

Cost Data for Liquid Fertilizer Plants

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THE NEXT STEP after the chemical problems involved in liquid fertilizer manufacture naturally concerns the problems of capital investment required for a plant.

Using pilot plant results, as well as other available data, as a basis, Monsanto engineers prepared operating costs and plant investments estimated for plants of several different sizes. Knowledge of successful operating plants confirms that this type of economic analysis is a good guide.

Naturally geographical locations govern raw material and plant equipment costs to varying degrees. The figures presented were done for a Midwest location. Adjustment to account for any local conditions would reflect a more accurate picture.

To cover a variety of situations, figures were developed for formulations of 1-1-1, 1-2-1, and 1-3-1 ratios. Figures for other formulations, set forth as possible in the preceding discussion, can be arrived at by following a similar procedure.

Table I gives an estimate of capital investment for a 200-ton-per day liquid fertilizer plant. Tables II, III, and IV give operating costs for different size plants.

Table I. Investment for 200-ton-per-day Liquid Fertilizer Plant

Item	No.	Description	Estd. Installed Cost
Building	1	40 × 60 ft., transite siding, concrete floor	\$ 5,000
Product storage tanks	4	20,000 gal. tanks, mild steel	15,000
Reaction tank	1	1,100 gal. stainless steel, agitated, 1.5 hp. motor	5,000
Phosphoric acid storage tank	1	10,000 gal., rubber-lined steel	7,000
Ammonia storage (aqueous)	2	20,000 gal., mild steel	8,000
Payloader	1	1,200
Potash chloride conveyor	1	300
Pumps and compressor	2	100 gal./min.	2,000
	2	50 gal./min.	
	1	Compressor	
Other: e.g. ammonia converter; product filter			5,000
Piping and meters			1,000
Electrical			500
Total			\$50,000

Table II. Operating Costs for 8-8-8 Liquid Fertilizer Plant

	Daily Capacity (20 Hr./Day)		
	50 net tons	100 net tons	200 net tons
Capital investment	\$25,000	\$35,000	\$50,000
Production cost	\$/net ton	\$/net ton	\$/net ton
Raw materials ^a			
Anhydrous ammonia	3.07	3.07	3.07
Phosphoric acid (75%)	13.35	13.35	13.35
Potash chloride (62.5%)	4.71	4.71	4.71
Urea	14.22	14.22	14.22
Total raw material	\$35.35	\$35.35	\$35.35
Direct conversion ^b			
Labor and supervision	2.00	1.00	0.50
Other	1.00	0.60	0.40
Total direct conversion	\$3.00	\$1.60	\$0.90
Indirect conversion ^c			
Depreciation	0.55	0.40	0.30
Other	0.70	0.40	0.25
Total indirect conversion	\$1.25	\$0.80	\$0.55
Total production cost	\$39.60	\$37.75	\$36.80

Table III. Operating Costs for 5-10-5 Liquid Fertilizer Plant

	Daily Capacity (20 Hr./Day)		
	50 net tons	100 net tons	200 net tons
Capital investment	\$25,000	\$35,000	\$50,000
Production cost	\$/net ton	\$/net ton	\$/net ton
Raw materials ^a			
Anhydrous ammonia	3.84	3.84	3.84
Phosphoric acid (75%)	16.68	16.68	16.68
Potash chloride (62.5%)	3.31	3.31	3.31
Urea	4.60	4.60	4.60
Total raw material	\$28.43	\$28.43	\$28.43
Direct conversion ^b			
Labor and supervision	2.00	1.00	0.50
Other	1.00	0.60	0.40
Total direct conversion	\$3.00	\$1.60	\$0.90
Indirect conversion ^c			
Depreciation	0.55	0.40	0.30
Other	0.70	0.40	0.25
Total indirect conversion	\$1.25	\$0.80	\$0.55
Total production cost	\$32.68	\$30.83	\$29.88

Table IV. Operating Costs for 6-18-6 Liquid Fertilizer Plant

	Daily Capacity (20 Hr./Day)		
	50 net tons	100 net tons	200 net tons
Capital investment	\$25,000	\$35,000	\$50,000
Production cost	\$/net ton	\$/net ton	\$/net ton
Raw materials ^a			
Anhydrous ammonia	7.00	7.00	7.00
Phosphoric acid (75%)	30.00	30.00	30.00
Potash chloride (62.5%)	3.54	3.54	3.54
Total raw material	\$40.54	\$40.54	\$40.54
Direct conversion ^b			
Labor and supervision	2.00	1.00	0.50
Other	1.00	0.60	0.40
Total direct conversion	\$3.00	\$1.60	\$0.90
Indirect conversion ^c			
Depreciation	0.55	0.40	0.30
Other	0.70	0.40	0.25
Total indirect conversion	\$1.25	\$0.80	\$0.55
Total production cost	\$44.79	\$42.94	\$41.99

^a RAW MATERIALS—The following prices (including freight) per net ton were used in calculating: anhydrous ammonia, \$95; phosphoric acid, \$90; potash chloride, \$35; urea, \$120.

^b DIRECT CONVERSION—Labor: Each plant is to be operated with two men per shift, 20 hours per day, totaling 40 man-hours per day, with labor at \$2.25 per man-hour. Supervision: Charged at \$10 per day, assuming that the supervisor would have other duties. Other: Payroll charges, such as social security compensation, insurance, etc.; electricity; water; factory supplies, such as cleaning soap, laboratory expense, repairs.

^c INDIRECT CONVERSION—Depreciation: A standard depreciation of 10 years was used, but plant was assumed to be operating only 90 days so the 10% for any one year was charged off during that period. Other: Controllable indirects include such items as fences, cafeteria charges, guards, first aid, roads, etc. (calculated at 20% of the total direct cost figure); noncontrollable indirects includes such items as taxes, insurance, etc. (computed at 2.5% of the capital figure and charged during 90-day operating period).