROYALTIES & RENTALS $		$	$
6.	BURDEN			
	A. Repair Labor	$	$	$
	B. Repair Supplies	$	$	$
	C. Operating Supplies			
	D. Supervision			
	E. Indirect Payroll	$	$	$
	Subtotal, Burden			
7.	FIXED AND SERVICE COSTS			
	A. General Works Expense	$	$	$
	B. Depreciation			
	C. Laboratory			
	D. _____			
	Subtotal, Fixed & Service Costs	$	$	$
8.	TOTAL BULK COST	$	$	$
9.	LOADING, PACKING & SHIPPING			
	A. _____			
	B. _____	$	$	$
10.	CONTINGENCIES	$	$	$
11.	TOTAL MFG. COST	$	$	$

NOTES:

Form VAFE 6

Prepared by Checked by Date

copy of original for John Miles

2/27/96

FROM THE DESK OF...
ROBERT M. FABIAN

TO: John Miles

Subj: Mobil Manufg Cost.

The attached were in my file, but apparently never formally sent to Eagle River (sorry about that!)

Pls. have Mike McKellar put our actual Mobil manufg. costs on the same format so we can easily compare.

If our actual costs are running less than 10¢/lbs., it looks like the attached curve is pretty close.

I deducted the interest + contingency charges from the final estimate, also revised to reflect final capital @ $450m

Bob

ESTIMATED MANFACTURING COST
FOR ADDED PRODUCTION, ANNUAL BASIS DACO 613A

(1 copy)

APPROPRIATION NUMBER RMF 6-30-75

15,000 gal

Mobil Nitration Proposal

		* Fixed Cost @ Full Rate Reduced 1/2	Full Fixed Cost %	Full Fixed Cost %
1.	PLANT PRODUCTION			
	RATE, ____ OF ____ /			
	RATE, IN % OF NEW TOTAL CAPACITY			
	ADDED, IN ____ OF ____ / lbs/mo. →	100,000	250,000	500,000
	ADDED, IN % OF ADDED CAPACITY	20 %	50 %	100 %
2.	RAW MATERIAL & FUEL COST (TYPE / UNITS / UNIT COST / USAGE)	$	$	$
	SUBTOTAL, RAW MATERIALS & FUEL	$ —	$ —	$ —
3.	UTILITIES (TYPE / UNITS / UNIT COST / USAGE)	$	$	$
	ELECTRICITY — 600 kwh @ 2.5¢/kwh			
	STEAM — 17,000# @ $1-/m#			
	WATER — 10,000 gal @ 10¢/m gal.			
	Refrig. — 1.5×10⁶ Btu @ .033¢/m Btu			
	SUBTOTAL, UTILITIES	$ .008	$ .008	$ .008
* 4.	OPERATING LABOR $ 2 men/shift	$ .043	$ .035	$ .017
5.	ROYALITIES & RENTALS $ ____ /	—	$ —	$ —
6.	BURDEN			
	A. REPAIR LABOR	$ .028	$ .022	$ .011
	* B. REPAIR SUPPLIES (incl. O.H.)			
	C. OPERATING SUPPLIES	.065	.026	.013
	D. SUPERVISION — #135			
	E. INDIRECT PAYROLL @ ____ Included above	—	—	—
	SUBTOTAL, BURDEN	$ .093	$ .048	$ .024
7.	FIXED AND SERVICE COSTS			
	* A. GENERAL WORKS EXPENSE, INCL. TAXES & INS. #85.62	$ .020	$ .016	$ .008
	B. DEPRECIATION #350M — 8 yr. S.L. — #74.91	.035	.014 .018	.007 .009
	* C. LABORATORY — #26-/batch	.005	.004	.002
	D. Interest #71.26	.035	.014 .015	.007 .007
	SUBTOTAL, FIXED & SERVICE COSTS	$ .095	$ .048	$ .024
8.	TOTAL BULK COST	$ .239	$ .139	$ .073
9.	LOADING, PACKING & SHIPPING			
	A. ____			
	B. ____			
	SUBTOTAL, L.P. & S.	$	$	$
10.	CONTINGENCIES @ 10% #77.73	$ .028	$ ~~.014~~ *	$ ~~.007~~ *
11.	TOTAL MFG. COST FOR ADDED PROD. ANNUAL BASIS	$ .267	$ .153 .158	$ .08 .081
12.	UNIT MANUFACTURING COST ~~FOR ADDED PRODUCTION~~	$ .120	$ .100	$ .08
	Tolling Chg →			
	Total Prod. Cost	.387	.253	.16

