

George E. Hopkins

VISTA

To RDH

Date 5/27/87

Just noted entry in Houston
weekly progress report that
a fee of \$ 2,500 is now
charged for filing PMN's.
May need to add to ~~BFG~~
Heavy Ends to BFG economics
for "white paper".

GEH

CWH 000008376

2MN issue
on BFG
option
do we need
to address
in this letter?
Is there a cont for it?

Please review:

CC: RAC, PEM, MLA, GEN, WPS, SCR, SUC, PLF
NLN, GWB, ERT

Is there a
potential of BFG
connecting to an
O₂-based oxy?

How quickly
could we
get approved
to incinerate
heavy ends at
CWH or P
Rollins?
Or do they
have capability
what is the
cost?

May want to
itemize reasons
for recommendation
1. Economics
2. Two outlets
instead of
one.
3. No impact on
incinerators
There is still a
risk on stream
factor if one
defaults.

reducing risk
and eliminating
impact of
heavy ends on
incinerators
stream factor
or operation.

This urgency is

What are the
appropriate
steps?
Plant review
and planning

TO: R.A. Conrad
FROM: R.D. Hillman, S.V. Corkran, and G. ^WB. Bacon (FED)
DATE: May 22, 1987
SUBJECT: Heavy Ends Disposition White Paper

Possibly add
Appendix with
① Vulcan tour
report
② BFG catex
meeting rep.
③ GEN file
on catex
vs RPL
economic
④ Other it

Attached are the results and recommendations from the study made to examine the ~~proposed~~ options for the disposition of the heavy ends material produced at the VCM Plant as a by-product in the manufacture of EDC and VCM. Several options were examined with the majority of the time spent examining options which involved sending the heavy ends to PPG, as is currently done, sending the heavy ends to BFG in La Porte, Texas, and the use of the VCM Plant incinerators to burn the heavy ends.

The results of this study indicate that the most desirable solution to the heavy ends disposition problem would be the option of continuing to send about one-half of the material to PPG and to negotiate a contract with B.F. Goodrich in La Porte in which BFG would agree to take the remaining material for use as feedstock for their CATOXID Unit. This solution (with a NPV of \$92-98M relative to the current practice), would be more economical than ~~both~~ the current practice of sending the material to PPG or permitting and revising the VCM Plant incinerators to burn the heavy ends (with an NPV of -\$171-380M relative to the current practice).

This option would provide Vista with two disposition options, thereby while not having a possible affect on the stream factors of the VCM Plant or its incinerators. There would be no increase in the risk of possibly increased regulation or enforcement measures applied to the incinerators which could result if the number of incinerator bypasses and stack exceedances, which could be increased by burning heavy ends, increases sufficiently to draw action by regulatory actions. as soon as practicable.

A decision must be made to determine which of the options discussed in the attached document ~~should be made as soon as is practicable~~ due to the existing deadlines which ~~would~~ apply to the permitting process of the incinerators. A complete permit application ~~should~~ ^{will} be submitted by August 8, 1987 to ensure that the complete permitting process can be completed by November 8, 1988. Even now the timing is such that it would be difficult to complete the time consuming and expensive permitting process in time to meet the existing deadline which was imposed by Congress. If the permitting process is not completed (permit in hand) by the November 8, 1988 deadline, Vista would lose interim status and would have to cease burning heavy ends until the permit is approved. An alternate disposition option would then be required for the interim period.

CWH 000008377

Please review the attached document and initiate the appropriate steps which are required to have the disposition

decision made in the required time frame. If you have any questions, please contact us.

Richard D. Hillman
Process Engineer

Sandra V. Corkran
Process Engineer

Graham W. Bacon
PED Engineer

cc: PEM,GEH,WPS,MLA,SCR,PLF,HLH,MGH,ERT
WLM,JCL,GWB,CRM,JDZ

CWH 000008378

*Suggest
Table of Contents*

1000

HEAVY ENDS DISPOSITION OPTIONS

SUMMARY

A study was made to examine several proposed options to provide for the disposition of the heavy ends material produced at the VCM Plant as a by-product in the manufacture of EDC and VCM. The objective was to determine whether the VCM Plant incinerators should be permitted to burn the heavy ends, which would be classified as a hazardous waste material. This decision is required at this time since ~~currently~~ the VCM Plant ~~has~~ ^{currently} interim status for burning hazardous waste in the incinerators but in order to retain approval to do so a complete RCRA Part 2 permit application, along with a test burn plan should be submitted by August 8, 1987. This is the expected latest date that would allow sufficient time to complete the permitting process by the November 8, 1988 deadline set by Congress in the RCRA Amendments of 1984. If this deadline is not met, then Vista would lose the option of burning heavy ends in the VCM Plant incinerators until a complete reapplication could be submitted and approved. An alternate disposition option would have to be utilized during this interim period since Vista would have to cease burning heavy ends once the interim status ~~is~~ ^{is lost}.

The following options were examined :

CWH 000008379

- Option 1 - Continue to send the heavy ends to PFG without a signed contract, possibly negotiating for a lower cost and a signed contract in the future.
- Option 2 - Obtain a contract with B. F. Goodrich to have them process the heavy ends material in their La Porte CATOXID Unit to recover the chlorine as HCl which is fed to their Oxychlorination Unit to produce EDC while generating high pressure steam.
- Option 3 - Obtain a contractual agreement with B. F. Goodrich and approval from PFG which would allow Vista to send approximately the same amount of heavy ends to both plants. This would provide two disposition options thereby making Vista less dependent upon one industry for the disposition of heavy ends, would allow for price negotiations with PFG, and would likely result in cost savings for Vista.
- Option 4 - Permit the VCM Plant incinerators to burn heavy ends and perform the required revisions to allow for this operation.
- Option 5 - Permit and construct a new hazardous waste incinerator to burn heavy ends at the VCM Plant.
- Option 6 - Commercial incineration of all heavy ends by participation in a take-or-pay arrangement with a company such as Chemical Waste Management or Gulf Coast Waste Disposal Authority.
- Option 7 - Negotiate an arrangement with Georgia Gulf in developing a process similar to the CATOXID Process of B. F. Goodrich, possibly building such a process unit at or near the VCM Plant.

The results of this study indicate that the best option would be Option 3: Continue to send heavy ends material to PPG while negotiating a contract with B. F. Goodrich and then to split the shipments of heavy ends material between the two companies. This would provide two disposition options and would allow for future price negotiations. It should also provide for an annual savings of about \$30M relative to the current cost of sending all of the material to PPG. This option would also provide a minimum of two to three years in which other options, such as the Georgia Gulf process, could be examined or developed.

There is also a choice to be made concerning the mode of transportation utilized for transporting the heavy ends to the BFG Plant in La Porte. The NPV (relative to the PPG option) for both rail transportation and trucking by Vista Transportation are about \$90M. No capital revisions would probably be required for the trucking option while the revisions required at the VCM Plant to allow for railcar loading of heavy ends, including loading rack revisions (minor) and the required secondary containment would cost about \$50M. ^{much less} The deciding factor ^{incurred by} However, should be the reduced risk ^{of} of a serious exposure incident which would be ~~attributed to~~ rail shipments ^{of} of the heavy ends relative to the use of trucks. This factor should ^{be} more than sufficient to warrant the use of rail transportation for this material.

shown by

Suggest each option discussion start on a new page.

HEAVY ENDS DISPOSITION OPTIONS

~~XXXXXXXX~~

CWH 000008380

OPTION 1 - CONTINUE TO SEND HEAVY ENDS TO PPG

Currently Vista sends all of its heavy ends to PPG where some of the material is recovered in one of their solvent processes and the remaining material is incinerated. There is no signed contract and future environmental regulations or changes in the solvent market could result in PPG refusing to accept the Heavy Ends upon a sixty-day notification. ^{Presently} this would leave Vista with no other disposition option except for commercial incineration which has an estimated \$4-7 million annual cost.

would this be immediate?

