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ECONOMIC ANALYSIS OF THE ROTARY KILN AND FLUIDIZED BED P & E INCINERATORS

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SEPTEMBER 1978

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
LARGE CALIBER
WEAPON SYSTEMS LABORATORY
DOVER, NEW JERSEY

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In the evaluation of alternate systems, it is necessary to consider the economic factors associated with each system. The economic analysis of the rotary kiln versus the fluidized bed incinerator was performed using the present value unit cost method. The method considers capital costs, operating costs, time horizons, depreciation, interest and other related factors. In all cases considered, the fluidized bed incinerator was the preferred alternative.

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TABLE OF CONTENTS

TABLE OF EQUIVALENTS

Metric Unit	English Unit	Metric Unit	English Unit
kilograms-kg	pounds-lb	$/kg	$/lb
80	177	0.04159	0.09170
91	200	0.04213	0.09288
113	250	0.04282	0.09441
227	500	0.04370	0.09634
272	600	0.04478	0.09872
340	750	0.04567	0.10069
454	1,000	0.04634	0.10217
567	1,250	0.04721	0.10407
680	1,500	0.04830	0.10649
794	1,750	0.04965	0.10946
907	2,000	0.05800	0.12787
1,021	2,250	0.05900	0.13008
1,134	2,500	0.06030	0.13294
1,814	4,000	0.06194	0.13656
2,722	6,000	0.06397	0.14102
3,629	8,000	0.08792	0.19382
4,082	9,000	0.08873	0.19562
4,536	10,000	0.08978	0.19794
5,443	12,000	0.09022	0.19891
6,350	14,000	0.09030	0.19908
7,257	16,000	0.09074	0.20004
8,164	18,000	0.09111	0.20088
9,072	20,000	0.09130	0.20128
10,886	24,000	0.09201	0.20285
12,701	28,000	0.09223	0.20333
13,608	30,000	0.09276	0.20450
14,515	32,000	0.09289	0.20479
16,329	36,000	0.09343	0.20598
18,143	40,000	0.09398	0.20718
19,051	42,000	0.09468	0.20873
21,772	48,000	0.09483	0.20906
24,494	54,000	0.09556	0.21068
27,216	60,000	0.09666	0.21310
226,796	500,000	0.09810	0.21629
453,592	1,000,000	0.10215	0.22520
680,389	1,500,000	0.10987	0.24222
849,125	1,872,000	0.11150	0.24581
		0.11361	0.25046
		0.11627	0.25633
		0.11956	0.26358

TABLE OF EQUIVALENTS CONT'D

Metric Unit	English Unit
meters-m	**feet-ft**
1.5	5
67.1	220
meters-m	**inches-in**
0.0016	1/16
0.0025	0.1
0.0508	2
0.1270	5
°C	**°F**
32.2	90
37.8	100

SUMMARY

Incinerator technology has been studied for many years as a possible alternative to open burning in disposing of waste propellants and explosives in an environmentally acceptable manner. As the technical feasibility of various incinerator systems became established, attention was focused on the economic factors associated with each system. Consequently, at the request of the Manufacturing Technology Division, ARRADCOM, a study was undertaken by the Petroleum and Environmental Technology Division of the Army Mobility Equipment Research and Development Command (MERADCOM) to evaluate and compare two of the leading incinerator concepts, the fluidized bed and the rotary kiln. A dual approach was taken: at ARRADCOM a fluidized bed incinerator was planned and funded for evaluation, while a "best available", off-the-shelf rotary kiln was installed at the Radford Army Ammunition Plant. Both were operated on the pilot plant scale.

The present value unit cost (PVUC) method of analysis was used in the evaluation. In this method, a computerized mathematical model is used to consider capital costs, operating costs, depreciation, interest, and other related factors over various time periods and load (operating) rates. The output yields the PVUC per pound of material incinerated. The TNT/slurry weight ratio was 25% for these calculations and the data used for the analysis were derived from actual pilot plant testing. The rotary kiln data were obtained from runs at 250 lb/hr and the fluidized bed data from runs at 177 lb/hr (250 lb/hr @ 67%).

A discriminant (the PVUC difference between the two alternatives) was evaluated as the quantified indicator of the more practical alternative. A review of all of the cases considered and evaluated indicated that the fluidized bed is the preferred system because its lower operating costs result in major cost savings. The sensitivity of the discriminant to variations in capital costs was also calculated. This analysis showed that, with even a 40% increase in capital cost, the fluidized bed is still preferred over the rotary kiln because it is the operating cost (not the capital) that significantly affects the PVUC value. For example, a 40% increase in capital cost differential reflects only a 13% change in the discriminant.

The PVUC model can be used to evaluate any number of alternative designs if sufficient operating data are available. Efficiently used, it provides management with the economic data necessary to make viable decisions when choosing among various alternatives.

INTRODUCTION

The primary objective of this study is to evaluate the economics of two specific waste incinerators designed to satisfy the environmental requirements for pollution abatement at ammunition manufacturing and loading plants.

The evaluation technique used, the Present-Value Method, is consistent with AR 37-13 (ref 1). This method employs a structured mathematical model which evaluates the alternatives and allows for direct comparison on an equitable cost basis. A relevent cost figure, called the Present-Value Unit Cost (PVUC), is determined and applied. A determinant, δXj (the difference between the calculated PVUC's for each alternative) is examined over selected planning horizons (j). It indicates the practicality of a particular scheme in the total analysis (ref 2).

The two basic systems considered in this study are the rotary kiln incinerator and the fluidized bed incinerator systems. A diagram of a simplified rotary kiln is shown in figure 1; the fluidized bed setup, in figure 2.

The scope of the study embraces design capacity, operating capacity, economic life, time horizons, capital costs, and operating costs. Pertinent data on these points were prepared for input into the PVUC model.

To evaluate different sized systems, a design capacity range of 250 to 2500 lb/hr at increments of 250 lb/hr coupled with a range of operating conditions was considered (table 1). For example, a 1000 lb/hr design capacity system was evaluated under four different operating conditions: at 33%, 67%, 100% and 100% at mobilization of the total daily design value. The systems were considered to be operated on an 8-hour shift, thereby indicating a simulated load or ideal capacity equal to the rated design multiplied by 24. A 1000 lb/hr system was capable of incinerating 24,000 pounds of explosive waste per day. The use or operating percentage factor was then applied to this total capacity. On this basis, there were 40 different design cases available for consideration in the economic evaluation.

The planning horizons used in each simulation run varied from 5 to 25 years (the expected economic life of the system) in increments of 5 years. The individual cost functions used for determining the PVUC's for each alternative were those obtained in an associated study conducted for MERADCOM by the Value Engineering Company, Alexandria, VA (ref 3).

Thus, with the primary elements of the problem approach outlined, the fundamental task was to find and evaluate the least cost alternative to meet the incinerator design and loading requirements. A typical computer run consists of input data specification, execution of the computer program, and analysis of the printed output. The decision discriminant is examined for both algebraic sign and magnitude. For each planning horizon, three pertinent values are calculated: the decision discriminant and the PVUC's for A & B, each functional as input to the total decision making process. The solutions for the presented explosives waste incinerator alternatives were generated for the specified conditions which accounted for 40 different design and loading schemes or cases. The resulting computer outputs were collated, interpreted and tabulated.

The decision discriminant and PVUC obtained from the two incinerator systems, the respective planning horizons, the design capacity and daily loading, and computed annual costs are presented in table 2. The associated graphs (CALCOMP plots) for these data are shown in figures 3 through 79. The computed system capital costs for the two alternatives are shown in table 3. Table 4 shows the calculated savings estimated by selection of the fluidized bed and table 5 shows the calculated variations of the discriminant based on an increase in the capital expenditure.

DISCUSSION

The computerized methodology used in this study permits comparison of the two incinerator systems on the basis of Present Value-Unit Costs. Cost input data, which included capital and operating values, were collected and analyzed which also included: a detailed literature survey; personal contact with manufacturers, distributors, and several government agencies; and the data reduction and interpretation gathered from these sources. The cost data collected were based on predetermined design capacity range of 250-2500 lb/hr input of dry propellant waste and operational parameters meeting the necessary standard effluent limitation regulations and safety factors. The cost figures were the vendors' current pricing at the time of the survey.[1] Capital cost is basically the cost of equipment plus instrumentation and accessories (land or installation are excluded). Operational and maintenance costs include the cost of power, water, air, fuel, labor and replacement parts.

Incineration of waste propellants in relatively small quantities (250 to 2500 lb/hr) differs from the incineration of large quantities of industrial and municipal solid wastes, regardless of whether rotary kiln or fluidized bed systems are used. Consequently, in some instances, vendors could not provide costs covering the entire minimum-to-maximum range, and cost figures were extrapolated from the available data for plotting and comparison purposes. In all cases, the vendors' cost data were considered estimates, not firm quotes.

Capital and operational costs are expressed in dollars per 250-lb increment of dry propellant waste. All equipment prices are for one item, F.O.B.

The following guidelines were used to plot and interpret the reduced cost data:

1. For each unit process the data quoted by the equipment manufacturers closely approximates the costs that could be reasonably expected on the basis of published literature and actual experience.

2. Cost figures for the same design capacity and type of equipment vary significantly from one manufacturer to another. This may be due to the fact that some distributors are preoccupied by sales and were not interested in taking the necessary time to provide accurate cost data for this study.

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[1] All dollar values reflect 1974 standards.

3. Operating and maintenance costs differ with respect to geographical location. Consequently, in order to establish a uniform basis of comparison, it was assumed that all plants would be located in the same temperate area. Cost figures interpolated from the curve represent average values.

The design capacity considered in this study and the daily loading simulated in the computer runs are shown in table 1. The daily loading factor is computed by taking the hourly design capacity over a 24-hour period, the ideal capacity for any one day. The percentage factor is then applied to the total capacity to give the daily loading rate. This loading rate was fed into the computer model with the incinerator system assumed to be operating at its designed hourly capacity on 8-hour shifts. On this basis, the number of shifts needed to accomplish the loading was calculated and included as part of the program output. For example, if a system with a design capacity of 750 lb/hr (6000 lb/shift or 18,000 lb/day) were simulated at 50% loading, it would require two shift operations. It was also assumed that if any portion of a shift were included, it would be considered a full 8-hour shift in terms of labor and operation costs.

The capital costs for the two incinerator systems at different levels of capacity are listed in table 2. These dollar figures are representative of the systems' costs in 1974.

Table 3 shows the calculated economic evaluation parameters for a typical case; that is, for a design capacity of 250 lb/hr, given loading factors of 33%, 67%, 100% and planning horizons of 5 through 25 years, the calculated PVUC's and average annual costs are shown based on the simulated operation of the incinerator systems.

The graphs of the PVUC and discriminant values for this 250-lb/hr design capacity case are shown in figures 3 through 79. A direct cost comparison can therefore be made of the two systems. The estimated annual dollar savings obtained by selecting the fluidized bed system over the rotary kiln are shown in table 4. A similar analysis can be made for each of the 40 cases presented in this report by following the same technique as that described for the 250 lb/hr design using the data in figure 3 through 79. A review of these plots shows that in every case, the fluidized bed system is preferred.

The sensitivity of the discriminant to variations in the capital costs for the fluidized bed was calculated (table 5). These values show how the decision discriminant varied in response to selected percentage increases in capital costs. This may also be interpreted as a variation in the difference between the capital costs of both alternatives. In this case it shows that even if the capital costs of the fluidized bed were to increase, it would still be favored over the rotary kiln.

During the fluidized bed pilot plant operations conducted at ARRADCOM during 1977, the average loading rate was 177 lb/hr. This value closely approximates the 67% loading rate for the 250 lb/hr design and is closely correlated to the pilot plant operations.

The selection of any particular case or case set is not an easy or well defined task, since the "demand" for the disposal of waste propellant and explosives cannot be predicted with any degree of accuracy; or can any valid variations be played without being considered simply random guesses. Therefore, it was assumed that the demand would be considered constant, and valid variations were approximated by varying the loading conditions. Each case, therefore, represented a design capacity and a varied operating or loading condition for each time period. Thus, although each case was discrete and defined, variations were simulated and played in the computer model.

CONCLUSIONS

Based on the results of this study and the provisions for cost evaluation developed by MERADCOM (ref 3), the fluidized bed incinerator system offers an economic advantage over the rotary kiln and is recommended as the preferred system for disposal of propellant and explosive wastes at ammunition manufacturing plants.

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1. "Economical Analysis and Program Evaluation of Resource Management," AR 37-13, June 1973.
2. Ciccone, et al, "A Present Value-Unit Cost Methodology for Evaluating Municipal Wastewater Reclamation and Direct Reuse," Water Resources Bulletin, Vol. 11, No. 1, 1975.
3. "Engineering Evaluation to Determine Cost Elements for Incinerators," Report No. 1, US Army Mobility Equipment Research and Development Center, Fort Belvoir, VA., June 1974.
4. Modern Cost-Engineering Techniques, McGraw Hill, New York, 1970.
5. Joseph S. Santos and Robert Scola, "Fluidized Bed Incinerator for Disposal of Propellants and Explosives," Technical Report ARLCD-TR-78032, ARRADCOM, Dover, NJ, 1978.

TABLE 1

SIMULATED DESIGN CAPACITY AND DAILY LOADING

DESIGN CAPACITY (lb)			DAILY LOADING (lb) (% OF TOTAL CAPACITY)		
1 hr	8 hr	24 hr	33.33%	66.66%	100%
250	2000	6000	2000	4000	6000
500	4000	12000	4000	8000	12000
750	6000	18000	6000	12000	18000
1000	8000	24000	8000	16000	24000
1250	10000	30000	10000	20000	30000
1500	12000	36000	12000	24000	36000
1750	14000	42000	14000	28000	42000
2000	16000	48000	16000	32000	48000
2250	18000	54000	18000	36000	54000
2500	20000	60000	20000	40000	60000

operating costs ?

TABLE 2

Capital Costs for 250 lb/hr Incinerator Systems

	Rate (%)	Daily loading rate (lb)	Yearly loading rate (lb)	Planning horizon (yr)	PVUC ($/lb exp)[a] RK	PVUC ($/lb exp)[a] FB	Avg Annual Cost[b] RK	Avg Annual Cost[b] FB
8 hr day	33	2000	500,000	5	0.26358	0.22520	$131	$113
		8hr	5×10^6 lbs	✓ 10	0.25633	0.21629	128	108
				15	0.25046	0.20906	125	105
				20	0.24581	0.20373	123	102
				25	0.24222	0.19891	121	99
16 hr day	66	4000	1,000,000	5	0.20450	0.14102	205	141
				10	0.20088	0.13656	201	137
				15	0.19794	0.13294	198	133
				20	0.19562	0.13008	196	130
				25	0.19382	0.12787	194	128
24 hr day	100	6000	1,500,000	5	0.21310	0.10946	320	164
	5-day-week		250-day/yr	10	0.21068	0.10649	316	160
				15	0.20873	0.10407	313	156
				20	0.20718	0.10217	311	153
				25	0.20598	0.10069	309	151
	MOB	6000	1,872,000	5	0.20479	0.09872	383	185
	6-day-week		312-day/yr	10	0.20285	0.09634	380	180
				15	0.20128	0.09441	377	177
				20	0.20004	0.09288	374	174
				25	0.19908	0.09170	373	172

---

a. RK = rotary kiln; FB = fluidized bed
b. Nearest thousand

TABLE 3

CALCULATED CAPITAL COSTS
FOR
VARIOUS CAPACITY SYSTEMS

1974 Costs

DESIGN CAPACITY (lb/hr)	Cost in Thousands* Rotary Kiln	 Fluidized Bed
250	473	582
500	513	645
750	558	715
1000	606	792
1250	658	878
4' 1500	715	973
1750	777	1078
2000	844	1195
2250	917	1324
2500	996	1468

---

* Reference #2, (1974 dollars)

PV method discount 10%/yr

	RK	FB
	473K + (128K) 6.144	582K + (108K) 6.144
	$ 1.259 M	$ 1.245 M
PV UC	.252	.249

250 lb/hr capacity, 10 yrs. life,
500,000 lb/yr disposal

TABLE 4

CALCULATED SAVINGS BY USING FLUIDIZED BED

(TYPICAL)

DESIGN CAPACITY IS 250 lb/hr

LOADING RATE IS 67% 2 x 8hr/shift

TIME (yr)	DISCRIMINANT ($\delta x j$)	SAVINGS ($) *
5	0.50919	241
10	0.83625	395
15	1.04608	494
20	1.18056	558
25	1.26667	599

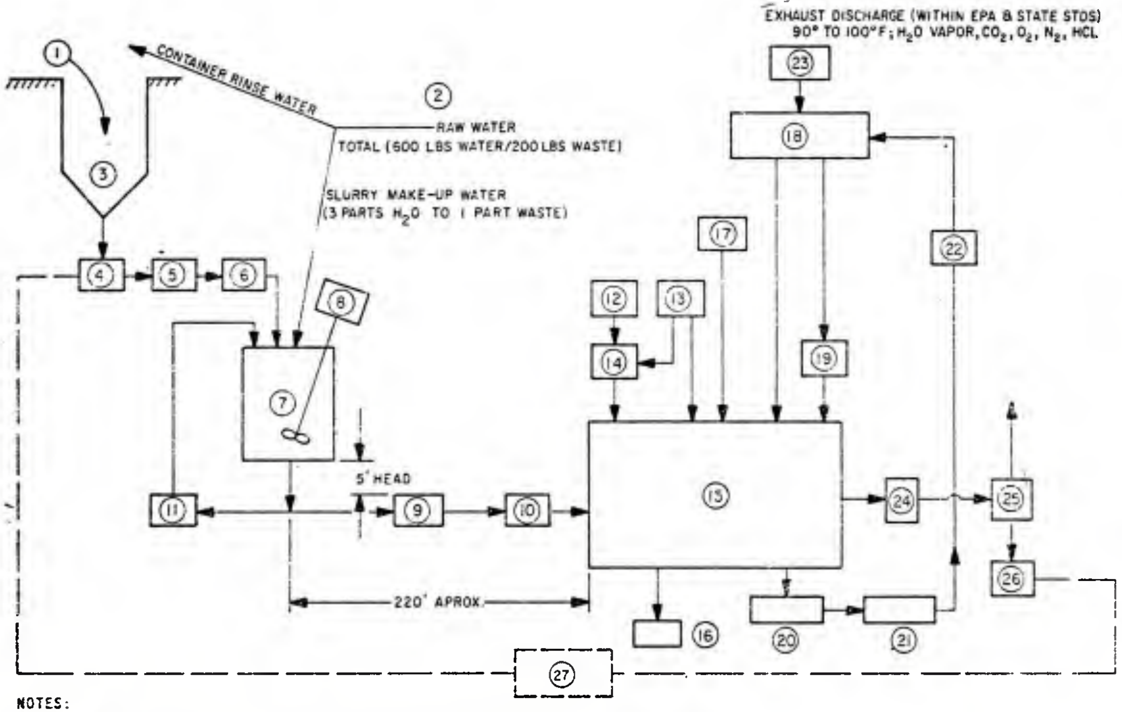
---

* Nearest thousands. Obtained by multiplying discriminant by the capital cost of rotary kiln, here $472,600.

TABLE 5

SENSITIVITY ANALYSIS FOR VARIATIONS IN CAPITAL COSTS of 250 lb/hr FLUIDIZED BED

Year	PERCENTAGE INCREASE IN CAPITAL COST DIFFERENTIAL				
	0%	25%	30%	35%	40%
	Discriminant Variations				
5	1.68	1.54	1.51	1.48	1.45
10	2.73	2.50	2.45	2.41	2.36
15	3.39	3.11	3.06	3.01	2.95
20	3.81	3.51	3.45	3.39	3.33
25	4.06	3.76	3.70	3.63	3.57



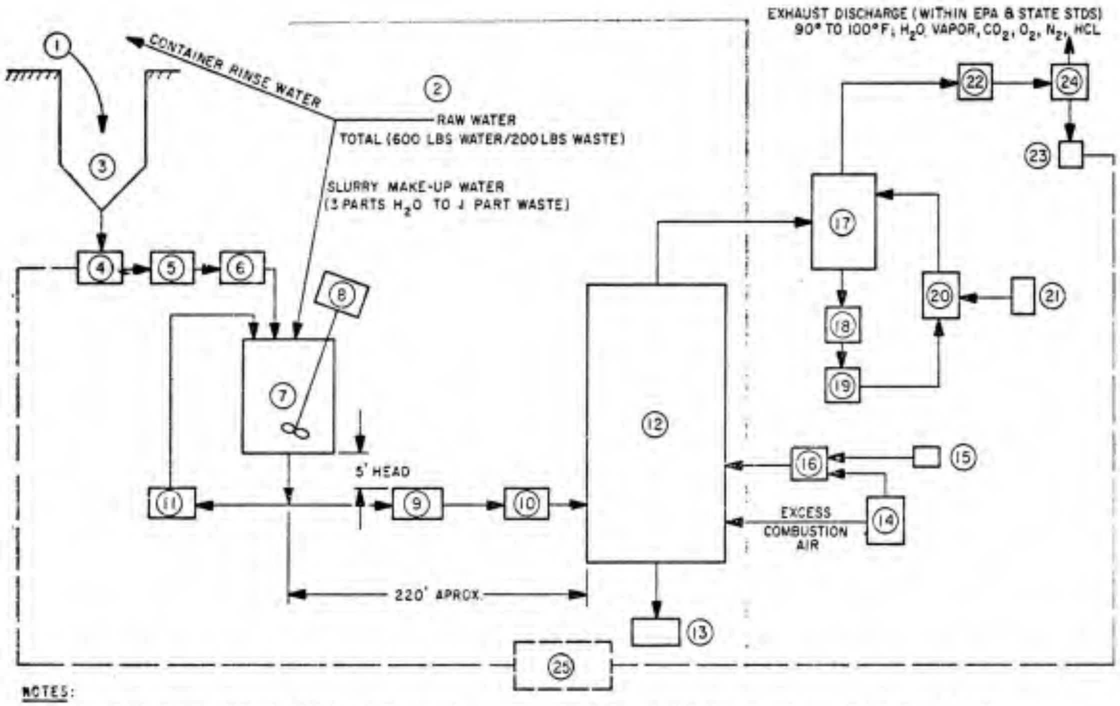
SCHEDULE

1. DRY DISPOSAL WASTE
2. RAW WATER FACILITY SUPPLY
3. WASTE DRUM DUMPER HOPPER
4. METAL WASTE DETECTOR (FERROUS AND NON-FERROUS)
5. CONVEYOR (OPEN TROUGH, VIBRATORY)
6. GRINDER (NO. 8 SCREEN (0.1 IN. OUTPUT).
7. SLURRY HOLDING TANK
8. AGITATOR
9. SLURRY CIRCULATING PUMP
10. SLURRY FEED METERING PUMP
11. SLURRY RECYCLING PUMP
12. AUXILIARY BURNER DIESEL FUEL SUPPL
13. COMBUSTION AIR SUPPLY
14. AUXILIARY BURNER
15. ROTARY KILN INCINERATOR
16. ASH PIT
17. AFTER BURNER, IF REQUIRED
18. EXHAUST PRECOOLER
19. SCRUBBER
20 PARTICULATE SETTLING POND
21. COOLING POND
22 COOLING WATER CIRCULATING PUMP
23. MAKE UP COOLING WATER
24. INDUCED DRAFT EXHAUST FAN
25. EXHAUST STACK
26. EXHAUST ANALYSIS MEASURING AND AUTOMATIC PLANT OPERATION CONTROL DEVICE
27. REMOTE PLANT OPERATION CONTROL STATION

NOTES:

1. POWER AVAILABLE: 440 VAC, 60 Hz, 3 Ø, EXPLOSION WEATHERPROOF ELECT. MOTORS REQUIRED.
2. SLURRY PIPING-TYPE 304 STAINLESS STEEL, SCHEDULE 40.
3. MALFUNCTION HEAT SENSORS, LOCATED AS NECESSARY, WITH AUTOMATIC PLANT SHUT-DOWN REQUIRED.
4. DRY WASTE INPUT PARTICLE SIZE: MAX. 5" TO 2" APPROX. 5 TO 10%
   MIN. 2" TO 1/16" APPROX. 85%
5. PLANT CAPACITY: WASTE INPUT 200 LBS/HR. TO 2000 LBS/HR. IN 200 LBS/HR. INCREMENTS

FIGURE NO. 1 Flow diagram--rotary kiln incinerator system



SCHEDULE

1. DISPOSAL WASTE (DRY)
2. FACILITY SUPPLY
3. WASTE DRUM DUMPER
4. METAL DETECTOR (FERROUS AND NON-FERROUS)
5. CONVEYOR (OPEN TROUGH, VIBRATORY TYPE, STAINLESS STEEL DECK, 15 FT. LENGTH
6. GRINDER (GRIND TO 0.1 INCH, NO.3 SCREEN)
7. SLURRY STORAGE AND MIXING TANK
8. AGITATOR (VERTICAL MOUNTED, PROPELLOR TYPE)
9. SLURRY CIRCULATING PUMP
10. SLURRY METERING FEED PUMP TO INCINERATOR COMBUSTOR.
11. EXCESS SLURRY RECYCLING PUMP
12. FLUIDIZED BED INCINERATOR.
13. ASH PIT
14. COMBUSTION AIR SUPPLY
15. AUXILLIARY FUEL SUPPLY (PROPANE PREFERRED, DIESEL NO. 2 OPTIONAL)
16. AUXILLIARY FUEL BURNER
17. EXHAUST PARTICULATE PRECIPITATOR
18. PARTICULATE COLLECTOR
19. WATER COOLING SETTLING POND
20. COOLING WATER RECYCLING PUMP
21. MAKE-UP COOLING WATER SUPPLY
22. INDUCED DRAFT EXHAUST FAN
23. EXHAUST COMPOSITION MEASURING CONTROL DEVICE
24. EXHAUST CHIMNEY (STACK)
25. REMOTE PLANT CONTROL STATION

NOTES:

1. DRY WASTE INPUT-CAPACITY RANGE 200 LBS/HR. TO 2000 LB/HR. IN INCREMENTS OF 200 LBS/HR. PARTICLE SIZE: 5"-2" APPROX. 15%. 2"-1/16" APPROX. 85%.
2. POWER AVAILABLE: 440 VAC, 60 Hz, 3 Ø.
3. AUTOMATIC PLANT SHUT-DOWN CONTROLS AT ④ AND ㉓.
4. MALFUNCTION HEAT SENSOR-LOCATED AS NECESSARY WITH AUTOMATIC PLANT SHUT-DOWN SWITCH CONTROLS.
5. REMOTE CENTRAL OPERATIONAL CONTROL/MONITORING STATION.
6. TYPE 304 STAINLESS STEEL, SCHEDULE 40 PIPING AND FITTINGS FOR SLURRY CIRCULATING LOOP.

FIGURE NO. 2 Flow diagram--fluidized bed incinerator system

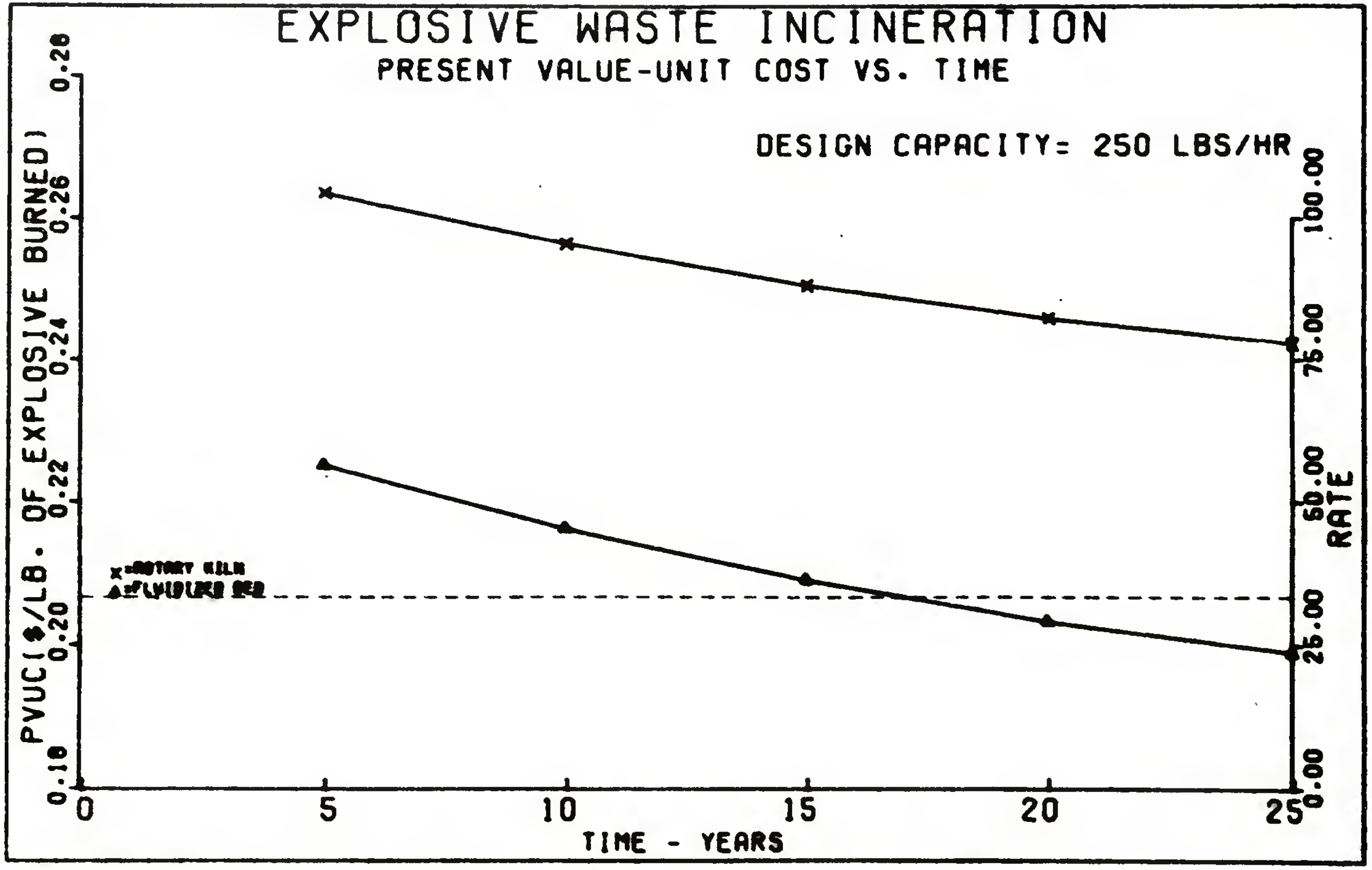
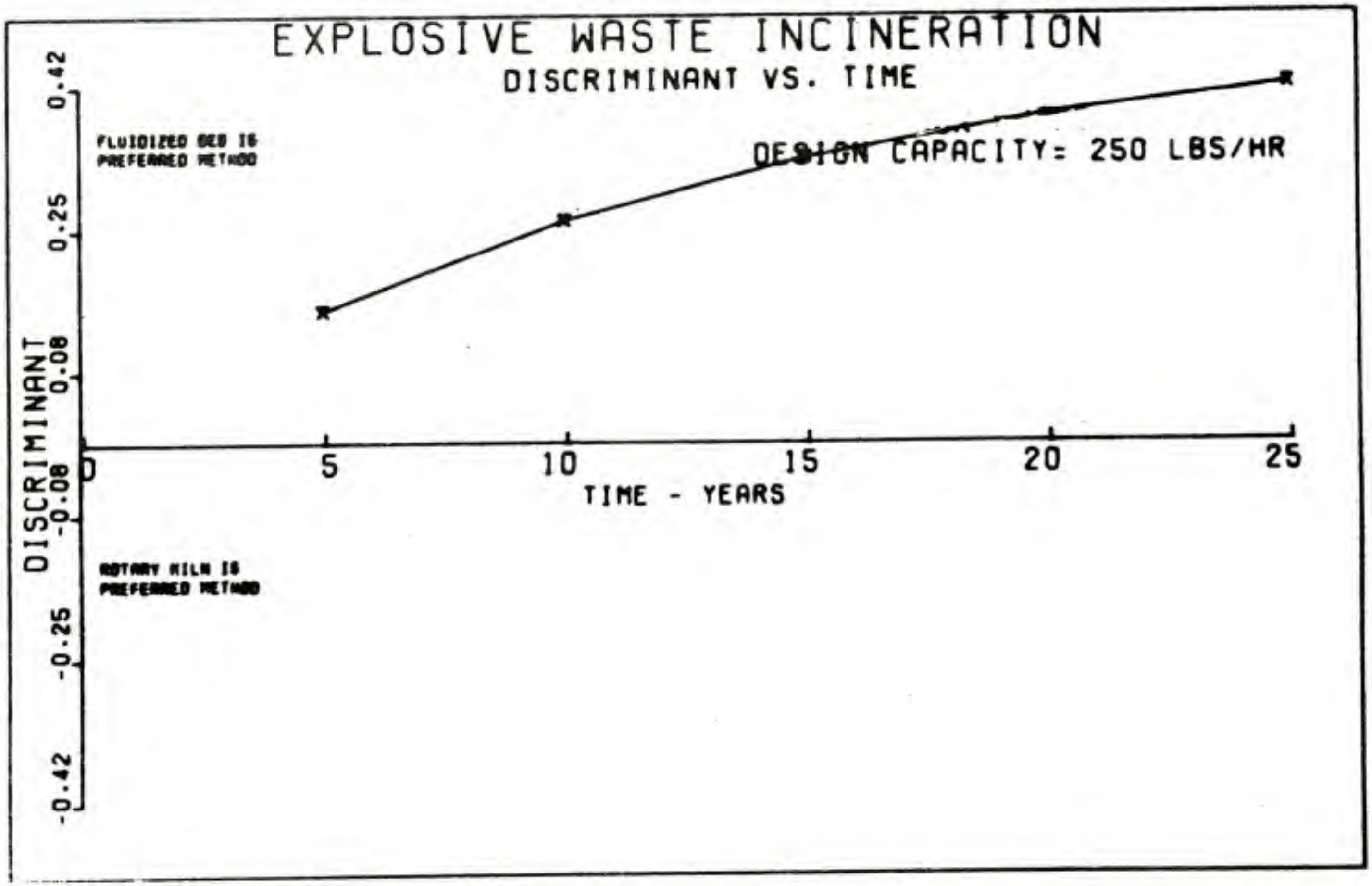

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.18
0.20
0.22
0.24
0.26
0.28
RATE
0.00
25.00
50.00
75.00
100.00
x=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 3



EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
0.42
0.25
0.08
-0.08
-0.25
-0.42
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 4

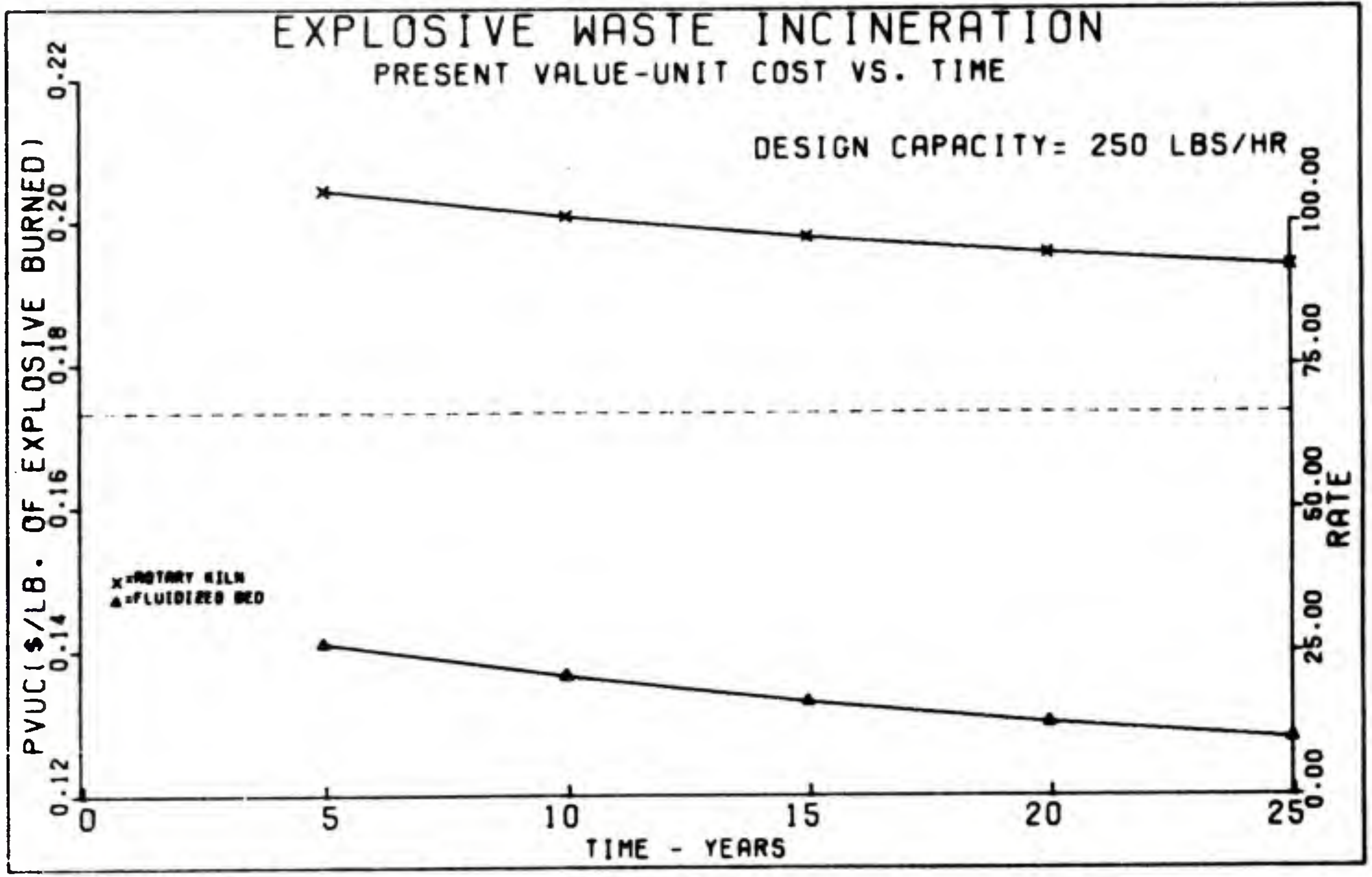

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.12
0.14
0.16
0.18
0.20
0.22
RATE
0.00
25.00
50.00
75.00
100.00
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 5