NOTES:

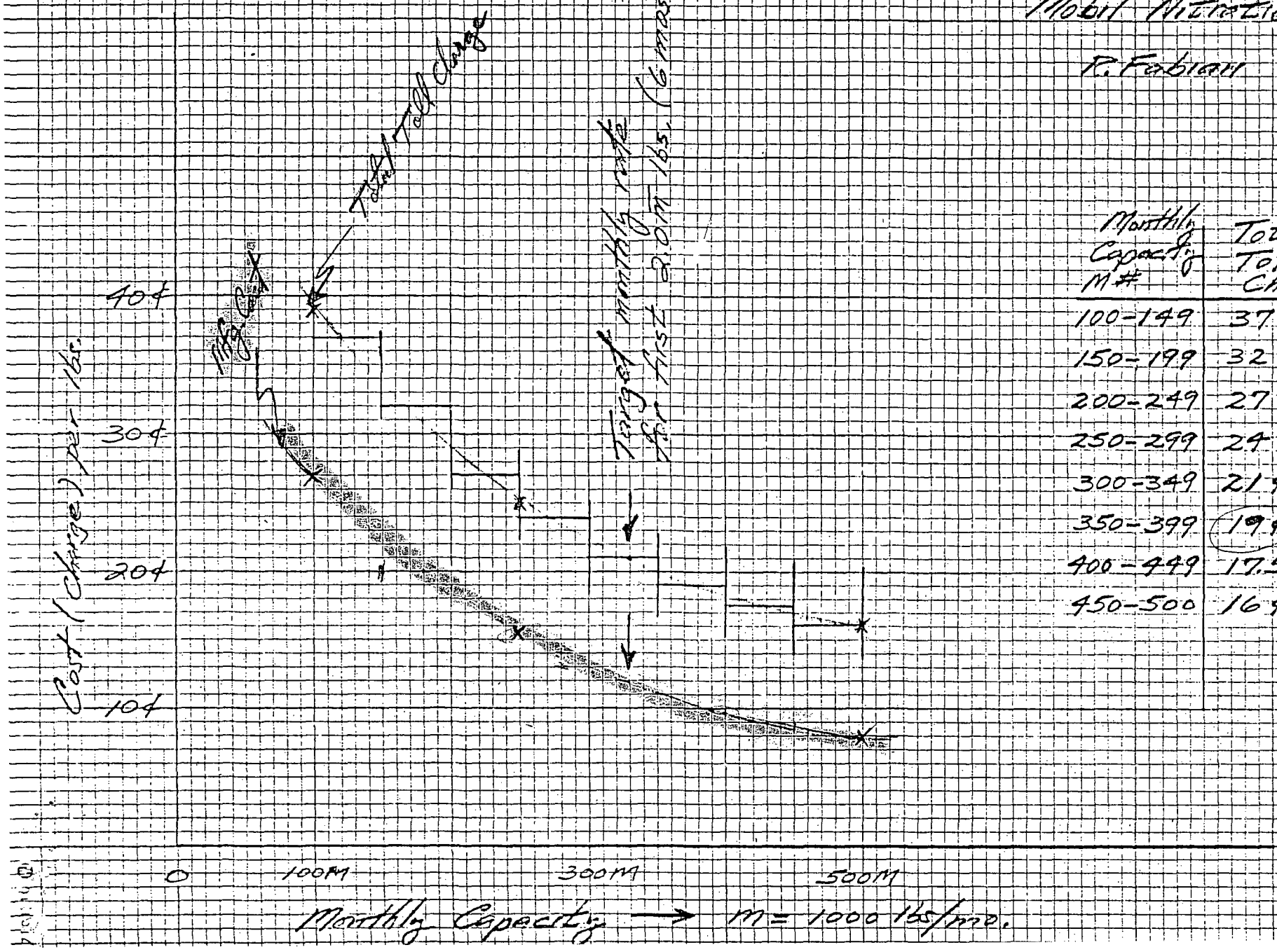
Note: To get cost per lbs, John Miles batch cost figures were divided by 10,417 lbs per batch @ 500M lbs/mo.;
Batch size for 250M lbs/mo. is one-half of above.
Bd has represent #450M capital

