Appendix C

Library of Congress' Capital Cost Estimates for Full-Scale Mass Deacidification Facility November 1987

This appendix includes the estimates of capital costs for a full scale mass deacidification facility prepared by the Library of Congress and its contractors in November 1987. This facility would be composed of two structures, a warehouse support building and a chemical treatment building. The appendix consists of four parts:

1. The cover memorandum provides some of the major assumptions used to come up with the estimates.
2. Table C-1 lists the construction costs for the chemical treatment facility.
3. Table C-2 lists the space requirements for the different components of the warehouse support facility and the estimate of costs to construct such space.
4. Table C-3 lists the changes in equipment that will probably be required to scale-up the Texas Alkyls pilot plant into a full-scale facility that can treat 1 million books per year.

Table C-1.—Capital Cost Estimate for a One. Million. Book-per-Year Deacidification Chemical Process Facility

Item	Cost estimate
Concrete	$ 40,000
Steel	40,000
Equipment	875,000
Spare Parts (Inventory)	50,000
Pipe	250,000
Electrical	275,000
Instruments	450,000
Building (Shell)	[a]
Insulation	50,000
Coatings	20,000
Fire Protection	50,000
Field Indirects	300,000
Engineering and Home Office	190,000
Fee	200,000
Total	$2,750,000

[a]Included in total space and capital estimate for warehouse/processing facility.

Table C-2.—Capital Cost Estimates for a Deacidification Plant Office/Warehouse Support Facility

		Square feet
1.0	Administration	
1.1	Vestibule	75
1.2	Reception and Waiting	190
1.3	Plant Manager	120
1.4	Operations Engineer	100
1.5	Chemical/Computer Technician	100
1.6	Office	100
1.7	Office	100
1.8	copy	80
1.9	Storaae	80
1.10	Toilet; (2 @ 80 SF)	160
1.11	Janitor Closet	35
1.12	First Aid	165
1.13	Lunch Room	250
1.14	Conference Room w/Screen	300
	Subtotal	1,855
2.0	Warehouse/Processing	
2.1	Pallet Storage	8,000
2.2	Chemical Process Area.	8,000
2.3	Quality Assurance Laboratory	750
2.4	Maintenance	1,100
2,5	Men's and Women's Lockers	400
2.6	Loading/Unloading	1,050
2.7	Spare Parts Storage	1,000
2.8	Service Oock	300
	Subtotal	20,600
3.0	Building Support	
3.1	Mechanical Room	1,500
3.2	Electrical Room	1,000
3.3	Telephone Equipment Room	120
3.4	Building Maintenance Room.	120
	Subtotal	2,740
	Support Building Area:	8,178
	Support Building Gross:	2,818
	Support Building and Chemical Process Totals (square feet):	30,996

		Gross SF	Cost/SF	Amount
4,0	Building Cost Estimate			
4.1	Administration	2,504	$72.00	$ 180,288
4.2	Warehouse/Processing	22,660		1,246,300
4.3	Building Support	3,014	55.00	165,770
4.4	Building Walls	3,818	55.00	209,990
	Total Building Cost.	31,996		$1,802,348
5.0	Project Cost Estimate			
5.1	Building Cost			$1,802,348
5.2	Site Work			328,000
	Total Project Cost (w/o Process Equipment)			$2,130,348

LIBRARY OF CONGRESS

TO: Mr. Peter Johnson
Office of Technology Assessment

DATE: November 23, 1987

FROM: Peter G. Sparks
Director, Mass Deacidification Program

SUBJECT: Capital Cost Estimates for Main Deacidification Facility

As requested the Library has taken steps to come up with capital cost estimates for the Ft. Detrick facility. These costs were based on our current thinking that the facility would consist of two separate structures--a support facility and a chemical treatment facility. It is unclear at the moment how these structures would be connected but we see this as a minor cost. We worked with the architect that had previously been for the project Shertz, Franklin, Crawford and Shaffner in Roanoke, Virginia and with S&B Engineering in Houston, Texas to get estimates. Both estimates were done in consultation with our engineer who reviewed the chemical plant costs in detail.

The estimates for the warehouse support facility are fairly self-explanatory showing the various functions that will be in the building with gross square footage allocated to each and the construction cost estimate at the end. These data are shown in table C-2.