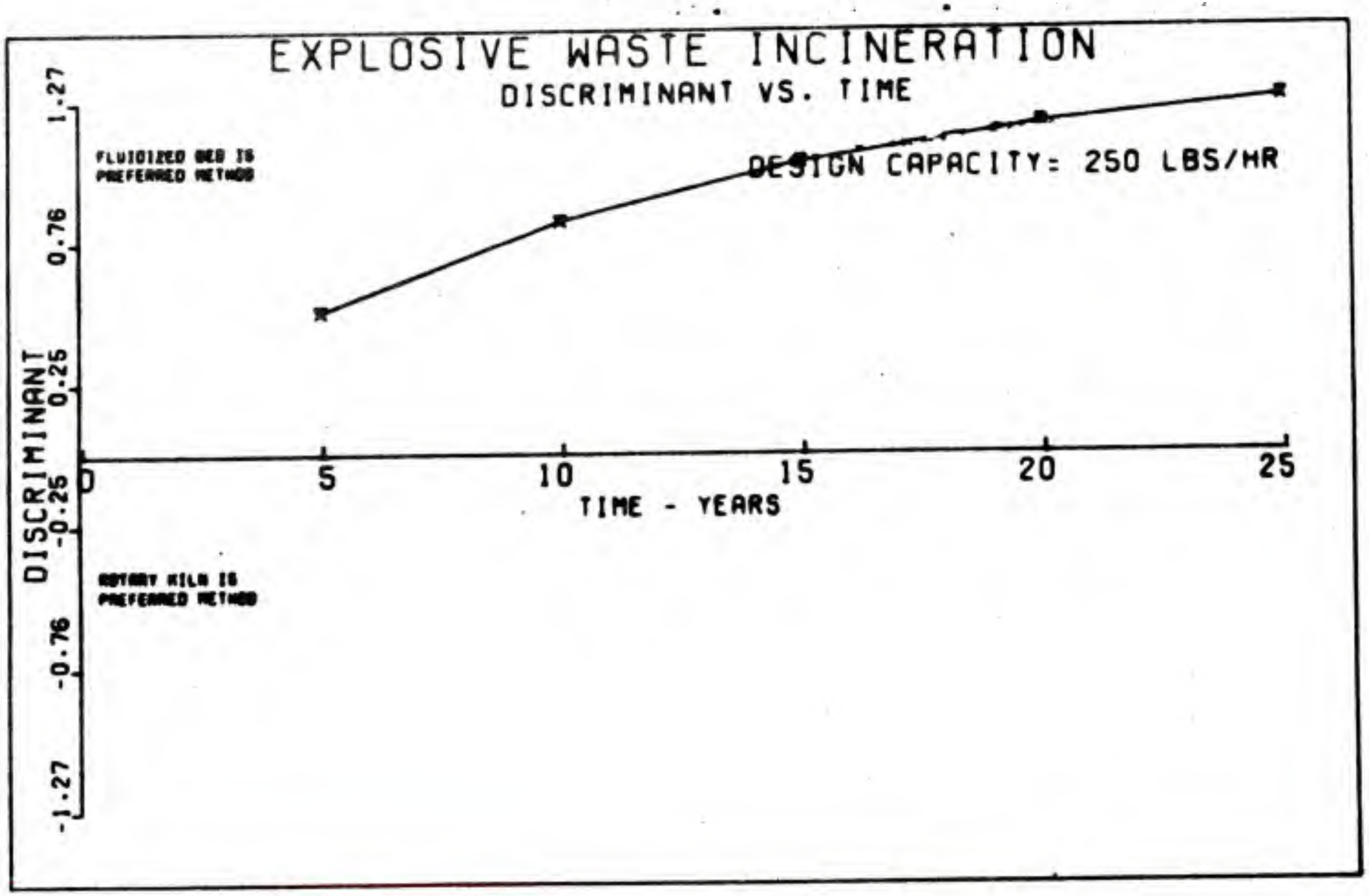

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY: 250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
1.27
0.76
0.25
-0.25
-0.76
-1.27
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 6

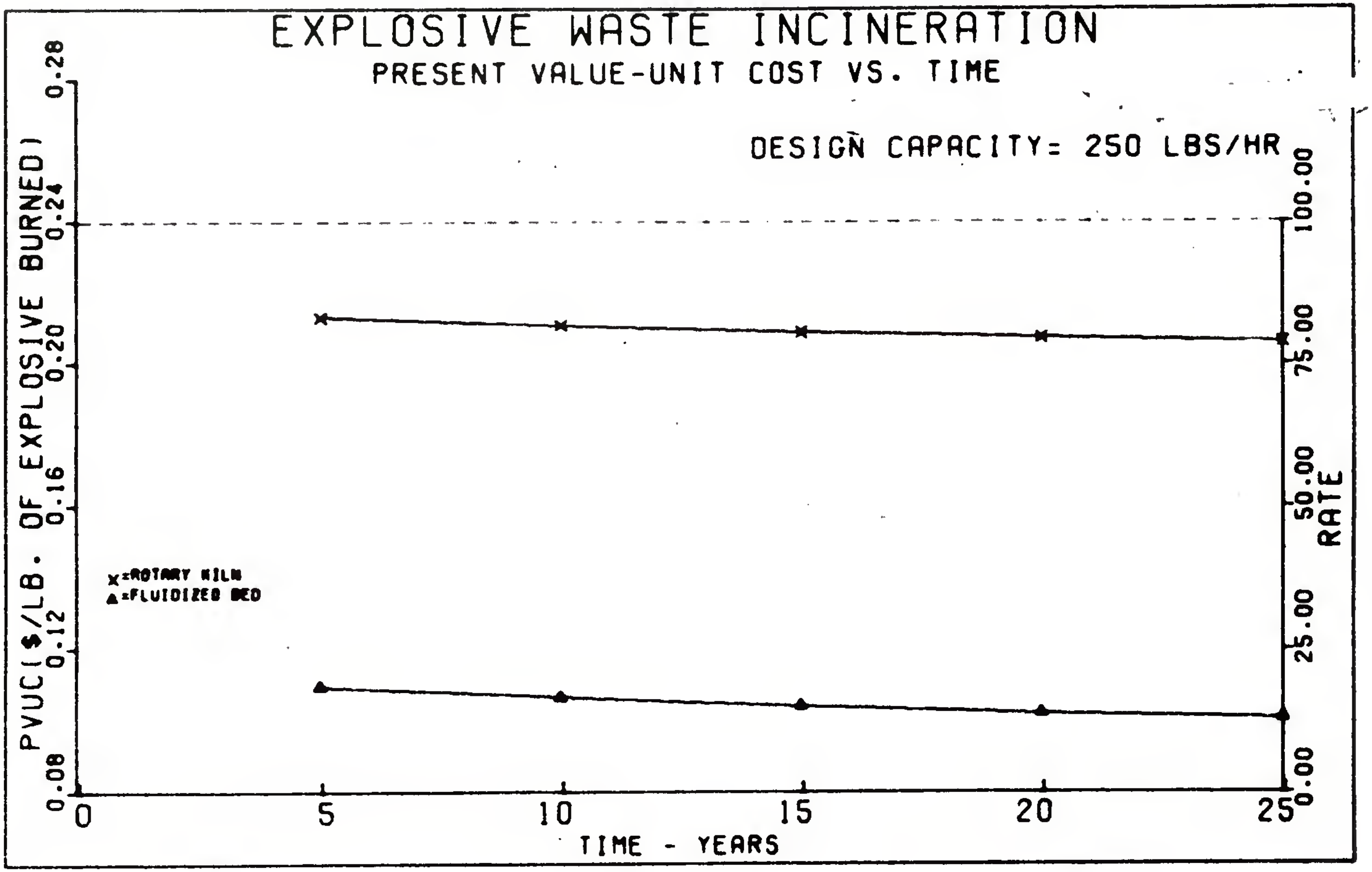
EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.28
0.24
0.20
0.16
0.12
0.08
RATE
100.00
75.00
50.00
25.00
0.00
0
5
10
15
20
25
TIME - YEARS
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 7

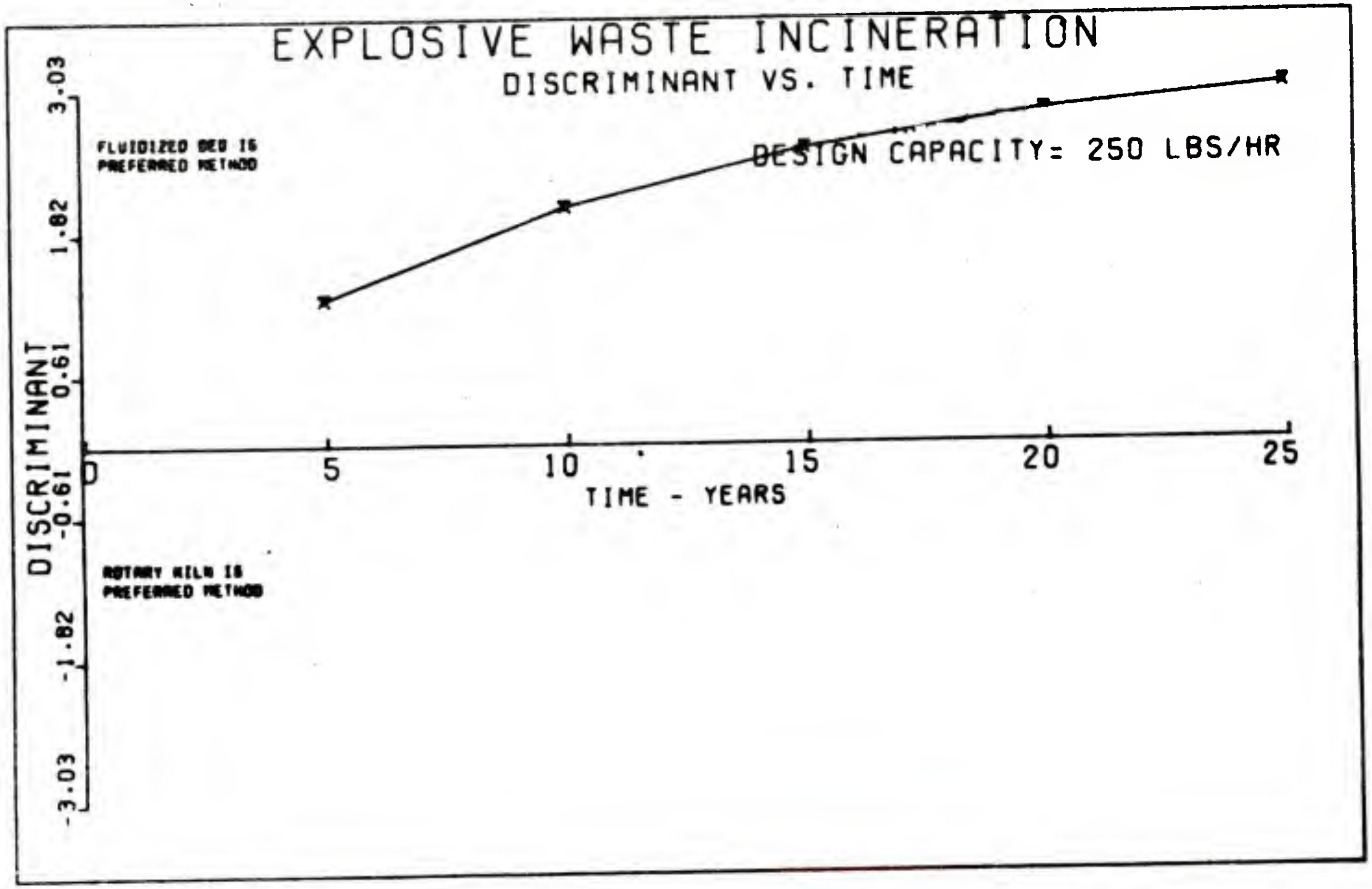
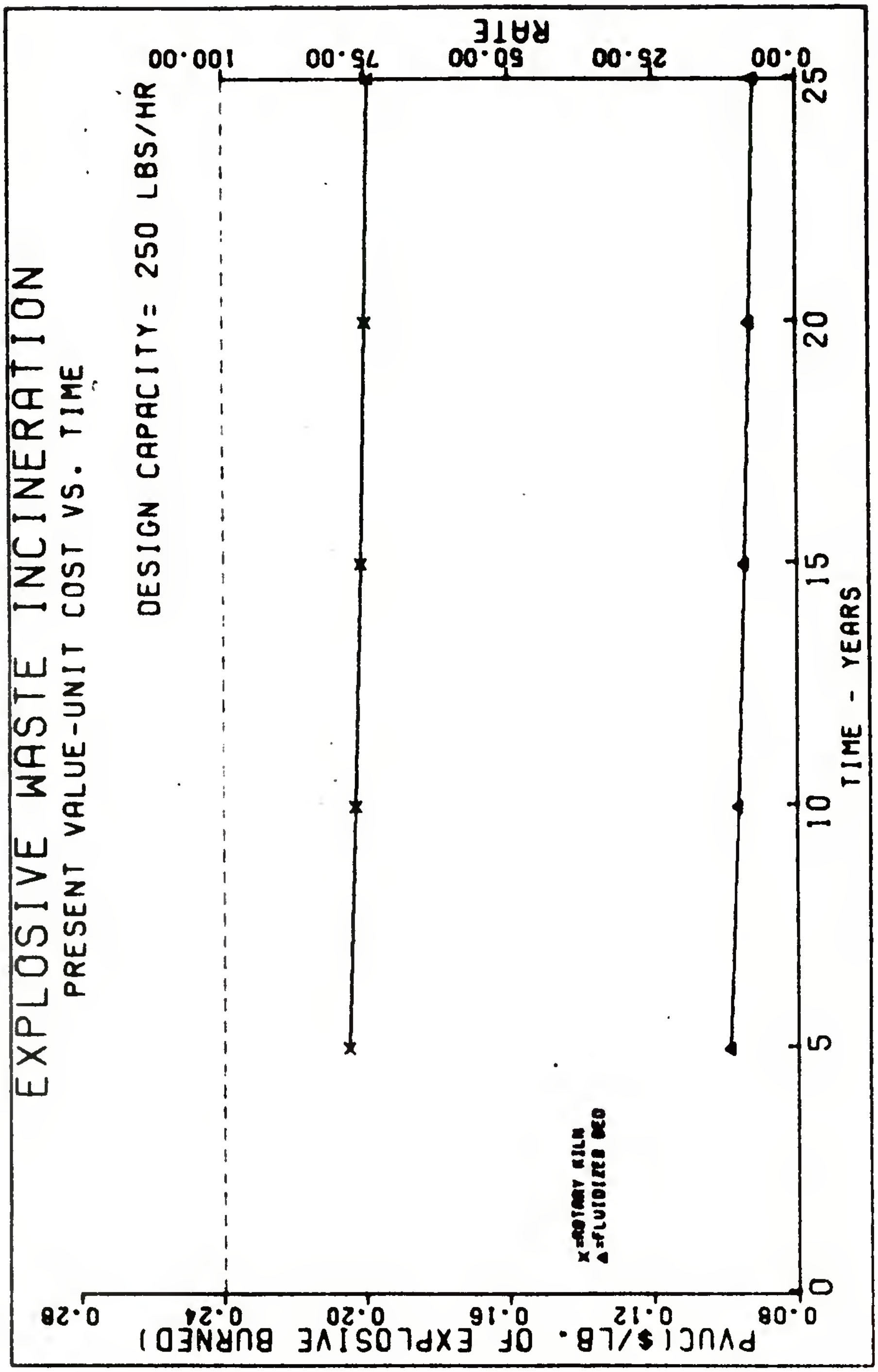

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.03
1.82
0.61
-0.61
-1.82
-3.03
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 8



EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.08
0.12
0.16
0.20
0.24
0.28
TIME - YEARS
0
5
10
15
20
25
RATE
0.00
25.00
50.00
75.00
100.00
X =ROTARY KILN
▲ =FLUIDIZED BED

FIGURE NO. 9

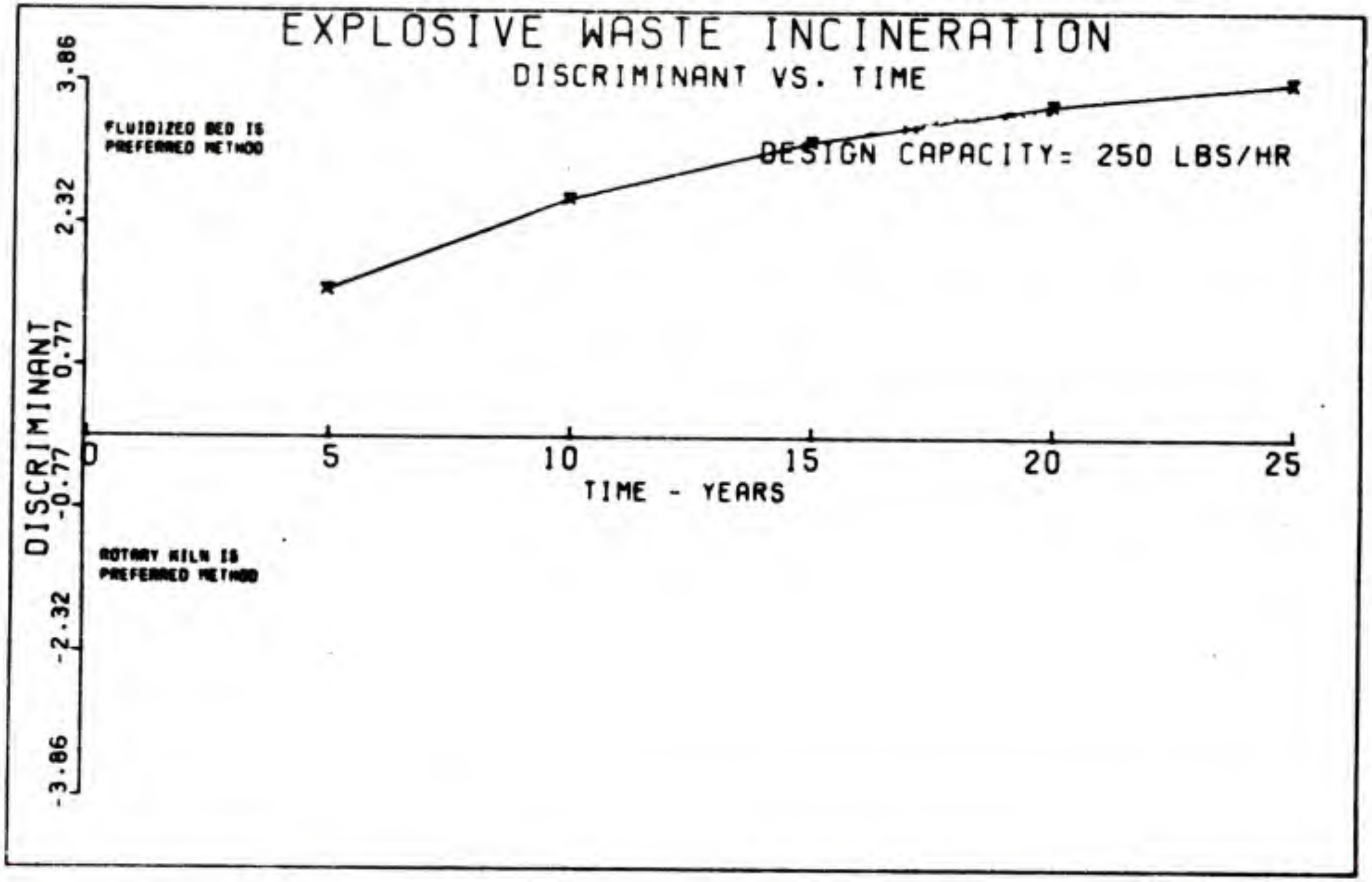

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.86
2.32
0.77
-0.77
-2.32
-3.86
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 10

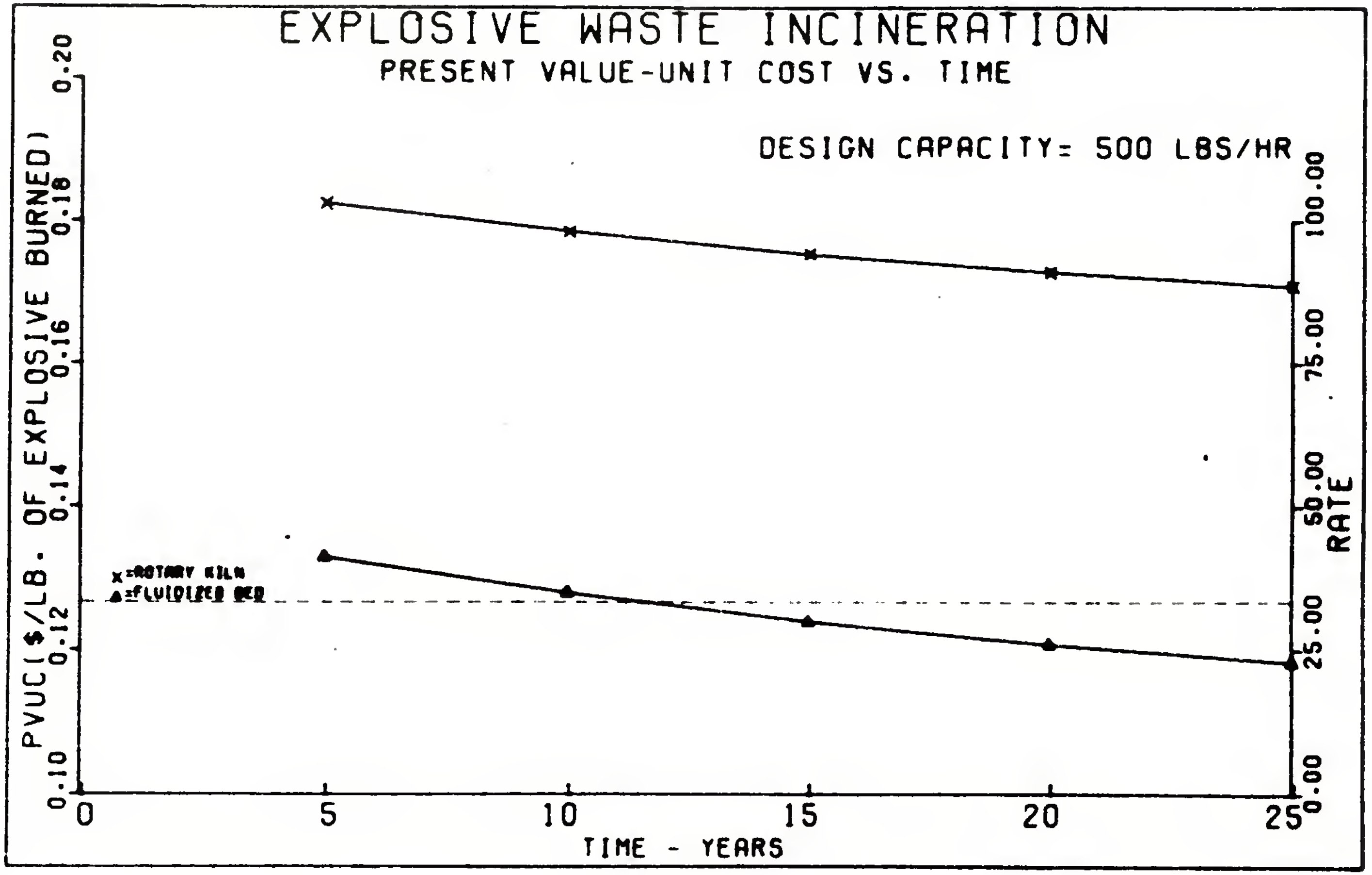
EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.10
0.12
0.14
0.16
0.18
0.20
RATE
0.00
25.00
50.00
75.00
100.00
x=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 11

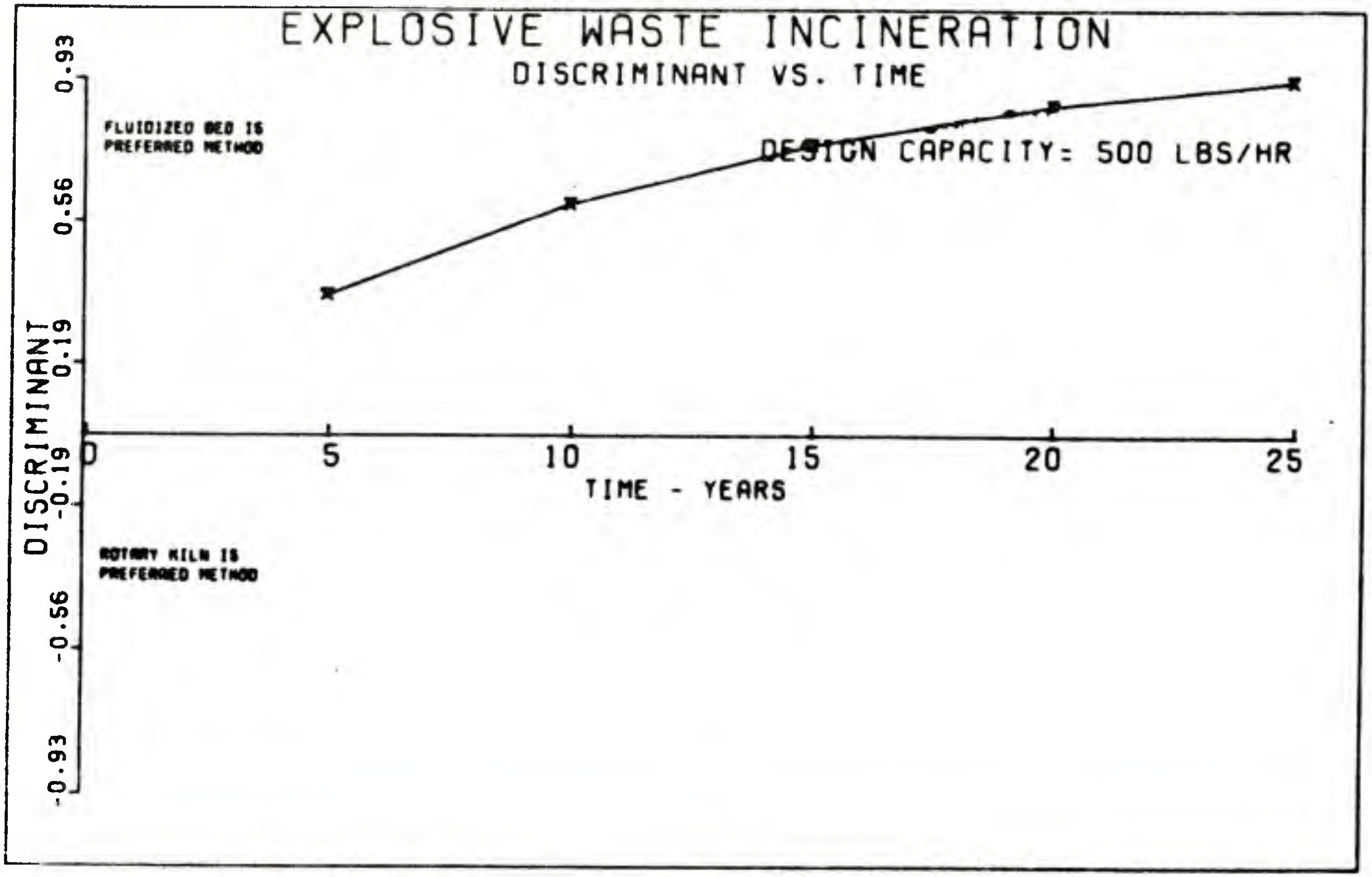

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
0.93
0.56
0.19
-0.19
-0.56
-0.93
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 12

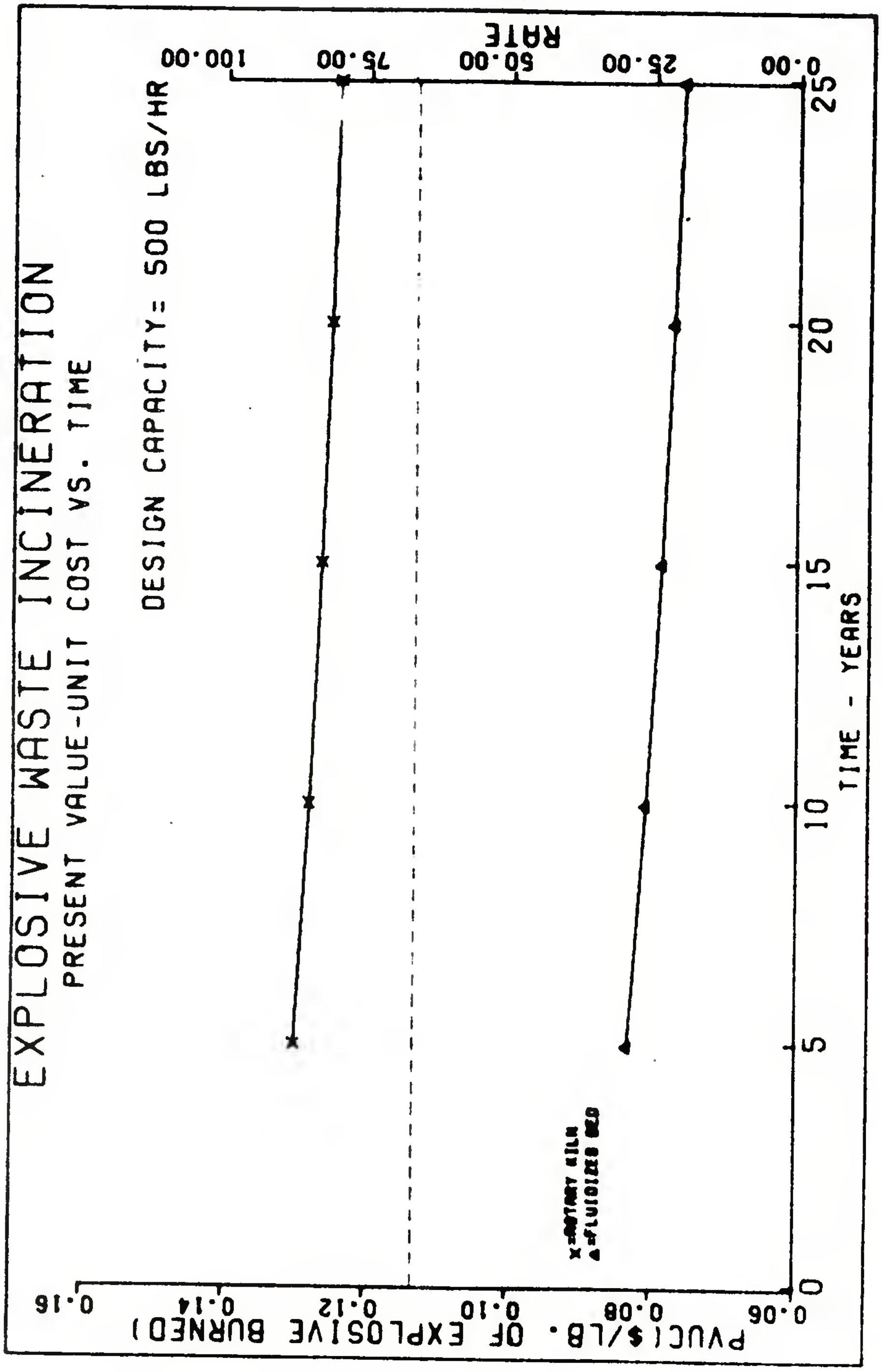

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 13

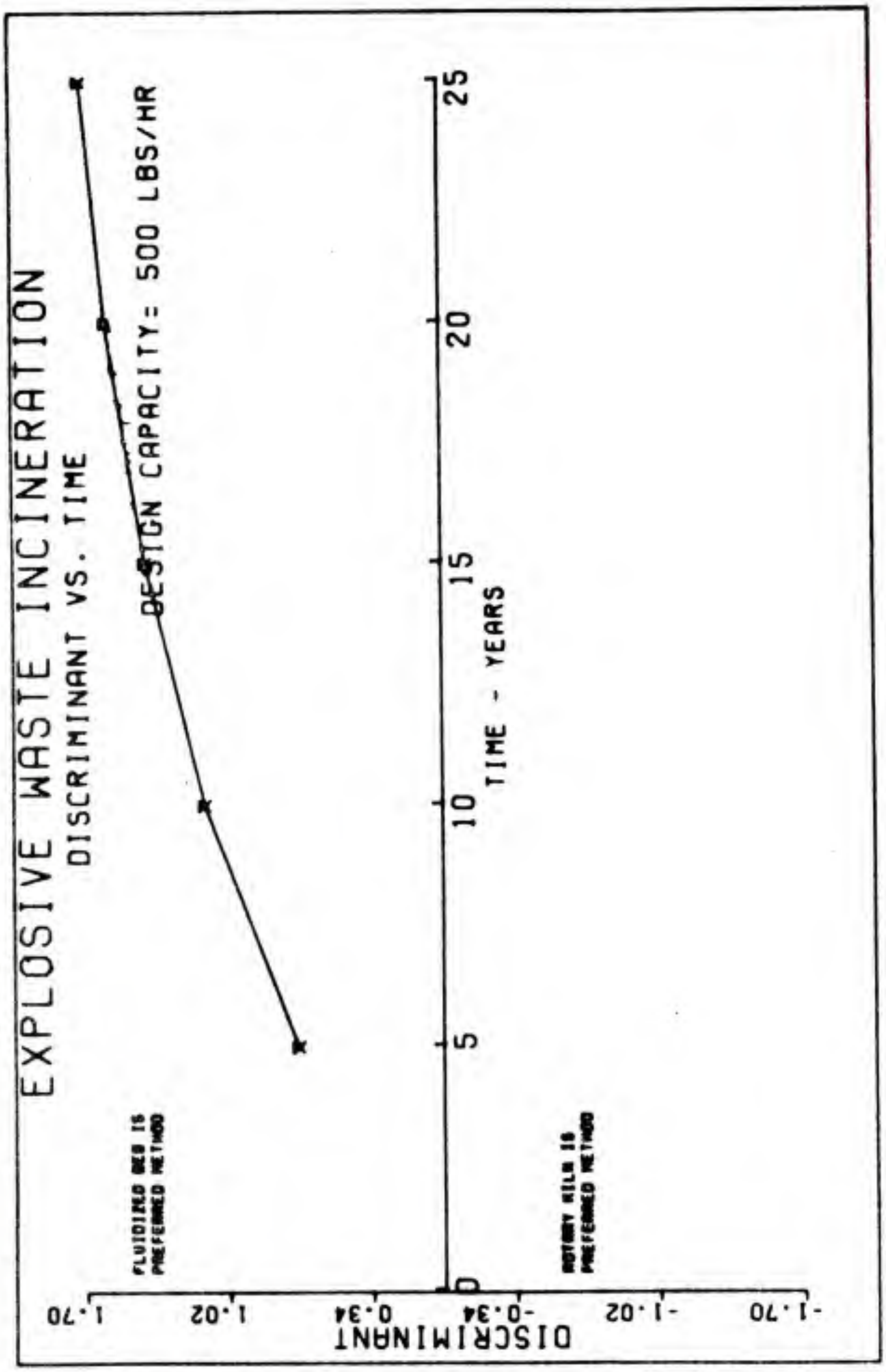

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
1.70
1.02
0.34
-0.34
-1.02
-1.70
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 14

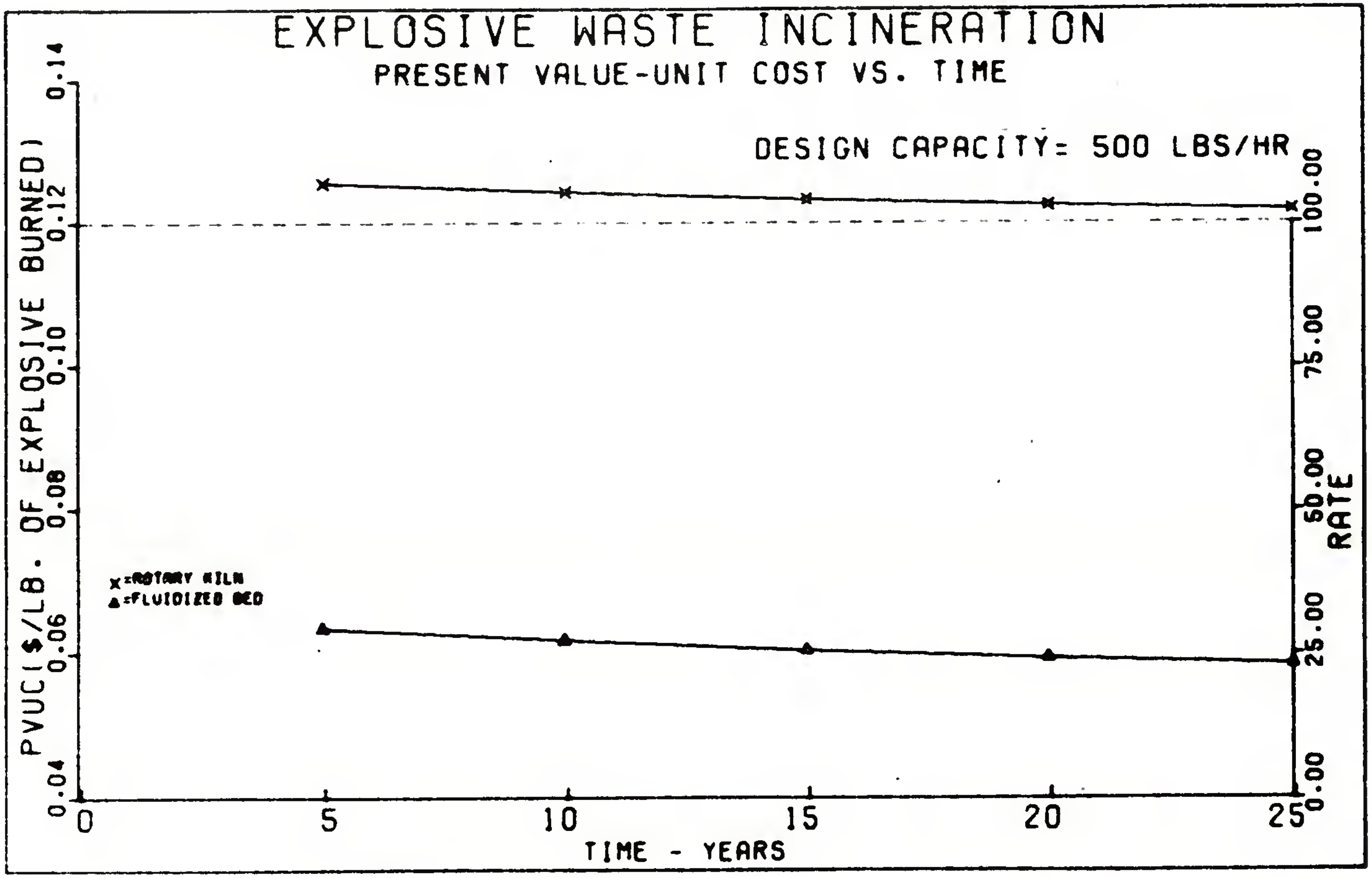

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.04
0.06
0.08
0.10
0.12
0.14
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 15