Currently Vista pays about \$333,500 annually to send about 11.4 million pounds of Heavy Ends to PPG. This material is shipped by truck and each shipment must be shipped under a hazardous waste manifest and can be refused for various reasons, (such as difficulty unloading due ^{to} high solids content). Each of these refusals necessitates state and ~~federal~~

would still like a column showing expected capital req'd and extra ~~value~~ (savings) expected relative to base case.

OPTION	DESCRIPTION	NET PRESENT VALUE * (M)	MAJOR ADVANTAGES	MAJOR DISADVANTAGES
1	SEND HEAVY ENDS TO PFG	0	1. NO CAPITAL COSTS 2. NO INCINERATOR MODIFICATIONS 3. NO STREAM FACTOR EFFECTS	1. RISK OF LOSS OF OPTION 2. ANNUAL COST OF \$2200/YR 3. VISTA DEP. ON OUTSIDE DISPOSITION
2	SEND HEAVY ENDS TO BFG	195-220	1. SMALL CAPITAL COST (PFGM) 2. GUARANTEED DISP. OPTION 3. NO STREAM FACTOR EFFECTS	1. ANNUAL COST OF \$240-250M/YR 2. VISTA DEP. ON OUTSIDE DISPOSITION 3. LOSS OF PFG VOLUME
3	SEND H.E. TO PFG & BFG	93-98	1. PROVIDES TWO DISPOSITION OPTIONS 2. SMALL CAPITAL COSTS (PFGM) 3. NO STREAM FACTOR EFFECTS	1. ANNUAL COST OF \$290M/YR 2. VISTA DEP. ON OUTSIDE DISPOSITION 3. LOSS OF PFG VOLUME
4	RCRA PERMIT INCINERATORS	-171-380	1. IN-PLANT DISPOSITION OF H.E. 2. SOME RECOVERY OF CHLORINE VALUE	1. INITIAL COST OF \$4500M 2. PERMITTING COST AND TIMING 3. INCREASED ENVIRONMENTAL RISKS
5	NEW HAZ. WASTE INCIN.	-5000-10000	1. IN-PLANT DISPOSITION OF H.E. 2. SOME RAW MATERIAL RECOVERY 3. CAN HANDLE OTHER WASTE	1. HIGH COST - \$5-10MM 2. INCREASED ENVIRONMENTAL RISKS 3. NO INTERIM DISPOSITION REQUIRED ^{REQUIRED}
6	COMMERCIAL INCINERATION	-7000-9000	1. NO STREAM FACTOR EFFECTS 2. GUARANTEED DISPOSITION OPTION 3. NO CAPITAL COSTS	1. HIGH COST - \$7-9MM/YEAR 2. VISTA TIED INTO AGREEMENT 3. NO INTERIM DISPOSITION OPTION ^{REQUIRED}
7	GEORGIA GULF PROCESS	UNKNOWN	1. POSSIBLY PROFITABLE OPTION 2. POSSIBLY IN-PLANT DISPOSITION 3. ELIMINATES HAZ. WASTE DESIGNATION	1. FEW DETAILS AVAILABLE CURRENTLY 2. NO INTERIM DISPOSITION OPTION ^{REQUIRED}

* RELATIVE TO THE CURRENT BASE CASE OF SENDING HEAVY ENDS TO PFG - NPV = \$-1.2MM

CWH 000008381

notification in which the reason for refusal is given along with what was done to correct the problem.

It should be noted that the actual cost of heavy ends to Vista, including the raw material value, processing costs, and the disposition costs is currently about \$1.9MM/year. This indicates directionally the best use of ~~any~~ capital expenditures would be ~~involved in reducing~~ the amount of heavy ends ~~which are~~ produced. ^{to}

Cost
Summary
Table.

ADVANTAGES

1. No need for permitting or modifications to the VCM Plant incinerators.
2. No potential effect on the stream factor of the VCM Plant or the incinerators.
3. No capital modifications required.

↑ would be if PPG defaulted.

DISADVANTAGES

1. Risk of having to resort to commercial incineration or other option upon sixty-day notification by PPG of refusal of heavy ends due to changes in either environmental regulations or solvent market conditions.
2. Vista would still be dependent upon another company, ^{as PPG producer,} for the disposition of heavy ends.
3. Cost - Vista pays about \$383,000 per year for sending heavy ends to PPG.
4. Heavy ends sent to PPG must be treated as hazardous waste and each shipment must be manifested and is subject to all hazardous waste shipping regulations.
5. No recovery of the raw material or energy value of the heavy ends by Vista.

CWH 000008382

OPTION 2 - B. F. GOODRICH CATOXID PROCESS

B. F. Goodrich has developed a CATOXID Process which uses a fluidized catalytic bed reactor to oxidize chlorinated hydrocarbon feed streams to HCl, water, and nitrogen oxides which are then fed to their air-based Oxychlorination reactors to be used in the production of EDC. They have a CATOXID Unit in operation at their La Porte, Texas facility and have presented Vista with a terms proposal in which they would agree to accept up to 12 million pounds of heavy ends per year for a charge of \$25 per ton.

of heavy ends disposition for a minimum of three years with less chance of being affected by future environmental regulations or solvent market conditions which would cause PFG to shut down the solvent process in which they utilize some of the heavy ends material.

DISADVANTAGES

a competing VCM producer,

1. Vista would still be dependent upon another company[^] for disposition of the heavy ends and would not recover any of the chlorine value in the heavy ends.
2. Increased expense and risk involved in shipping the heavy ends to La Porte, Texas although these would be minimized by the use of railcars instead of trucks.
3. Cost - Vista would still have to pay about \$227,000 annually for the disposition of the heavy ends.
4. Risk of having PFG arrange for another company to supply heavy ends material to fill the gap left by the heavy ends sent by Vista to BFG, thus eliminating a disposition option for that fraction of Vista heavy ends.

OPTION 3 - ARRANGE TO DIVIDE THE HEAVY ENDS BETWEEN PFG AND BFG

This option would involve negotiations with both PFG and BFG to reach an agreement with the two companies ^{such that} the shipments of heavy ends could be split between them. Provisions should be made which would allow the amount sent to each of them to be varied ^{changing operations} to meet current conditions. The most economical split would be to maximize the amount of heavy ends ~~being~~ sent to BFG while maintaining a share of PFG's demand. The PFG share should be maintained in order to prevent PFG from arranging for another company to fill the gap left by having Vista send heavy ends to BFG.

PFG will still fill a gap, it will just be a smaller gap. Need to rephrase accordingly. Basically we are spreading the risk, sort of like a stock mutual fund.

ADVANTAGES

CWH 000008384

Cost Summary Table

1. Provides for two ~~options~~ ^{outlets} for the disposition of heavy ends.
2. Yearly cost is about \$33M less than the current option with a NPV of

\$90-\$8M relative to the current option.

3. Eliminates the need to revise and permit the VCM Plant incinerators.
4. No potential effect on the stream factors of the VCM Plant or its incinerators.

Same comment on stream factor

5. Reduces the risk of having to resort to other more costly options upon short notice due to future changes in either environmental regulations or the solvent market, either of which could cause PFG to refuse the heavy ends upon a 60-day notice. [?]

for years.

6. Would provide a guaranteed option for heavy ends disposition ^{which}

This time.

7. Would not involve the tie-up of large amounts of either capital or engineering manpower.

DISADVANTAGES

*competing
both VCM producers,*

1. Vista would still be dependent upon outside companies[^] for the disposition of heavy ends.
2. Increased risk and cost involved with transporting heavy ends for further distances, although this would be minimized by the use of railcar transportation.
3. Would provide for no recovery of raw material value of heavy ends by Vista.