PREPARED BY ____ DIRECTED BY ____ DATE ____

* Excludes Interest

Mobil Nitration Proposal

R. Fabian 6/30/75



Monthly Capacity M#	Total Toll Chg.
100-149	37¢
150-199	32¢
200-249	27¢
250-299	24¢
300-349	21¢
350-399	19¢
400-449	17.5¢
450-500	16¢

Attachment #2

CAPITAL REQUIREMENTS

A.	Purchased Equipment (28,500 in plant, 79,700 to be purchased)	$ 108,200
B.	Installation (Instruments, Piping, Electrical, Construction Expenses - Misc., Engineering Cost, etc.)	189,300
	TOTAL CAPITAL ...	$ 297,500
	CONTINGENCY 15% ...	52,500
		$ 350,000

PRODUCTION CAPACITY

500,000 lbs./month @ 80% Operating Factor = 10,417 lbs./batch.

MANUFACTURING COSTS - MOBIL NITRATION - REVISED - 500,000 #/mo.

I. Raw Materials

All Raw Materials Supplied by Mobil.

II. Utilities - Per Batch

1.	Electricity 600 kwh @ 2.5¢/kwh	$15.00
2.	Steam 17,000# @ 1.00/m#	17.00
3.	Refrigeration 1.5×10^6 btu x .033¢/m btu	50.00
4.	Cooling Water 10,000 gals. @ 10¢/m	1.00
5.	Tempered Water	1.00
6.	Nitrogen	.50
7.	Total	$84.50

III. Operating Labor - Per Batch

2 men/shift @ 6.00/hr (includes burden) $180.00

IV. Maintenance (Routine)

Labor 8 man hr/batch	$ 48.00
Material $30,000/yr	51.00
Maintenance Overhead	13.00
	$112.00

V. Miscellaneous Operating Expenses

1.	Supervision and Clerical	$135.00 ?
2.	Operating Materials	8.00
3.	Laboratory 0.5 Technician/Batch	26.00
		$169.00

VI. Administrative Overhead

1.	General Works Expense	$ 85.62
2.	Depreciation $350,000 - 8 year. S.L.	74.91
3.	Interest $350,000 - 18 mo @ 12%	71.26 12?
		$231.79

VII. Contingency 10% $77.73

$855.02

VIII. Cost per # @ 500,000 #/mo & 80% Operating Factor (10,417 #/batch)

$$\$/\# = \frac{855.02}{10417} = 0.0821$$

EQUIPMENT REQUIREMENTS - MOBIL NITRATION - REVISED

I. Vessels

1. 97% Nitric Acid Day Tank..... $1,500
   300 gals. 304 ss
2. 98% Sulfuric Acid Day Tank..... 1,000
   600 gals. cs
3. EDC Day Tank 3,000
   2,500 gals. cs
4. Reactor 15,000
   3,000 gals. 316 ss Atmospheric
   w/ 15 hp Turbine Agitator
5. Extraction Tank 8,000
   2,000 gals. 316 ss
   w/ Agitator
6. Spent Acid Hold Tank 5,000
   8,000 gals. cs
7. $(NH4)_2 SO_4$ Waste Hold Tank..... 5,000
   5,000 gals. cs
8. Product Still/EDC Stripper 8,000
   3,000 gals. 316 ss Full Vacuum Rated