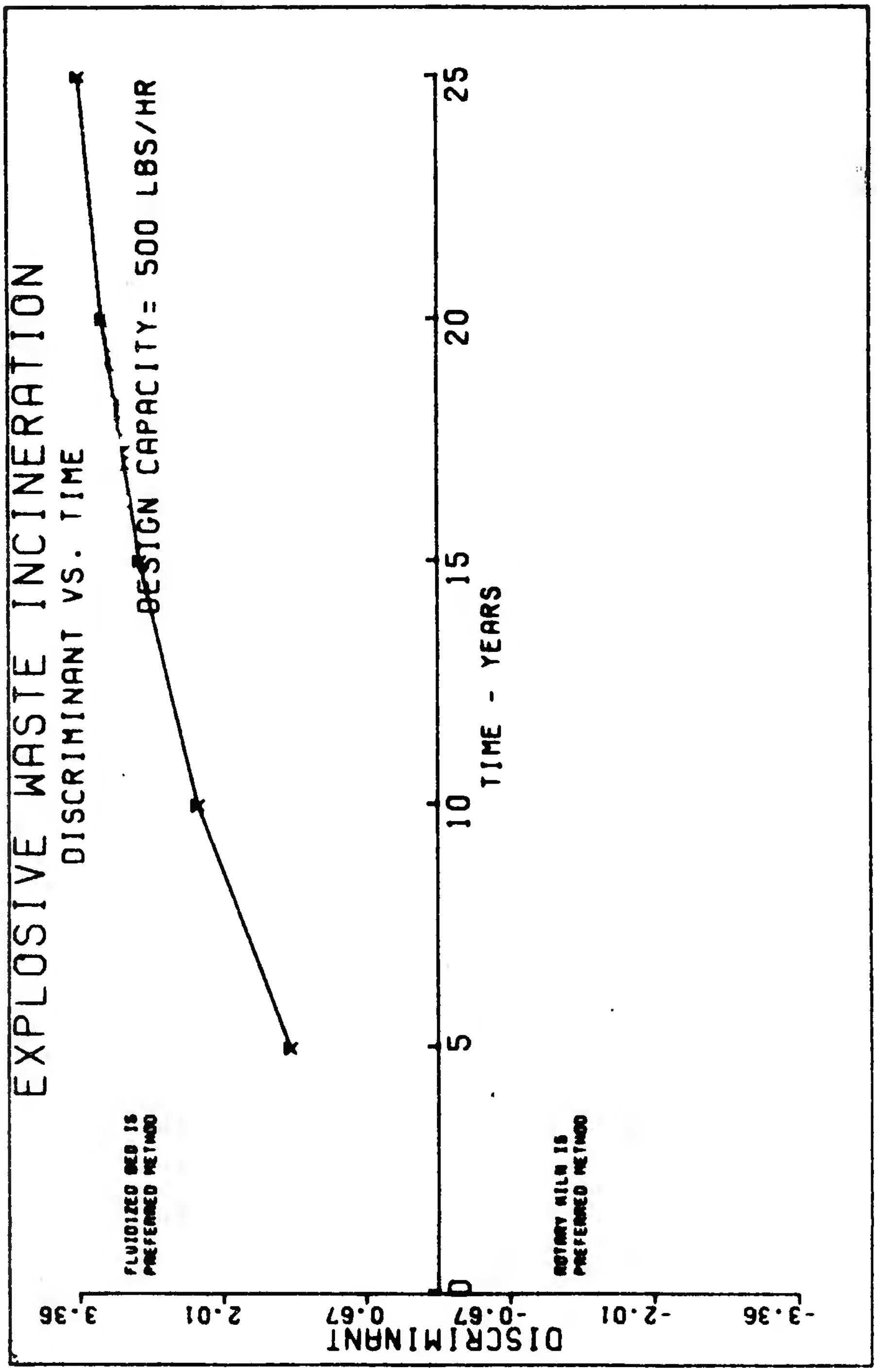

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.36
2.01
0.67
-0.67
-2.01
-3.36
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 16

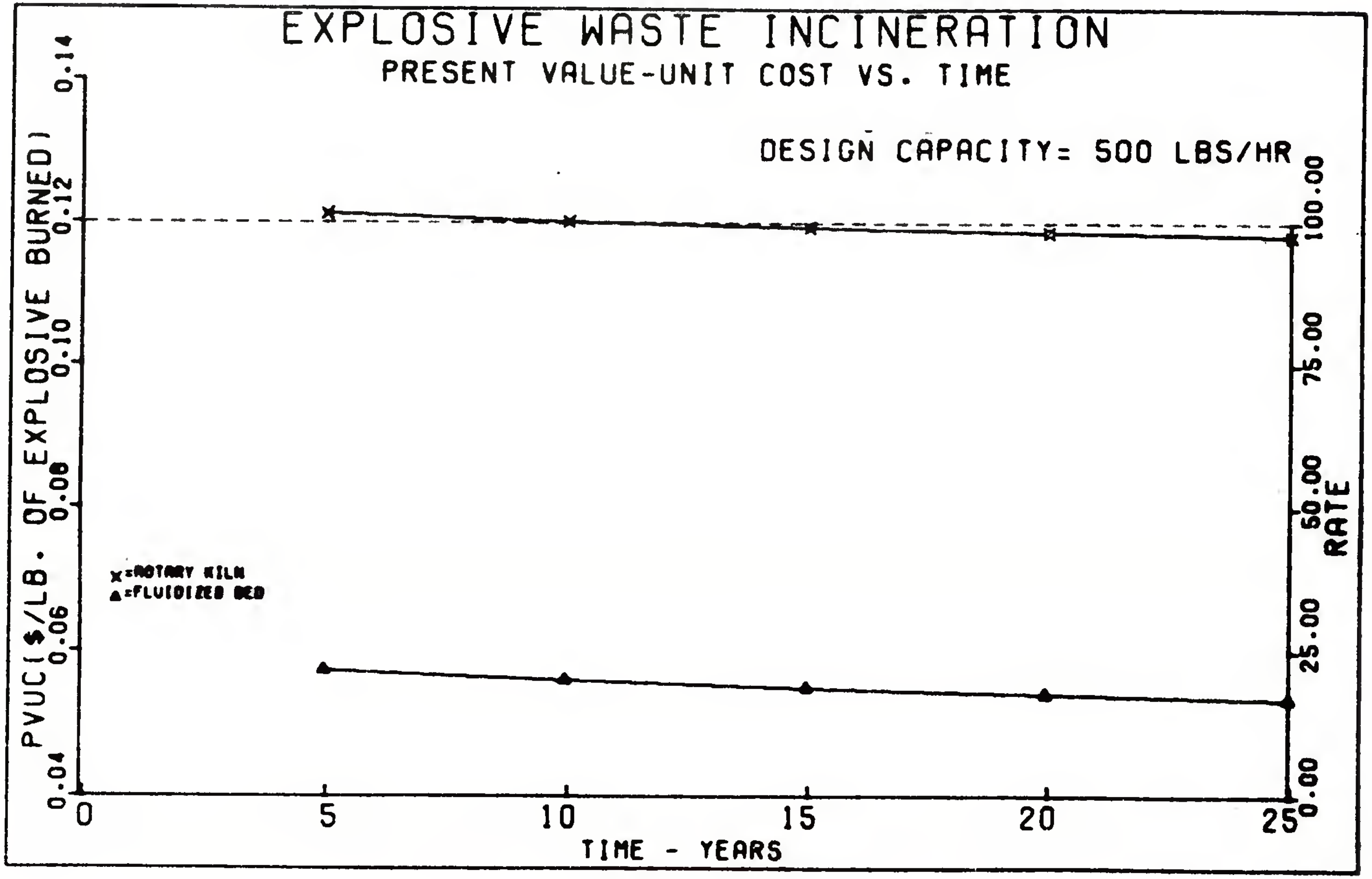
EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.04
0.06
0.08
0.10
0.12
0.14
RATE
0.00
25.00
50.00
75.00
100.00
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 17

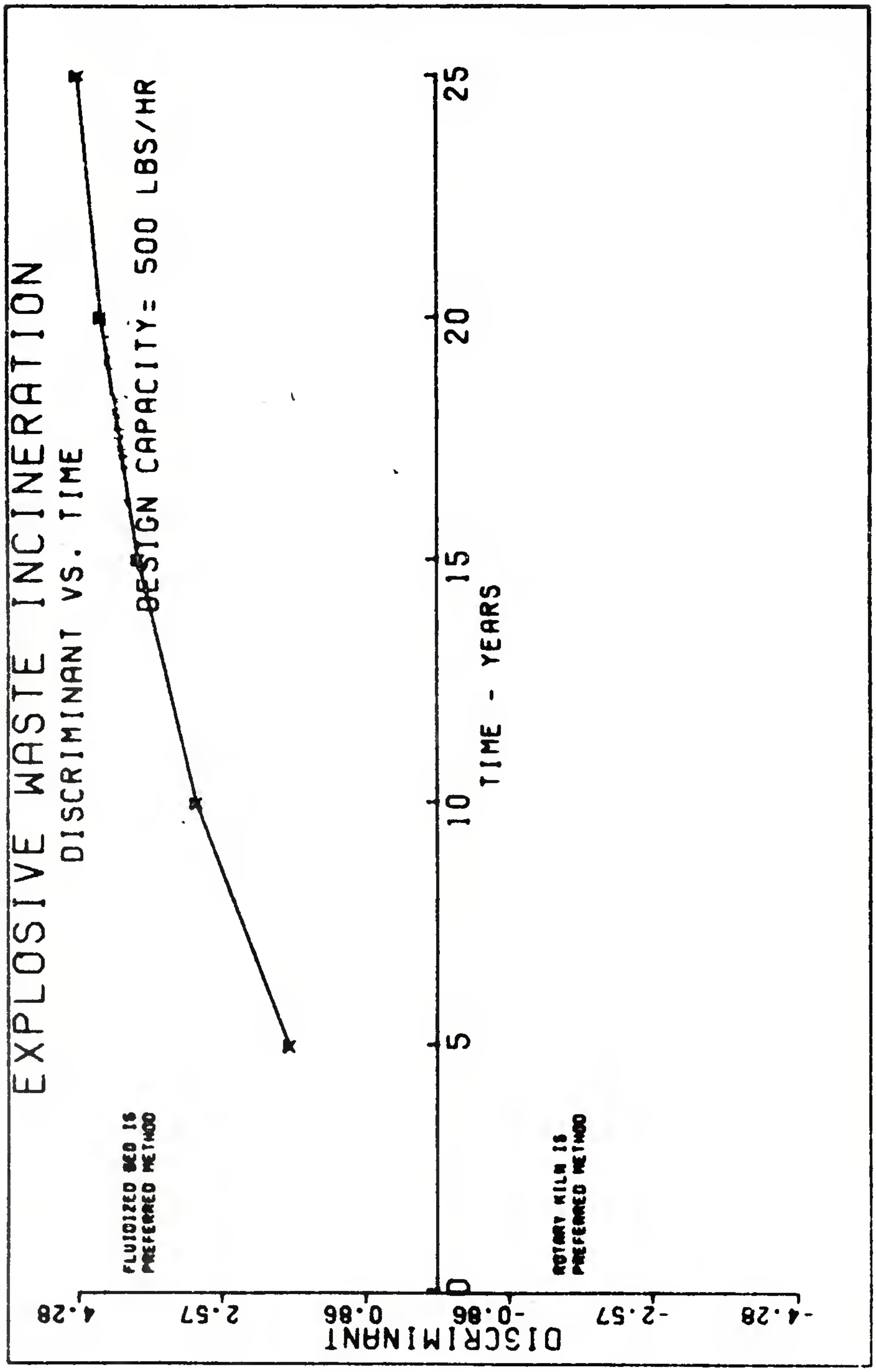

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 500 LBS/HR
DISCRIMINANT
4.28
2.57
0.86
-0.86
-2.57
-4.28
TIME - YEARS
0
5
10
15
20
25
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD

FIGURE NO. 18

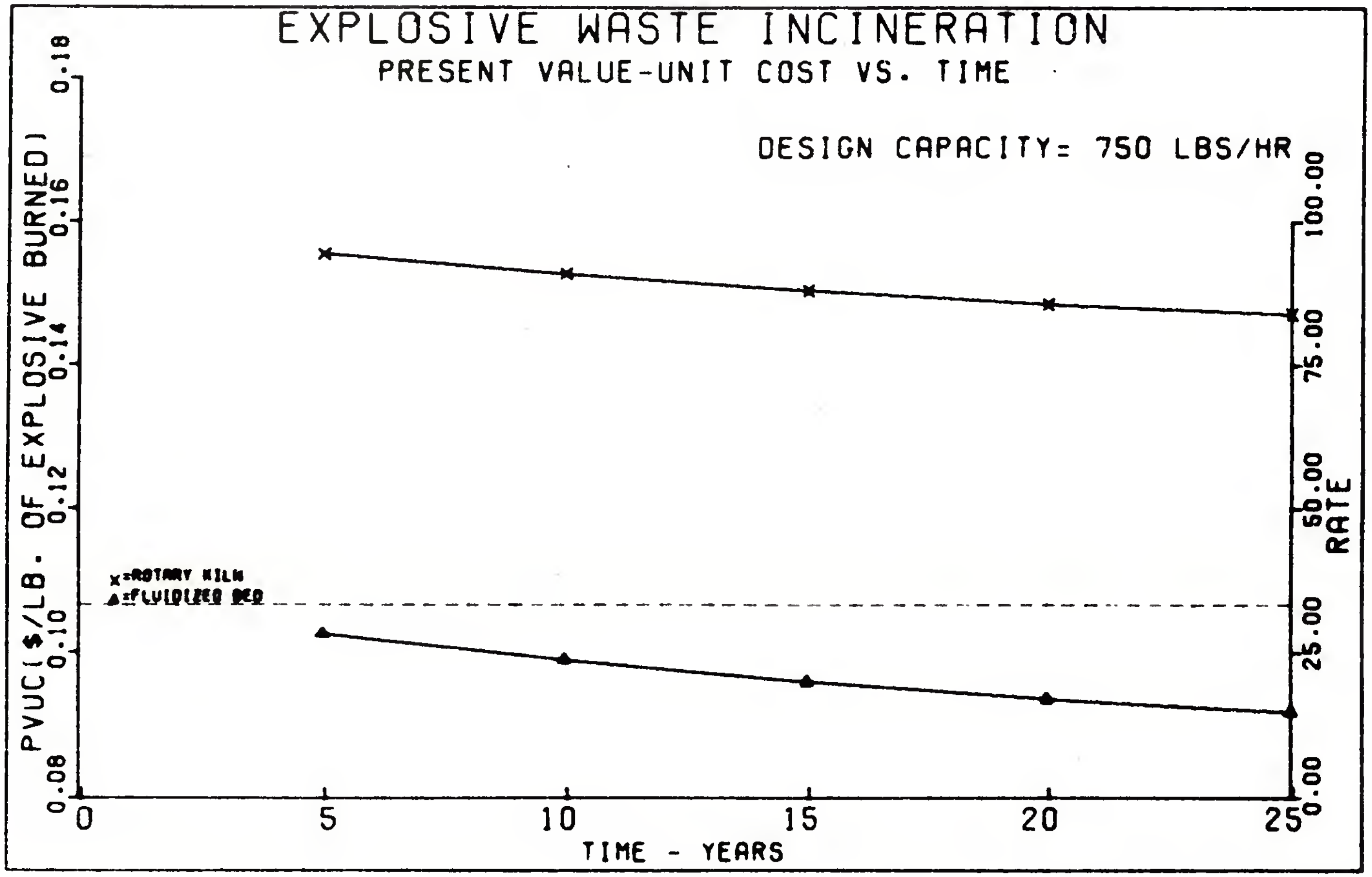

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.08
0.10
0.12
0.14
0.16
0.18
RATE
0.00
25.00
50.00
75.00
100.00
x=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 19

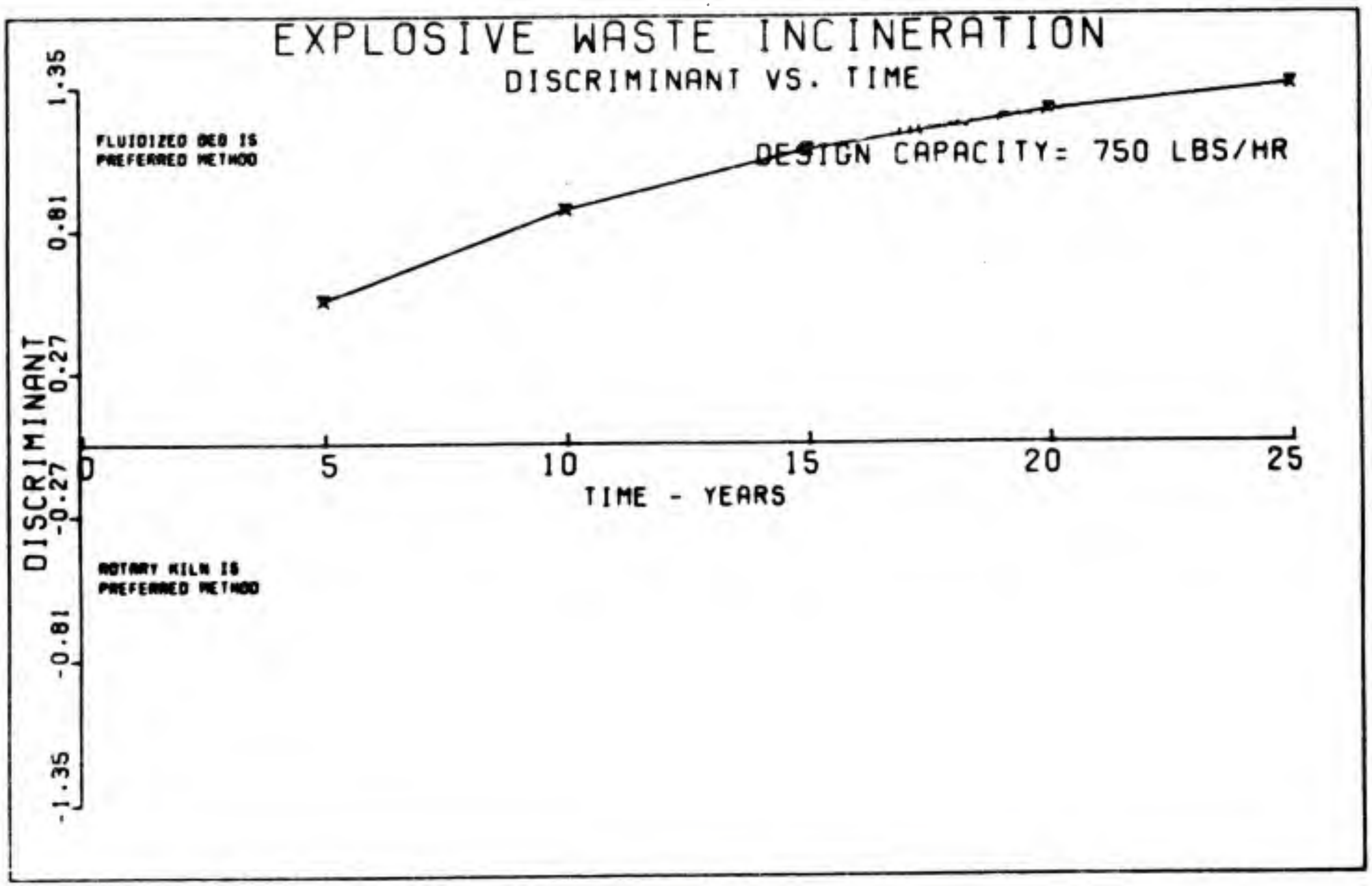
EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
1.35
0.81
0.27
-0.27
-0.81
-1.35
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 20

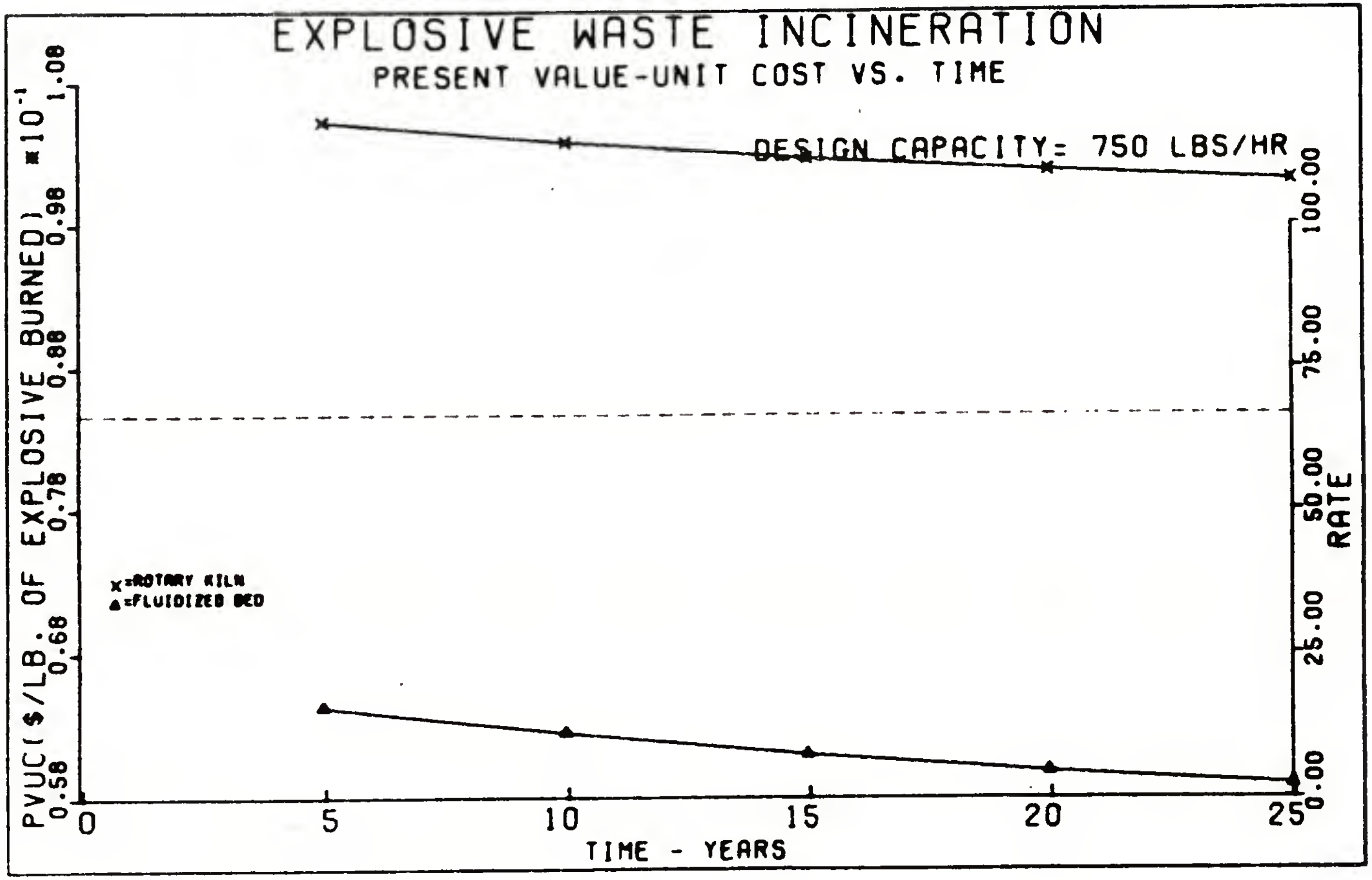

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.58
0.68
0.78
0.88
0.98
1.08
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
×=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 21

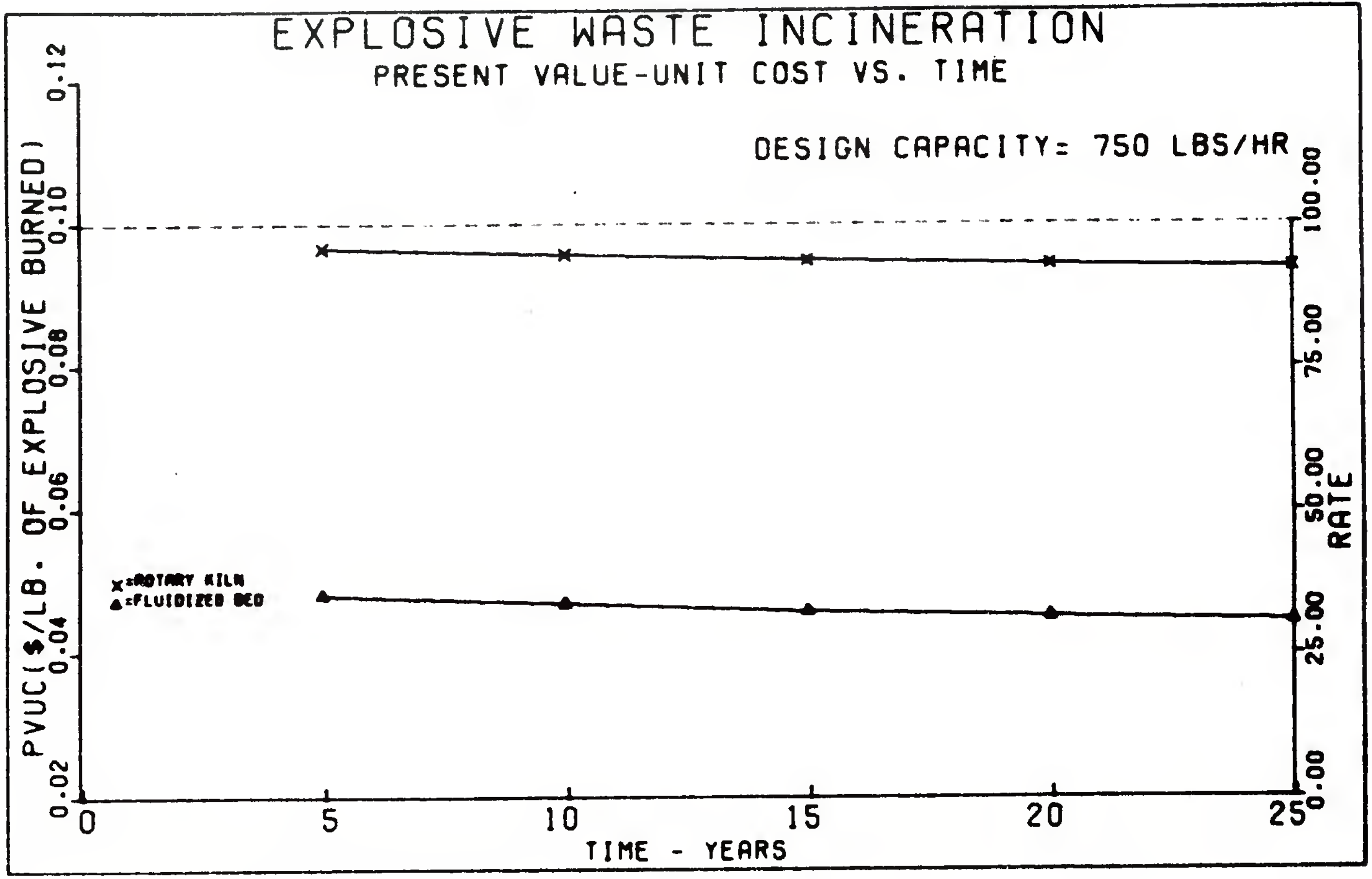

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.02
0.04
0.06
0.08
0.10
0.12
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 22

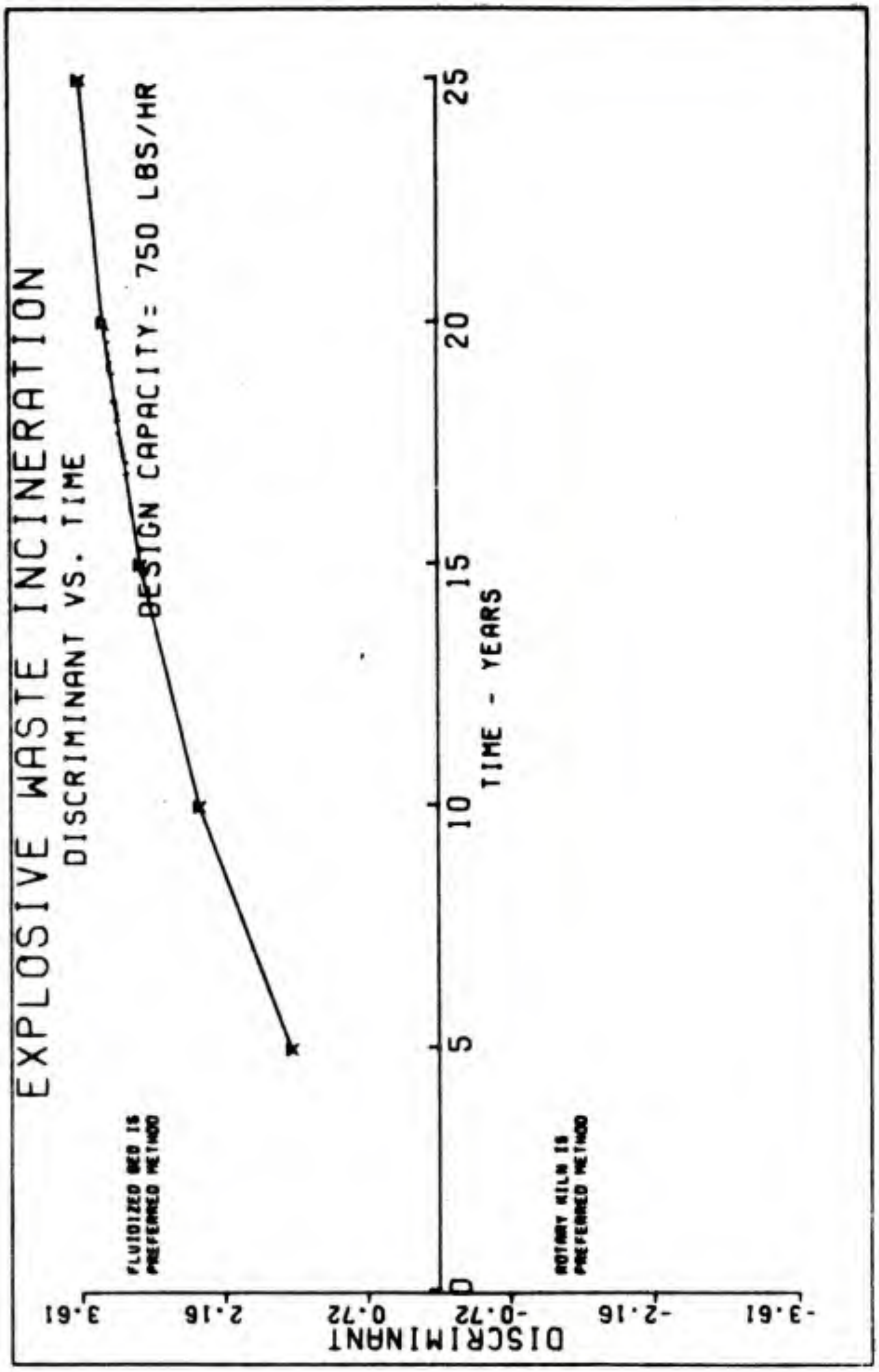

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.61
2.16
0.72
-0.72
-2.16
-3.61
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 23

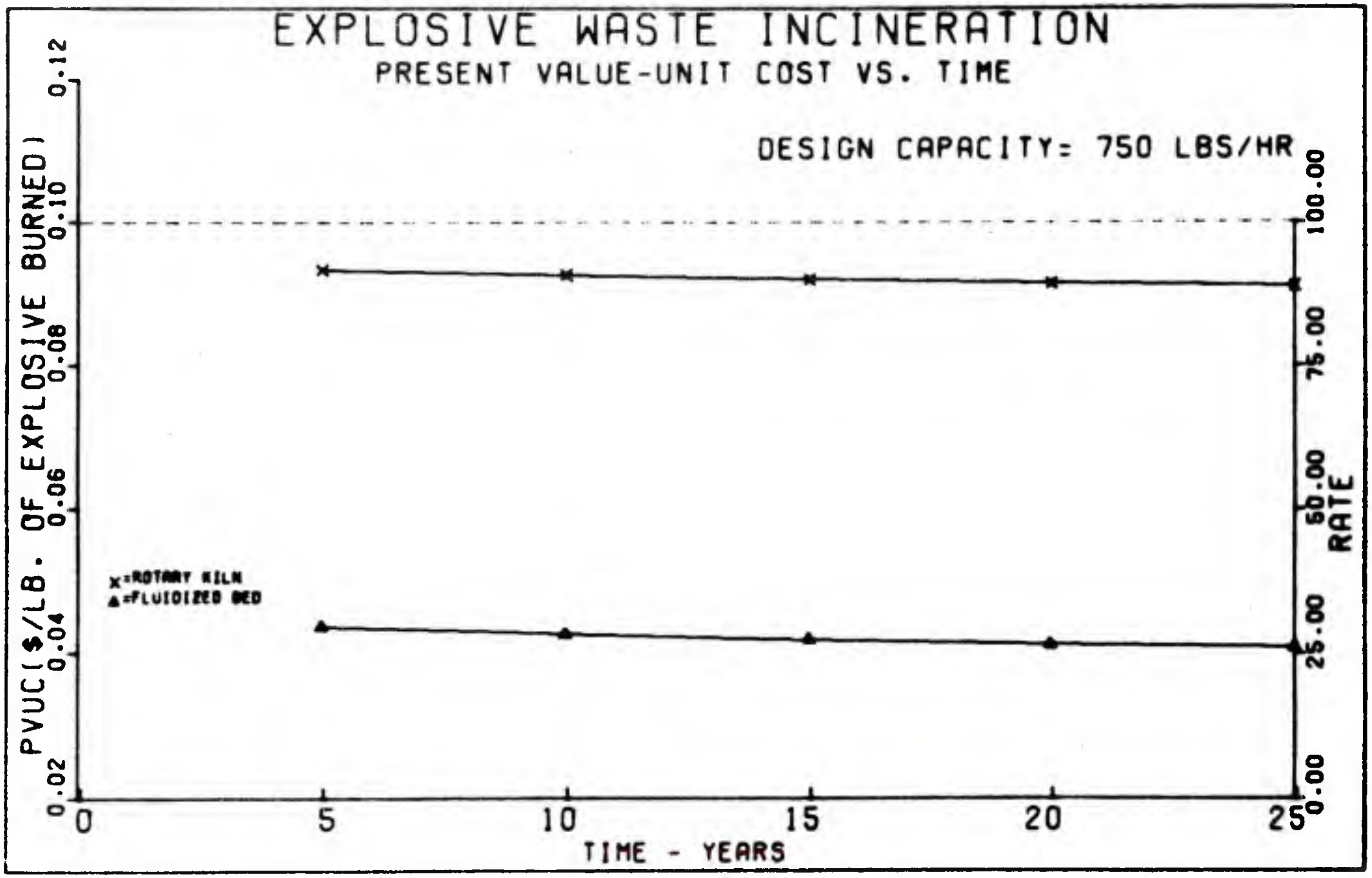

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.02
0.04
0.06
0.08
0.10
0.12
RATE
0.00
25.00
50.00
75.00
100.00
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 24

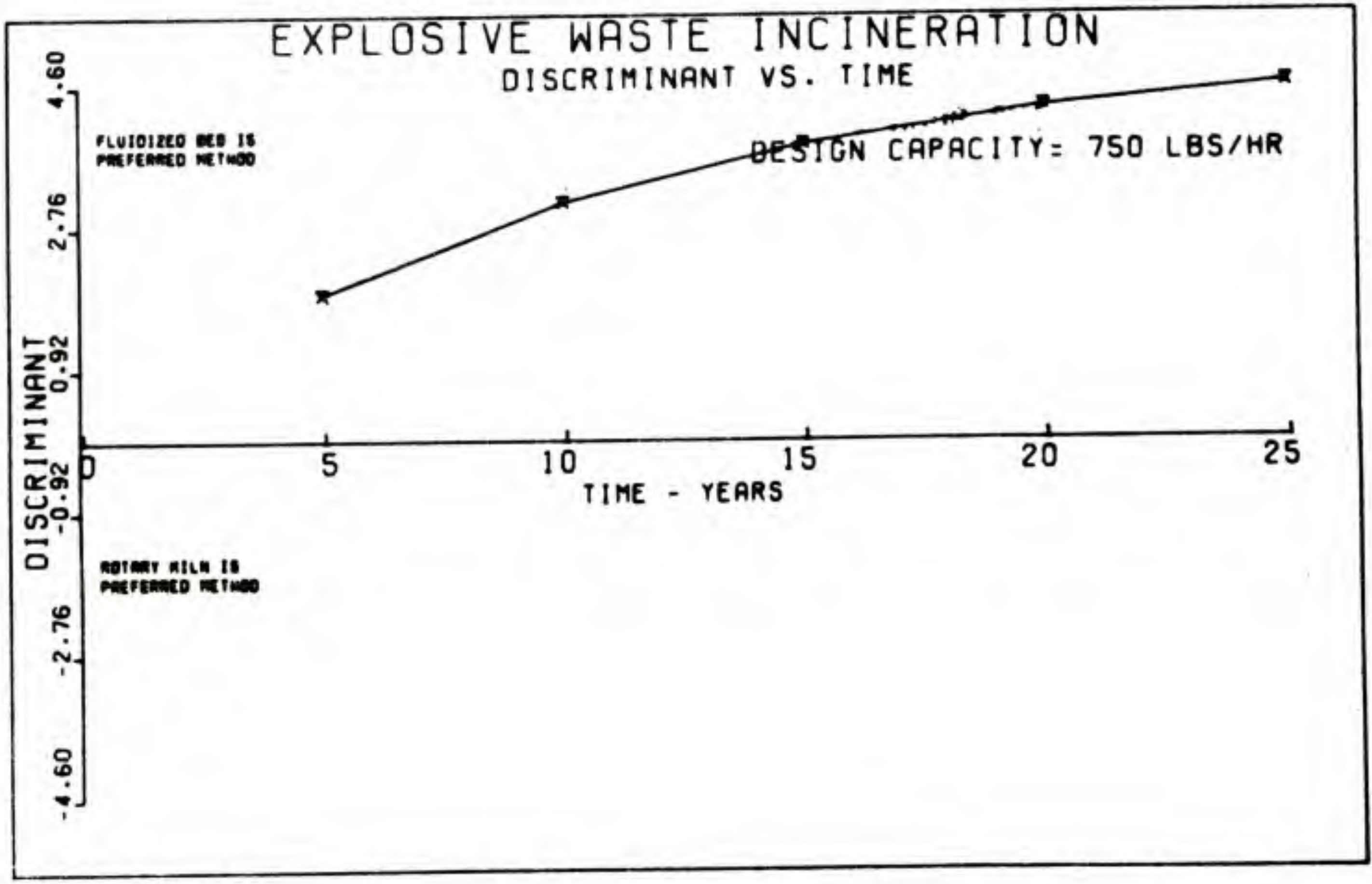
EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
4.60
2.76
0.92
-0.92
-2.76
-4.60
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 25