Since this one has so many items, would also like to see a cost and credits table itemizing capital costs, operating costs, and acid sales, etc.

OPTION 4 - RCRA Permit the VCM Plant Incinerators to Burn Heavy Ends

Currently Vista has interim status ^{it is likely} to burn heavy ends in the VCM Plant incinerators. Unless a complete permit application, including a trial burn plan is submitted by August 8, 1987, ^{including RCRA approval} this interim status will be lost. The complete permitting process must be completed by November 8, 1988 or the entire process must be repeated. The permitting process required for hazardous waste incinerators is very time consuming and is expensive. The timing is such that it would be difficult to have the required work completed in time to meet the existing deadlines.

Even if it was decided now to permit this in

Some studies and test burns have been completed to determine whether the heavy ends could be successfully burned in the VCM Plant incinerators. Previous test burns were only partially successful but John Zink representatives feel that it is possible. The major problem which would be encountered would be the need to remove essentially all of the sodium present in the heavy ends. Past studies indicate that the newly-installed static mixers in conjunction with a mesh coalescer system should lower the current sodium concentration in the heavy ends from the current level of 1000 ppm to an acceptable 10-20 ppm.

The presence of sodium in the feed to the incinerators can cause excessive fouling of the waste heat boiler tubes and severe damage to the refractory lining, requiring frequent cleaning of the tubes and possibly annual replacement of the refractory lining. Both of these would result in greater downtime for the liquid-burning incinerator which would increase the risk of having incinerator bypasses since the downtime required to replace the refractory is estimated to be three to four weeks during which time the VCM Plant would have no back-up incinerator should there be a problem with the on-line incinerator. Recent tightening of the regulations and enforcement practices pertaining to the number of incinerator bypasses and stack exceedances cause this added risk to be highly undesirable and possible costly in the future.

*Cost
Summary
Table* →

CWH 000008385

ADVANTAGES

1. This option would provide for in-plant disposition of heavy ends with no dependency upon other companies.
2. Some possible revenues from increased steam and muriatic acid

additions

production, although these revenues would be nearly negligible since the extra steam has little current value and the market for muriatic acid is nearly non-existent, especially for the low-grade acid which would be produced.

3. Savings of costs for sending heavy ends to PFG or BFG (\$227M - 383M/year).
4. Lower capital expenditure when compared to building a new hazardous waste incinerator dedicated to heavy ends (\$5-10MM).

DISADVANTAGES

1. Higher risk of incinerator bypasses and the resulting possible increased enforcement measures by environmental agencies. This increased risk is due to:
 - a) higher feed rates to the incinerator resulting in a lower tolerance for possible upsets in the vent flows and
 - b) more downtime required for more frequent maintenance including a possibly annual 3-4 week downtime required for refractory replacement (\$90M)
2. Increased maintenance cost - about \$200M per year
3. RCRA permitting costs (\$130M) and timing requirements
4. Modifications required for sodium removal (\$250M)
5. Additional incinerator instrumentation required by RCRA regulations. (carbon monoxide monitoring system and fuel shut-off controls, costing about \$80M).
6. Need for secondary containment around the heavy ends feed storage tank and feed pumps (about \$95M)
7. Risk of reducing the stream factor for both the incinerators and the VCM Plant
8. Possible capital modifications which may be required to achieve the required 99.99% destruction efficiency (not likely to be needed)
9. The VCM Plant would become a hazardous waste disposal site and subject to any applicable regulations
10. This option would involve the tie-up of a large amount of capital (about \$440M) and engineering manpower (1.5-2 manyears) which could be more profitably utilized toward reducing the amount of heavy ends being produced.

CWH 000008386

OPTION 5 - CONSTRUCT AND PERMIT A NEW INCINERATOR TO BURN HEAVY ENDS

A quick examination of the option of constructing and permitting a new hazardous waste incinerator to burn heavy ends and possibly other Vista-generated wastes indicated that this option would not be desirable at this time. If built at the VCM Plant it would cause the VCM Plant to be classified as a hazardous waste disposal site and subject to all applicable regulations. The estimated cost (\$5-10 million plus an undetermined operating cost) is not justifiable at this time.

Cost
Summary
Table

ADVANTAGES

1. Could provide capacity to process much of Vista's hazardous waste materials.
2. Would be more capable of meeting the required destruction efficiencies for all types of waste produced by Vista.
3. Would eliminate the risk of decreasing the stream factor of the VCM Plant or its incinerators

DISADVANTAGES

1. 3-5 years would be required before start-up of the new incinerator.
2. The VCM Plant would become a hazardous waste disposal site and subject to any applicable regulations and enforcement measures.
3. Estimated cost - \$5-10 million plus an undetermined operation cost.

OPTION 6 - COMMERCIAL INCINERATION OF ALL HEAVY ENDS

This option would involve Vista participating in a take-or-pay arrangement with other companies in which the expense of constructing, permitting, and operating a commercial incinerator would be shared by the companies which would send material to be incinerated. Usually the companies subscribing to the incineration services must agree to supply a certain fraction of the feed material to the incinerator or to pay the required minimum fee for processing that amount whether they send it or not.

Currently both Gulf Coast Waste Disposal Authority and Chemical Waste Management are proposing such arrangements. In the case of the Chemical Waste Management proposal the subscribers would be required to supply eighty percent of the capacity of the incinerator for a period of three to four years depending on the required payback period. After the payback period, each subscriber would have an annual right of first refusal to renew its original capacity commitment or to reduce its commitment if so desired. A similar arrangement should be available from Gulf Coast Waste Management Authority.

HASN'T Vista started on this some?

Cost
Summary
Table

ADVANTAGES

1. Secure, long-term solution to heavy ends disposition problem
2. No need to permit and revise the VCM Plant incinerators
3. No demand on Vista engineering manpower required
4. No possible effect on the stream factor of the VCM Plant

DISADVANTAGES

1. Cost - estimated to be \$7-9 million annually *required*
2. ~~No provisions for~~ interim disposal of heavy ends while the incinerator is constructed (possibly in 1990)
3. Increased risk of transporting hazardous waste further distances.
4. Increased onsite and offsite storage capacity may be required.
5. No raw material or energy recovery by Vista.
6. Vista would have to commit to a take-or-pay arrangement with the

CWH 000008387

company constructing and permitting the incineration facility with no payback or payout possibility.

OPTION 2 - NEGOTIATE AN ARRANGEMENT WITH GEORGIA GULF

Georgia Gulf has been working on developing a process similar to the CATOXID Process of B. F. Goodrich which could be of value to Vista for processing heavy ends. They ~~has~~ been some tentative contact with them and the initial impression is that they would possibly work with Vista in the development of this process. They currently ~~don't~~ have this process in operation and are probably several years away from doing so.



ADVANTAGES

1. Possible long-term solution to heavy ends disposition problem
2. Future bargaining tool for negotiating pricing and terms with both FPG and BFG
3. Might be feasible to build a CATOXID-like unit at or near the VCM Plant as either a joint venture with Georgia Gulf or by licensing the technology from Georgia Gulf and constructing the unit ourselves.
4. Possible revenues from the recovery of the chlorine and energy value of the heavy ends.

DISADVANTAGES

1. This option is still several years away from possible operation.
2. No firm commitment or proposal from Georgia Gulf is expected in the near future.
3. May not be economically feasible due to the possibly high capital expenditure required for the development and construction of this process.