9. Ejector Hot Well ..... $ 1,000

500 gals. cs

10. Product Surge Tank 3,000

2,000 gals. cs w/Steam Coil or Jacket

$50,500

II. Heat Exchangers

1. Reactor Cooler $16,000

600 ft^2 316 ss Tube cs Shell

2. Still Heater 10,000

400 ft^2 304 ss 75 psig Shell Side

3. Still Condensers

A. 100 ft^2 cw condenser 3,000

cs Full Facuum Rated

B. 100 ft^2 Brine Tail Condenser..... 3,000

cs Full Vacuum Rated

$32,000

III. Pumps

0. Waste Pumps (2 - 100 gpm) ..... $ 3,000

1. 97% HNO_3 Feed Pump - Metering Type Pump - 0-2 gpm.. 1,200

2. 98% H_2SO_4 Feed Pump - Metering Type Pump - 0-3 gpm. 1,200

3.	EDC Day Tank Pump - 40 gpm @ 80' - 2x1 cs	$ 1,200
4.	Reactor Circulation Pump - 500 gpm @ 130' - 4x3 316 ss	4,000
5.	Reactor Phase Separation Pump - 20 gpm @ 60' - 1½x1 316 ss	1,500
6.	Extraction Tank Pump - 40 gpm @ 80' - 2x1 316 ss ..	1,600
7.	Still Circulation Pump - 250 gpm @ 120' - 3x2 316 ss	2,500
8.	Product Surge Tank Pump - 100 gpm @ 100' - 3x1½ cs	2,000
		$18,200

IV. Miscellaneous

1.	Vacuum System	$3,500
	2-Stage - Non-condensing Steam Ejector Set	
2.	In-Line Static Mixer	4,000
		$7,500

V. Total Equipment $108,200

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR • MEMPHIS, TN 38137 • 901-767-6851 • TELEX 53927

March 17, 1976

MEMO

TO: Bill Shackelford

FROM: Bob Fabian RMF

Subject: Mobil Nitration Manufacturing Costs

Per our conversation, please submit to this office actual Mobil Nitration manufacturing costs on a monthly basis covering the production from start-up through March 31, 1976. As discussed with John Miles, it would be best if this were done on the format for manufacturing costs elements presented in our capital management program. This information is for our internal review and use, and will hopefully produce better estimates in the future. Can you complete this by April 15?

Also regarding Mobil Nitration, Don Faggert asked me today if Tuesday, March 23 would be acceptable for him to visit Eagle River and review operation to date per the contract. I told him this would be okay since I feel we must complete this item.

RMF/gn

cc: R. A. Guidi
Vertac Consolidated

J. Miles
Eagle River Chemical Co.

Phone: (501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

February 23, 1976

Mr. Don Faggert
Mobil Chemical Company
P.O. Box 26683
Richmond, Virginia 23261

Dear Don,

In confirmation of my phone call of February 12, we would like to meet on Thursday, March 11, to discuss and set yields for NBE production as per Section 8 of the contract. The meeting will be at Eagle River Chemical Corp.

Thank you,

John H. Miles
Production Superintendent

JHM:rvk

CC: Bob Fabian/Ray Guidi
J.W. Shackelford
George F. Mather

Phone: (501) 572-3701

P. O. Box 2648

Eagle River Chemical Corp.