The estimates for the chemical treatment plant are based on a hypothetical chamber size and configuration since there is no firm design in place for this part of the facility. The chemical part of the facility and the control room flow from the design of the pilot facility. The chemical facility estimates are based on a number of assumptions which are listed below:

1. The four chamber design has been chosen to stay within the capacity of commercially available vacuum pumps.
2. The unit can be installed in a building approximately 100 feet by 80 feet.
3. Utilities such as electricity, instrument air, fire water, and potable water are available at battery limits.
4. No site development work is included.
5. No emergency power generator is provided.
6. Estimate is based on Houston area open shop labor rates.
7. No contingency is added to the estimate.

An analysis of the large scale facility requirements and equipment changes are shown in table C-3. Construction cost estimates for a one million book per year treatment facility are given in table C-1.

Attachments

Table C-3.–Equipment Changes for Scale-UP

1. Design items	Pilot unit as designed	1 mm book/year facility
No. **of** Chambers	1	**4**
No. Carts in Chamber (27" Wx48"H x41 L)		5
Average No. of Books per Cart	—	224
No. Books/Chamber—Maximum	**360**	1,120
Design Cycle Length'	**30.5**	36
Cycles/Year/Chamber	—	223
Chamber, Hrs. in Operation	—	8,028
Hrs. Down	—	732
Overall Service Factor		91.6
Per Chamber per Cycle, Ibs.		
DEZ Consumed	23.31	**72.52**
C_2H_6 Released	11.35	**35.52**
Annual Rates, Ibs/yr.		
DEZ Consumed	—	64,687
C_2H_6 Released	—	31,505
Chamber, Diameter	6′0″	6'0"
Length	5′6T-F	IO'O" T-F
DEZ Circulation Rate, Ibs/hr	573.8	773.4
N2DD Circulation Rate, lbs/hr	1,600	4,300

'Does not Include time to load or unload chamber.

2. Equipment	Pilot unit as designed	1mm book/year facility
DEZ Vaporizer Duty, BTU/hr	105,000	141,000
DEZ 1st Stg. Condenser		
Duty, BTU/ hr	120,000	152,500
DEZ 2nd Stg. Condenser		
Duty, BTU/hr	17,000	**23,000**
N_2 Heater/Cooler		
Duty, Heating BTU/hr	17,500	50,000
Cooling BTU/hr	20,000	54,000
Dehydration Water Heater		
Duty, BTU/hr	92,670	288,178
Kw	30	100
Watlow Model	FPN720G5	FRN744E5
Hot Oil Heater		
Duty, BTU/hr	130,000	151,000
Kw	40	50
Watlow Model	CFRS743E5	CFRS751 E5
Refrigeration Unit		
Duty, Tons	11	**15**
DEZ Receiver		
Diameter	12.09"	17.25"
Height	30"T-T	36"S/S
Dehydration Tank		
Diameter	24"OD	24"OD
Length	18"	50"
Hot Oil Surge Tank		
Diameter	**23.25"**	**35.25"**
Height	**4'O"T-T**	**4'6"T-T**
Chilled Oil Surge Tank		
Diameter	29.25"	35.25-ID
Height	4'O"T-T	5'O"T-T

Table C-3.—Equipment Changes for Scale-UP—(Continued)

2. Equipment	**Pilot unit** as designed	**1** mm book/year facility
Seal Pot		
Number	2	2
Diameter	12.75'OD	18"OD
Height	18"T-T	18"T-T
Exhaust Blower	(Balzers)	(Balzers)
Suction Pressure	40 Torr	140Torr
Discharge Pressure	800Torr	800Torr
ACFM Suction	128	**110**
Balzers - Model	DUO250A (Two Stg. Rotary Vane)	**2 C D U 0 2 5 0 A**
DEZ Recycle Blower	(Balzers)	(Balzers)
Suction Pressure	18Torr	18 Torr
Discharge Pressure	50Torr	150 Torr
ACFM Suction	1,505	2,610
Balzers Model	WKP4000	2@WKP4000
Nitrogen Recycle Blower	(Not Provided)	
Suction Pressure	0Psig	0 Psig
Discharge Pressure	10 Psig	15 Psig
ACFM Suction	364	1,050
Chamber Vacuum Pump		
Suction Pressure	....Oil to760Torr	Oil **to 760 Torr**
Discharge Pressure	800 Torr	800 Torr
ACFM Suction	85	170
Kinney Model	KTC-112	3@ KTC-225
Hot Oil Circulation Pump		
GPM, Rated	67.0	**200**
TDH, Rated	**89.5'**	**100'**
H.H.P.	**1.25**	**4.17**
Chilled Oil Circulation Pump		
GPM, Rated	**112.5**	**270**
TDH, Rated	**88.9'**	**100'**
H.H.P.	**2.23**	**6.12**