CWH 000008388

ECONOMIC BASIS

Revenues

1. PFG Disposal Fee Savings - Heavy ends disposal fee costs are based on the yearly average (for the last 17 months) production rate of 11,355 MM lbs./yr of heavy ends with an average concentration of 33.15% EDC plus 1,1,2-Trichloroethane with the current pricing formula. This price was held constant for three years and then escalated at 3.5% annually.
2. PFG Transportation Charges - Transportation costs were obtained from the estimated Vista cost of \$150 per 21-ton load of heavy ends trucked to PFG by Vista Transportation. This cost was escalated at 3.5% annually.
3. Muriatic Acid Sales - The revenue from possible muriatic acid sales are obtained from the current price paid by Texas United for the muriatic acid produced currently (\$0.003501/lb). It was assumed that 35% of the chlorine in the heavy ends (assumed to be 33 wt% chlorine) was recovered as 18 wt% HCl and that 50% of this recovered HCl is purchased by Texas United. This was escalated at 3.5% annually.

4. Steam ?

COSTS

1. BFG Processing Fee - The charge by BFG for processing our heavy ends in their CATOXID Unit was obtained from their current terms proposal in which they offer to accept up to 12 MM lb/yr of heavy ends. This charge, \$25/ton, was held constant for 3 years and then escalated at 3.5% annually.
2. BFG Transportation Charges - The transportation charges for transporting heavy ends to the BFG plant in La Porte, Texas were estimated for two options:

CWH 000008389

 - (a) Railcars - The negotiated rate of \$11.40/ton plus \$20,000 for annual maintenance and lease charges was used for the option which provided for sending all of the heavy ends to BFG. For the option providing for sending only half of the heavy ends to BFG, the charge of \$11.40/ton and \$10,000 for annual maintenance and leasing was used. Both of these options involved an annual escalation rate of 3.5%.
 - (b) Trucking - The estimated Vista cost of \$400/21-ton load for trucking the heavy ends to La Porte, Texas by Vista Transportation. This charge was estimated by assuming an hourly cost of \$40/hr for the 10-hour round trip (two hours each for loading and unloading, and three hours each way for the trip). This estimate made no allowances for the possibility of higher maintenance costs, extra driver, etc. as well as increased

environmental risks incurred by transporting the heavy ends on ~~major~~ major highways longer distances.

3. Acid Neutralization Costs - It was assumed that 85% of the chlorine in the heavy ends (about 33 wt%) was recovered as HCl with 75% of the remaining 15% of the acid produced being neutralized in the caustic scrubber (75%) and the limestone pits (25%). These assumptions were originally made in a 4/28/83 memo by S.J. Reynolds. It was also assumed that 50% of the recovered HCl was neutralized in the limestone pits with the remaining 50% being sold to Texas United. The cost of the caustic (\$0.057/lb) and the limestone (\$0.0093/lb) were taken from the March, 1987 IPA sheet. These costs were then escalated at a 3.5% annual rate.
4. Electricity Costs - The electricity costs were obtained from the 237.7 MKWHR/year incremental increase (per 4/23/83 budget estimate ~~estimate~~ by S. J. Reynolds) with prices supplied by PED.
5. Incinerator Permitting Costs - The cost of permitting the VCM Plant Incinerators was obtained from estimates by Scott Environmental to M. ~~W. Cheesman~~ (\$100M for trial burn ~~preparation and conducting, data collection, etc.~~ and \$30M for the preparation of the actual permit). These costs were divided evenly between 1987 and 1988.
6. Refractory Replacement - The ^{anticipated} cost of ~~possible~~ annual (per 1/31/84 memo by J. G. Cole) replacement of the refractory walls of the incinerator being used to burn heavy ends was an order of magnitude in-plant estimate. This cost was escalated at an annual rate of 4.8%.
7. Maintenance - The annual added maintenance cost was estimated as 30% of the current annual cost (\$627M/year) plus 4% of the capital expenditure required for burning heavy ends. This amount was then escalated at an annual rate of 4.8%.
8. Sodium Removal - The cost for revisions required for removing sodium from the heavy ends (\$250M) was based on a preliminary design by J. G. Cole (5/22/84) which provided for a mesh coalescer system to be used in conjunction with a static mixer to lower the sodium level to the target level of 20 ppm. This target level was apparently chosen as the level required to reduce fouling of the waste heat boiler tubes and damage to the refractory material ~~to an acceptable level~~.
static mixer already installed?
minimize
9. Feed System Revisions - The cost of the revisions required for burning heavy ends was based on an escalated cost of a design (J.G. Cole, 7/27/80; and S.J. Reynolds, 6/6/84) to provide a circulation loop to reduce solids build-up in the Heavy Ends Storage Tank, T-405. It was assumed that the existing feed tank, feed pumps, and feed control system would be sufficient for burning all of the heavy ends. The 1987 budget included an additional \$100M for revising these components but this amount was not included in the base case.
10. Additional Incinerator Instrumentation - The cost required for the additional incinerator instrumentation required by the RCRA regulations (\$80M) was obtained from the 1987 Budget Estimate which

included a continuous carbon monoxide monitoring system along with the required shut-off controls and alarms.

11. Secondary Containment for the Feed System - The cost for the secondary containment required at the heavy ends feed tank and feed pumps was estimated at \$55M in a preliminary plant estimate.
12. Insurance and Taxes - This cost was estimated at 2% of the construction capital and escalated at 3.5% annually. (P)
13. After Tax Start-Up Cost - This cost was estimated as 63% of 5% of the construction capital costs.

CWH 000008391

VISTA CHEMICAL COMPANY
CALCULATION OF PROJECT ECONOMICS (M\$)

VERSION 12-86

BFG OPTION - 10 YR W/RAIL

01-Jan-80

Project Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Revenues													
FPG DISPOSAL FEE SAVINGS				286.20	286.20	286.20	296.22	306.58	317.32	328.42	339.92	351.82	364.20
FPG TRANSPORTATION SAVINGS				40.55	40.55	40.55	41.97	43.44	44.96	46.53	48.16	49.85	51.59
Total Revenues				326.75	326.75	326.75	338.19	350.02	362.28	374.95	388.08	401.67	415.79
Costs													
BFG PROCESSING FEE				141.94	141.94	141.94	146.90	152.04	157.38	162.88	168.58	174.48	180.58
BFG TRANSPORTATION CHARGES				84.72	84.72	84.72	87.68	90.76	93.92	97.20	100.62	104.14	107.78
Maintenance				2.00	2.10	2.20	2.30	2.41	2.53	2.65	2.78	2.91	3.05
Insurance and Taxes				1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27	1.32	1.36
Depreciation-Construction Capital				10.00	16.00	9.50	7.50	7.00	0.00	0.00	0.00	0.00	0.00
Total Costs				239.66	245.79	239.43	245.49	253.36	255.02	263.96	273.25	282.85	292.77
Taxable Income				87.09	80.96	87.32	92.70	96.66	107.26	110.99	114.83	118.82	123.02
Income Tax				32.22	29.95	32.31	34.30	35.76	39.69	41.07	42.49	43.96	45.52
After Tax Income				54.87	51.00	55.01	58.40	60.90	67.58	69.92	72.34	74.86	77.50
Operating Cash Flow				64.87	67.00	64.51	65.90	67.90	67.58	69.92	72.34	74.86	77.50
Investment													
Construction Capital	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
After Tax Startup	0.00	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Investment	0.00	0.00	51.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash Flow	-0.00	0.00	-51.58	64.87	67.00	64.51	65.90	67.90	67.58	69.92	72.34	74.86	77.50

Internal Rate of Return, % = 127
Discounted Payback Period, yrs = 3.9
Cost of Capital, % = 13%

NPV of operating cash flow = 255.74
NPV of investment, working capital = 35.74
NPV of net cash flow = 219.99