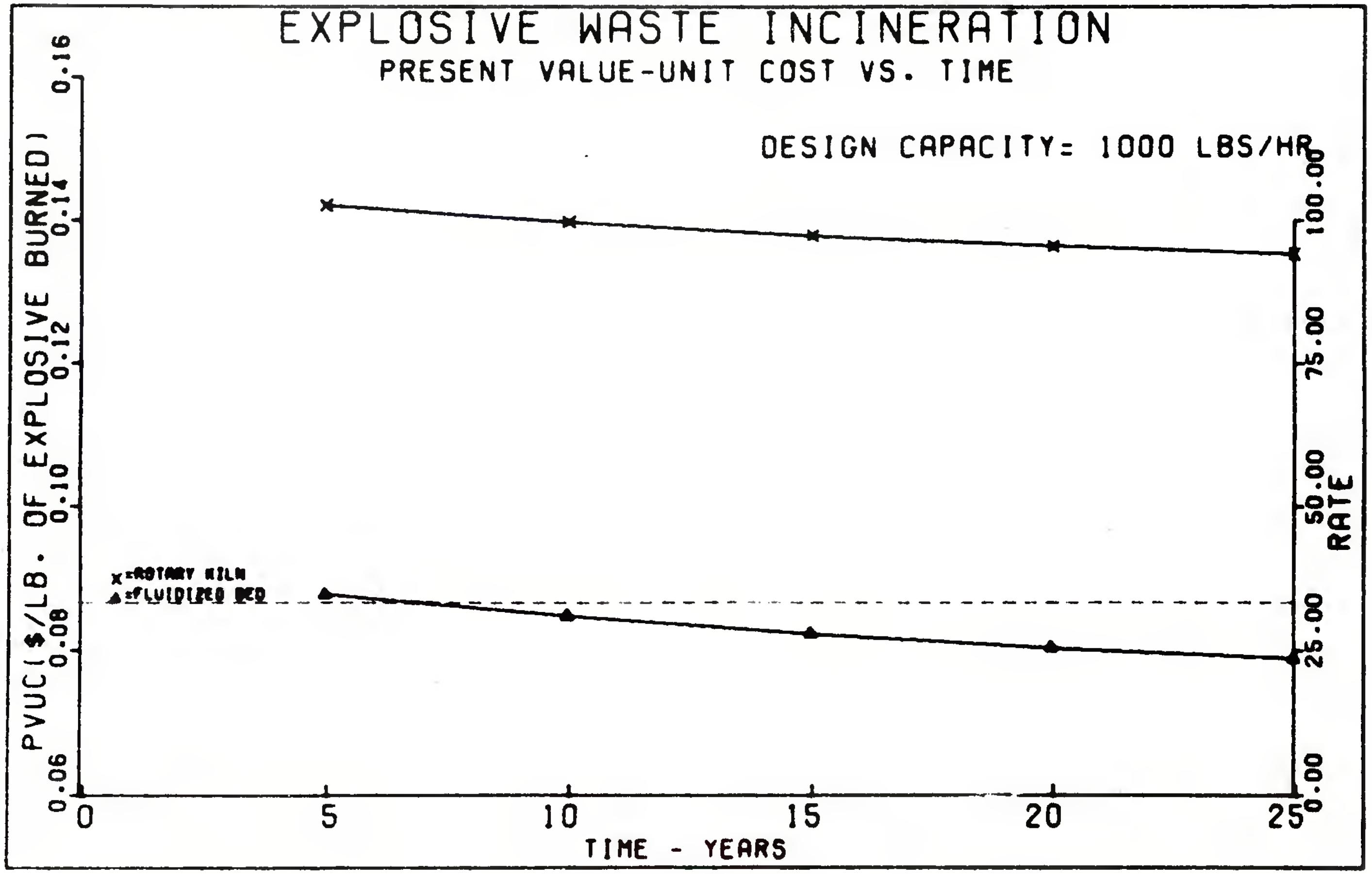

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 1000 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 26

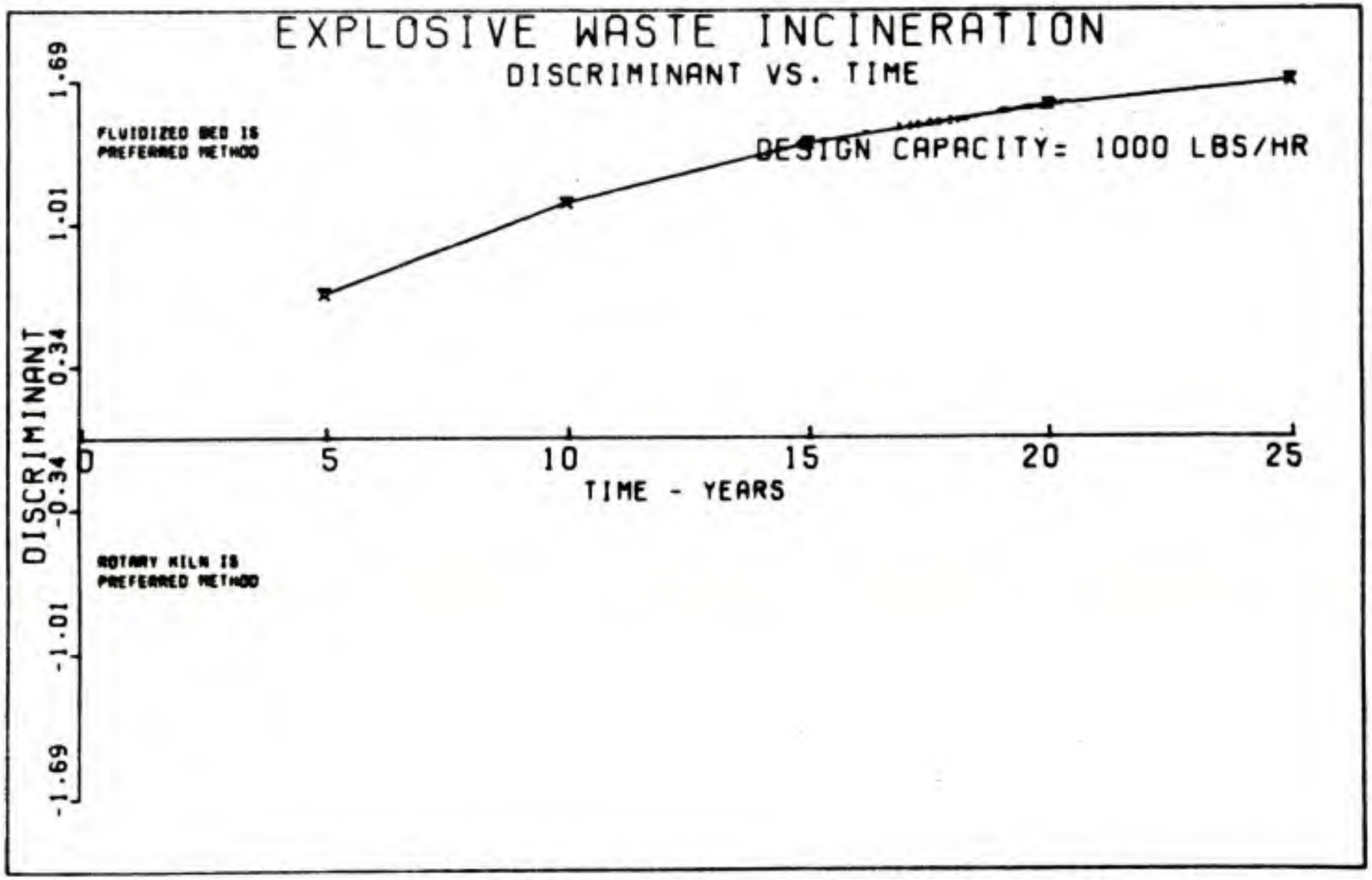

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
1.69
1.01
0.34
-0.34
-1.01
-1.69
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 27

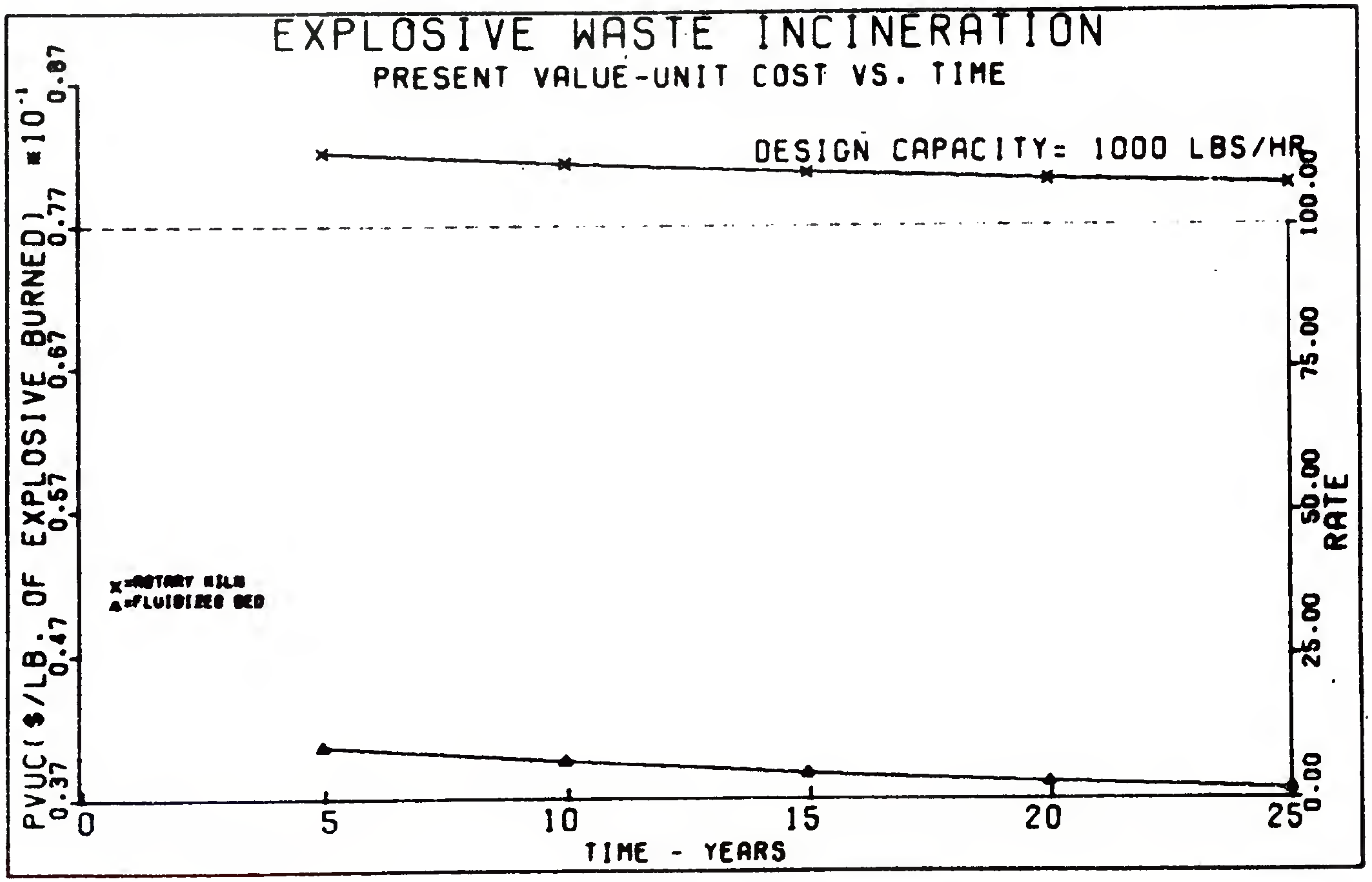

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 1000 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.37
0.47
0.57
0.67
0.77
0.87
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 28

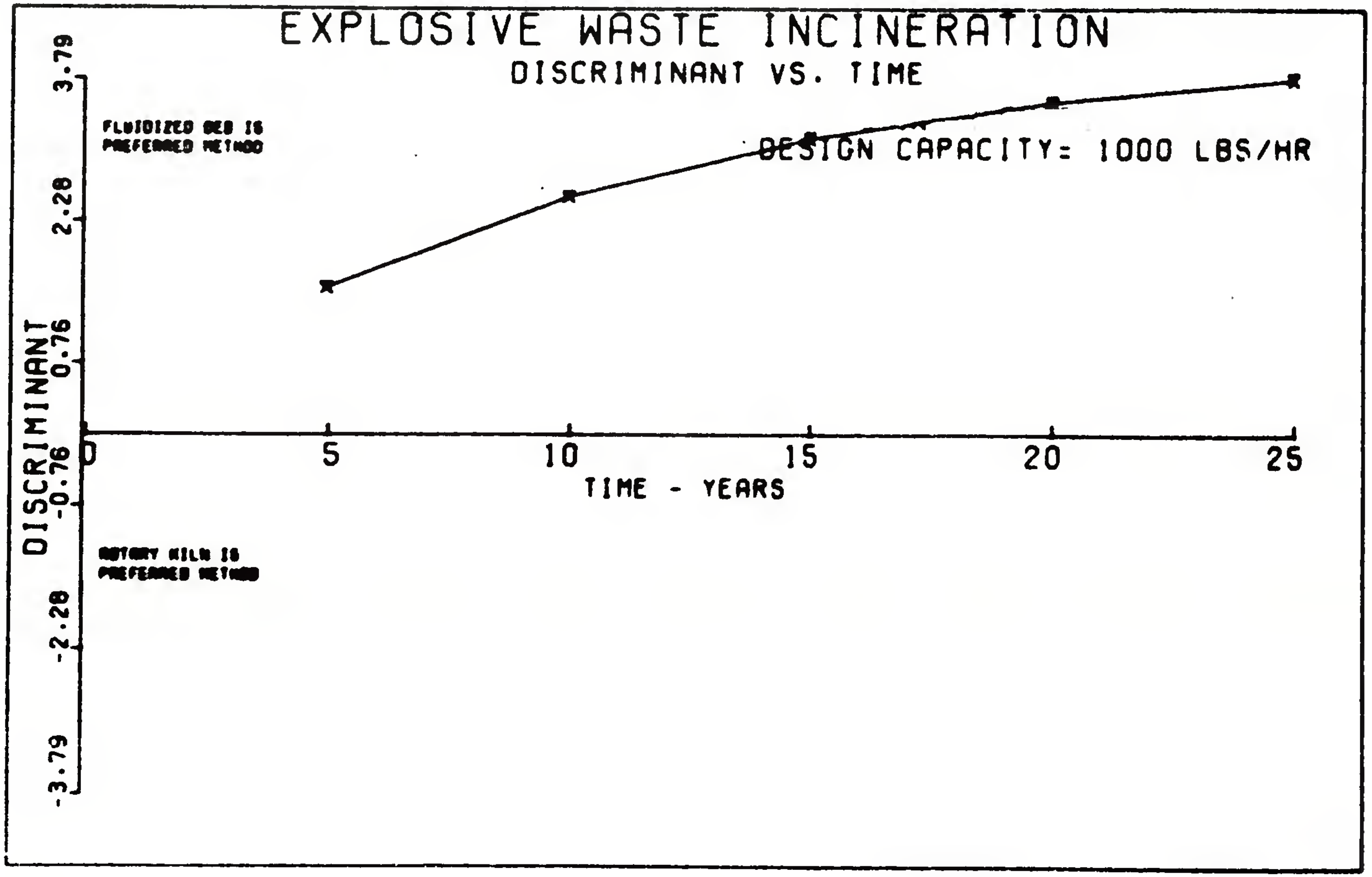

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.79
2.28
0.76
-0.76
-2.28
-3.79
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 29

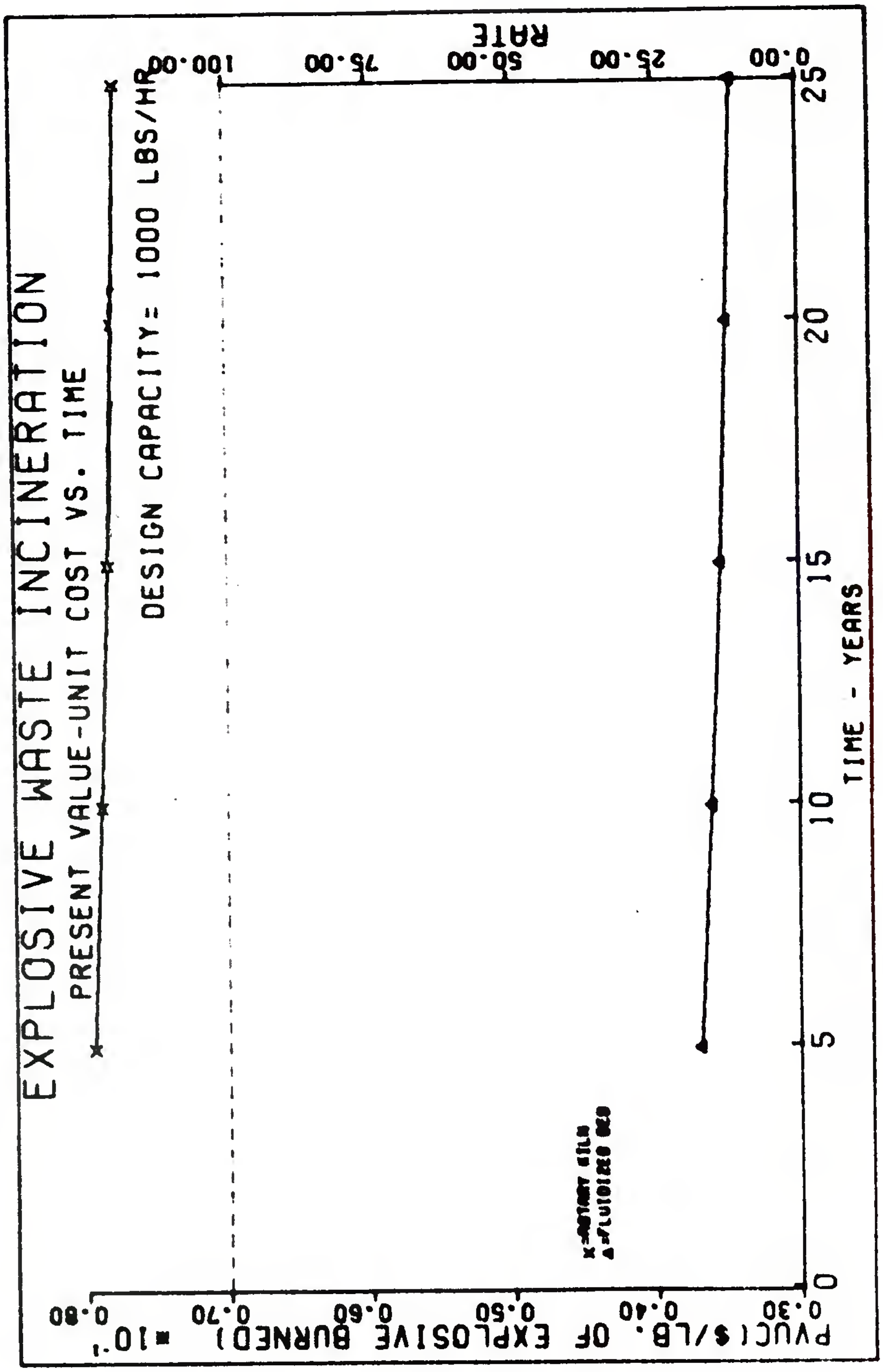

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 1000 LBS/HR
RATE
100.00
75.00
50.00
25.00
0.00
X=ROTARY KILN
Δ=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.30
0.40
0.50
0.60
0.70
0.80

FIGURE NO. 30

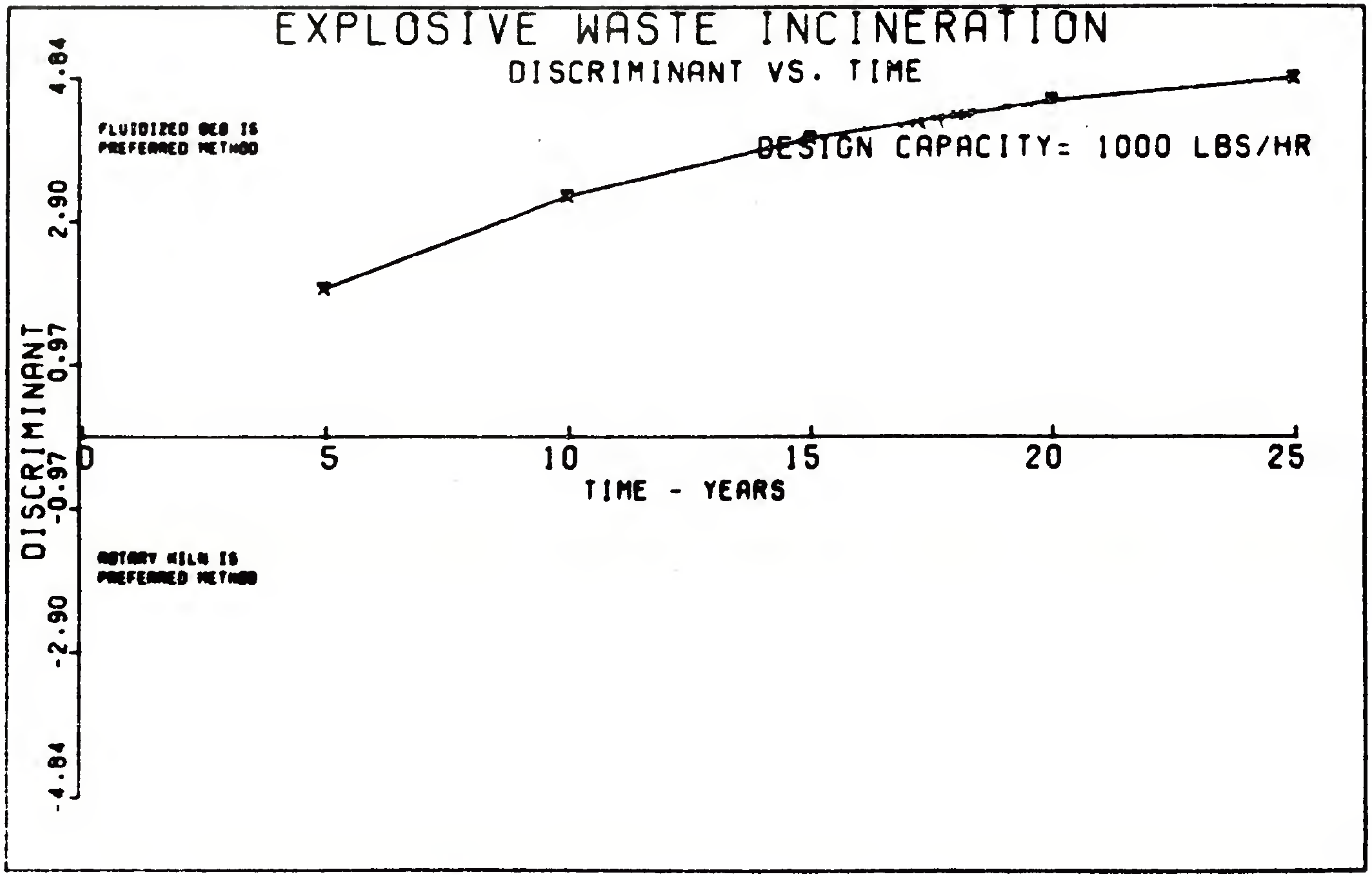

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
4.84
2.90
0.97
-0.97
-2.90
-4.84
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 31

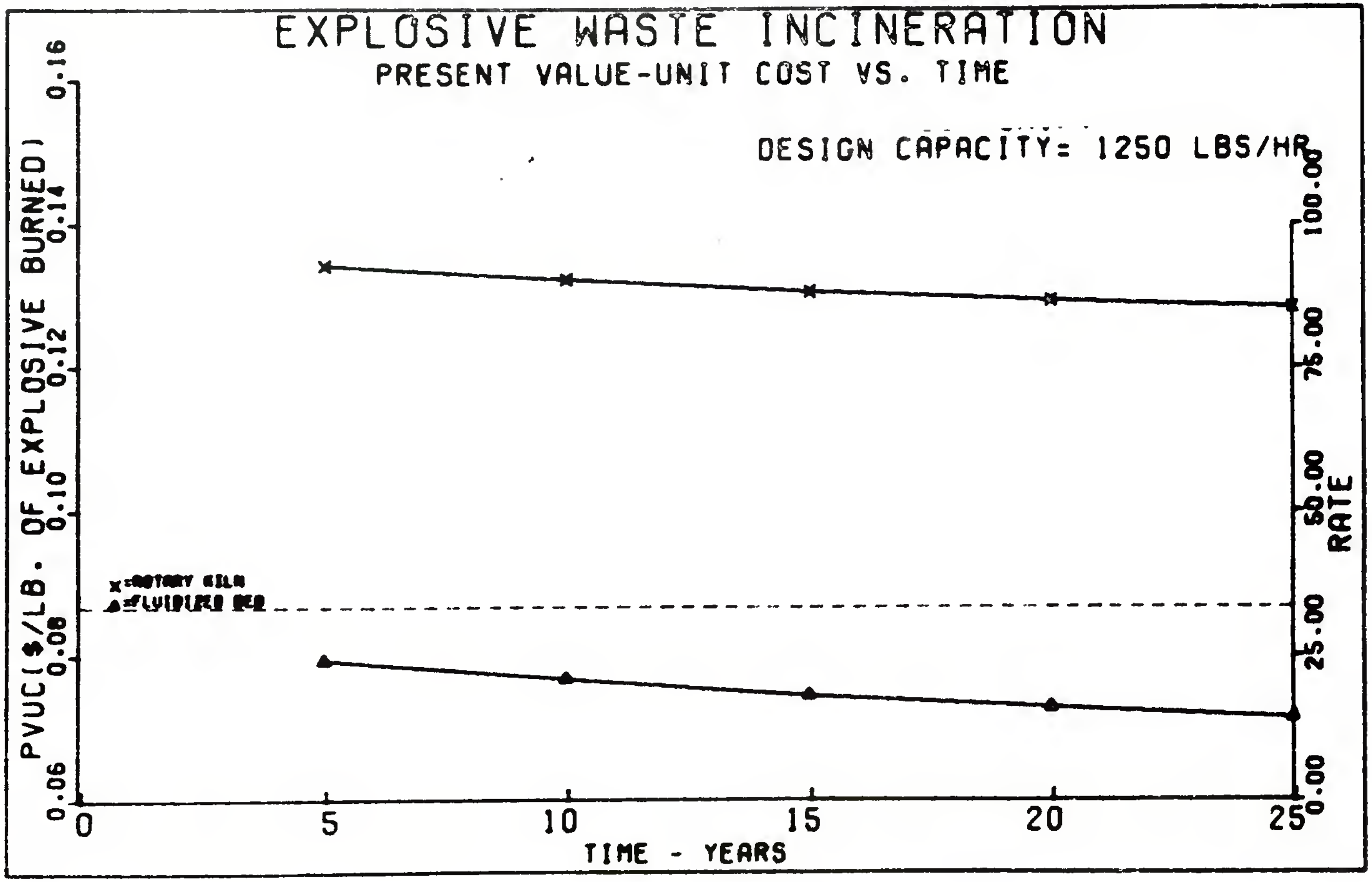

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 1250 LBS/HR
X=ROTARY KILN
▲=FLUIDIZED BED
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 32

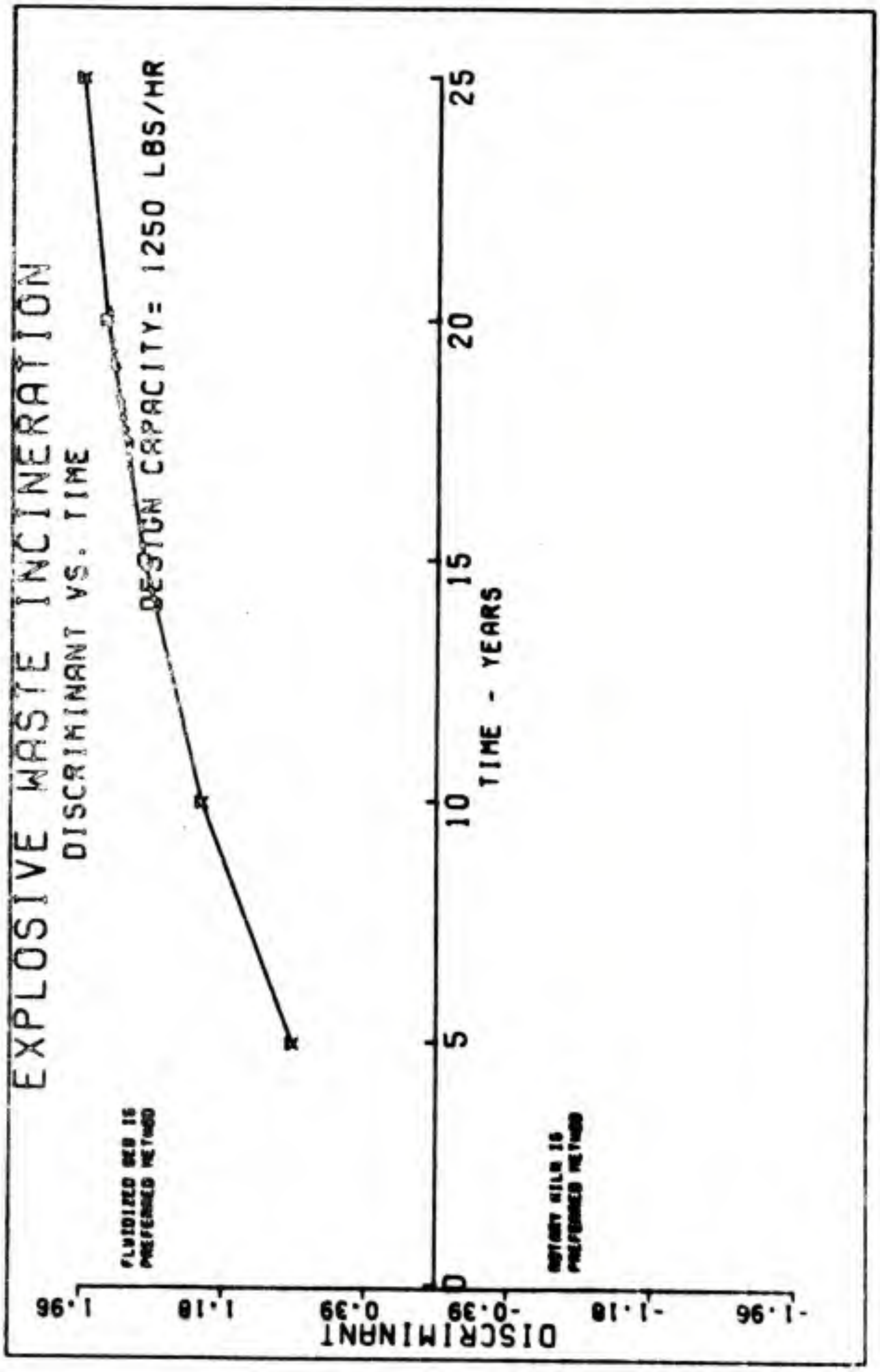

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1250 LBS/HR
DISCRIMINANT
1.96
1.18
0.39
-0.39
-1.18
-1.96
TIME - YEARS
0
5
10
15
20
25
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD

FIGURE NO. 33

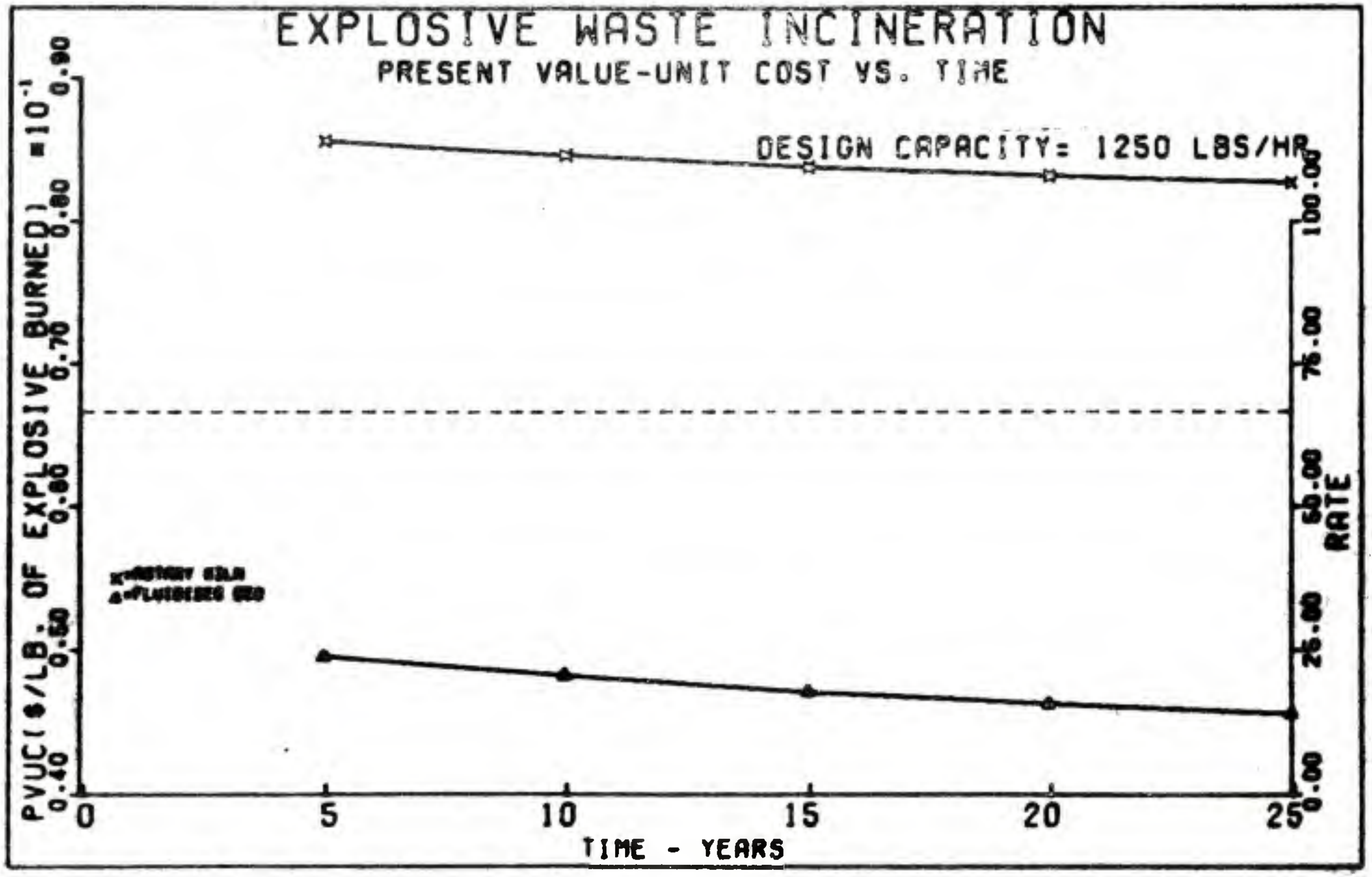

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 1250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) $\times 10^{-1}$
0.40
0.50
0.60
0.70
0.80
0.90
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
X=ROTARY KILN
Δ=FLUIDIZED BED

FIGURE NO. 34

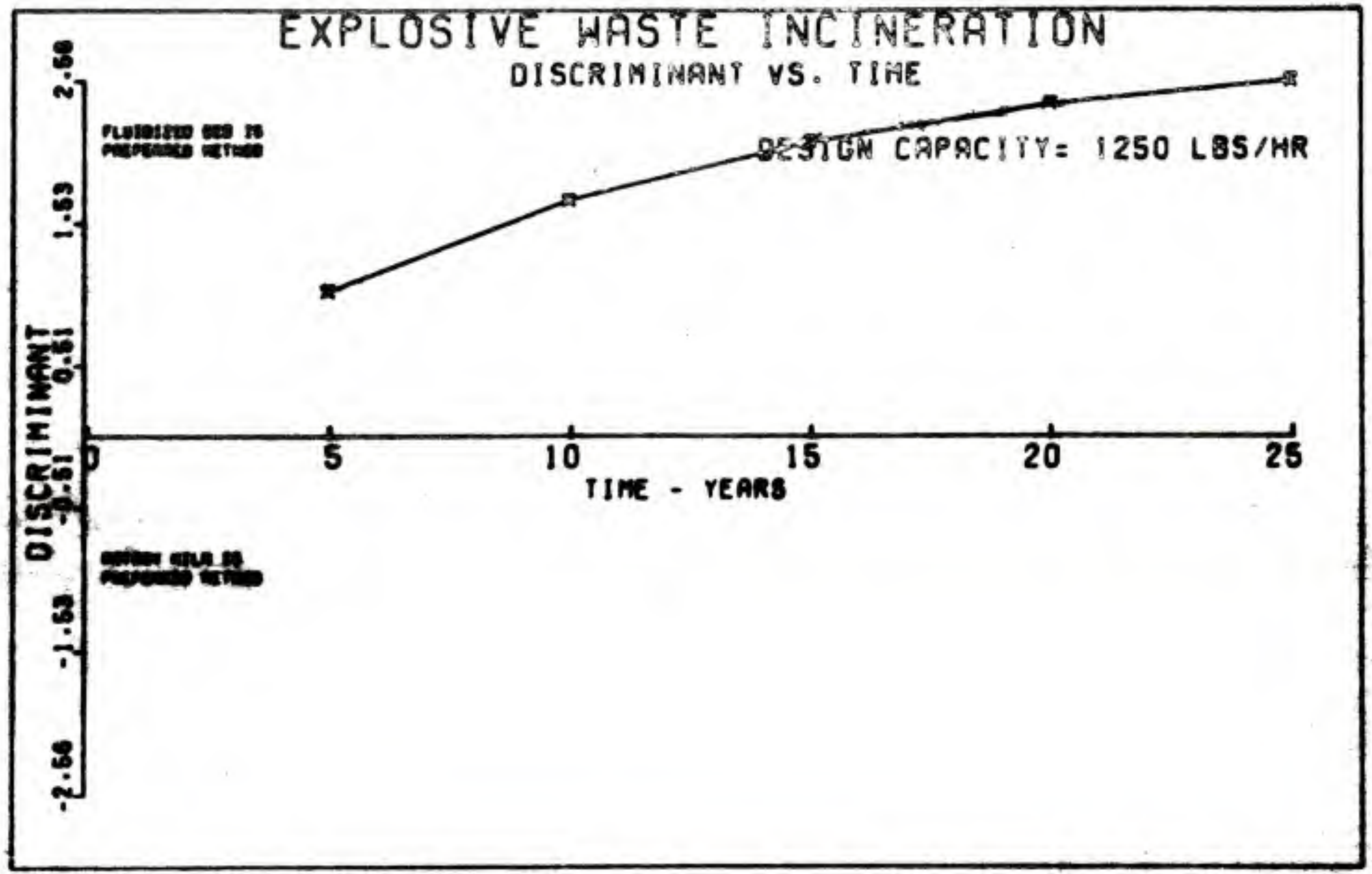

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.56
1.53
0.51
-0.51
-1.53
-2.56
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 35