Highway 242

WEST HELENA, ARKANSAS 72390

September 29, 1976

Mr. John O'Neill
Vertac Consolidated
Suite 2414 Clark Tower
5100 Poplar Avenue
Memphis, Tenn. 38137

Dear John:

Attached you will find a proposal for the Mobil NBE expansion directed to Don Faggert for your review, comment, and signature. For your backgroud a 7/30/76 NBE cost curve workup provided for Bob Fabian on the existing operation and a 9/22/76 "family of curves" for expanded cases is provided. I believe the 7/30/76 cost curve work-up may be a more "optimum" basis for contract negotiation than the new budgets being prepared at Eagle River. In any case, I have copied John Miles & Mike McKellar for their input.

John, I think we have a strong case here and we need to not delay our proposal to Mobil too much longer. I welcome the opportunity to review this package with you and other interested parties. If you don't care for the "style" of the proposal prose, have at it!

Sincerely,

George F. Mather

George F. Mather

GFM/br

Attachment

cc: Bill Shackelford
John Miles
Sil Lutkewitte
Mike McKellar
George Mather
Dicky Hill

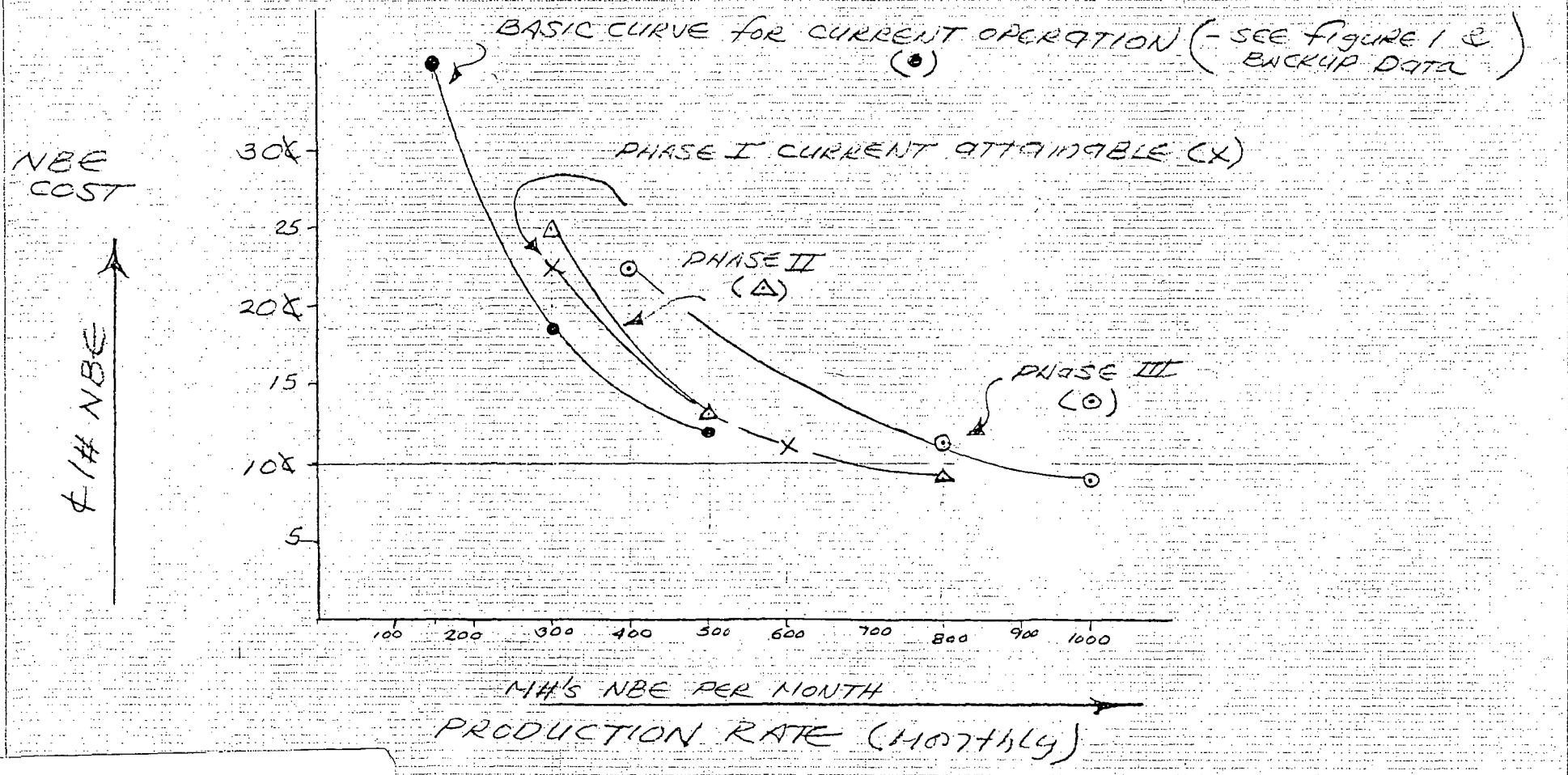
K+E 20 X 20 TO THE INCH 46 1200
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