CWH 000008392

VISTA CHEMICAL COMPANY
CALCULATION OF PROJECT ECONOMICS (M\$)

VERSION 12-86

BFG ONLY 10-YEAR WITH TRUCKS

01-Jan-80

Project Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Revenues													
PPG DISPOSAL FEE SAVINGS				286.20	286.20	286.20	296.22	306.58	317.32	328.42	339.92	351.82	364.20
PPG TRANSPORTATION SAVINGS				40.55	40.55	40.55	41.97	43.44	44.96	46.53	48.16	49.85	51.59
Total Revenues				326.75	326.75	326.75	338.19	350.02	362.28	374.95	388.08	401.67	415.79
Costs													
BFG PROCESSING FEE				141.94	141.94	141.94	146.90	152.04	157.38	162.88	168.58	174.48	180.58
BFG TRUCK TRANSPORTATION CHARGES				108.15	108.15	108.15	111.93	115.85	119.90	124.10	128.44	132.94	137.59
Depreciation-Construction Capital				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Costs				250.09	250.09	250.09	258.83	267.89	277.28	286.98	297.02	307.42	318.17
Taxable Income				76.66	76.66	76.66	79.36	82.13	85.00	87.97	91.06	94.25	97.62
Income Tax				28.36	28.36	28.36	29.36	30.39	31.45	32.55	33.69	34.87	36.12
After Tax Income				48.30	48.30	48.30	50.00	51.74	53.55	55.42	57.37	59.38	61.50
Operating Cash Flow				48.30	48.30	48.30	50.00	51.74	53.55	55.42	57.37	59.38	61.50
Investment													
Construction Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
After Tax Startup	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Investment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash Flow	-0.00	0.00	-0.00	48.30	48.30	48.30	50.00	51.74	53.55	55.42	57.37	59.38	61.50

CMH 000008393

Internal Rate of Return,% = -203
Discounted Payback Period,yrs = 3.0
Cost of Capital,% = 13%

NPV of operating cash flow = 195.11
NPV of investment,working capital = 0.00
NPV of net cash flow = 195.11

VISTA CHEMICAL COMPANY
CALCULATION OF PROJECT ECONOMICS (M\$)

VERSION 12-86

BFG/PPG 10 YEAR OPTION

01-Jan-80

Project Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Revenues													
PPG DISPOSAL FEE SAVINGS				143.10	143.10	143.10	148.11	153.29	158.66	164.21	169.96	175.91	182.10
PPG TRANSPORTATION SAVINGS				20.28	20.28	20.28	20.98	21.72	22.48	23.27	24.08	24.92	25.80
Total Revenues				163.38	163.38	163.38	169.09	175.01	181.14	187.48	194.04	200.83	207.90
Costs													
BFG PROCESSING FEE				70.97	70.97	70.97	73.45	76.02	78.69	81.44	84.29	87.24	90.29
BFG RAIL TRANSPORTATION CHARGES				42.36	42.36	42.36	43.84	45.38	46.96	48.60	50.31	52.07	53.89
Maintenance				2.00	2.10	2.20	2.30	2.41	2.53	2.65	2.78	2.91	3.05
Insurance and Taxes				1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27	1.32	1.36
Depreciation-Construction Capital				10.00	16.00	9.50	7.50	7.00	0.00	0.00	0.00	0.00	0.00
Total Costs				126.33	132.46	126.10	128.20	131.96	129.37	133.92	138.65	143.54	148.59
Taxable Income				37.05	30.92	37.28	40.89	43.05	51.77	53.56	55.39	57.29	59.31
Income Tax				13.71	11.44	13.79	15.13	15.93	19.16	19.82	20.49	21.20	21.94
After Tax Income				23.34	19.48	23.49	25.76	27.12	32.62	33.74	34.90	36.09	37.36
Operating Cash Flow				33.34	35.48	32.99	33.26	34.12	32.62	33.74	34.90	36.09	37.36
Investment													
Construction Capital	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
After Tax Startup	0.00	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Investment	0.00	0.00	51.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash Flow	-0.00	0.00	-51.58	33.34	35.48	32.99	33.26	34.12	32.62	33.74	34.90	36.09	37.36

CWH 000008374

Internal Rate of Return,% = 65
Discounted Payback Period,yrs = 4.8
Cost of Capital,% = 13%

NPV of operating cash flow = 128.37
NPV of investment,working capital = 35.74
NPV of net cash flow = 92.63

VISTA CHEMICAL COMPANY
CALCULATION OF PROJECT ECONOMICS (M\$)

VERSION 12-86

BFG/PPG 50/50 10 YR SPLIT W/TRUCKS

16-May-87

Project Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Revenues													
PPG DISPOSAL FEE SAVINGS				143.10	143.10	143.10	148.11	153.29	158.66	164.21	169.96	175.91	182.10
PPG TRANSPORTATION SAVINGS				20.28	20.28	20.28	20.98	21.72	22.48	23.27	24.08	24.92	25.80
Total Revenues				163.38	163.38	163.38	169.09	175.01	181.14	187.48	194.04	200.83	207.90
Costs													
BFG PROCESSING FEE				70.97	70.97	70.97	73.45	76.02	78.69	81.44	84.29	87.24	90.29
BFG TRANSPORTATION CHARGES				54.07	54.07	54.07	55.96	57.92	59.95	62.05	64.22	66.47	68.79
Depreciation-Construction Capital				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Costs				125.04	125.04	125.04	129.41	133.94	138.64	143.49	148.51	153.71	159.08
Taxable Income				38.34	38.34	38.34	39.68	41.07	42.50	43.99	45.53	47.12	48.82
Income Tax				14.19	14.19	14.19	14.68	15.20	15.72	16.28	16.85	17.43	18.06
After Tax Income				24.15	24.15	24.15	25.00	25.87	26.77	27.71	28.68	29.69	30.76
Operating Cash Flow				24.15	24.15	24.15	25.00	25.87	26.77	27.71	28.68	29.69	30.76
Investment													
Construction Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
After Tax Startup	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Investment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash Flow	-0.00	0.00	-0.00	24.15	24.15	24.15	25.00	25.87	26.77	27.71	28.68	29.69	30.76

CUM 000008395

Internal Rate of Return,% = -203
Discounted Payback Period,yrs = 3.0
Cost of Capital,% = 13%

NPV of operating cash flow = 97.57
NPV of investment,working capital = 0.00
NPV of net cash flow = 97.57

VISTA CHEMICAL COMPANY
CALCULATION OF PROJECT ECONOMICS (M\$)

VERSION 12-86

BFG ONLY THREE YEAR OPTION

01-Jan-80

Project Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Revenues													
PPG DISPOSAL FEE SAVINGS				286.20	286.20	286.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PPG TRUCK TRANSPORTATION SAVINGS				40.55	40.55	40.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Revenues				326.75	326.75	326.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs													
BFG PROCESSING FEE				141.94	141.94	141.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BFG RAIL TRANSPORTATION CHARGES				84.72	84.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maintenance				2.00	2.10	2.20	2.30	2.41	2.53	2.65	2.78	2.91	3.05
Insurance and Taxes				1.00	1.04	1.07	1.11	1.15	1.19	1.23	1.27	1.32	1.36
Depreciation-Construction Capital				10.00	16.00	9.50	7.50	7.00	0.00	0.00	0.00	0.00	0.00
Total Costs				239.66	245.79	154.71	10.91	10.56	3.72	3.88	4.05	4.23	4.41
Taxable Income				87.09	80.96	172.04	-10.91	-10.56	-3.72	-3.88	-4.05	-4.23	-4.41
Income Tax				32.22	29.95	63.66	-4.04	-3.91	-1.37	-1.44	-1.50	-1.56	-1.63
After Tax Income				54.87	51.00	108.39	-6.87	-6.65	-2.34	-2.44	-2.55	-2.66	-2.78
Operating Cash Flow				64.87	67.00	117.89	0.63	0.35	-2.34	-2.44	-2.55	-2.66	-2.78
Investment													
Construction Capital	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
After Tax Startup	0.00	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Investment	0.00	0.00	51.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash Flow	-0.00	0.00	-51.58	64.87	67.00	117.89	0.63	0.35	-2.34	-2.44	-2.55	-2.66	-2.78