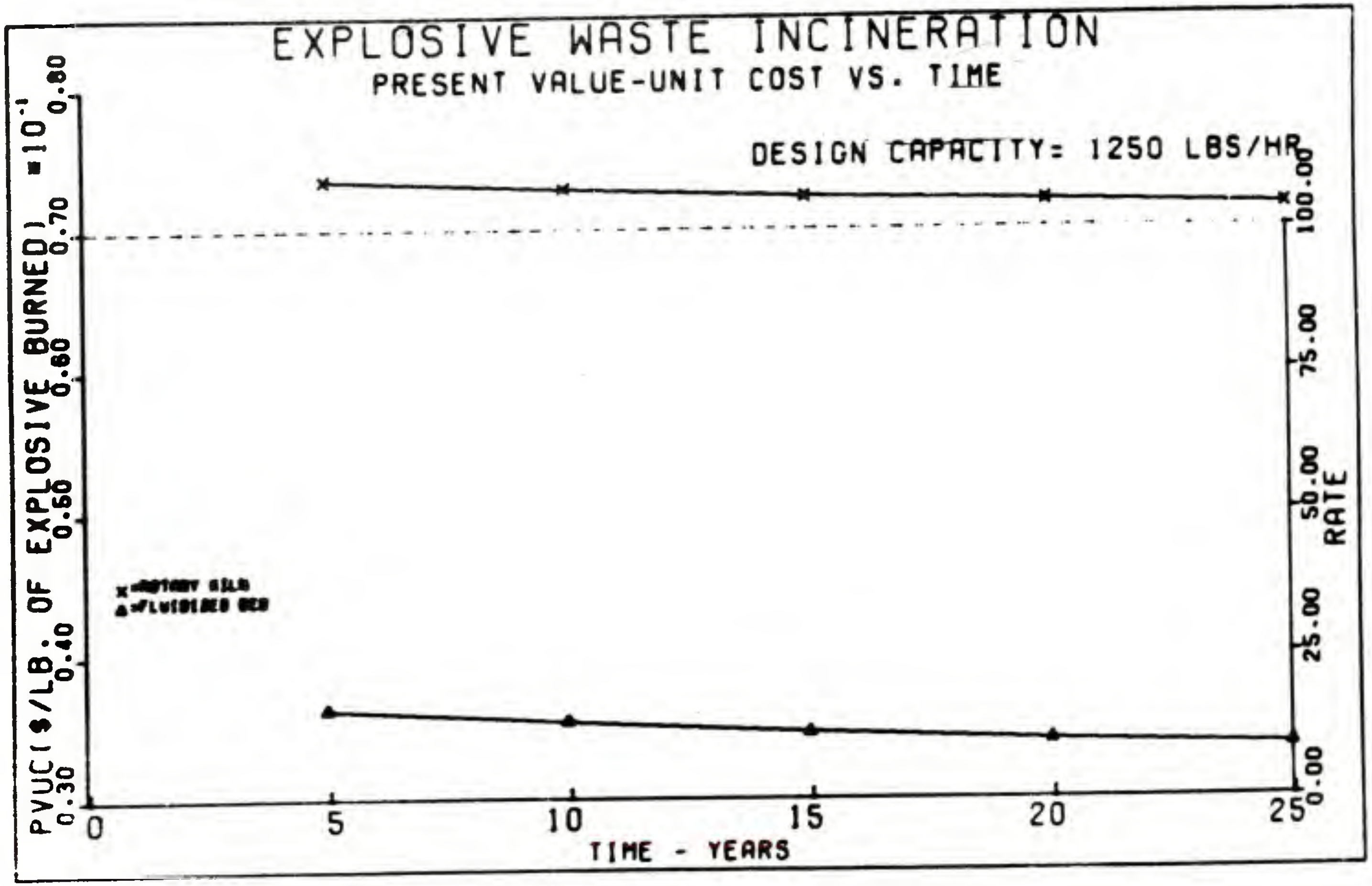

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 1250 LBS/HR
X=ROTARY KILN
▲=FLUIDIZED BED
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.30
0.40
0.50
0.60
0.70
0.80
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 36

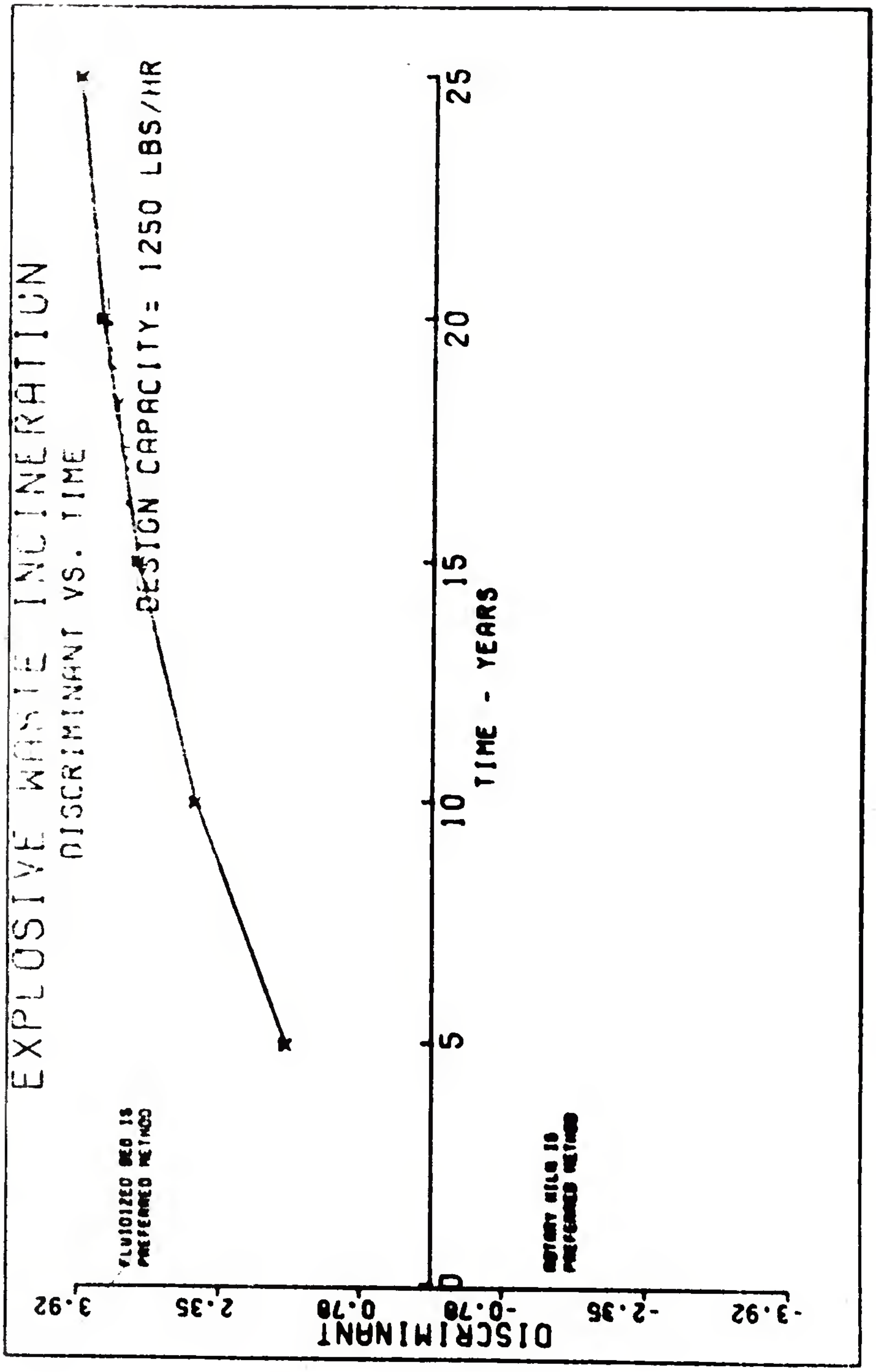

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.92
2.35
0.78
-0.78
-2.35
-3.92
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 37

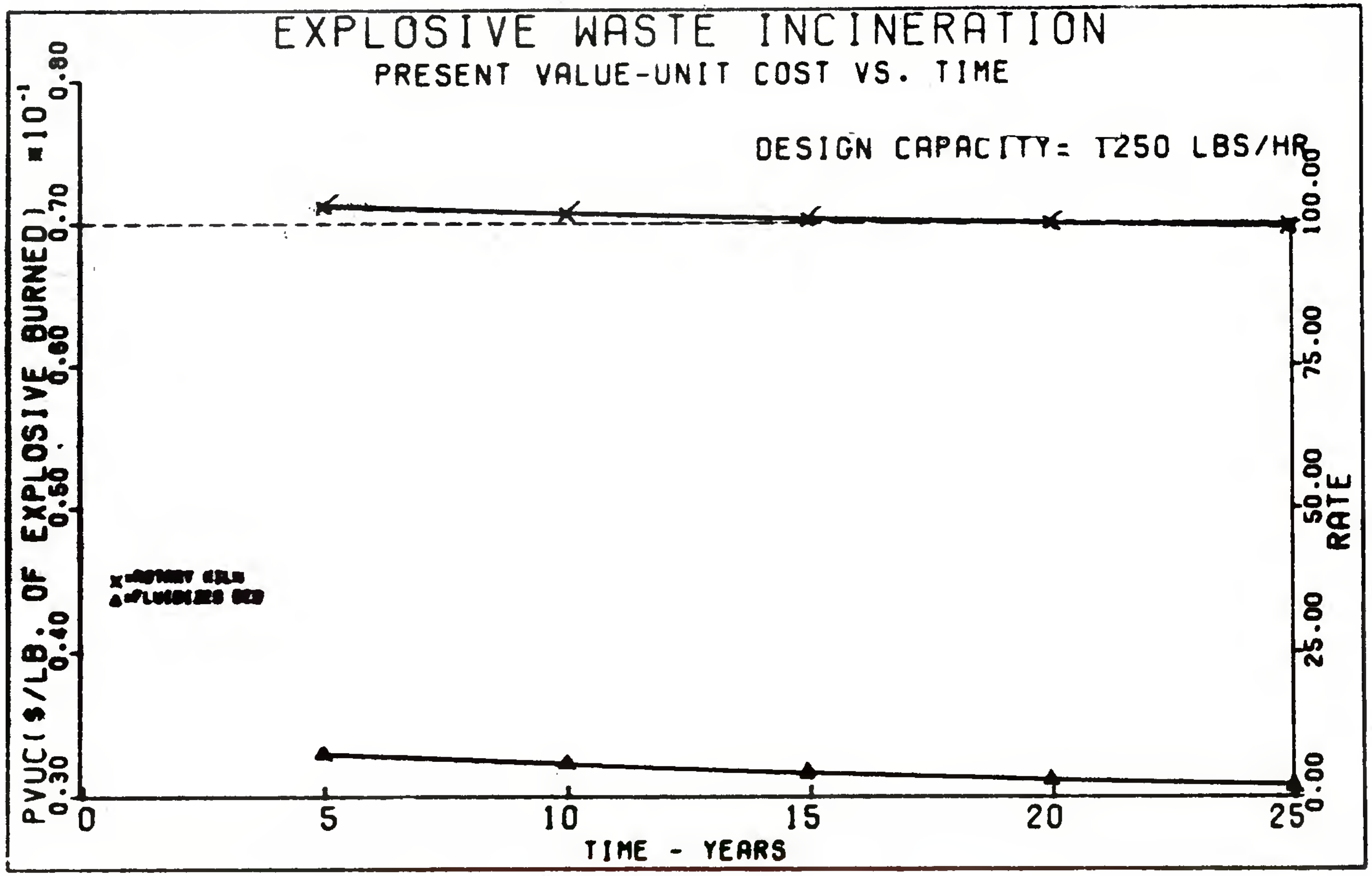

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= T250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) $\times 10^{-1}$
0.30
0.40
0.50
0.60
0.70
0.80
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 38

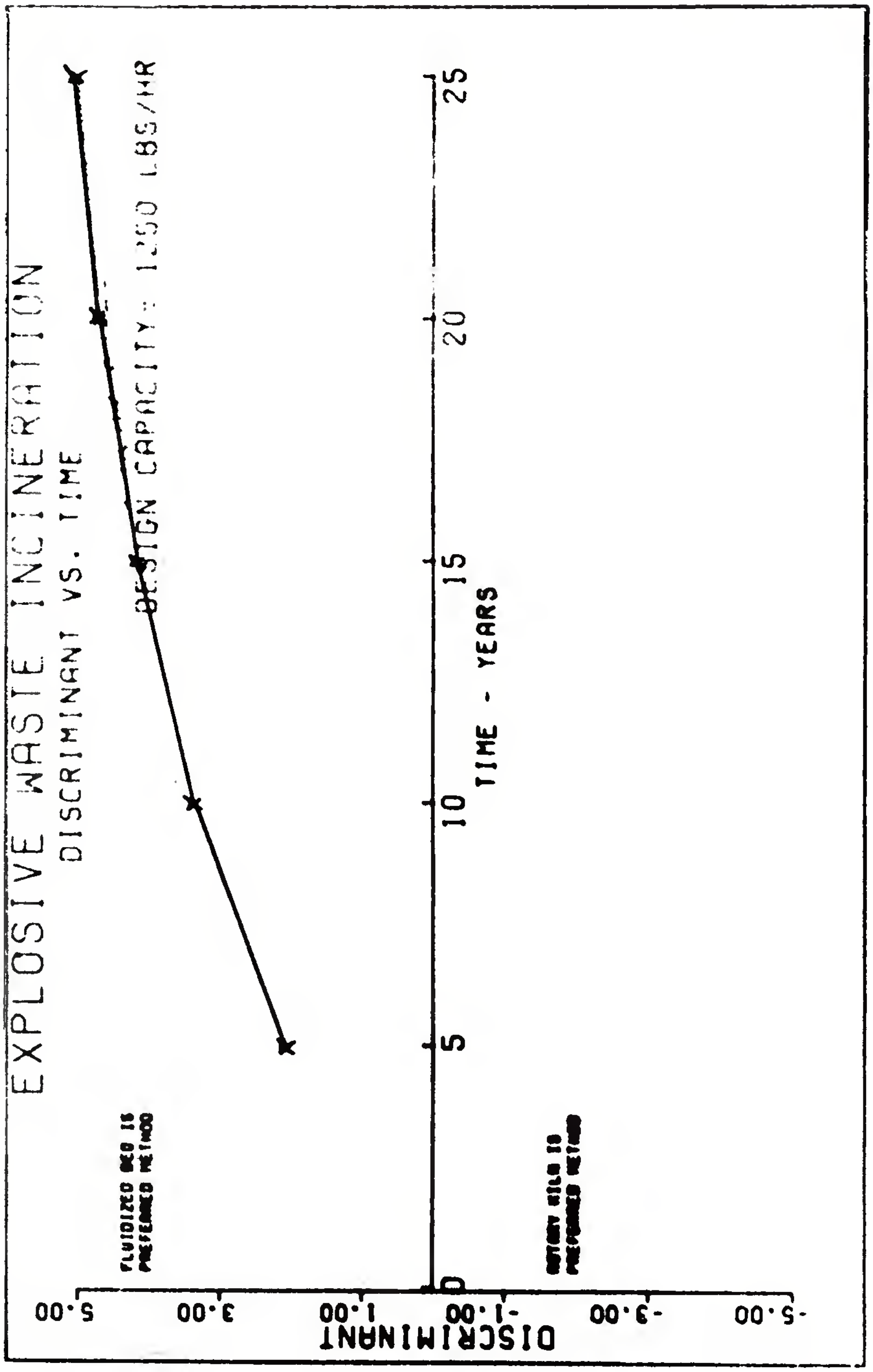

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY: 1250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
5.00
3.00
1.00
-1.00
-3.00
-5.00
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 39

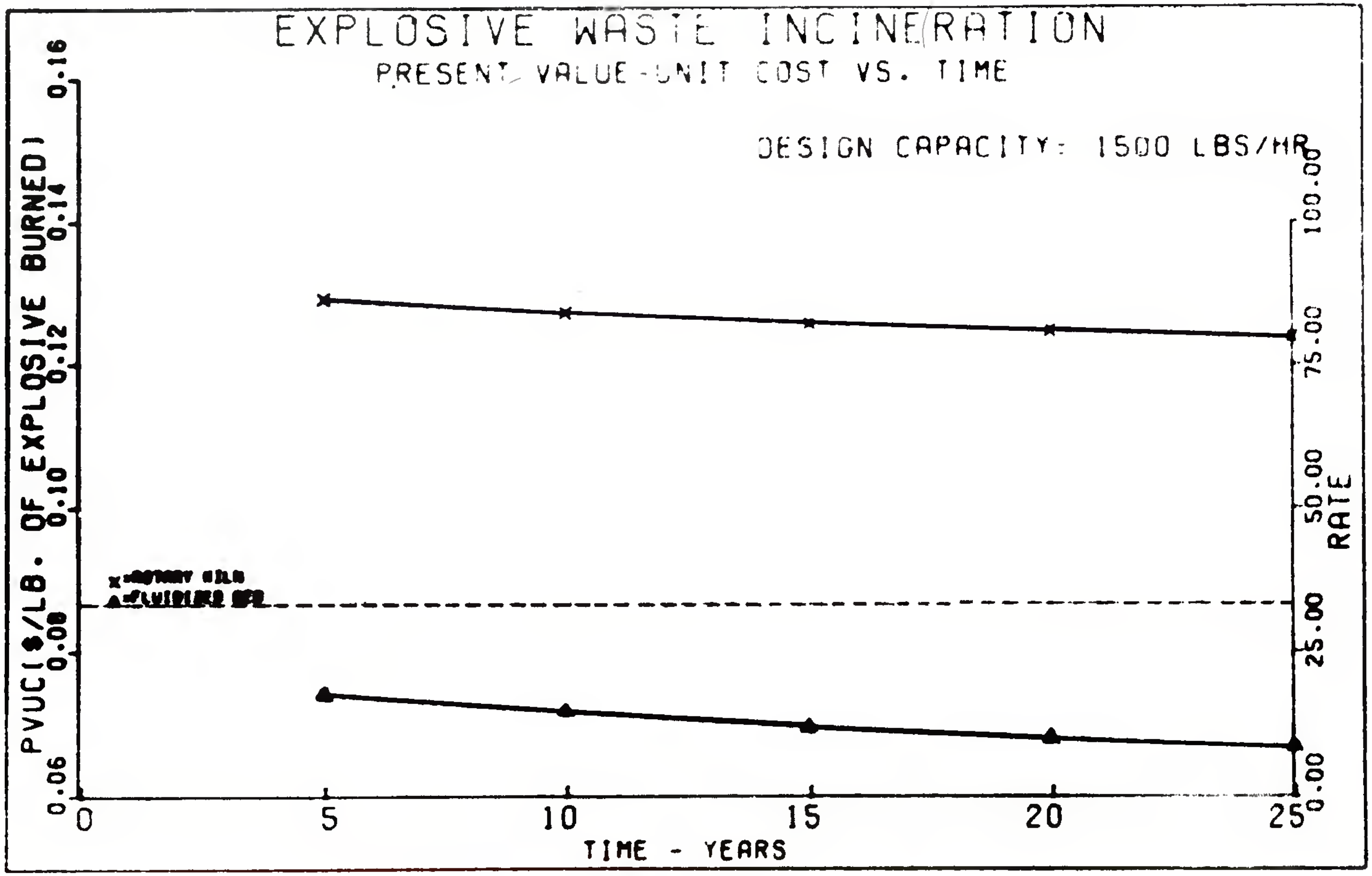

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY: 1500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
x=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 40

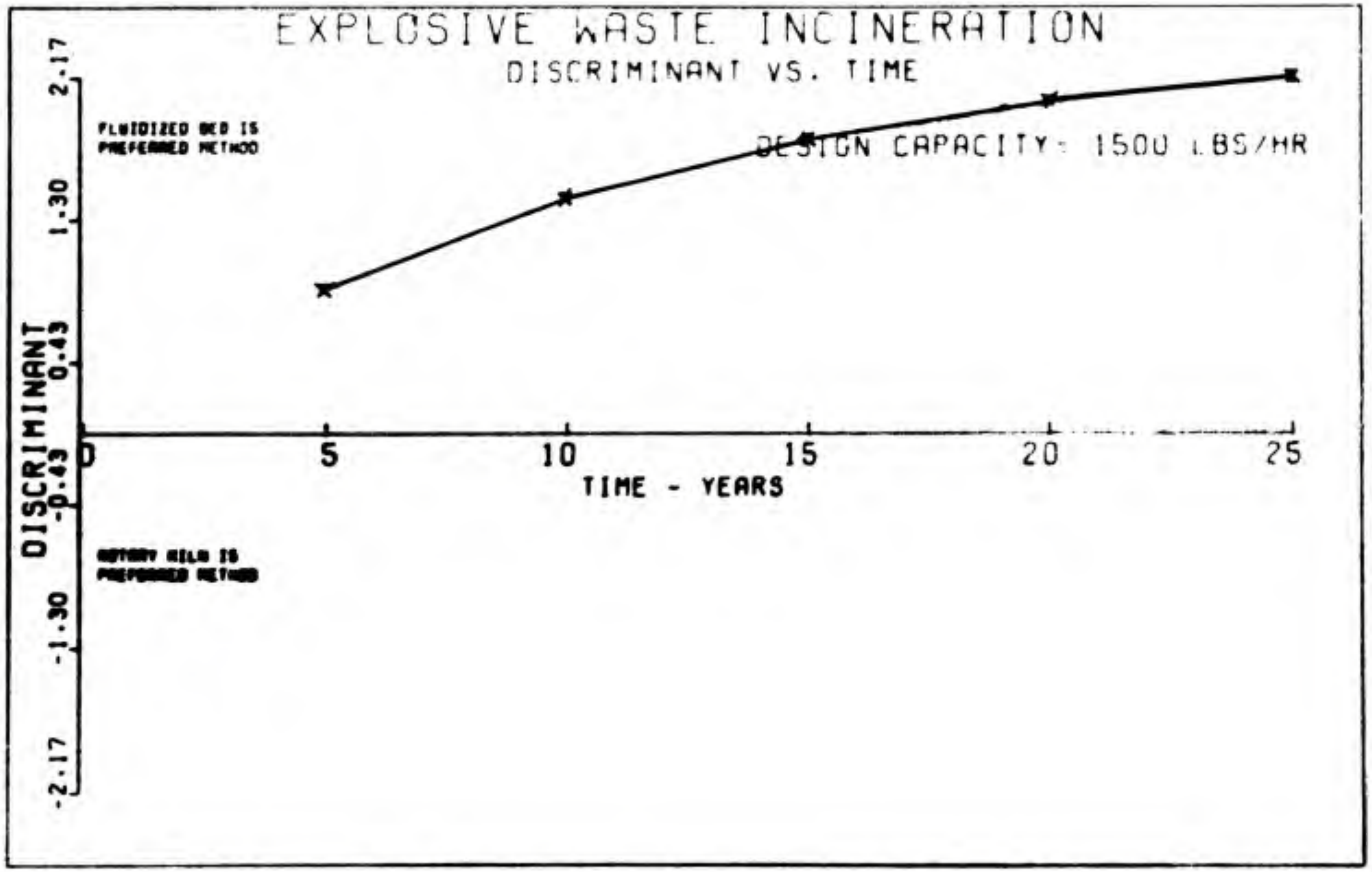

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY: 1500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.17
1.30
0.43
-0.43
-1.30
-2.17
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 41

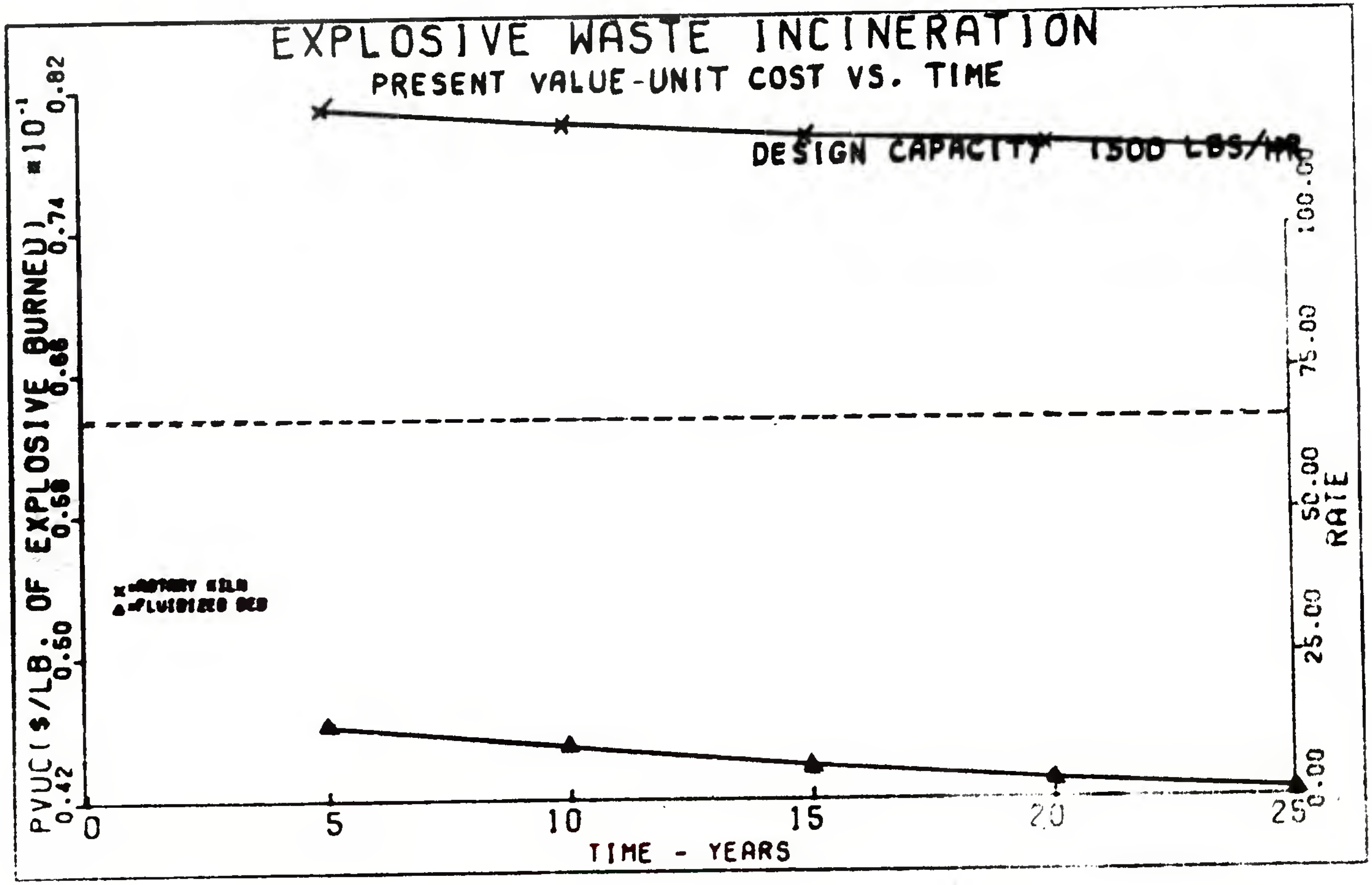

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY 1500 LBS/HR
x=ROTARY KILN
▲=FLUIDIZED BED
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.42
0.50
0.58
0.66
0.74
0.82
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 42

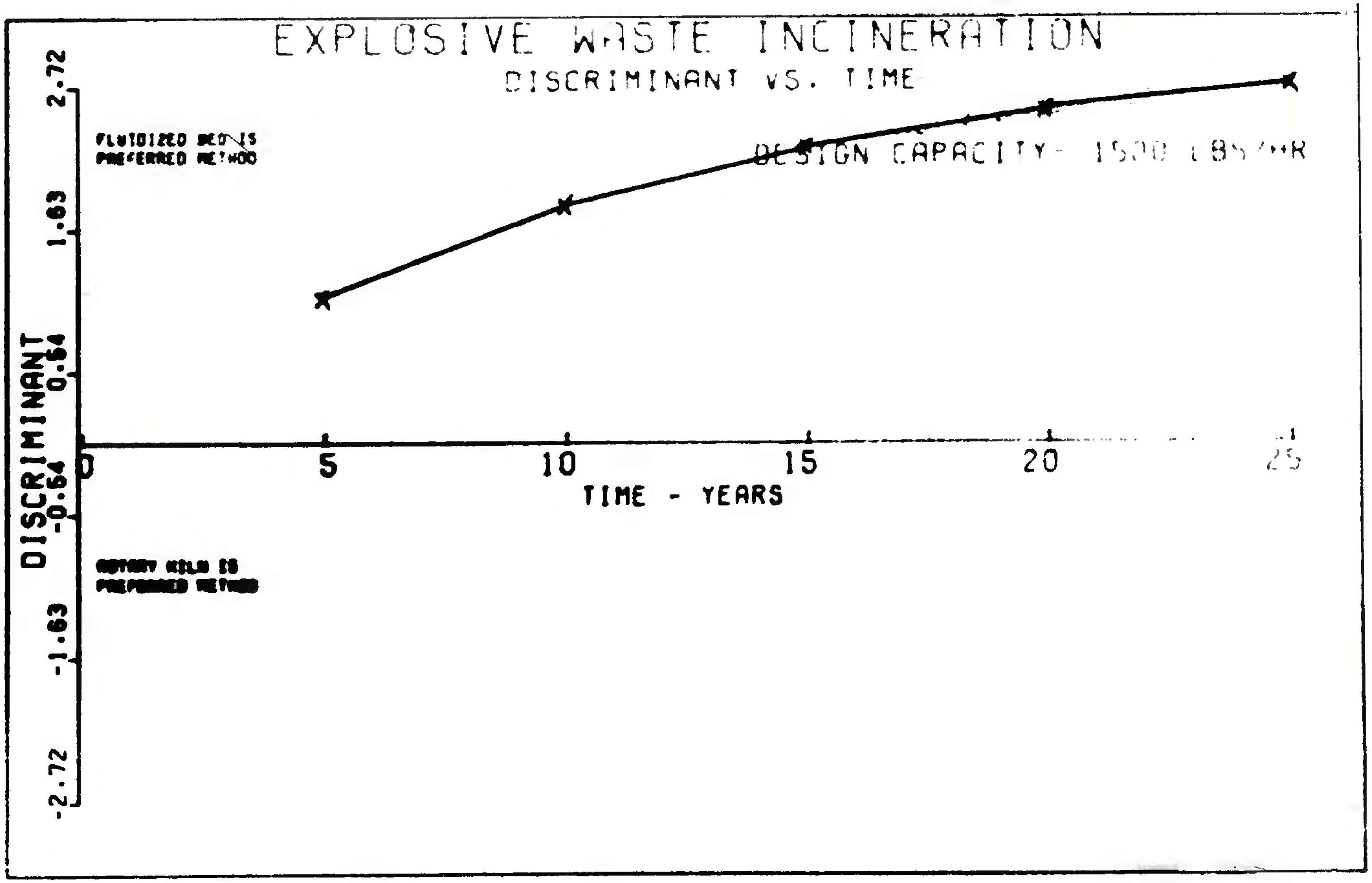

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY - 1500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.72
1.63
0.54
-0.54
-1.63
-2.72
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 43

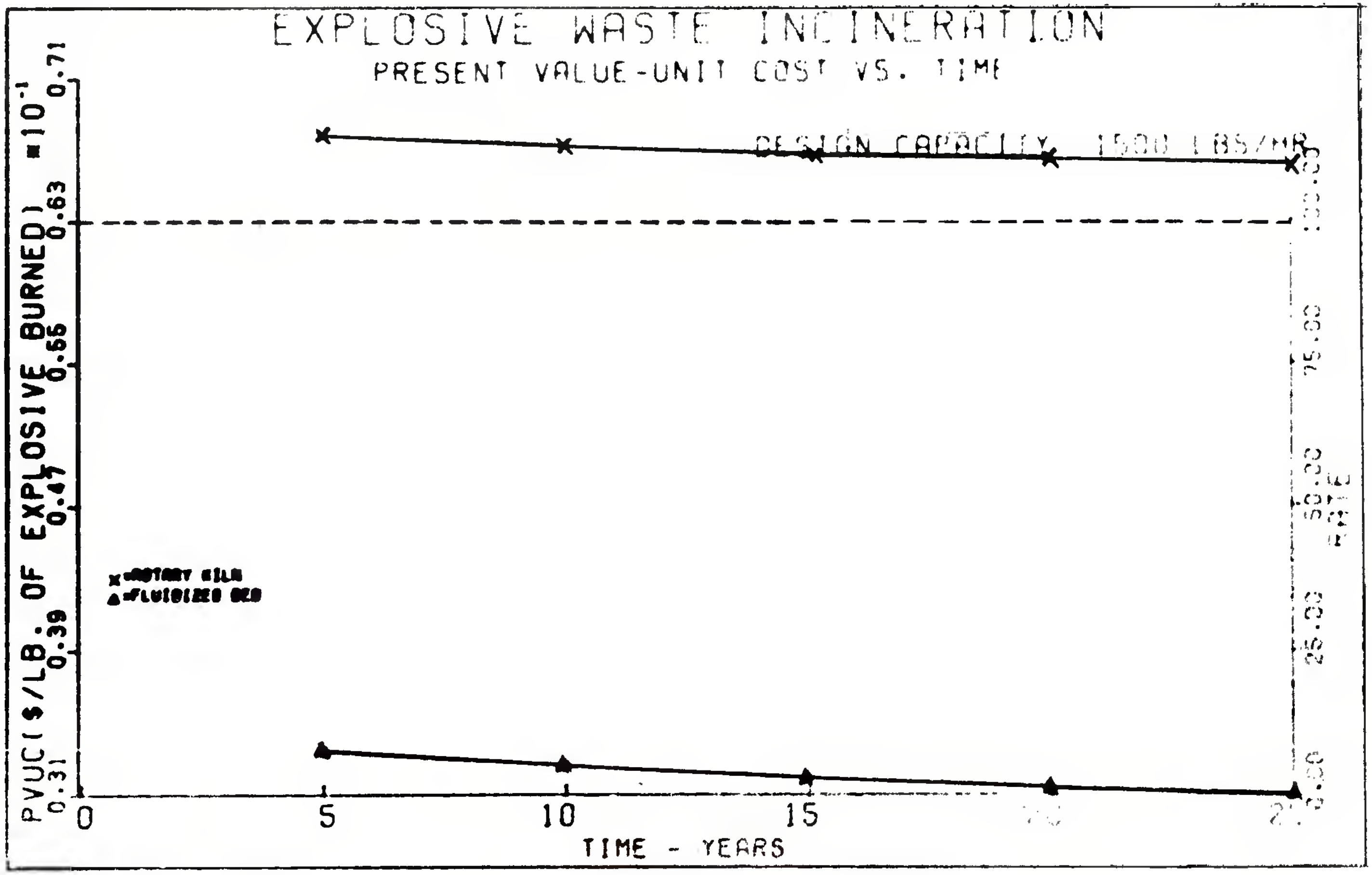

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY 1500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.31
0.39
0.47
0.55
0.63
0.71
0
5
10
15
20
25
TIME - YEARS
X=ROTARY KILN
▲=FLUIDIZED BED
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 44