FIGURE-2

MOBIL NITRATION COST CURVES

9/22/76 gf

COST VS PRODUCTION VOLUME



additional cost curves

(assumes cost scale to # of operators)

(I) PHASE I — 600 MLBS = 100% capacity

factor $\frac{9}{8}$ operators

TIMES all expenses DIVIDED

By PRODUCTION VOLUME

BASIC COST CURVE =

600 MLBS = 500 MLBS X $\frac{\$.1194}{\#}$ = \$59.7M X $\frac{9}{8}$ ÷ 600 = \$.1119/#

300 MLBS = " " = " " 300 = \$.2238/#

(II) PHASE II — 800 MLBS = 100% capacity

factor $\frac{10}{8}$ operators TIMES

all expenses DIVIDED

By PRODUCTION VOLUME

BASIC COST CURVE =

800 MLBS = 500 M# X \$.1194 = \$59.7M X $\frac{10}{8}$ ÷ 800 = \$.0933/#

600 MLBS = " " " " 600 = .1243/#

(III) Phase III — 1000 MLBS = 100% capacity

factor $\frac{12}{8}$ operators TIMES

all expenses DIVIDED By

PRODUCTION VOLUME

BASIC COST CURVE

1000 MLBS = 500 M# X \$.1194 = \$59.7M X $\frac{12}{8}$ ÷ 1000 = \$.0896/#

800 MLBS = " " = " " ÷ 800 = \$.1119/#

— MAXIMUM PROFIT

PROFIT @ CAPACITY AT EACH LEVEL
(COST PER LB PER 9/22/76 CURVE)

PHASE I

(16¢ — 12¢) = 4¢/# X 600M #'s/MT = $24M X 12 = $288M/YR
2 proposed fee

on $600M INVESTMENT

PHASE II

(15¢ — 9¢) = 6¢/# X 800M #'s/MT = $48M X 12 = $576M/YR
2 proposed fee

on $450M INVESTMENT

($288M incremental profit on $150M capital)

PHASE III

(14¢ — 8.5¢) = 5.5¢/# X 1000M #'s/MT = $55M X 12 = $660M/YR
2 proposed fee

on $1050M INVESTMENT

($372M incremental profit on $450 capital)

— ACTUAL PROFIT WILL OF COURSE depend on actual volume

VERTAC CONSOLIDATED
A MEMBER OF THE VERTAC GROUP
SUITE 2414 • 5100 POPLAR • MEMPHIS, TN 38137 • 901-767-6851 • TELEX 53927

September 29, 1976

Mr. Don Faggert
Mobil Chemical Company
P. O. Box 26683
Richmond, Virginia 23261

Dear Don:

We are pleased to submit our proposal for expanded Mobil Nitration capacity by the VERTAC companies. We offer a staged or three phase NBE expansion at Eagle River which provides Mobil and VERTAC outstanding flexibility and reliability. Briefly the final expansion phase calls for parallel nitration reactors, increased raw material storage capability, parallel or spared refrigeration and cooling water systems, and a semi-continous stripper mode. Table I outlines the three levels of expansion, their respective capacities, their additional capital and operating expenses, and each detailed mode of expansion. For your reference, current operation is also included.

