

Interoffice Communication

To : R. D. Gamblin
From : V. E. Messick
Date : September 24, 1981
Subject : AFE REQUEST - RECOVERY SYSTEM REVISIONS

Attached is the partial AFE request for \$402,000 for Recovery System Revisions. This project is included in the 1981 Capital Budget as item A-2. A \$30,000 partial AFE for recovery compressor relief valves was approved earlier this year under item A-2.

This project includes the following modifications to the plant recovery systems.

1. A new backwash filter will be installed on the lead water circulation knockout pot in both reactor modules in order to remove PVC slurry that is carried over from a reactor during recovery. Manual flushing of sight glasses and float chambers on knockout pots will be provided to improve level control.
2. The cooling capacity of the recovery system in both modules will be increased by installing larger recirculation pumps. The increased flowrate will provide the required cooling capacity during periods of maximum heat loading. New spray nozzles will be installed in the lead knockout pots to improve solids scrubbing and steam condensation.
3. A caustic addition system will be installed in each of the three recovery systems to reduce corrosion.

Some PVC resin is currently carried over to the VCM recovery system during recovery. The resin can plug the lead knockout pot recirculation water cooler, pump or level control system. This causes the knockout pot to fill with water and vibrate excessively.

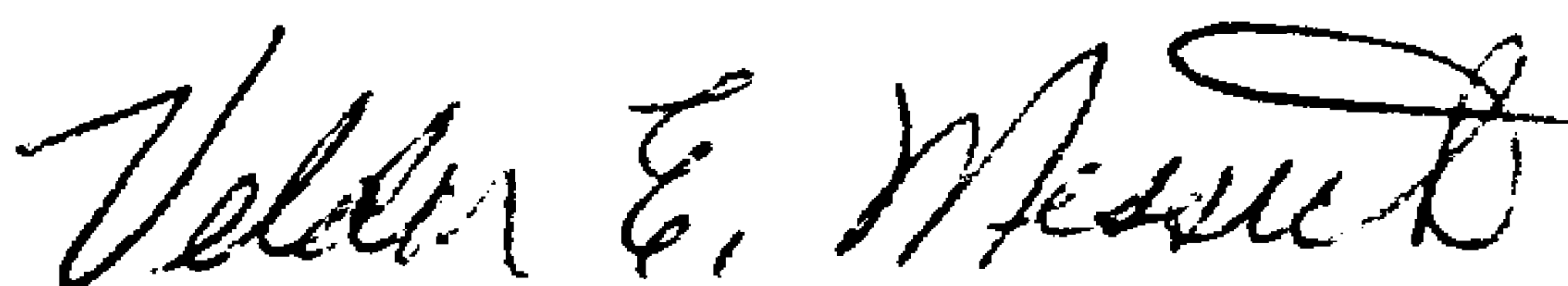
The PVC resin carryover also causes general wear and premature seal failures in the vacuum pumps, compressors, and seal water pumps. As a result the pumps and compressors operate at less than maximum capacity, increasing recovery times. Seal failures result in lost capacities and higher maintenance costs as well as potential VCM exposure problems.

The revisions to the water circulation system will prevent the lead knockout pot from becoming liquid full when resin carryover occurs. The improved scrubbing and steam condensing will remove PVC before it fouls the vacuum pumps and compressors and will reduce the steam vapor compression load.

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Excessive corrosion of the internals of the recovery system compressors and vacuum pumps is also occurring due to the acidic conditions of the circulating seal water. The acidic conditions are due to carbon dioxide which results from the decomposition of the initiator during the polymerization reaction. Studies by MED indicate this acid condition to be the major cause of the corrosion problems. Due to corrosion, frequent replacements of the cones and rotors results in maintenance parts and labor costs as well as down time of the equipment. Caustic addition to increase pH of the seal water will greatly reduce this problem.

Revenues for the project are from savings on maintenance labor and materials from less repairs to the recovery system, reducing downgrading of prime grade resin due to high gels, and increased productivity of 1 MM pounds per year due to improved stream factor. These revenues provide the project with a 26.1% DCF rate of return and a discounted payout period of 6.5 years.



Veldon E. Messick
Senior Process Engineer

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c: CLM, CRM, PEM, SJV, JAD, RAF

AFE REQUESTRECOVERY SYSTEM REVISIONS

1. The project cost is based on a class "A" process design and a definitive cost estimate, both by the plant. The design and estimate have been reviewed by the Engineering Center.
2. Money will be committed upon AFE approval.
3. There are no expense items associated with this project.
4. Project completion is expected 15 months after AFE approval.
5. This project is estimated to reduce maintenance costs by \$55,400 in the first project year.