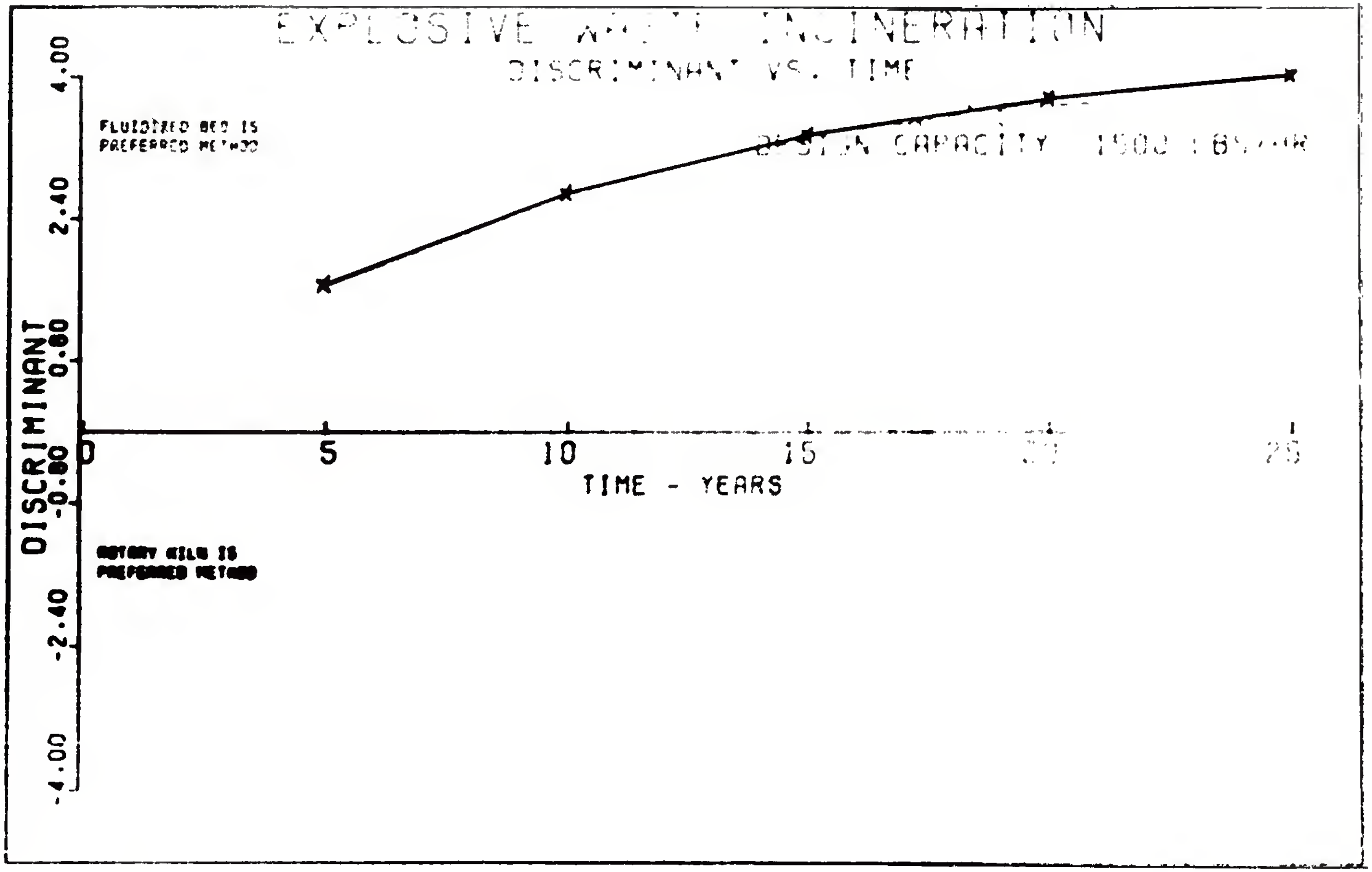

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY 1500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
4.00
2.40
0.80
-0.80
-2.40
-4.00
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 45

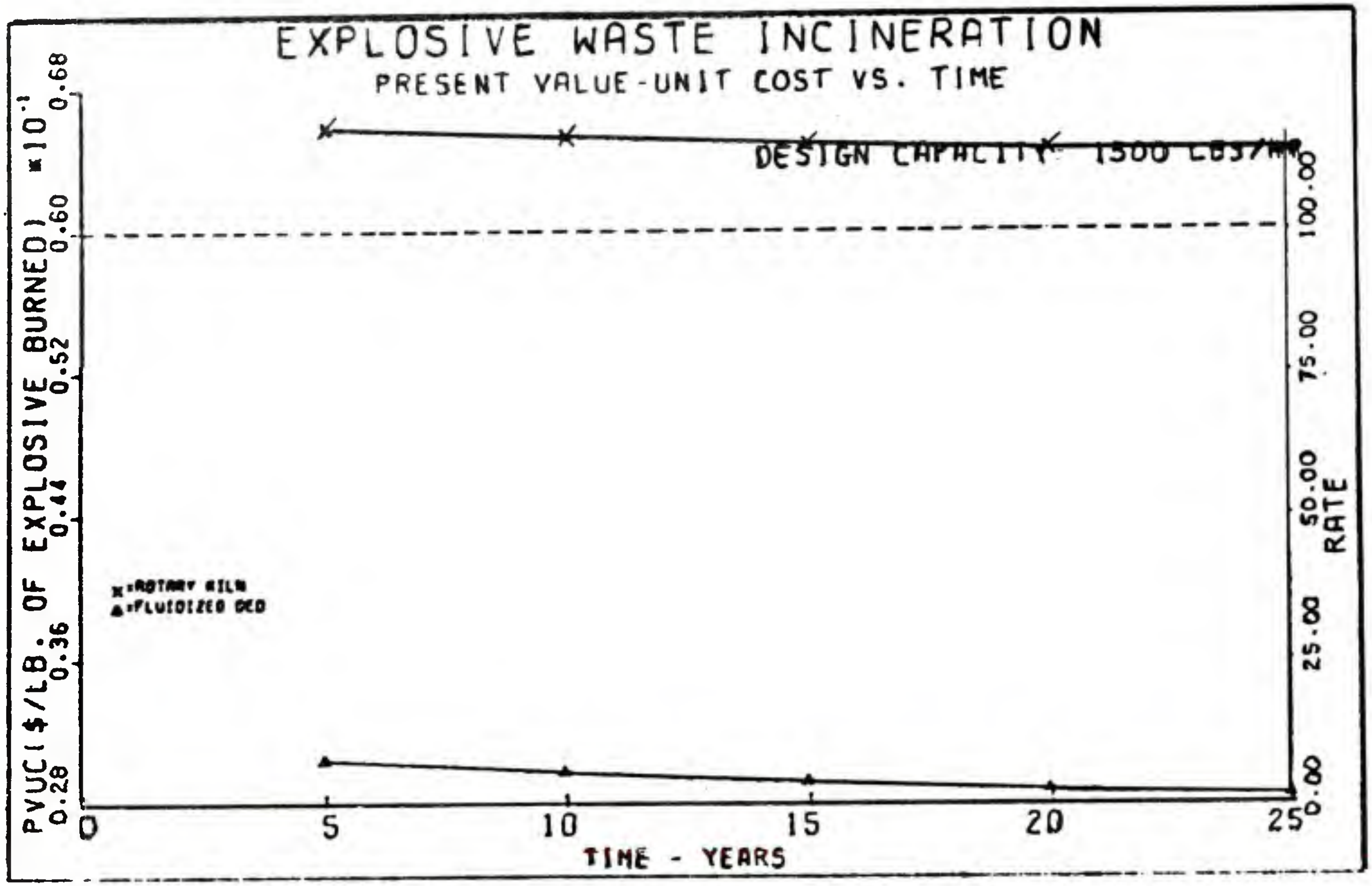

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY 1500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.28
0.36
0.44
0.52
0.60
0.68
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
×:ROTARY KILN
▲:FLUIDIZED BED

FIGURE NO. 46

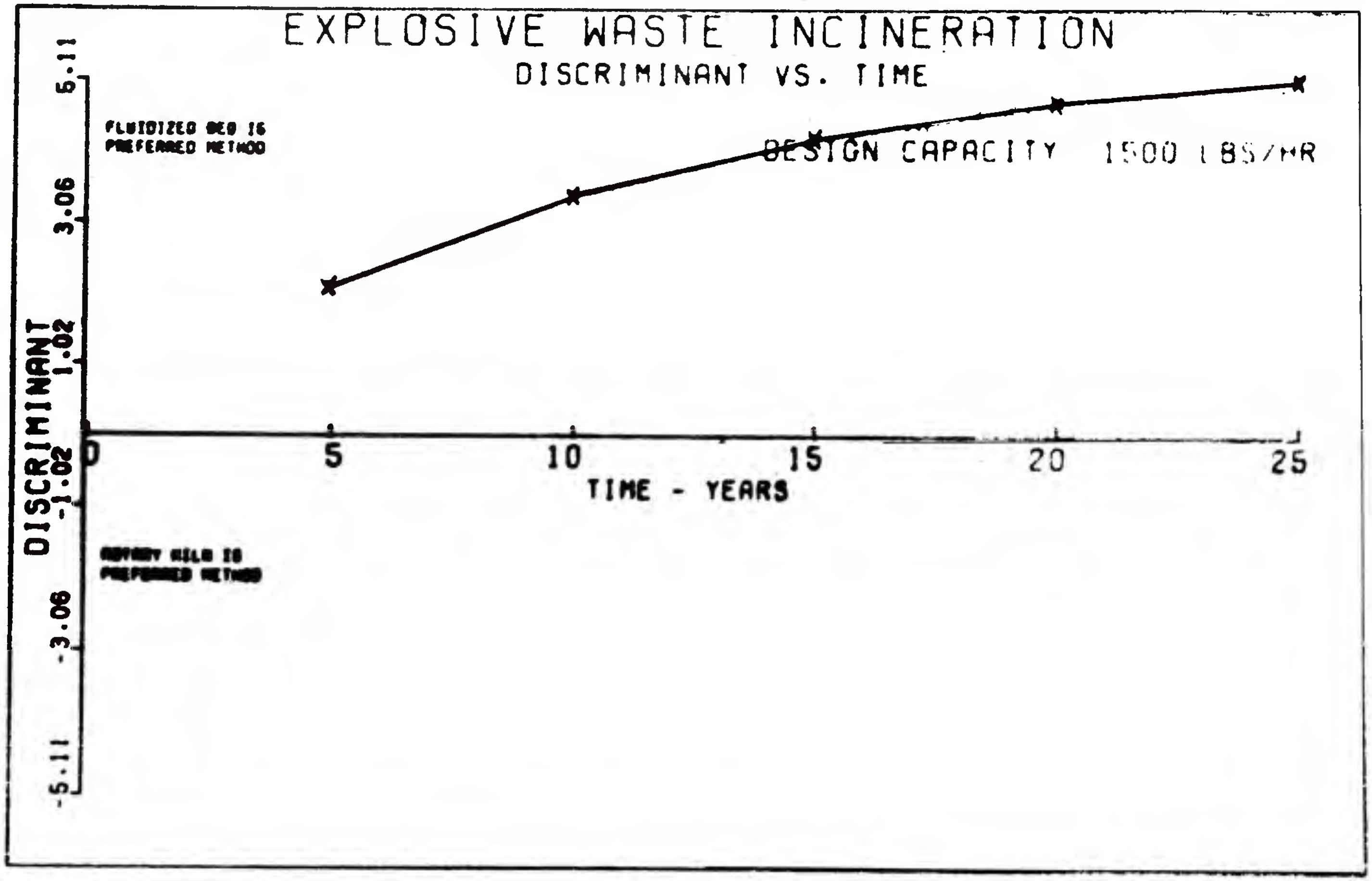

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY 1500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
5.11
3.06
1.02
-1.02
-3.06
-5.11
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 47

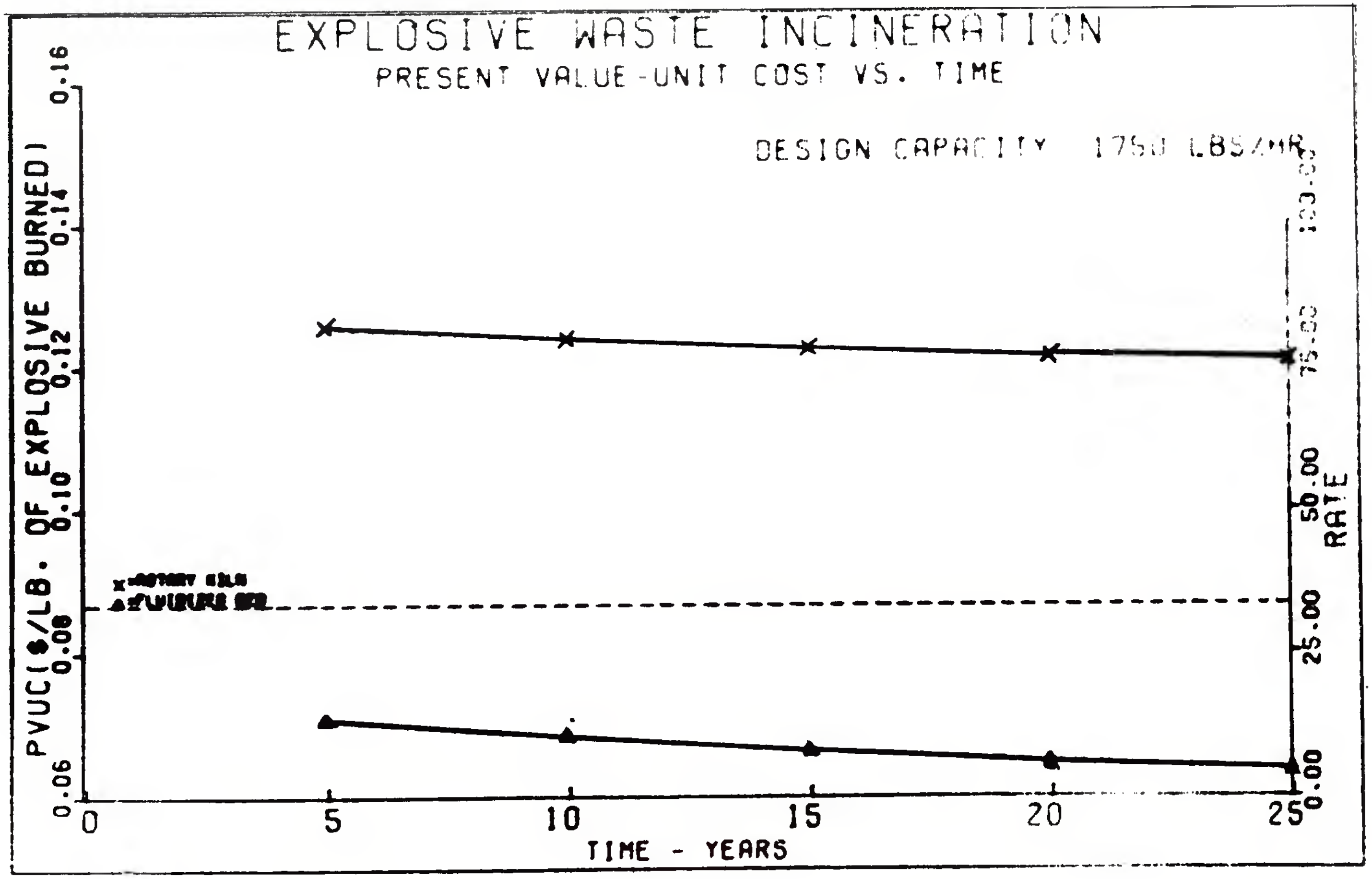

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY 1750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 48

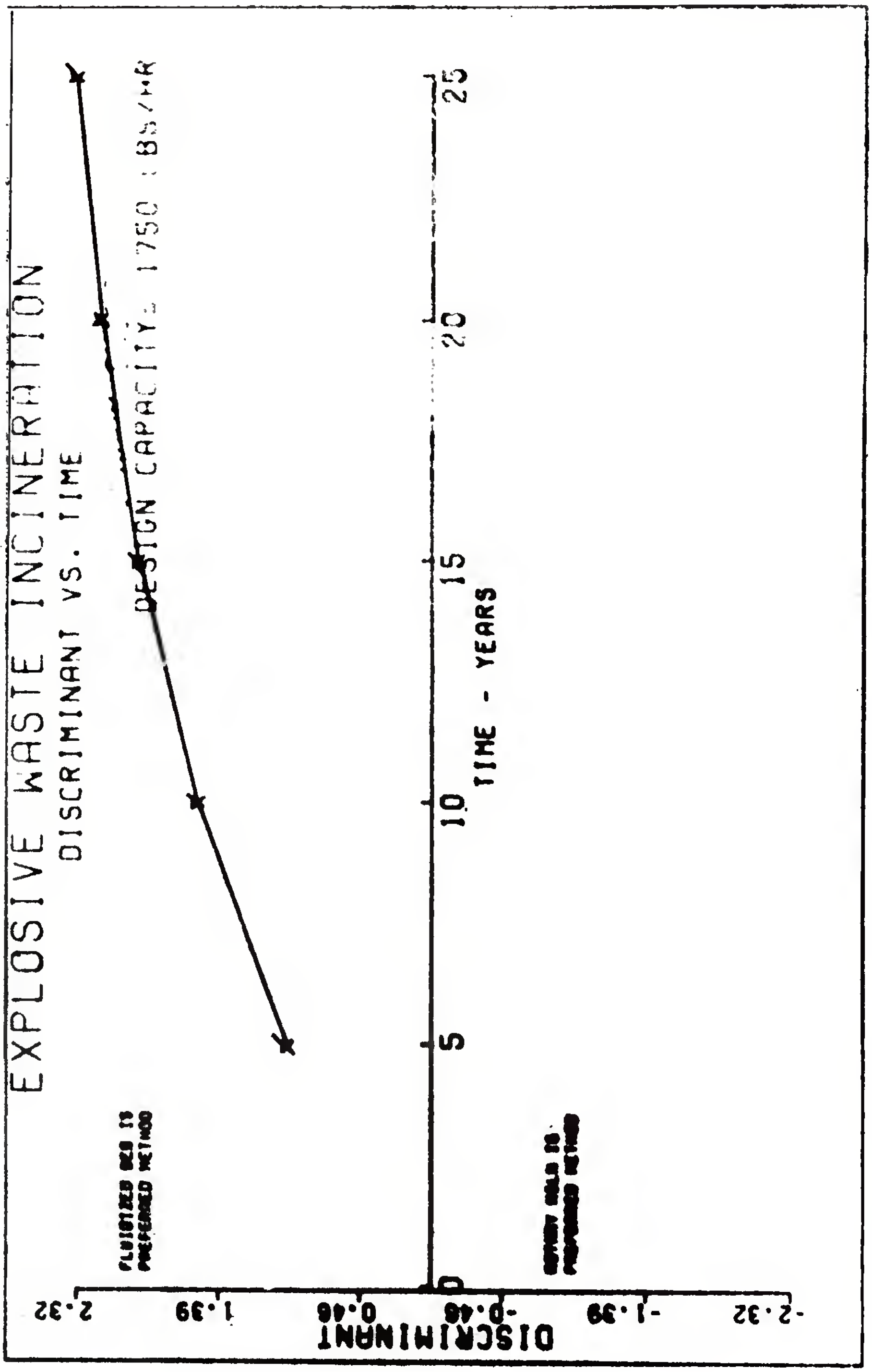

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.32
1.39
0.46
-0.46
-1.39
-2.32
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 49

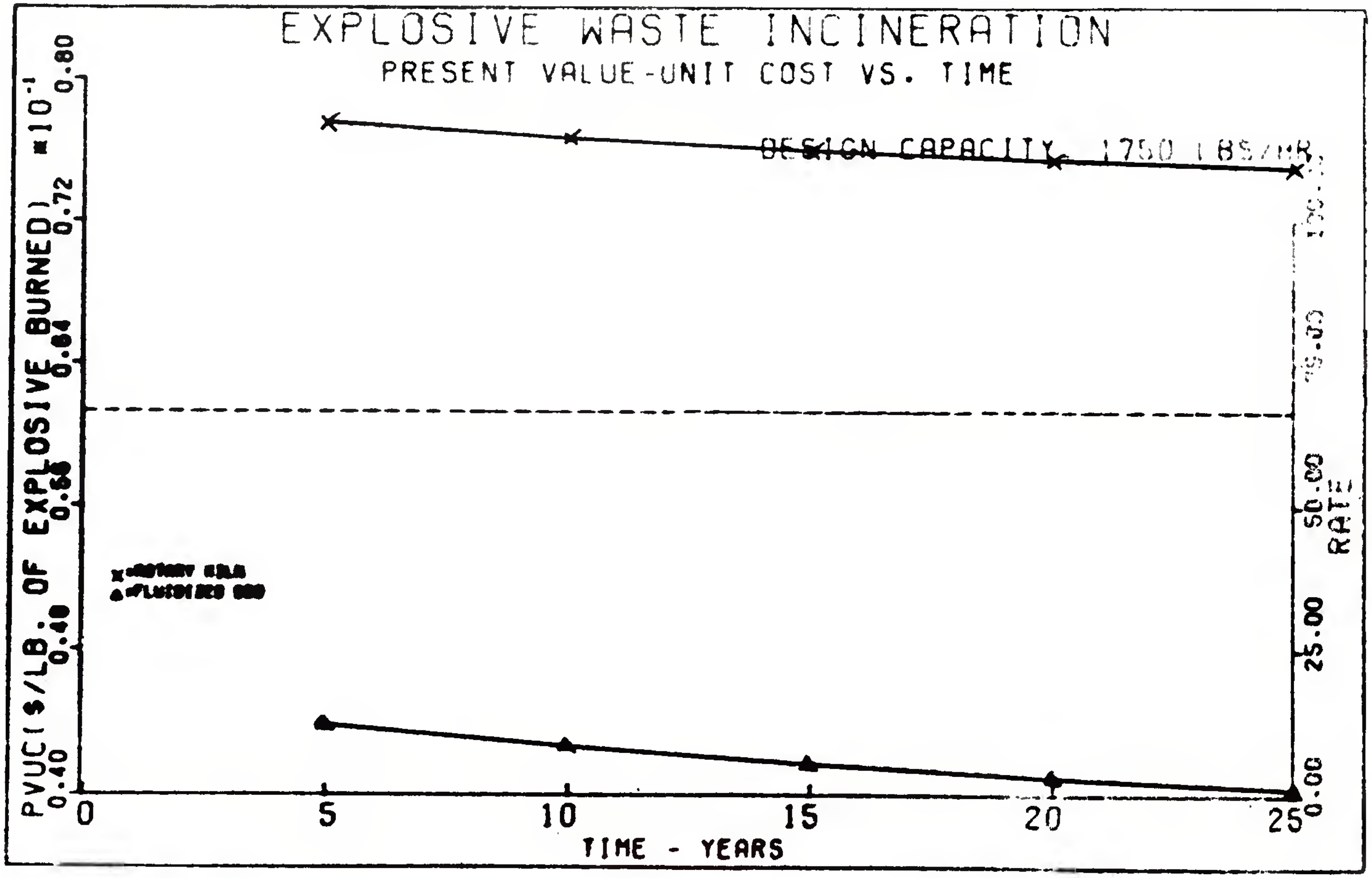

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY 1750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.40
0.48
0.56
0.64
0.72
0.80
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 50

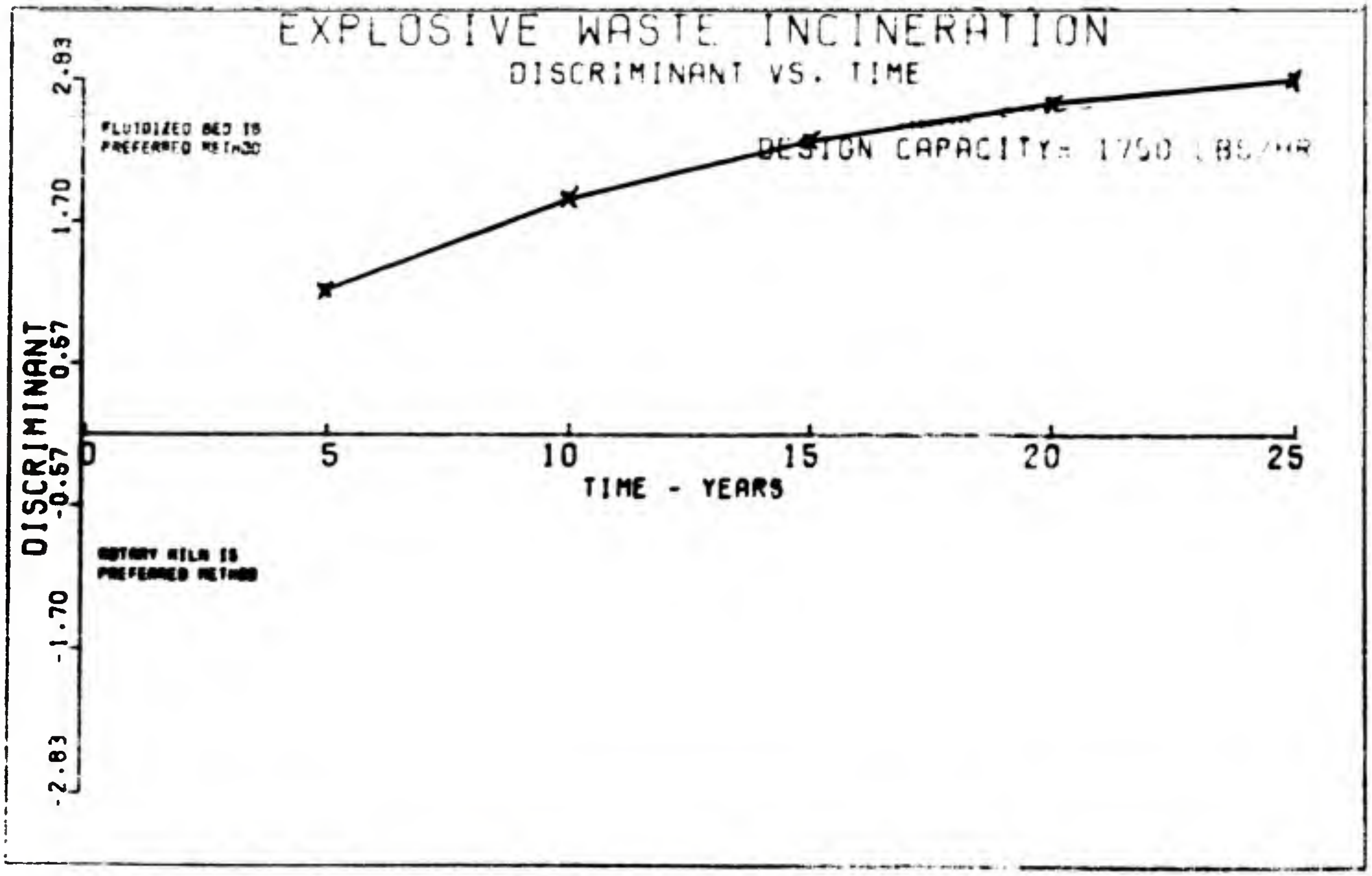

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.83
1.70
0.57
-0.57
-1.70
-2.83
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 51

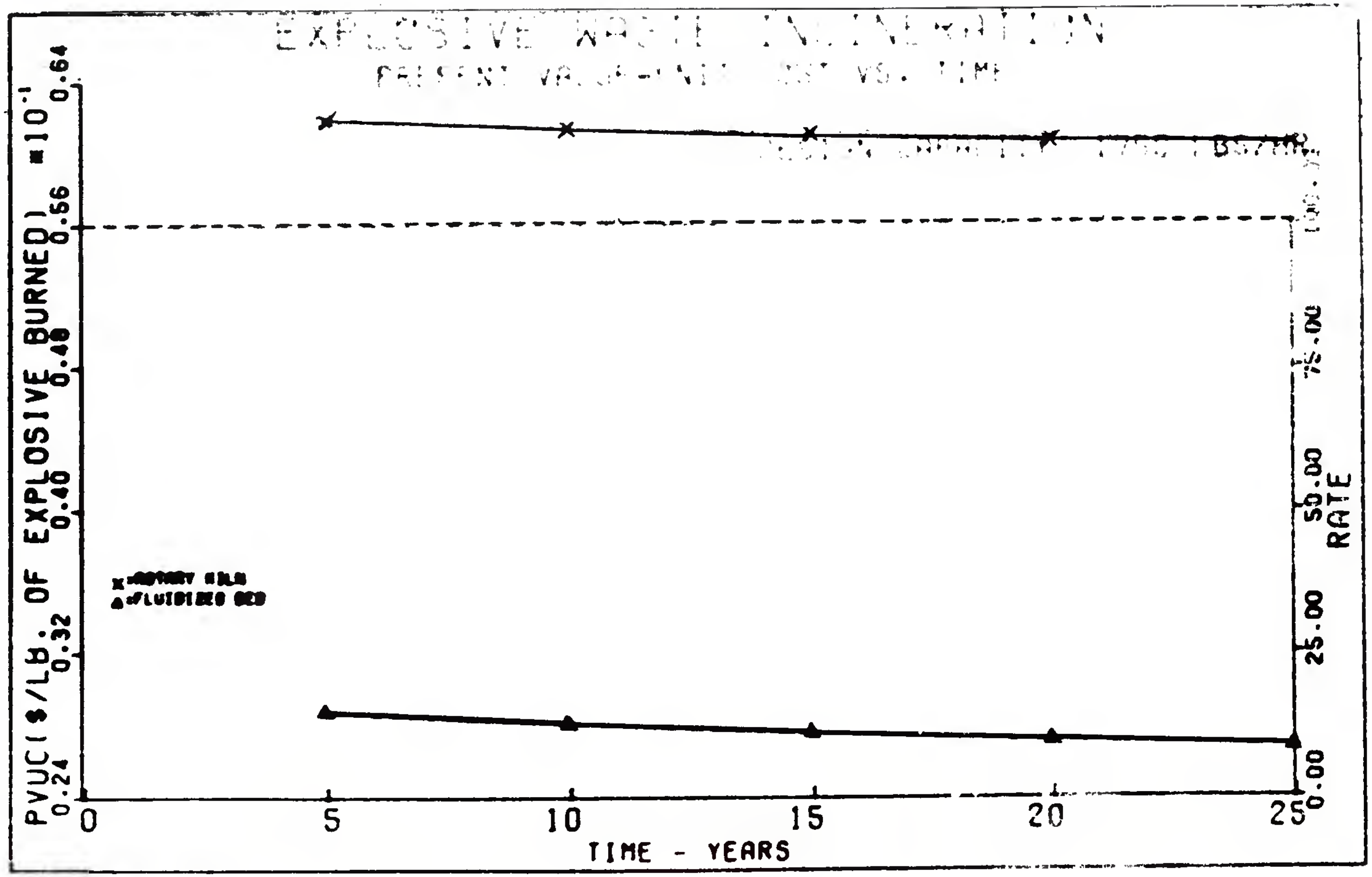

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 52

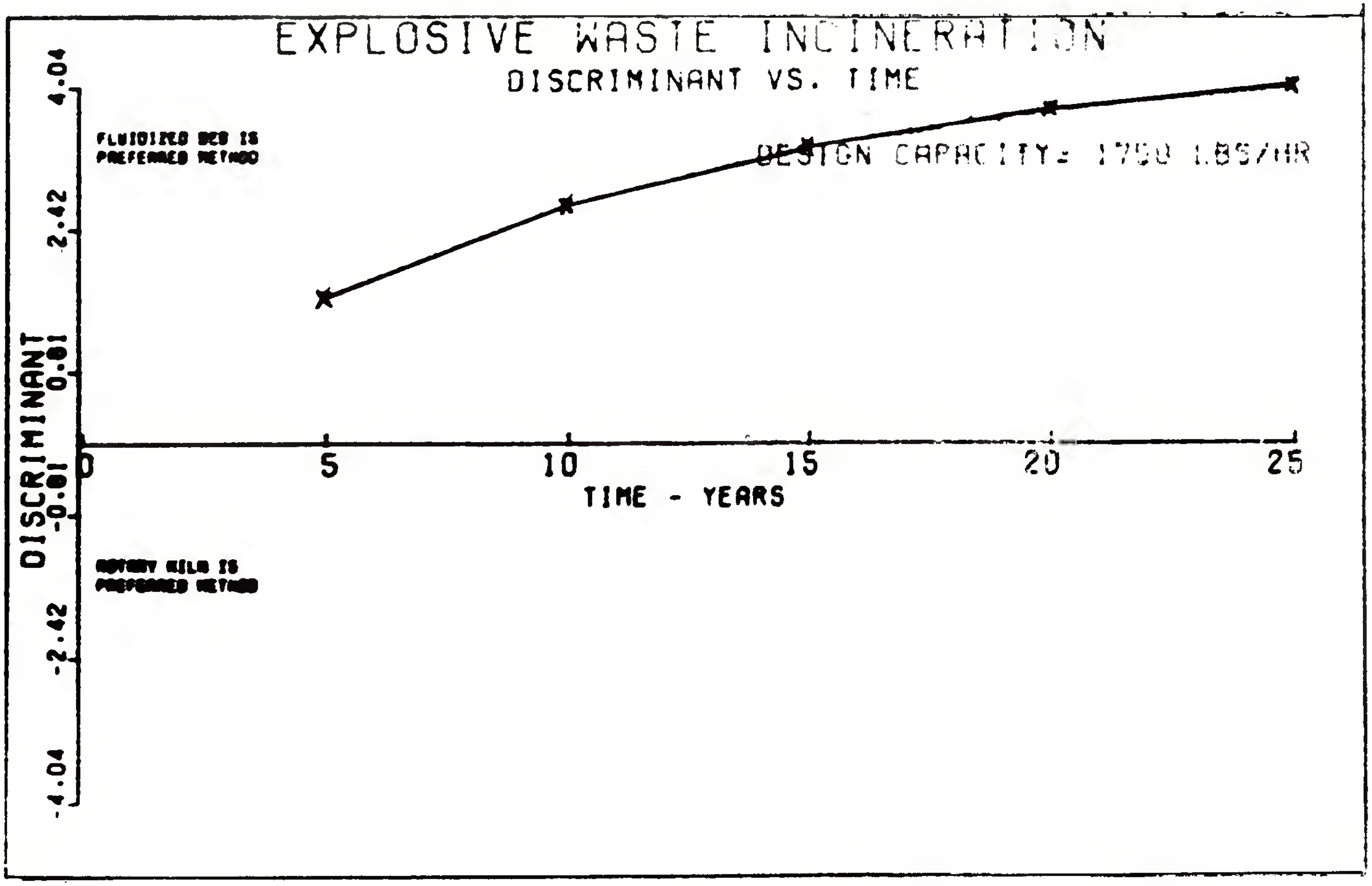

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 1750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
4.04
2.42
0.81
-0.81
-2.42
-4.04
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 53

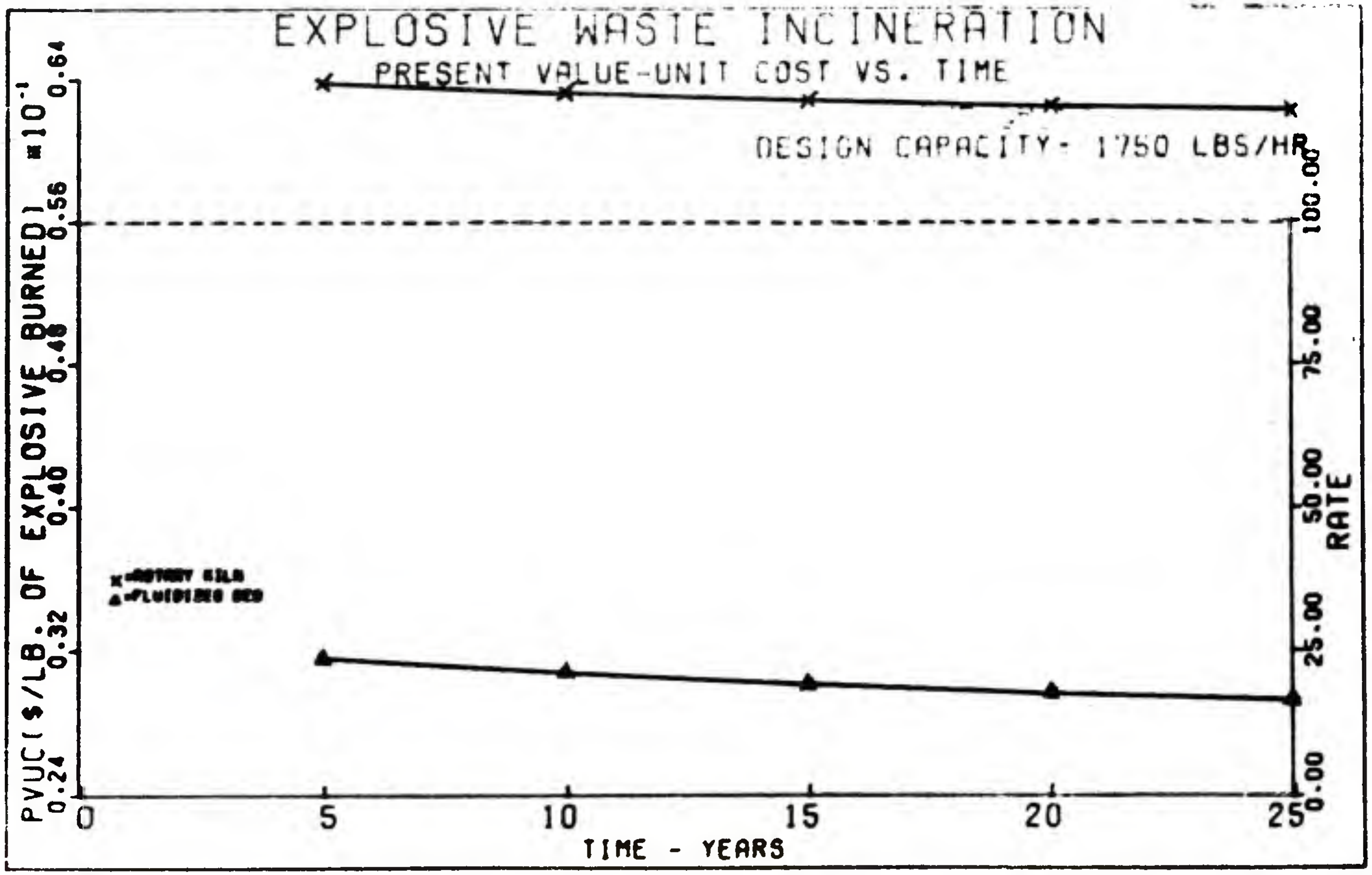

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY- 1750 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 54