CUM 000008396

Internal Rate of Return, X = 127
Discounted Payback Period, yrs = 3.9
Cost of Capital, X = 13%

NPV of operating cash flow = 129.82
NPV of investment, working capital = 35.74
NPV of net cash flow = 94.08

JISTA CHEMICAL COMPANY
CALCULATION OF PROJECT ECONOMICS (M\$)

VERSION 12-86

OPTION 3 - PERMIT VCM INCINERATORS

01-Jan-80

Project Year	-3	-2	-1	1	2	3	4	5	6	7	8	9	10
Revenues													
PPG DISPOSAL FEE SAVINGS				286.20	286.20	286.20	276.22	306.58	317.32	328.42	339.92	351.81	364.13
PPG TRANSPORTATION CHARGES				40.55	40.55	40.55	41.97	43.44	44.96	46.53	48.16	49.85	51.59
MURIATIC ACID SALES (50%)				31.86	32.98	34.13	35.32	36.56	37.84	39.16	40.53	41.95	43.42
Total Revenues				358.61	359.73	360.88	373.51	386.58	400.12	414.11	428.61	443.61	459.14
Costs													
ACID NEUTRALIZATION (50%)				29.17	30.19	31.25	32.34	33.48	34.65	35.86	37.12	38.42	39.76
ELECTRICITY				9.73	10.90	11.60	12.10	12.80	13.30	13.50	13.80	14.00	14.20
PERMITTING INCINERATOR				65.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
REFRACTORY REPLACEMENT (ONCE/YEAR)				90.00	93.60	97.34	101.20	105.29	109.50	113.88	118.43	123.17	128.10
Maintenance				199.00	208.55	218.56	229.05	240.05	251.57	263.65	276.30	289.56	303.46
Insurance and Taxes				8.70	9.00	9.32	9.65	9.98	10.33	10.69	11.07	11.46	11.86
Depreciation-Construction Capital				87.00	139.20	82.65	65.25	60.90	0.00	0.00	0.00	0.00	0.00
Total Costs				488.60	556.45	450.72	449.59	462.50	419.35	437.58	456.72	476.61	497.38
Taxable Income				-129.99	-196.72	-89.84	-76.08	-75.92	-19.23	-23.47	-28.11	-33.00	-38.24
Income Tax				-48.10	-72.79	-33.24	-28.15	-28.09	-7.12	-8.68	-10.40	-12.21	-14.15
After Tax Income				-81.89	-123.93	-56.60	-47.93	-47.83	-12.12	-14.79	-17.71	-20.79	-24.09
Operating Cash Flow				5.11	15.27	26.05	17.32	13.07	-12.12	-14.79	-17.71	-20.79	-24.09
Investment													
Construction Capital	0.00	0.00	435.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
After Tax Startup	0.00	0.00	13.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Investment	0.00	0.00	448.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Cash Flow	0.00	0.00	-448.70	5.11	15.27	26.05	17.32	13.07	-12.12	-14.79	-17.71	-20.79	-24.09

Internal Rate of Return, % =
Discounted Payback Period, yrs =
Cost of Capital, % =

ERR
NA
13%

NPV of operating cash flow = 17.22
NPV of investment, working capital = 397.08
NPV of net cash flow = -379.86

CAH 000008397

notification in which the reason for refusal is given along with what was done to correct the problem.

~~It should be noted that~~ The actual cost of heavy ends to Vista, including the raw material value, processing costs, and the disposition costs is currently about \$1.7MM/year. This indicates ^{that} directionally the best use of ~~any~~ capital expenditures would be ~~involved in reducing~~ the amount of heavy ends ~~to be~~ produced. ^{to}

ADVANTAGES

1. No need for permitting or modifications to the VCM Plant incinerators.
2. ~~No~~ ^{less} potential effect on the stream factor of the VCM Plant or the incinerators.
3. No capital modifications required.

DISADVANTAGES

1. Risk of having to resort to commercial incineration or other option upon sixty-day notification by PPG of refusal of heavy ends due to changes in either environmental regulations or solvent market conditions.
2. Vista would still be dependent upon another company, ^{a competing VCM producer,} for the disposition of heavy ends.
3. Cost - Vista pays about \$383,000 per year for sending heavy ends to PPG.
4. Heavy ends sent to PPG must be treated as hazardous waste and each shipment must be manifested and is subject to all hazardous waste shipping regulations.
5. No recovery of the raw material or energy value of the heavy ends by Vista.

Option 2 - B. F. GOODRICH CATOXID PROCESS

B. F. Goodrich has developed a CATOXID Process which uses a fluidized catalytic bed reactor to oxidize chlorinated hydrocarbon feed streams to HCl, water, and nitrogen oxides which are then fed to their air-based Oxychlorination reactors to be used in the production of EDC. They have a CATOXID Unit in operation at their La Porte, Texas facility and have presented Vista with a terms proposal in which they would agree to accept up to 12 million pounds of heavy ends per year for a charge of \$25 per ton.

This would provide for the disposition of the current 11.4 million pounds produced annually at the VCM Plant.

Since the heavy ends material would then be classified as a feedstock, and not as a hazardous waste, the shipment of heavy ends would be under a bill of lading instead of having to manifest it, as is currently done on shipments to PPG. Approval has been received from the Louisiana Department of Environmental Quality and the Texas Water Commission for this interpretation of applicable regulations.

Two truckloads of heavy ends were sent to the La Forte facility for sampling and testing for compatibility with their other feedstocks and the CATOXID Process. They reported no difficulties in unloading and blending of the heavy ends material.

? 50 The estimated cost of sending the heavy ends to BFG would be \$25 per ton for processing and \$11.40 per ton plus about \$20M per year for railcar transportation costs for a total annual expense of about \$227M per year to send 11.4 million pounds of heavy ends to BFG. An additional cost of about \$40M would be required for ~~secondary~~ ^{seal} containment and piping revisions which would allow for railcar loading at the VCM Plant. Utilization of Vista Transportation for trucking the heavy ends to BFG would cost about \$19.05/ton for an annual expense of about \$250M with no capital revision requirements. The net present value of each of these options is about \$90M, relative to the current option. Therefore, economically it makes little difference which option is utilized. Risk-wise, however, ~~it appears that the utilization of rail transportation would be directionally correct since the risk of having a serious public exposure incident should be significantly less because of the reduced number of trips required as well as the less populated route which would probably be followed for the railcar transportation.~~ ^{is recommended}

When approached on the possibility of Vista purchasing the CATOXID Technology for use at the VCM Plant, BFG indicated that the current technology was not compatible with the oxygen-based fixed bed Oxylchlorination Unit at the VCM Plant. BFG also indicated that they had no immediate plans of developing the required technology. The approximate cost of the La Forte CATOXID Unit, about \$10 million, indicates that even a smaller unit, such as would be required at the VCM Plant, could not be justified at this time.