RECOVERY SYSTEM REVISIONS

PROJECT ECONOMIC SENSITIVITY ANALYSIS

Base Case: Construction Capital \$402,000 DCF Return 26.1%
Transportation Capital 61,000

<u>Possible Variances</u>		<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>	<u>Impaired To</u>	<u>Improved To</u>
+10%	-10%	Construction Capital (1)	24.0 28.8
-20%	+20%	Revenues	19.6 32.1
		No Improved Product	23.8 -
		No Transportation Capital	- 29.4
		Total Construction Capital Including Earlier Partial AFE (2)	24.4 -

- (1) Corresponds to accuracy range of definitive estimate.
- (2) This case uses a total construction capital of \$432,000. This represents the total amount requested for this budget item which includes the \$30,000 partial AFE already approved.

RECOVERY SYSTEM REVISIONS

PROJECT ECONOMIC ASSUMPTIONS

Revenues

1. Revenue for the project will result from increased resin production due to improved stream factor of the recovery system. Recovery times are increased when one of the vacuum pumps is being repaired and when part of the system is being flushed to remove solids.

Reducing these problems is estimated to improve the reactor stream factor by 0.2% or a 1,000,000 pound per year production increase. Resin margins are provided in the 1982 Capital Budget.

2. Revenue will result from lower maintenance costs on the recovery systems. The recovery systems were down 52 times in 1979 and 42 times in 1980 for seal replacement. Reducing this frequency to one-half would result in a first project year savings of \$45,800. Also, reduced labor and material costs of \$9,600 would result in the first project year by increasing the pH of the seal water thus lessening the corrosion problem. Total first year maintenance savings are \$55,400. This savings was escalated by 10.2% per year.
3. Revenues will result from less downgrading of prime resin. The downgrading occurs because of high gels caused by resin carryover to the RVCM receivers. By reducing resin carry over, it is estimated 1,000,000 pounds per year less high gel 5425 and 5465 resin will be produced. The high gel resin must be sold for 2¢/lb. less than market price.

Costs

1. Maintenance costs at 5% of capital escalated at 10.2% per year.
2. Insurance and taxes at 2% capital cost escalated at 9.5% per year.
3. Increased utilities based on requirements of 0.15 KWH/lb. resin, 0.75 CF natural gas/lb. resin, and 0.71 lbs. steam/lb. resin. Utility costs are provided in the 1982 Capital Budget.

Other

1. Working capital is 45 days of production revenue.

RECOVERY SYSTEM REVISIONS
CALCULATION OF PROJECT ECONOMICS (M\$)

<u>PROJECT YEAR</u>	<u>-1</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues											
Increased Production		106.0	120.0	131.0	152.0	170.0	191.0	214.0	241.0	272.0	305.0
Reduced Maintenance		55.4	61.1	67.3	74.2	81.7	90.1	99.3	109.4	120.6	132.9
Product Improvement		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Railcar Revenue		2.6	2.9	3.2	3.5	3.9	4.3	4.8	5.3	5.8	6.3
TOTAL		184.0	204.0	221.5	249.7	275.6	305.4	338.1	375.7	418.4	464.2
Costs											
Maintenance		20.1	22.2	24.4	26.9	29.6	32.7	36.0	39.7	43.7	48.2
Insurance and Taxes		8.0	8.8	9.6	10.6	11.6	12.7	13.9	15.2	16.6	18.2
Incremental Utilities		18.2	21.2	25.9	28.1	32.2	36.9	42.2	48.2	55.0	62.9
Depreciation-Construction Capital		60.3	88.4	84.4	84.4	84.4	0.0	0.0	0.0	0.0	0.0
Depreciation-Transportation Capital		4.9	8.5	7.3	6.1	6.1	6.1	5.5	5.5	5.5	5.5
TOTAL COSTS		111.5	149.1	151.7	156.2	163.9	88.3	97.5	108.5	120.8	134.8
Taxable Income		72.5	54.9	69.8	93.5	111.7	217.1	240.6	267.2	297.6	329.4
Income Tax		34.8	26.3	33.5	44.9	53.6	104.2	115.5	128.2	142.8	158.1
Investment Tax Credit		46.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
After Tax Income		84.0	28.5	36.3	48.6	58.1	112.9	125.1	138.9	154.7	171.3
Operating Cash Flow		149.2	125.5	128.0	139.2	148.6	119.0	130.6	144.4	160.2	176.8
Investment											
Construction Capital	(402.0)										
Transportation Capital	(61.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Working Capital		(15.8)	(1.8)	(1.4)	(2.6)	(2.3)	(2.6)	(2.9)	(3.4)	(3.9)	(4.1)
Recovered Working Capital											40.6
Net Cash Flow	(463.0)	133.4	123.8	126.7	136.5	146.3	116.3	127.7	141.9	156.4	213.3
DCF Return =				26.1%							
Discounted Payout Period, Years =				6.5	Based on cost of capital of 16.0%						