In Phase I (also referred to as currently attainable), 600 MLBS NBE per month capacity is provided for $50M capital cost and an additional operator on day shift. The capital will provide improved materials of construction on selected piping systems, an EDC storage tank, and pH control for ammonia addition. As indicated in previous communications EDC storage and pH control have good payback potential for Mobil (12 months for EDC storage and 4 to 6 months for pH control). The main thrust of this expansion level is fine tuning of existing operation, stream factor, and raw and waste material logistics.

In Phase II, 800 MLBS NBE per month capacity is provided for an additional $150M capital cost and an additional operator on swing shift. Here, capital provides for an additional 3.5 M gal SS reactor to allow separate phase separation and neutralization, thus freeing the present reactor for more nitrations. Also, additional CBE storage (20M gal) and a parallel or spared cooling tower is provided. The main thrust of this expansion level is additional capacity with minimum capital but an eye for still further production increases.

In Phase III, 1000 MBLS per NBE per month capacity is provided for an additional $250 M capital cost and an additional operating spot (includes previous operators added). Here capital provides a completely parallel dual nitration reactor capability, NBE storage, enlarged spent acid/ammonium sulfate waste storage tanks, crude NBE/EDC storage and a semi-continous stripper. Last but not least, a parallel or spared refrigeration unit is provided for utility capacity and reliability. For further details on the expansion, refer to modified P & ID Drawings and Table II capital cost items. Construction timing for the three expansion levels is approximately 45 days, 60 days, and 90 days respectively after approval.

In addition to the above, VERTAC can provide assurances of "second site" production capability at the idle Vicksburg Chemical nitration facility should extraordinary problems develop at Eagle River.

For the staged expansion, VERTAC proposes the following toll conversion fees:

(1) Continued payment by Mobil at 16¢/lb NBE thru Phase I (600 Mlbs/mt capacity).
(2) Graduated payment by Mobil at 15¢/lb NBE thru Phase II (800 Mlbs/mt capacity) & 14¢/lb NBE thru Phase III (1000 Mlbs/mt capacity).
(3) Payment at 18¢/lb NBE at all levels below the respective cost break even point. VERTAC is prepared to present cost curves for all three phases plus current operation to establish this break even point.
(4) Prepayment of all required capital by Mobil with a fee adjustment schedule.
(5) The only other contract changes required would be sufficient guarantees of continued production.

As one final point we call your attention briefly to a record of proven product quality & yield performance. In part to put this in perspective, Table III summarizes year to date yield saving in the Mobil NBE unit at Eagle River.

Please feel free to contact George Mather or me directly on our proposal.

Sincerely,

John J. O'Neill

Attachments

cc: Sil Lutkewitte (w/o drawings)
Bill Shackelford (with drawings)
John Miles (" ")
Dicky Hill (" ")
Mike McKellar (w/o drawings)
George Mather (with drawings)

TABLE I

MOBIL NITRATION (NBE) EXPANSION

LEVEL OF EXPANSION	MONTHLY CAPACITY MLBS	ANNUAL CAPACITY MMLBS	CAPITAL * REQ'D $M	ADDITIONAL** EXPENSES	REMARKS
CURRENT	450	+5	none	none	Unit requires shakedown at higher production levels (sustained). Batch cycle times well documented.
CURRENT ATTAINABLE	600	+7	0-50	add operator on days for tank trucks	Replace selected CS piping and pumps with SS items. Requires slight increase in batch size and high stream factor. pH control of NH_3 & EDC storage recommended but not essential.
I	800	+9	150-200	add operator on swing shift for tank trucks	Requires additional 3.5M gal SS reactor to allow separate phase separation & neutralization thus freeing nitration reactor. Add additional CBE storage. Add second cooling tower.
II	1000	12	250-450	add third operator spot add day production supervisor for Mobil unit	Requires conversion of 3.5 M gal SS reactor (per above) to nitration service including two acid meas. bottles & their pumps, weigh cell & reactor interlocks, heat exchanger for reactor cooling etc.. Add NBE storage tank, enlarge spent acid & am. sulfate storage all to 20M gal. Add building structure & roof annex for reactor. Add second refrigeration unit. Convert NBE storage (current) to crude NBE/EDC surge. Feed stripper semi-continous "ala" Mobil NBE process from this converted tank.