ADVANTAGES

1. Few capital modifications (\$40,000) required.
2. Possible long-term solution to heavy ends disposition problem.
3. Eliminates the need to revise and RCRA permit the VCM Plant incinerators to burn heavy ends.
4. Provides for a lower disposition cost than either PPG or incineration.
5. ~~has~~ ^{has} potential effect on the stream factor for either the VCM Plant or the VCM Plant incinerators.
6. Heavy ends would not be classified as hazardous waste and would be subject to less stringent shipping regulations, with only a bill of lading required instead of a manifest.
7. Vista would have a signed contract with BFG with a guaranteed method,

~~See 27-11~~

of heavy ends disposition for a minimum of three years with less chance of being affected by future environmental regulations or solvent market conditions which would cause FPG to shut down the solvent process in which they utilize some of the heavy ends material.

DISADVANTAGES

a competing VCM producer,

1. Vista would still be dependent upon another company for disposition of the heavy ends and would not recover any of the chlorine value in the heavy ends.
2. Increased expense and risk involved in shipping the heavy ends to La Porte, Texas although these would be minimized by the use of railcars instead of trucks.
3. Cost - Vista would still have to pay about \$227,000 annually for the disposition of the heavy ends.
4. Risk of having FPG arrange for another company to supply heavy ends material to fill the gap left by the heavy ends sent by Vista to BFG, thus eliminating a disposition option for that fraction of Vista heavy ends.

OPTION 3 - ARRANGE TO DIVIDE THE HEAVY ENDS BETWEEN FPG AND BFG

This option would involve negotiations with both FPG and BFG to reach ~~an~~ agreements with the two companies ^{such that} ~~in which~~ the shipments of heavy ends ~~could~~ be split between them. Provisions should be made which would allow the amount sent to each of them to be varied to ^{meet changing operating} ~~meet current~~ conditions. The most economical split would be to maximize the amount of heavy ends ~~being~~ sent to BFG while maintaining a share of FPG's demand. The FPG share should be maintained in order to prevent FPG from arranging for another company to fill the gap left by having Vista send heavy ends to BFG.

ADVANTAGES

1. Provides for two ^{outlets} ~~options~~ ^{for} the disposition of heavy ends.
2. Yearly cost is about \$33M less than the current option with a NPV of ~~delete now~~ \$90-\$8M relative to the current option.
3. Eliminates the need to revise and permit the VCM Plant incinerators.
4. ~~has~~ ^{less} potential effect on the stream factors of the VCM Plant or its incinerators.
5. Reduces the risk of having to resort to other more costly options upon short notice due to future changes in either environmental regulations or the solvent market, either of which could cause FPG to refuse the heavy ends upon a 60-day notice.
6. ^{this time} Would provide ~~an~~ ^{for 3 years} ~~option~~ for heavy ends disposition ~~which~~ could be used to examine or develop other more economical options.
7. Would not involve the tie-up of large amounts of either capital or engineering manpower.

DISADVANTAGES

both competing VCM producers,

1. Vista would still be dependent upon outside companies, for the disposition of heavy ends.
2. Increased risk and cost involved with transporting heavy ends for further distances, although this would be minimized by the use of railcar transportation.
3. Would provide for no recovery of raw material value of heavy ends by Vista.

OPTION 4 - RCRA Permit the VCM Plant Incinerators to Burn Heavy Ends

Currently Vista has interim status to burn heavy ends in the VCM Plant incinerators. Unless a complete permit application, including a trial burn plan is submitted by August 8, 1983, ^{it is likely that} this interim status will be lost. The complete permitting process ^{including DEQ approval} must be completed by November 8, 1983 or the entire process must be repeated. The permitting process required for hazardous waste incinerators is very time consuming and is expensive. ^{the} timing is such that it would be difficult to have the required work completed in time to meet the existing deadlines. ^{even if it has decided how to permit the incinerator,}

Some studies and test burns have been completed to determine whether the heavy ends could be successfully burned in the VCM Plant incinerators. Previous test burns were only partially successful but John Zink representatives feel that it is possible. The major problem which would be encountered would be the need to remove essentially all of the sodium present in the heavy ends. Past studies indicate that the newly-installed static mixers in conjunction with a mesh coalescer system should lower the current sodium concentration in the heavy ends from the current level of 1000 ppm to an acceptable 10-20 ppm.

The presence of sodium in the feed to the incinerators can cause excessive fouling of the waste heat boiler tubes and severe damage to the refractory lining, requiring frequent cleaning of the tubes and possibly annual replacement of the refractory lining. Both of these would result in greater downtime for the liquid-burning incinerator which would increase the risk of having incinerator bypasses since the downtime required to replace the refractory is estimated to be three to four weeks during which time the VCM Plant would have no back-up incinerator should there be a problem with the on-line incinerator. Recent tightening of the regulations and enforcement practices pertaining to the number of incinerator bypasses and stack exceedances cause this added risk to be highly undesirable and possible costly in the future.

ADVANTAGES

1. This option would provide for in-plant disposition of heavy ends with no dependency upon other companies.
2. Some possible revenues from increased steam and muriatic acid

production, although these revenues would be nearly negligible since the extra stream ^{additional} has little current value ^{and acid} and the market for muriatic acid is nearly non-existent, especially for the low-grade acid which would be produced.

3. Savings of costs for sending heavy ends to PFG or BFG (\$227M - 383M/year).
4. Lower capital expenditure when compared to building a new hazardous waste incinerator dedicated to heavy ends (\$5-10MM).

DISADVANTAGES

1. Higher risk of incinerator bypasses and the resulting possible increased enforcement measures by environmental agencies. This increased risk is due to:
 - a) higher feed rates to the incinerator resulting in a lower tolerance for possible upsets in the vent flows and
 - b) more downtime required for more frequent maintenance including a ^{Potential} ~~Possible~~ annual 3-4 week downtime required for refractory replacement (\$90M)
2. Increased maintenance cost - about \$200M per year
3. RCRA permitting costs (\$130M) and timing requirements
4. Modifications required for sodium removal (\$230M)
5. Additional incinerator instrumentation required by RCRA regulations. (carbon monoxide monitoring system and fuel shut-off controls, costing about \$60M).
6. Need for secondary containment around the heavy ends feed storage tank and feed pumps (about \$55M)
7. Risk of reducing the stream factor for both the incinerators and the VCM Plant
8. Possible capital modifications which may be required to achieve the required 99.99% destruction efficiency (not likely to be needed)
9. The VCM Plant would become a hazardous waste disposal site and subject to any applicable regulations
10. This option would involve the tie-up of a large amount of capital (about \$440M) and engineering manpower (1.5-2 manyears) which could be more profitably utilized toward reducing the amount of neavy ends being produced.

OPTION 5 - CONSTRUCT AND PERMIT A NEW INCINERATOR TO BURN HEAVY ENDS

A quick examination of the option of constructing and permitting a new hazardous waste incinerator to burn heavy ends and possibly other Vista-generated wastes indicated that this option would not be desirable at this time. If built at the VCM Plant it would cause the VCM Plant to be classified as a hazardous waste disposal site and subject to all applicable regulations. The estimated cost (\$5-10 million plus an undetermined operating cost) is not justifiable at this time.

ADVANTAGES

1. Could provide capacity to process much of Vista's hazardous waste materials.
2. Would be more capable of meeting the required destruction efficiencies for all types of waste produced by Vista.
3. Would eliminate the risk of decreasing the stream factor of the VCM Plant or its incinerators

DISADVANTAGES

1. 3-5 years would be required before start-up of the new incinerator.
2. The VCM Plant would become a hazardous waste disposal site and subject to any applicable regulations and enforcement measures.
3. Estimated cost - \$5-10 million plus an undetermined operation cost.

OPTION 6 - COMMERCIAL INCINERATION OF ALL HEAVY ENDS

This option would involve Vista participating in a take-or-pay arrangement with other companies in which the expense of constructing, permitting, and operating a commercial incinerator would be shared by the companies which would send material to be incinerated. Usually the companies subscribing to the incineration services must agree to supply a certain fraction of the feed material to the incinerator or to pay the required minimum fee for processing that amount whether they send it or not.