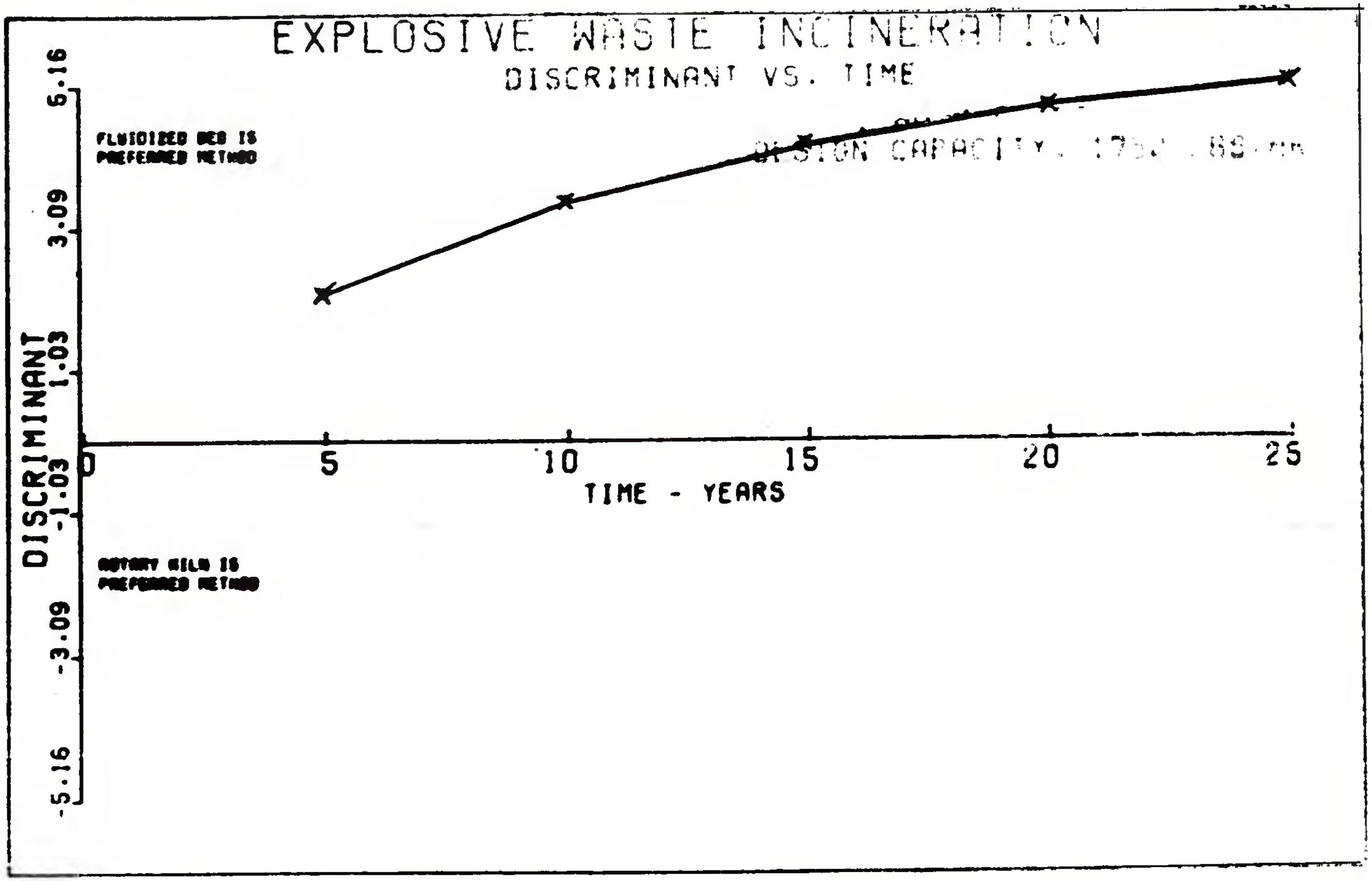

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY, 1750 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
6.16
3.09
1.03
-1.03
-3.09
-5.16
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 55

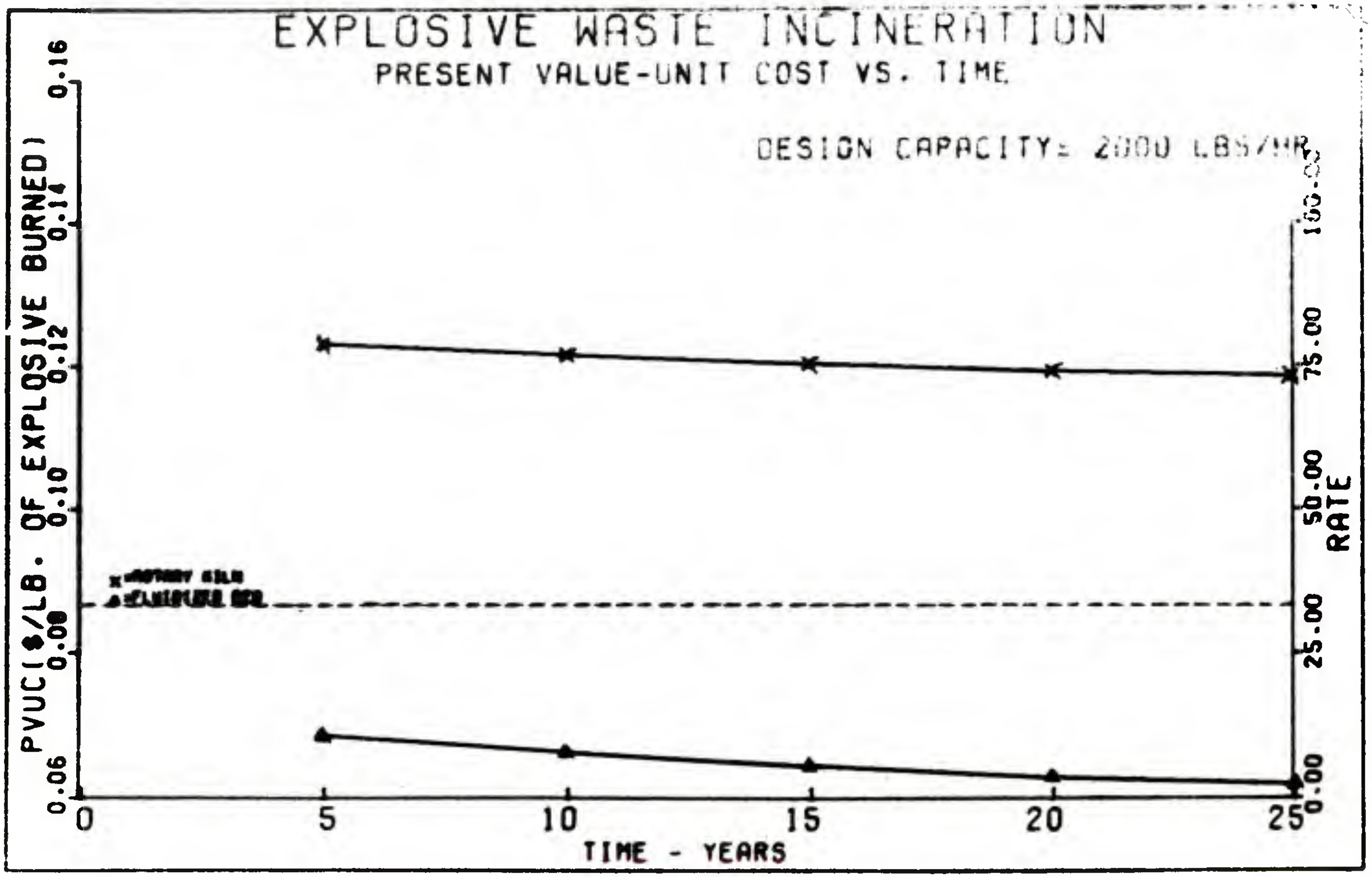

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2000 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
x ROTARY KILN
▲ FLUIDIZED BED

FIGURE NO. 56

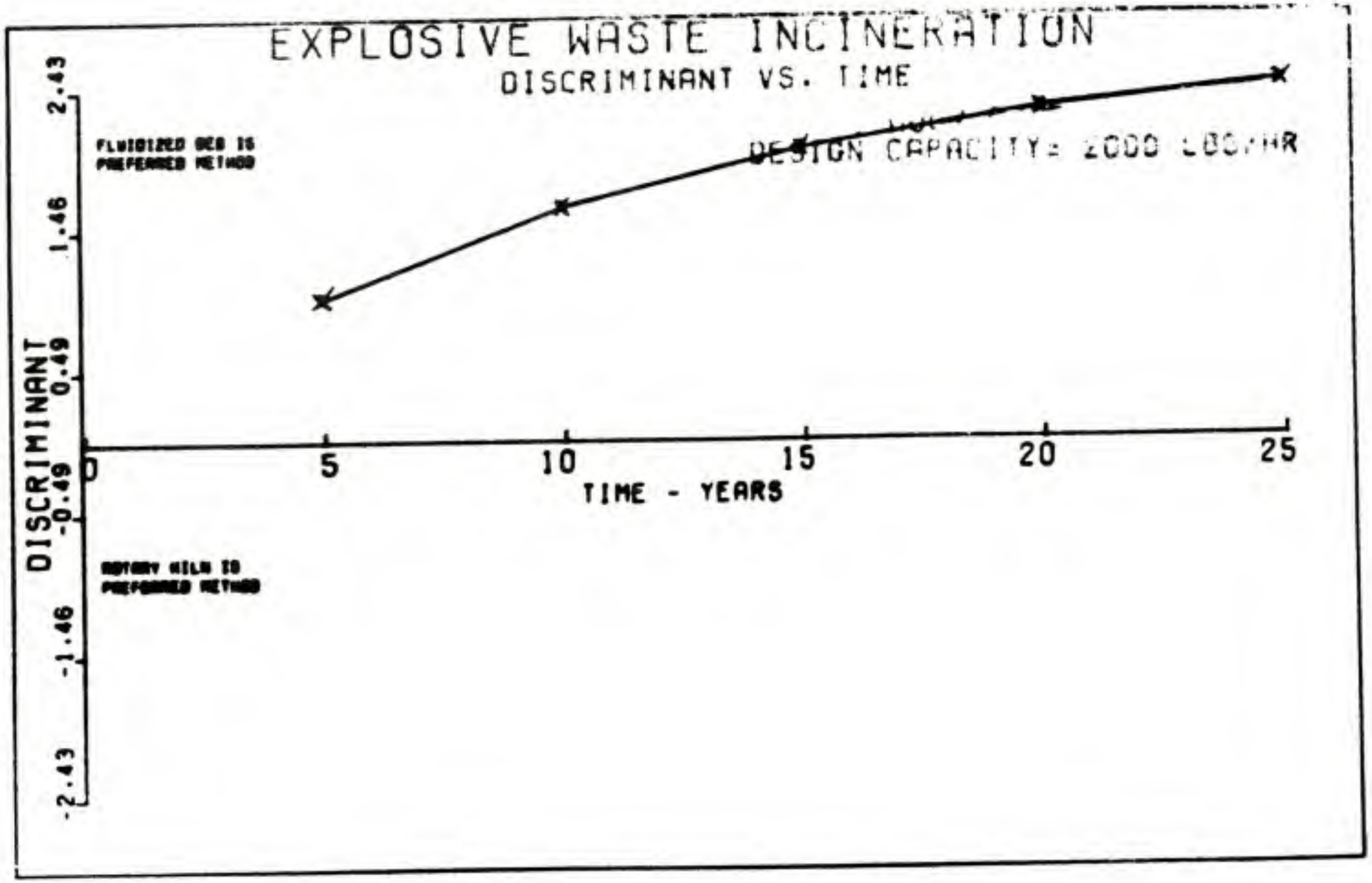

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.43
1.46
0.49
-0.49
-1.46
-2.43
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 57

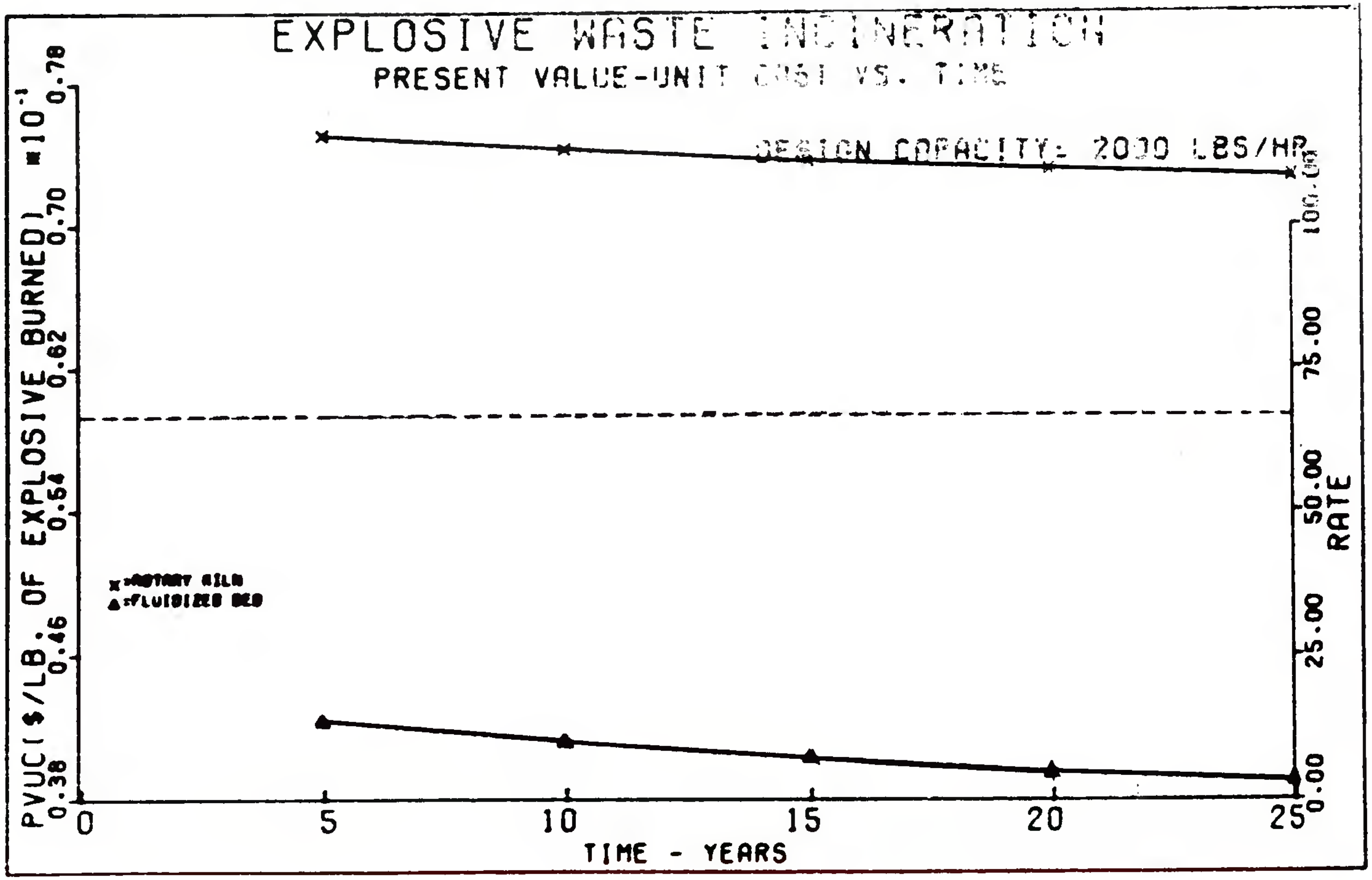
EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY: 2000 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.38
0.46
0.54
0.62
0.70
0.78
x =ROTARY KILN
▲ =FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 58

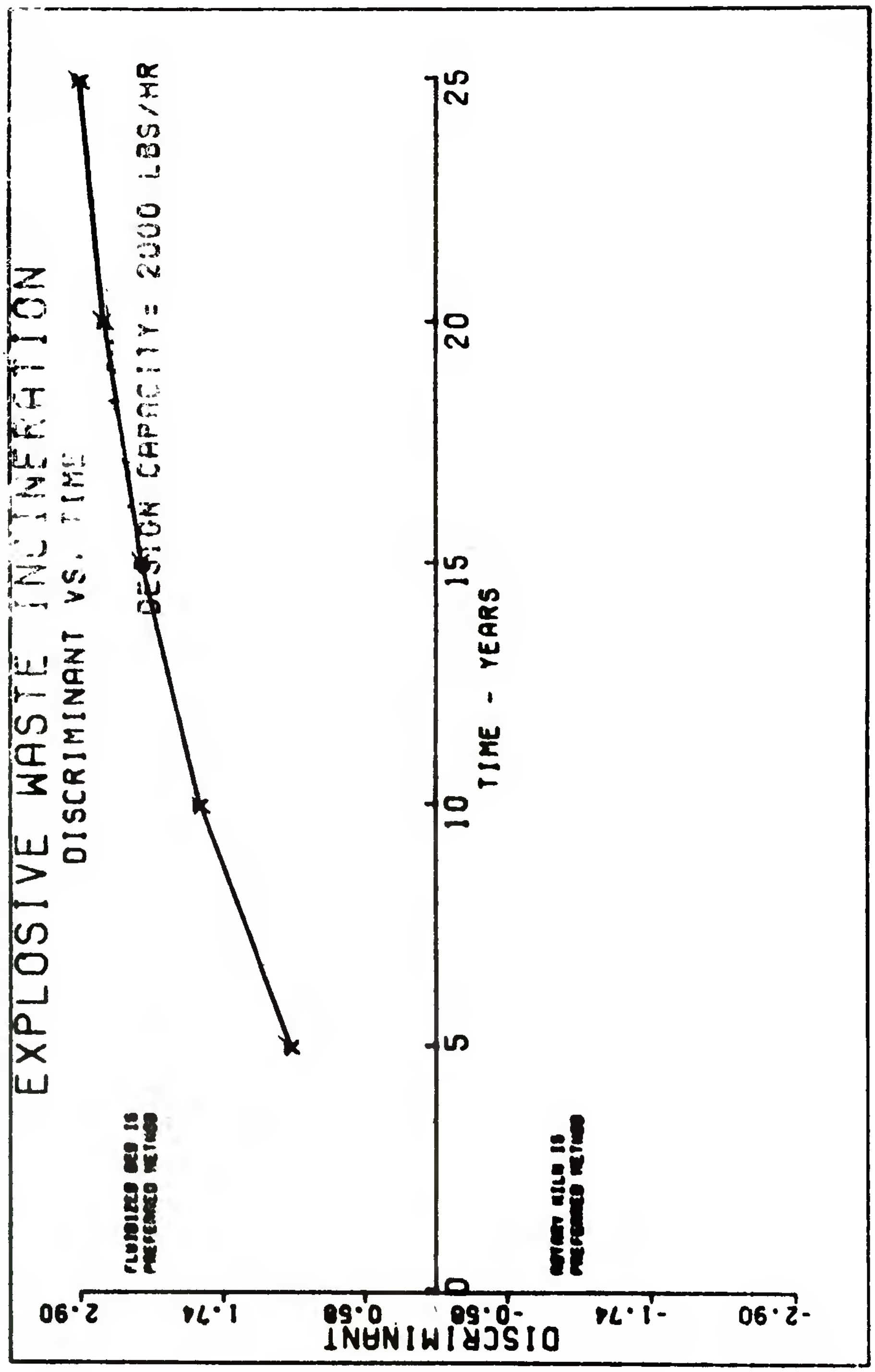

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY = 2000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.90
1.74
0.58
-0.58
-1.74
-2.90
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 59

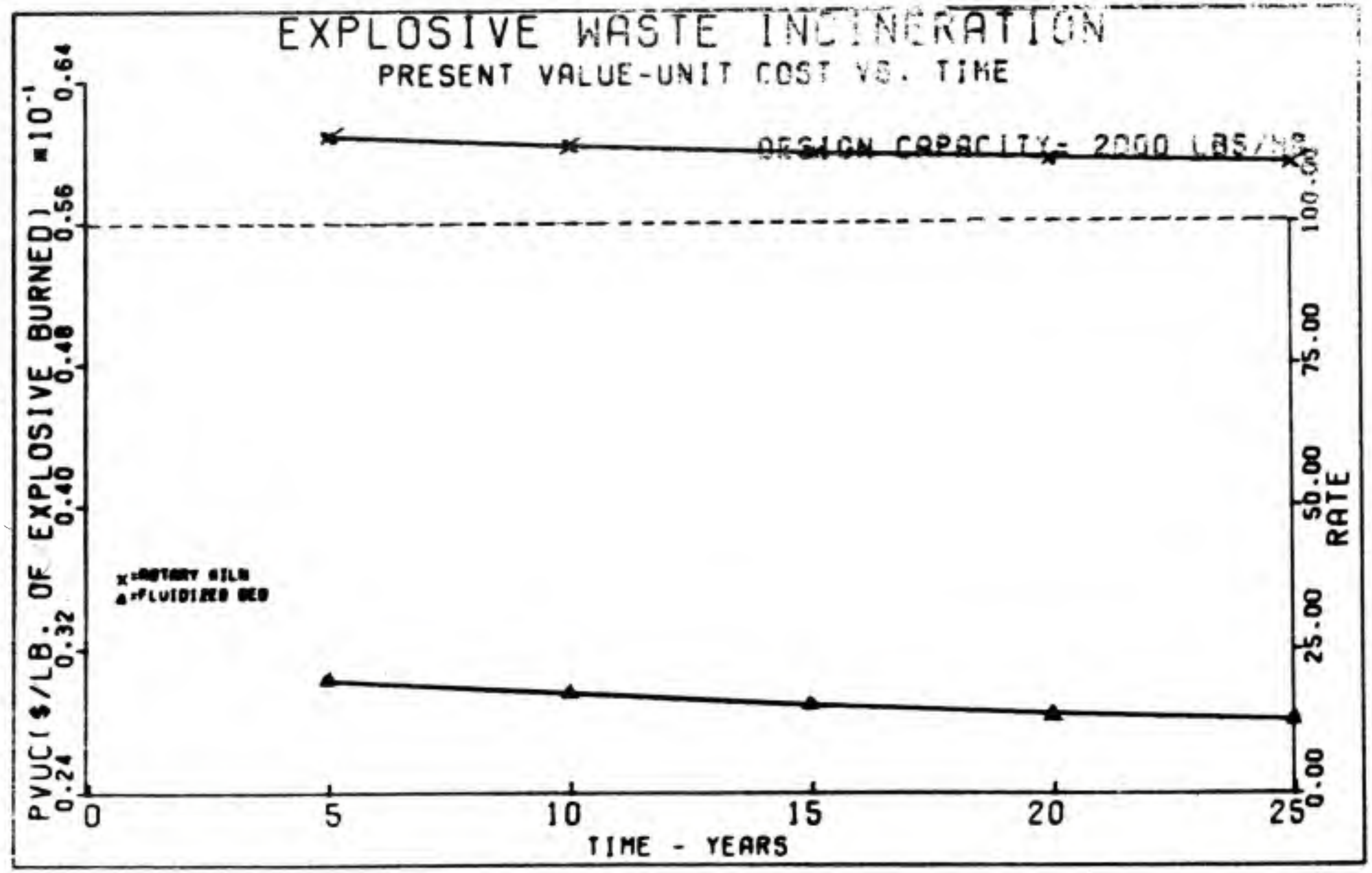

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY- 2000 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 60

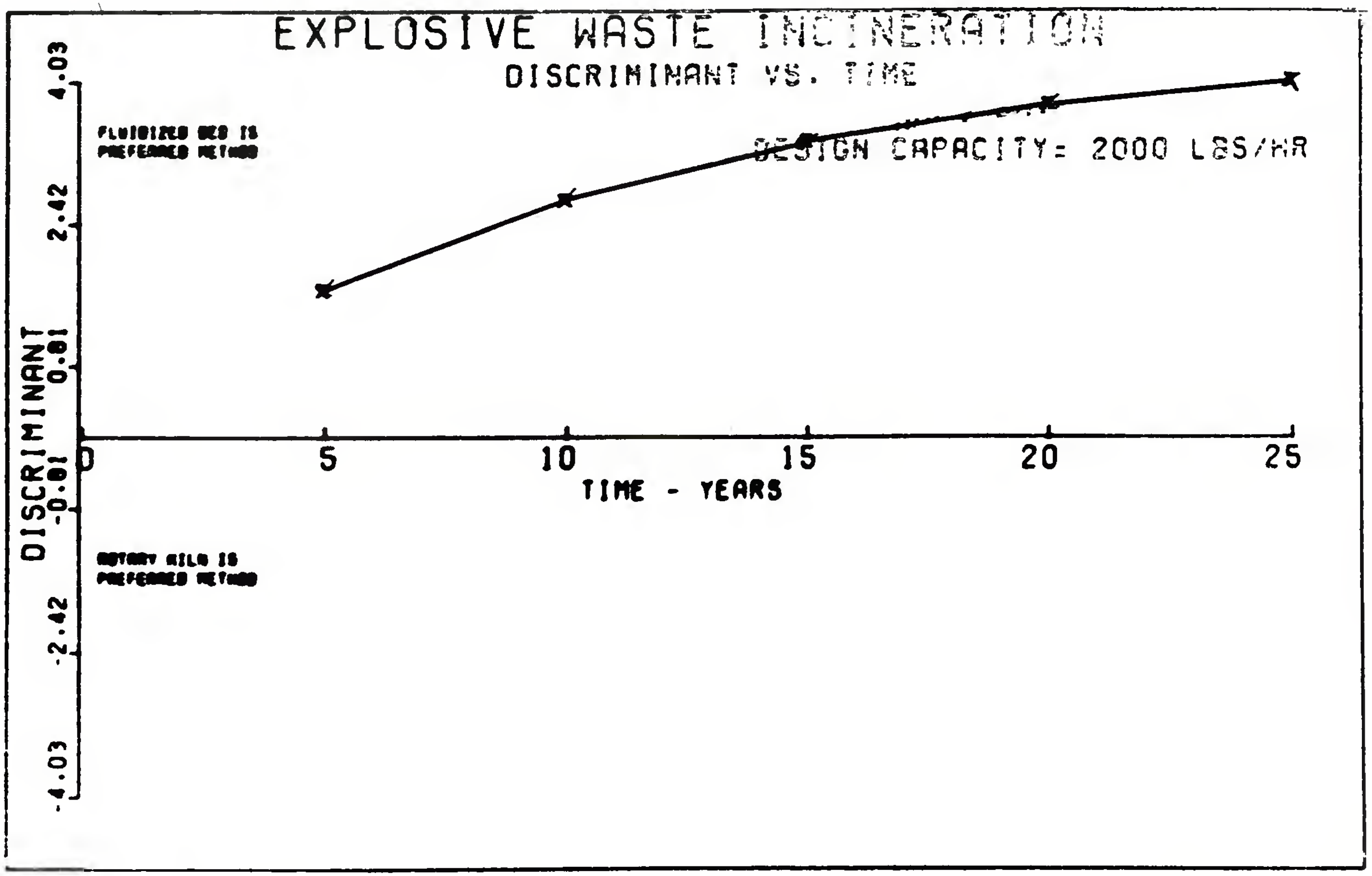

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
4.03
2.42
0.81
-0.81
-2.42
-4.03
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 61

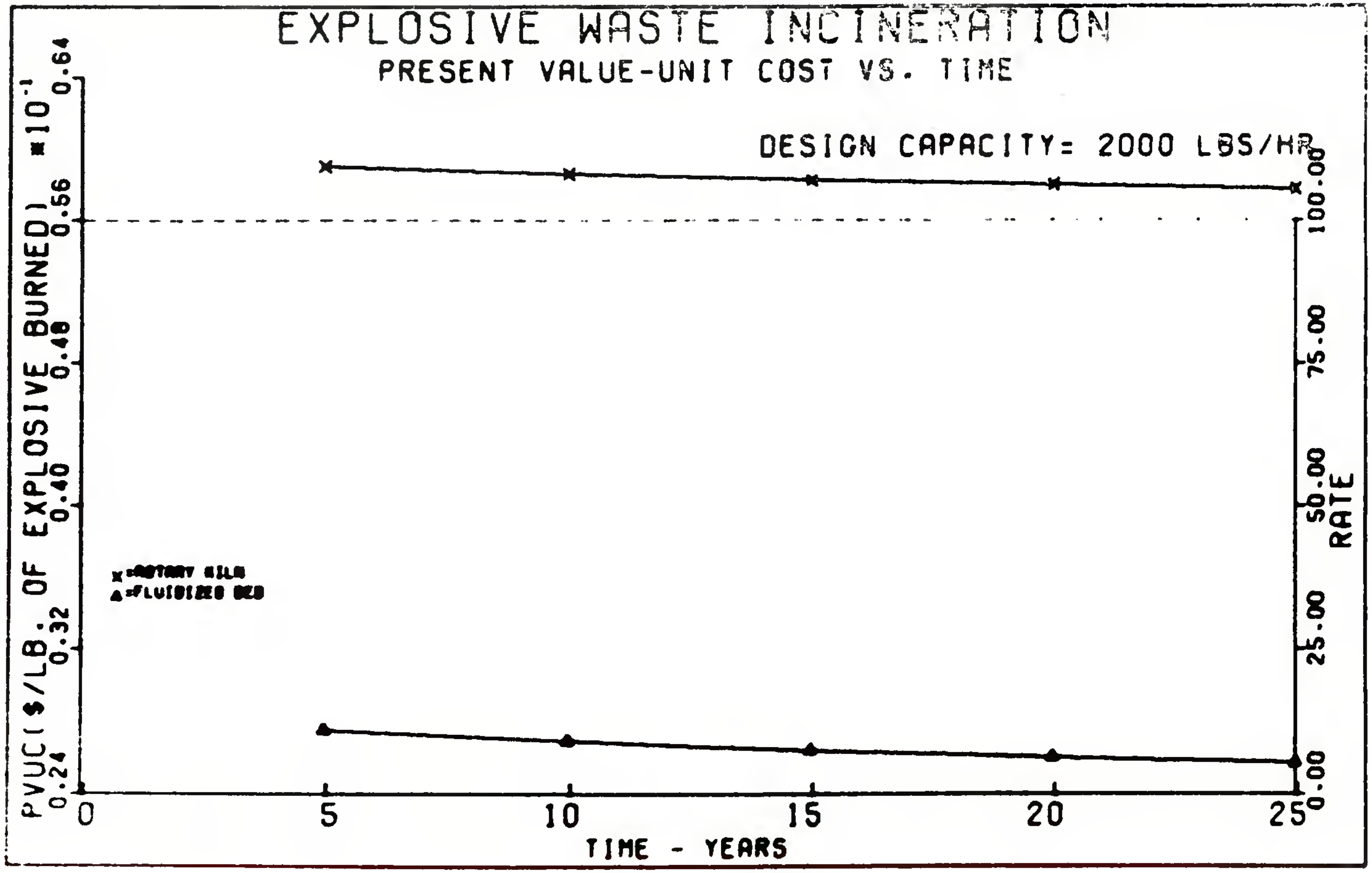

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2000 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
x=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 62

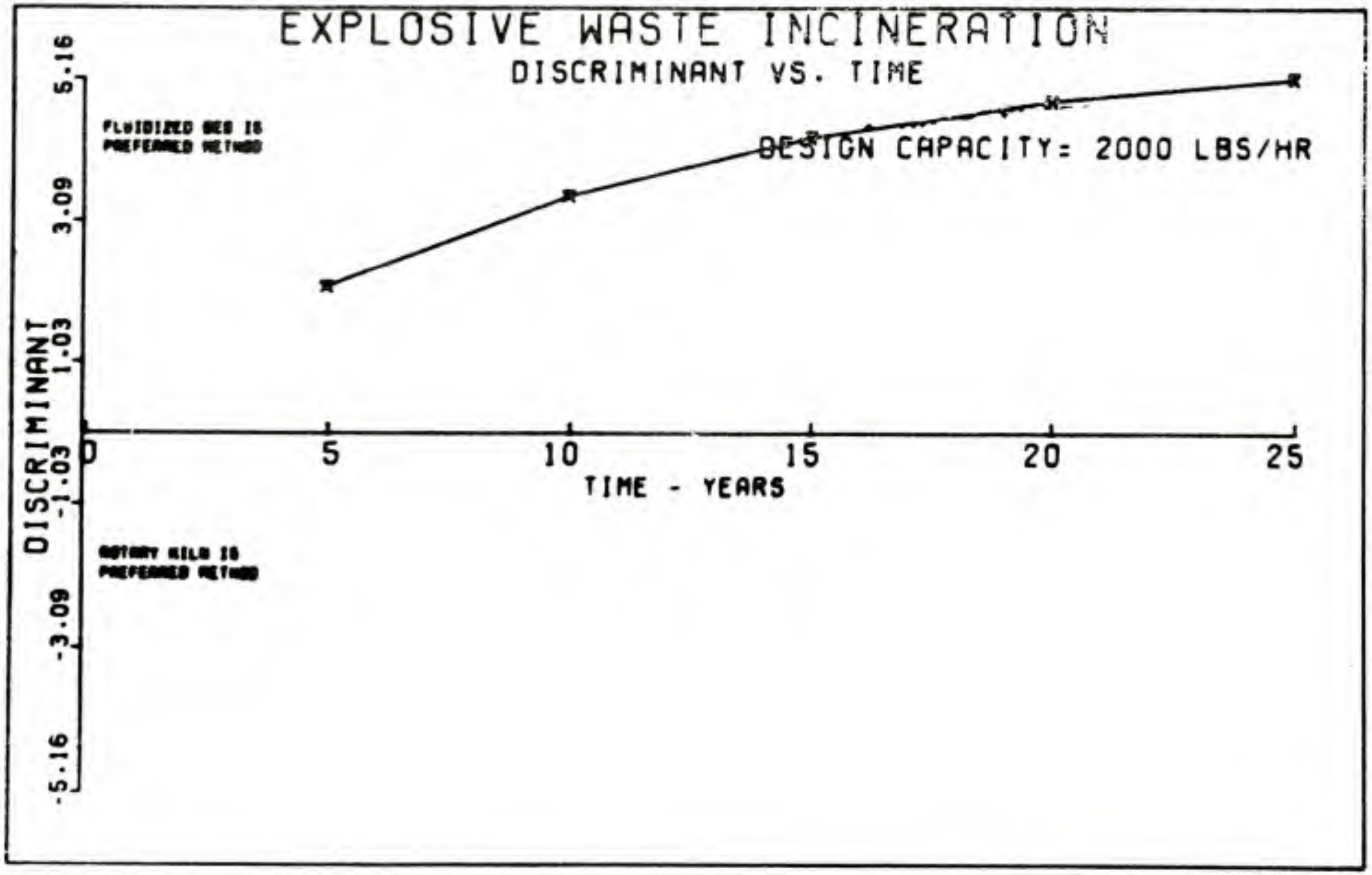

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2000 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
5.16
3.09
1.03
-1.03
-3.09
-5.16
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 63

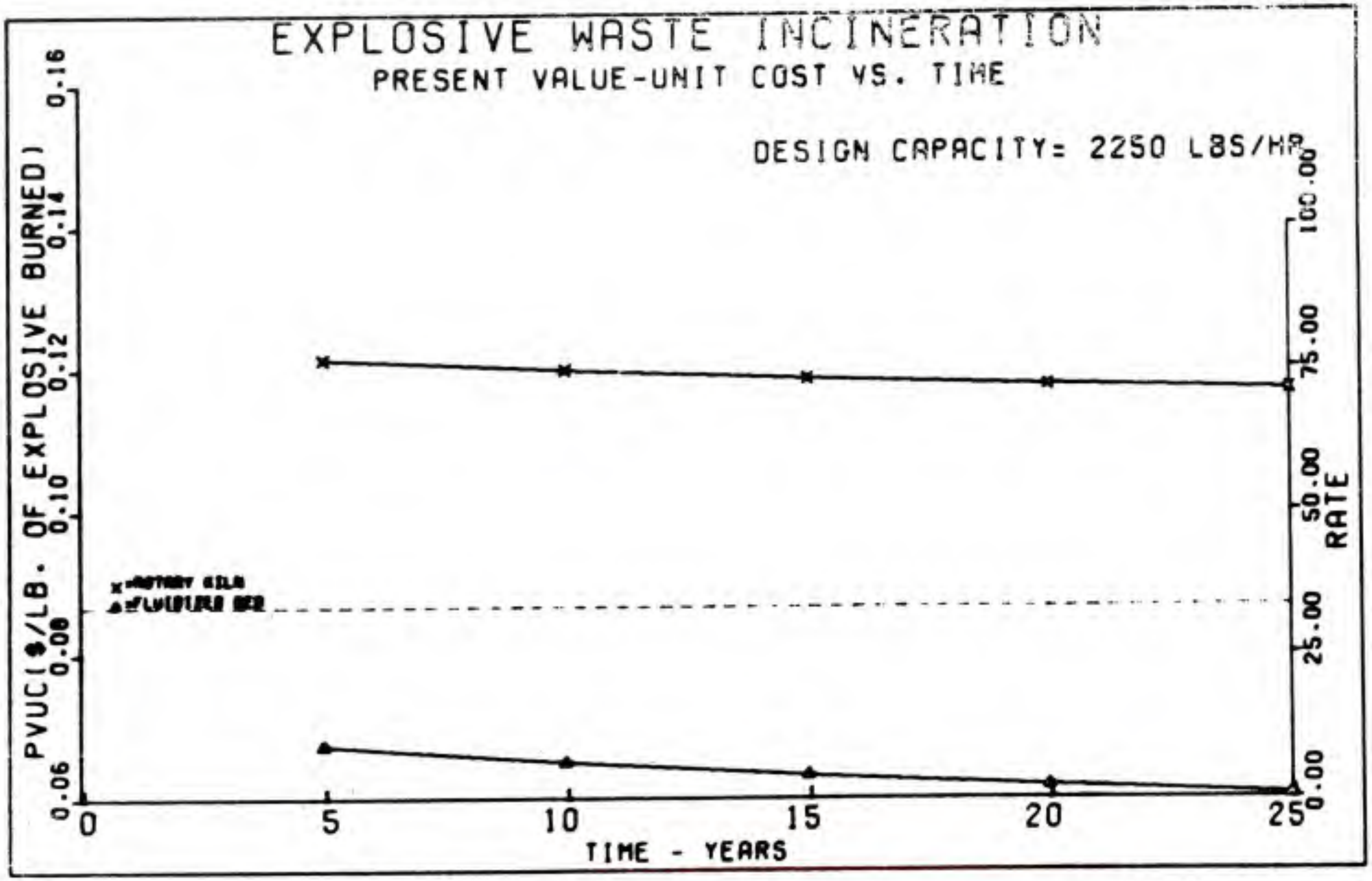

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
X=ROTARY KILN
▲=FLUIDIZED BED
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 64