* Low capital range value represents minimum capital for that phase only. High capital range value represents total capital thru each phase (i.e. total capital thru Phase III is $450M).

** Represents 9 operators Phase I, 10 operators Phase II, & 12 operators Phase III.

01197-1 (3-44)
Printed in U.S.A.

TABLE II
MOBIL EXPANSION

	INSTALLED COST	REMARKS
1. pH control for NH_3 addition	$ 5M	Uniloc type pH probe & transmitter/controller & control valve/SS tubing with valves, flush points, strainer etc.
2. EDC storage 20M gal CS with pump	20M	Tank +$6M plus pump $1M, concrete foundation, piping, level instrumentation cons. vent & flame arrestor.
3. Piping & Equipment revisions	25M	Replace CS process pumps with SS. Replace CS piping in EDC system, stripper vent, system etc.
TOTAL	50M Phase I	
4. Add reactor 3.5 M SS with transfer pump	75M	Base reactor $20-30M per J. E. Fowler, Times 3 for foundation, aqua NH_3 & process piping, electrical etc. Include weigh cell & base structural.
5. CBE storage 20M gal CS with pumps	25M	Ditto above item 2 plus cost of panelcoil (STM heated) & insulation.
6. Cooling tower	50M	Installed cost plus pumps by new or good shape used Marley Model 453-201 or similar ($24M~1/30/75).
TOTAL	150M Phase 2	
7. Acid feed tanks & pumps	20M	Two small 1Mgal CS (H_2SO_4) & aluminum (HNO_3) acid feed tanks with small (ECO) metering pumps ($5M times 4)
8. Enlarge Spent Acid & Am. sulfate storage	15M	Add CS rings to go from 10 Mgal to 20M gal in the field (Materials $7M & labor $8M)
9. Reactor Heat Exchanger & large circulating pumps	40M	Heat Exchanger (10M), pump $6M Bare Cost
10. NBE Storage 20Mgal CS with pump	25M	Ditto 5
11. Building Structure & roof	35M	Structural steel for additional large bay & roof (transite) to house new reactor, acid feed system reactor heat exchanger & refrigeration.
12. Refrigeration	100M	150M ton new or good used (J.E. Fowler $30M similar unit prod. 21—$65 new unit 1/30/75 quote).
13. Modify stripper for semi-continous operation & other minor changes	15M	Revise piping, add level instrument or weigh cell to stripper.
TOTAL	250M Phase 3	
TOTAL EXPANSION	$450M	

TABLE III

ESTIMATED YEAR TO DATE SAVINGS ON RAW MATERIALS TO MOBIL FOR UNDER CONSUMPTION

1.	CBE @~ $2.00/lb		
	(2,278,416 lb NBE)(.008 lbs CBE/lb NBE)(2.00)	=	$ 36,455
2.	HNO_3 @~ $190/ton		
	$(2,278,416)(.025)(\frac{190}{2000})$	=	5,411
3.	H_2SO_4 @~ $60/ton		
	$(2,278,416)(.025)(\frac{60}{2000})$	=	1,709
4.	EDC @~ 15¢/lb		
	(2,278,416)(.025)(.15)	=	8,544
5.	NH_3 @ ~ $125/ton		
	$(2,278,416)(.006)(\frac{125}{2000})$	=	854
6.	TOTAL		$ 52,973

7. $50,000 X 12/8 = $75,000 per year

or about 1.5 - 2.5 ¢/lb NBE