Currently both Gulf Coast Waste Disposal Authority and Chemical Waste Management are proposing such arrangements. In the case of the Chemical Waste Management proposal the subscribers would be required to supply eighty percent of the capacity of the incinerator for a period of three to four years depending on the required payback period. After the payback period, each subscriber would have an annual right of first refusal to renew its original capacity commitment or to reduce its commitment if so desired. A similar arrangement should be available from Gulf Coast Waste Management Authority.

ADVANTAGES

1. Secure, long-term solution to heavy ends disposition problem
2. No need to permit and revise the VCM Plant incinerators
3. No demand on Vista engineering manpower required
4. No possible effect on the stream factor of the VCM Plant

DISADVANTAGES

1. Cost - estimated to be \$7-9 million annually *required*
2. ~~No provisions for~~ Interim disposal of heavy ends *while* the incinerator is constructed (possibly *by* 1990)
3. Increased risk of transporting hazardous waste further distances
4. Increased onsite and offsite storage capacity may be required.
5. No raw material or energy recovery by Vista
6. Vista would have to commit to a take-or-pay arrangement with the

company constructing and permitting the incineration facility with no payback or payout possibility.

OPTION 2 - NEGOTIATE AN ARRANGEMENT WITH GEORGIA GULF

Georgia Gulf has been working on developing a process similar to the CATOXID Process of B. F. Goodrich which could be of value to Vista for processing heavy ends. There has been some tentative contact with them and the initial impression is that they would possibly work with Vista in the development of this process. They currently ~~do not~~ have this process in operation and are probably several years away from doing so.

ADVANTAGES

1. Possible long-term solution to heavy ends disposition problem
2. Future bargaining tool for negotiating pricing and terms with both PPG and BFG
3. Might be feasible to build a CATOXID-like unit at or near the VCM Plant as either a joint venture with Georgia Gulf or by licensing the technology from Georgia Gulf and constructing the unit ourselves.
4. Possible revenues from the recovery of the chlorine and energy value of the heavy ends.

DISADVANTAGES

1. This option is still several years away from possible operation.
2. No firm commitment or proposal from Georgia Gulf is expected in the near future.
3. May not be economically feasible due to the possibly high capital expenditure required for the development and construction of this process.

ECONOMIC BASIS

Revenues

1. PFG Disposal Fee Savings - Heavy ends disposal fee costs are based on the yearly average (for the last 17 months) production rate of 11.333 MM lbs./yr of heavy ends with an average concentration of 33.15% EDC plus 1,1,2-Trichloroethane with the current pricing formula. This price was held constant for three years and then escalated at 3.5% annually.
2. PFG Transportation Charges ^(not allocated charge) - Transportation costs were obtained from the estimated Vista cost of \$150 per 21-ton load of heavy ends trucked to PFG by Vista Transportation. This cost was escalated at 3.5% annually.
3. Muriatic Acid Sales - The revenue from possible muriatic acid sales are obtained from the current price paid by Texas United for the muriatic acid produced currently (\$0.003501/lb). It was assumed that 85% of the chlorine in the heavy ends (assumed to be 33 wt% chlorine) was recovered as 18 wt% HCl and that 50% of this recovered HCl is purchased by Texas United. This was escalated at 3.5% annually.

COSTS

1. BFG Processing Fee - The charge by BFG for processing our heavy ends in their CATOXID Unit was obtained from their current terms proposal in which they offer to accept up to 12 MM lb/yr of heavy ends. This charge, \$25/ton, was held constant for 3 years and then escalated at 3.5% annually.
2. BFG Transportation Charges - The transportation charges for transporting heavy ends to the BFG plant in La Porte, Texas were estimated for two options:
 - (a) Railcars - The negotiated rate of \$11.40/ton plus \$20,000 for annual maintenance and lease charges was used for the option which provided for sending all of the heavy ends to BFG. For the option providing for sending only half of the heavy ends to BFG, the charge of \$11.40/ton and \$10,000 for annual maintenance and leasing was used. Both of these options involved an annual escalation rate of 3.5%.
 - (b) Trucking - The estimated Vista cost of \$400/21-ton load for trucking the heavy ends to La Porte, Texas by Vista Transportation. This charge was estimated by assuming an hourly cost of \$40/hr for the 10-hour round trip (two hours each for loading and unloading, and three hours each way for the trip). This estimate made no allowances for the possibility of higher maintenance costs, extra driver, etc. as well as increased

environmental risks incurred by transporting the heavy ends on ~~major~~ major highways longer distances.

3. Acid Neutralization Costs - It was assumed that 85% of the chlorine in the heavy ends (about 33 wt%) was recovered as HCl with 75% of the remaining 15% of the acid produced being neutralized in the caustic scrubber (75%) and the limestone pits (25%). These assumptions were originally made in a 4/28/83 memo by S.J. Reynolds. It was also assumed that 50% of the recovered HCl was neutralized in the limestone pits with the remaining 50% being sold to Texas United. The cost of the caustic (\$0.057/lb) and the limestone (\$0.0093/lb) were taken from the March, 1987 IPA sheet. These costs were then escalated at a 3.5% annual rate.
4. Electricity Costs - The electricity costs were obtained from the 237.7 MKWHR/year incremental increase (per 4/28/83 budget estimate ~~estimate~~ by S. J. Reynolds) with prices supplied by PED.
5. Incinerator Permitting Costs - The cost of permitting the VCM Plant incinerators was obtained from estimates by Scott Environmental to M. W. Cheeseman (\$100M for trial burn ~~preparation and conducting, data collection, etc.~~ and \$30M for the preparation of the actual permit). These costs were divided evenly between 1987 and 1988.
6. Refractory Replacement - The ^{190M} cost of ^{anticipated} ~~possibly~~ annual (per 1/31/84 memo by J. G. Cole) replacement of the refractory walls of the incinerator being used to burn heavy ends was an order of magnitude in-plant estimate. This cost was escalated at an annual rate of 4.8%.
7. Maintenance - The annual added maintenance cost was estimated as 30% of the current annual cost (\$627M/year) plus 4% of the capital expenditure required for burning heavy ends. This amount was then escalated at an annual rate of 4.3%.
8. Sodium Removal - The cost for revisions required for removing sodium from the heavy ends (\$250M) was based on a preliminary design by J. G. Cole (5/22/84) which provided for a mesh coalescer system to be used in conjunction with a static mixer to lower the sodium level to the target level of 20 ppm. This target level was apparently chosen as the level required to reduce fouling of the waste heat boiler tubes ~~and damage to the refractory material to an acceptable level.~~
^{minimum}
9. Feed System Revisions - The cost of the revisions required for burning heavy ends was based on an escalated cost of a design (J.G. Cole, 7/27/80; and S.J. Reynolds, 6/6/84) to provide a circulation loop to reduce solids build-up in the Heavy Ends Storage Tank, T-405. It was assumed that the existing feed tank, feed pumps, and feed control system would be sufficient for burning all of the heavy ends. The 1987 budget included an additional \$100M for revising these components but this amount was not included in the base case.
10. Additional Incinerator Instrumentation - The cost required for the additional incinerator instrumentation required by the RCRA regulations (\$80M) was obtained from the 1987 Budget Estimate which

CWH 000008411

included a continuous carbon monoxide monitoring system along with the required shut-off controls and alarms.

11. Secondary Containment for the Feed System - The cost for the secondary containment required at the heavy ends feed tank and feed pumps was estimated at \$55M in a preliminary plant estimate.
12. Insurance and Taxes - This cost was estimated at 2% of the construction capital and escalated at 3.5% annually.
13. After Tax Start-Up Cost - This cost was estimated as 63% of 5% of the construction capital costs.