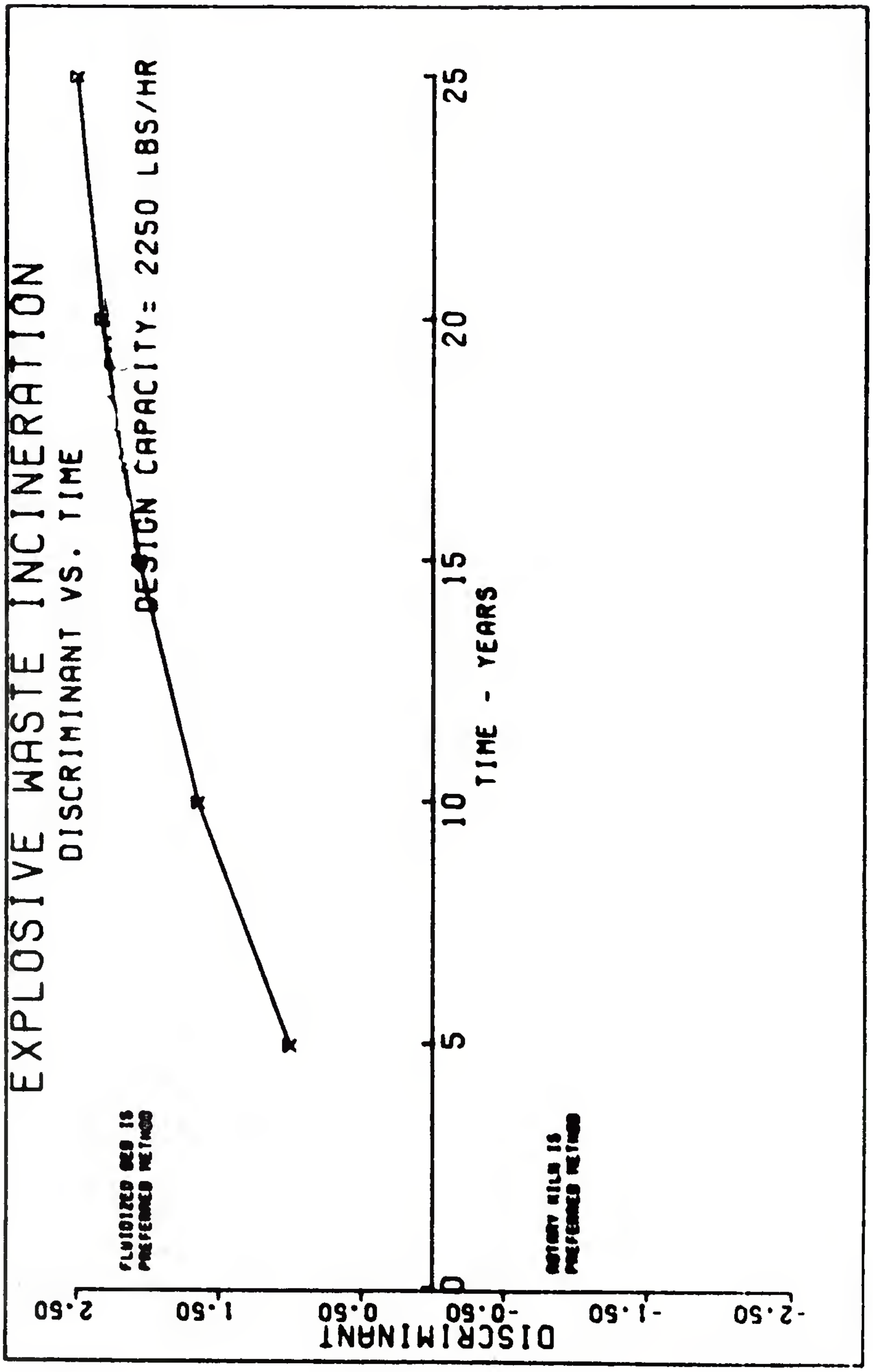

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.50
1.50
0.50
-0.50
-1.50
-2.50
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 65

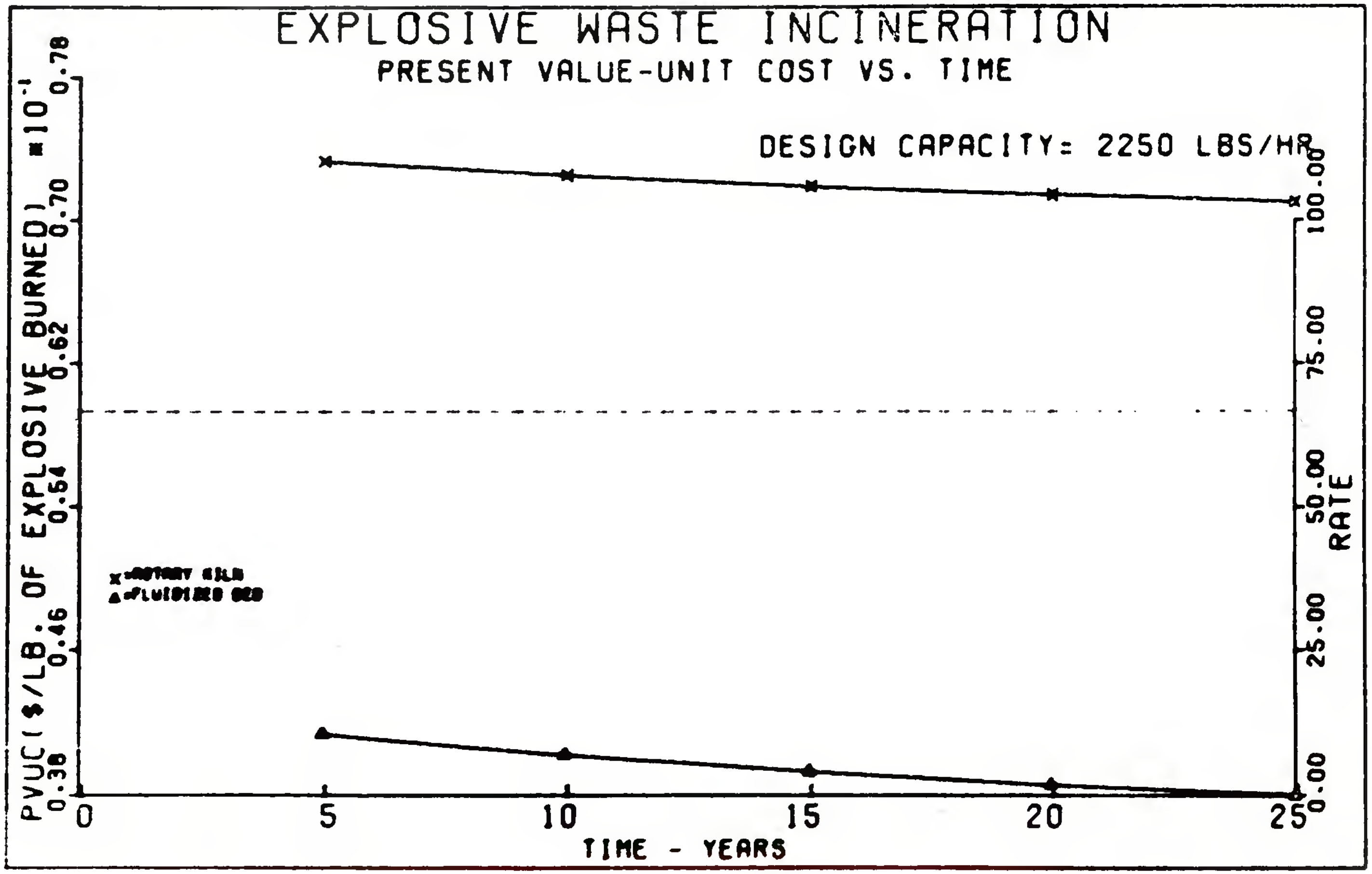

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.38
0.46
0.54
0.62
0.70
0.78
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS
X=ROTARY KILN
△=FLUIDIZED BED

FIGURE NO. 66

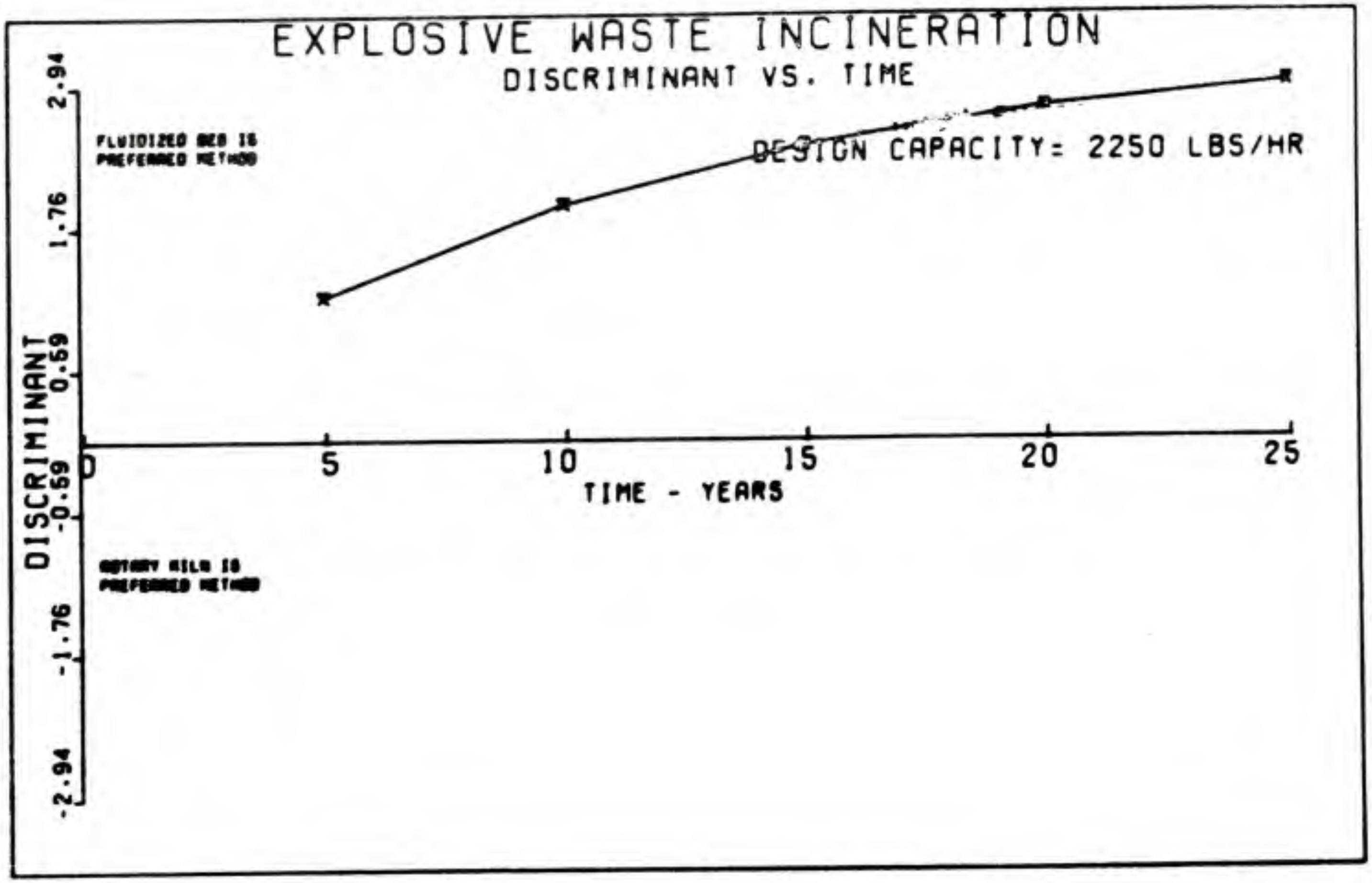

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.94
1.76
0.59
-0.59
-1.76
-2.94
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 67

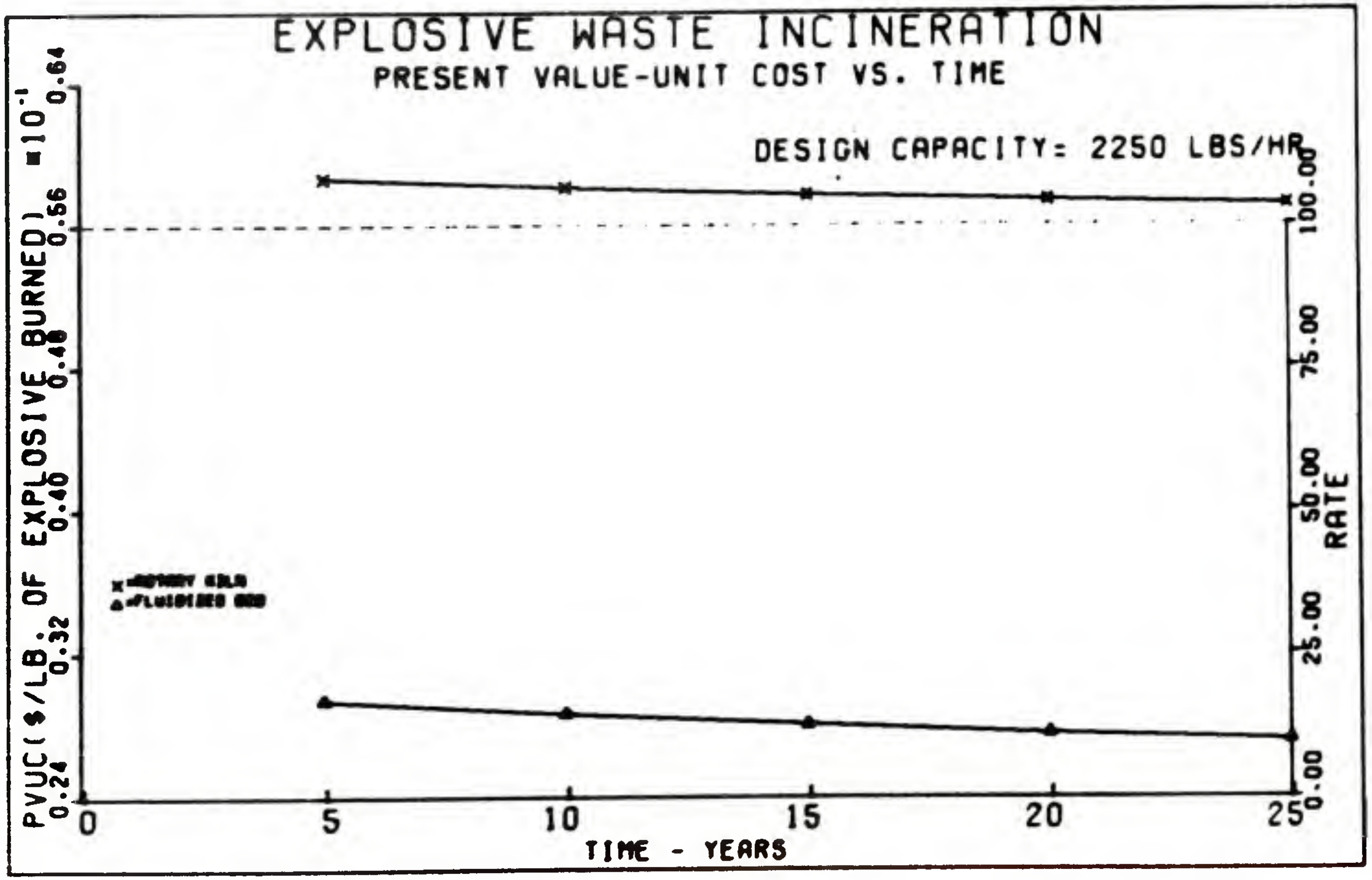

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
X=ROTARY KILN
▲=FLUIDIZED BED
PVUC($/LB. OF EXPLOSIVE BURNED) ×10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
RATE
0.00
25.00
50.00
75.00
100.00
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 68

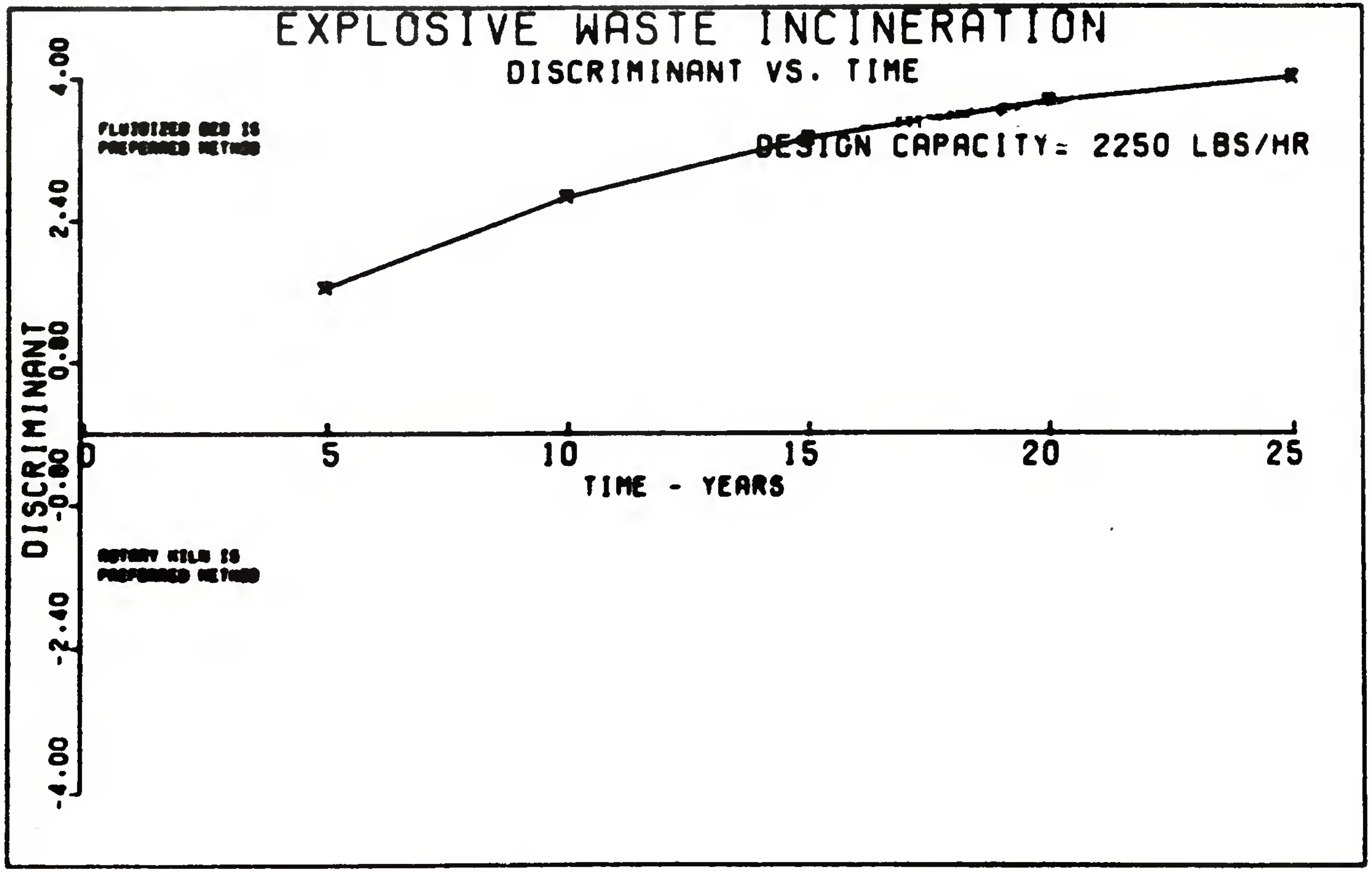

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
4.00
2.40
0.80
-0.80
-2.40
-4.00
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 69

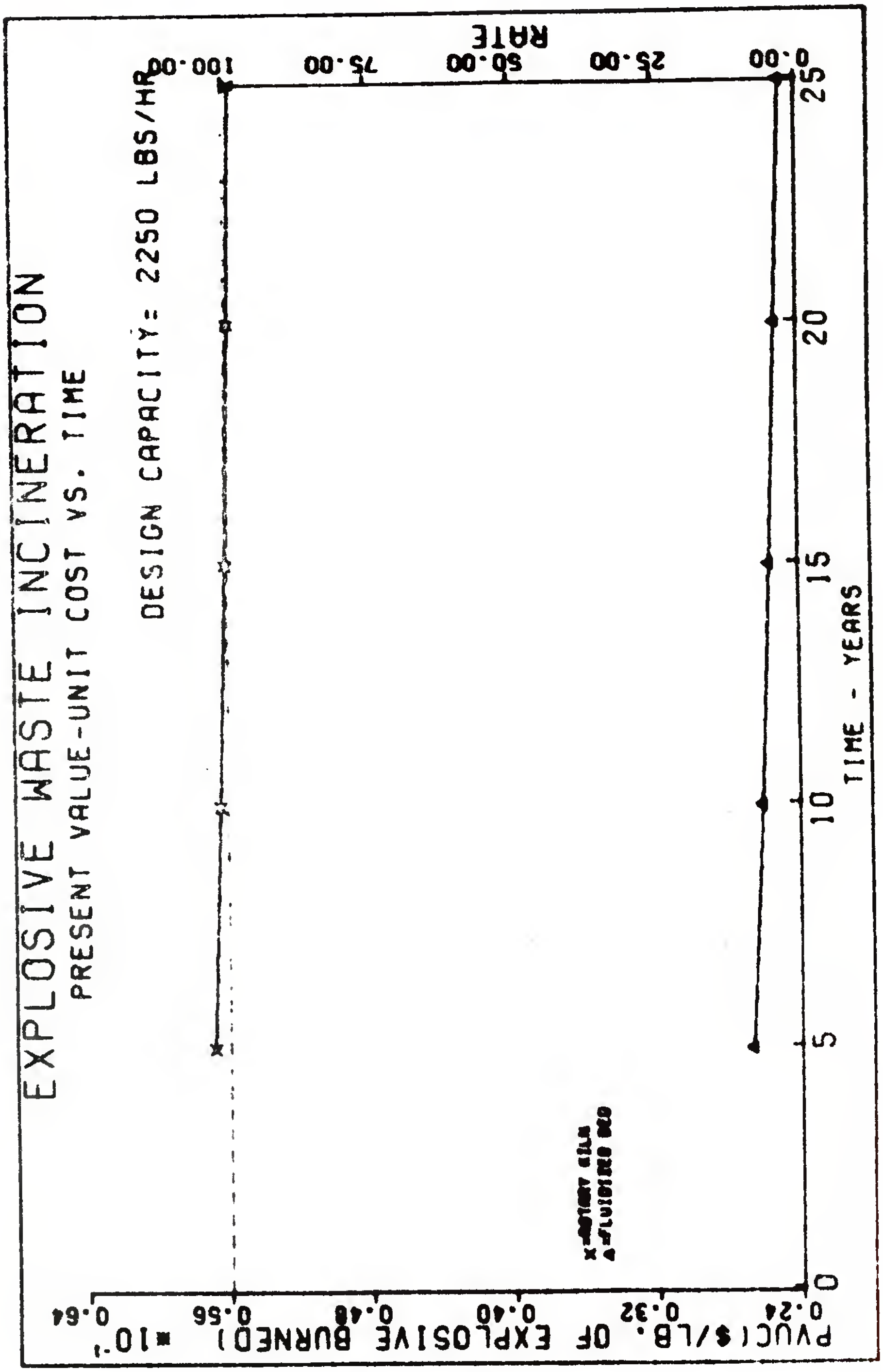

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2250 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
X ROTARY KILN
▲ FLUIDIZED BED

FIGURE NO. 70

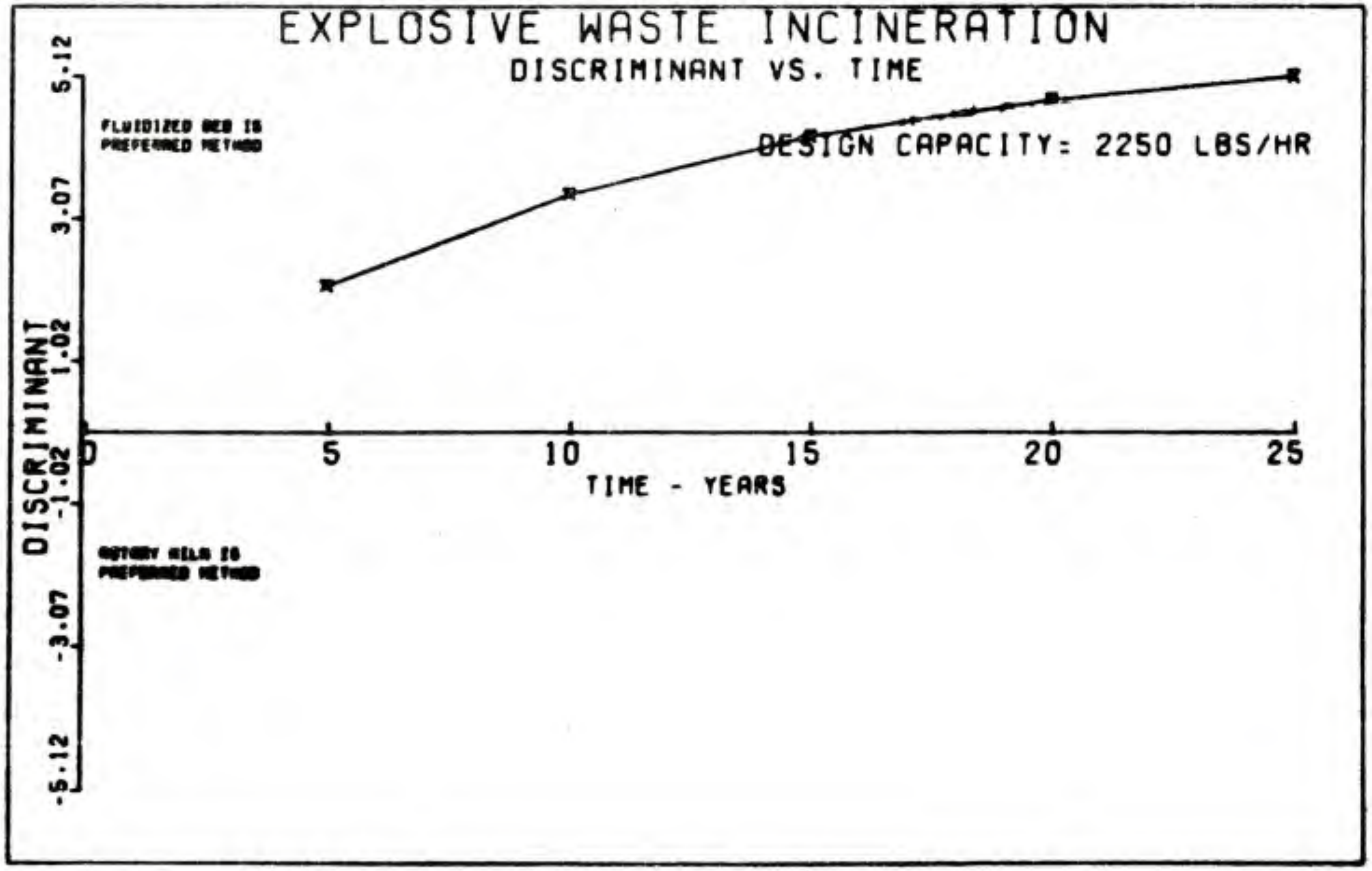

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY: 2250 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
5.12
3.07
1.02
-1.02
-3.07
-5.12
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 71

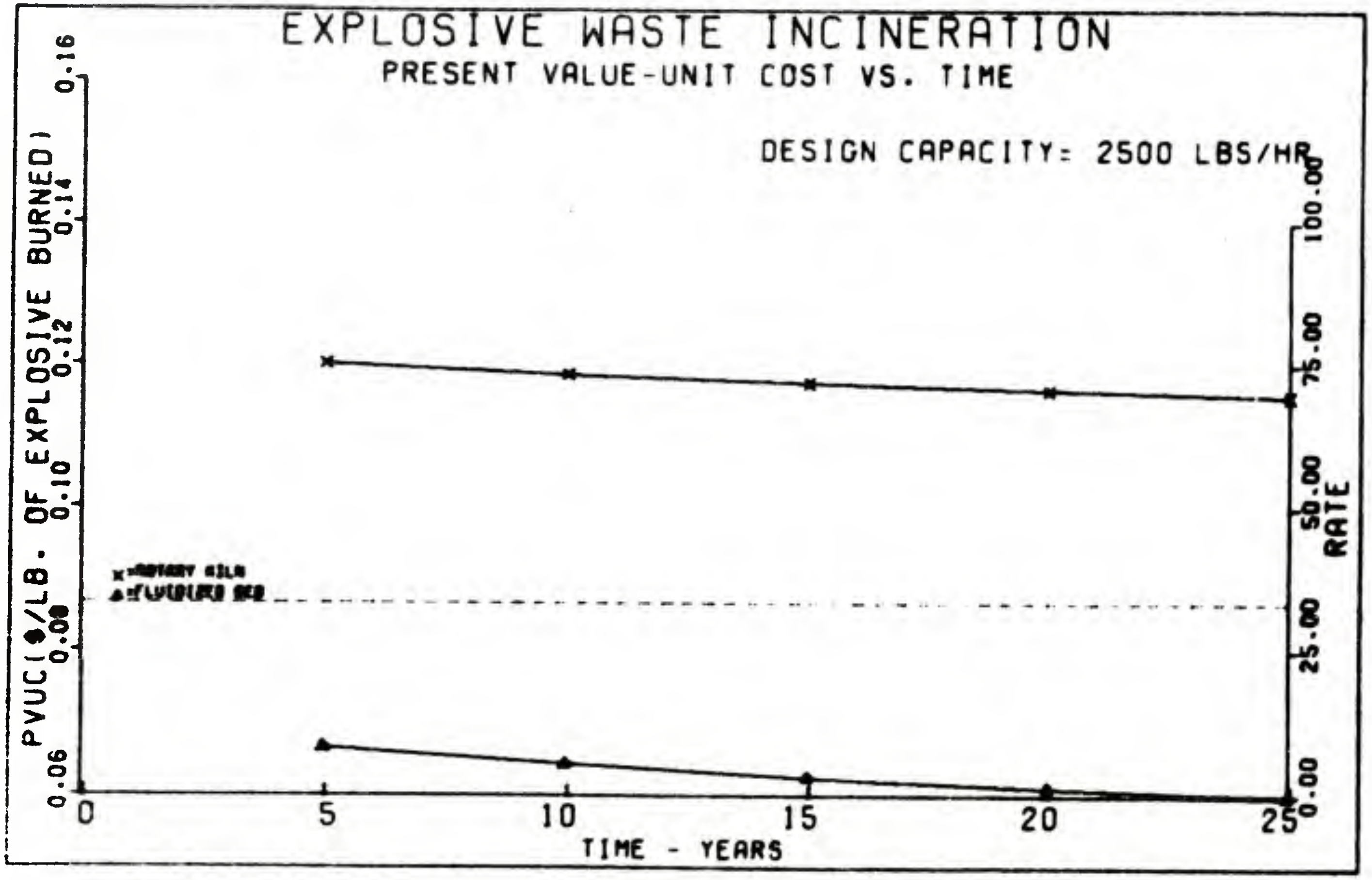

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED)
0.06
0.08
0.10
0.12
0.14
0.16
X=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 72

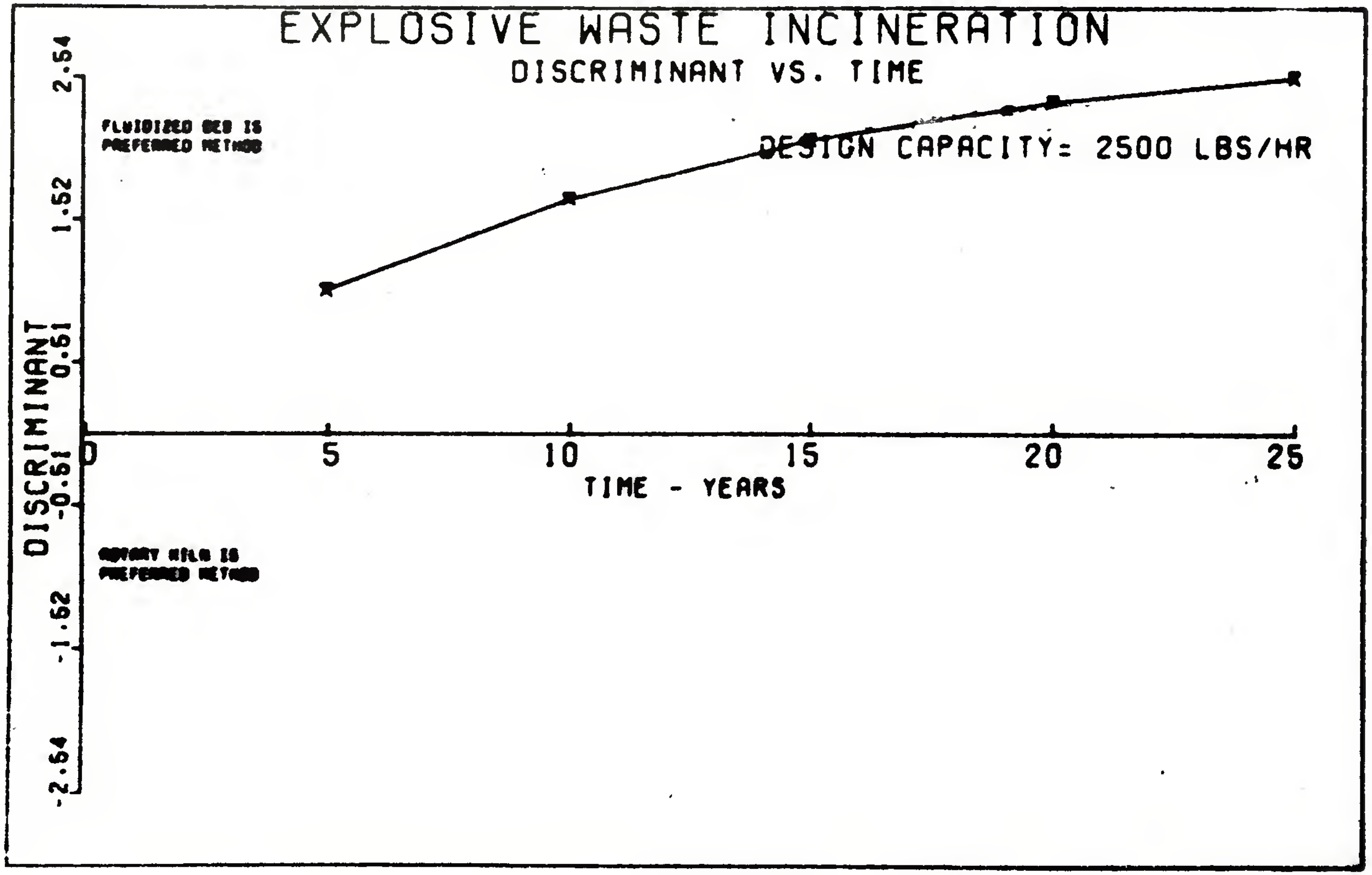

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.54
1.52
0.51
-0.51
-1.52
-2.54
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 73

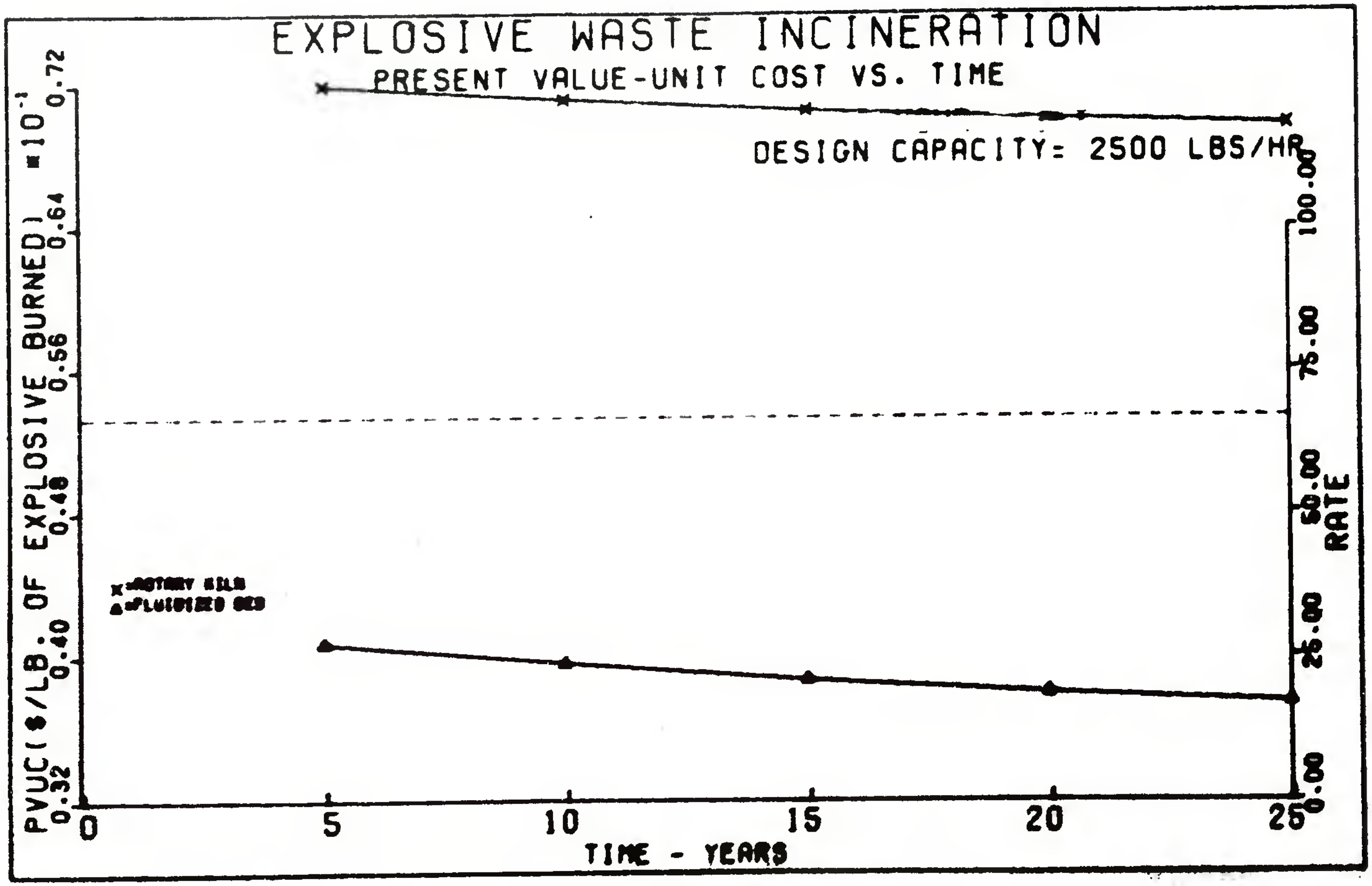

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.32
0.40
0.48
0.56
0.64
0.72
RATE
0.00
25.00
50.00
75.00
100.00
x=ROTARY KILN
▲=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 74

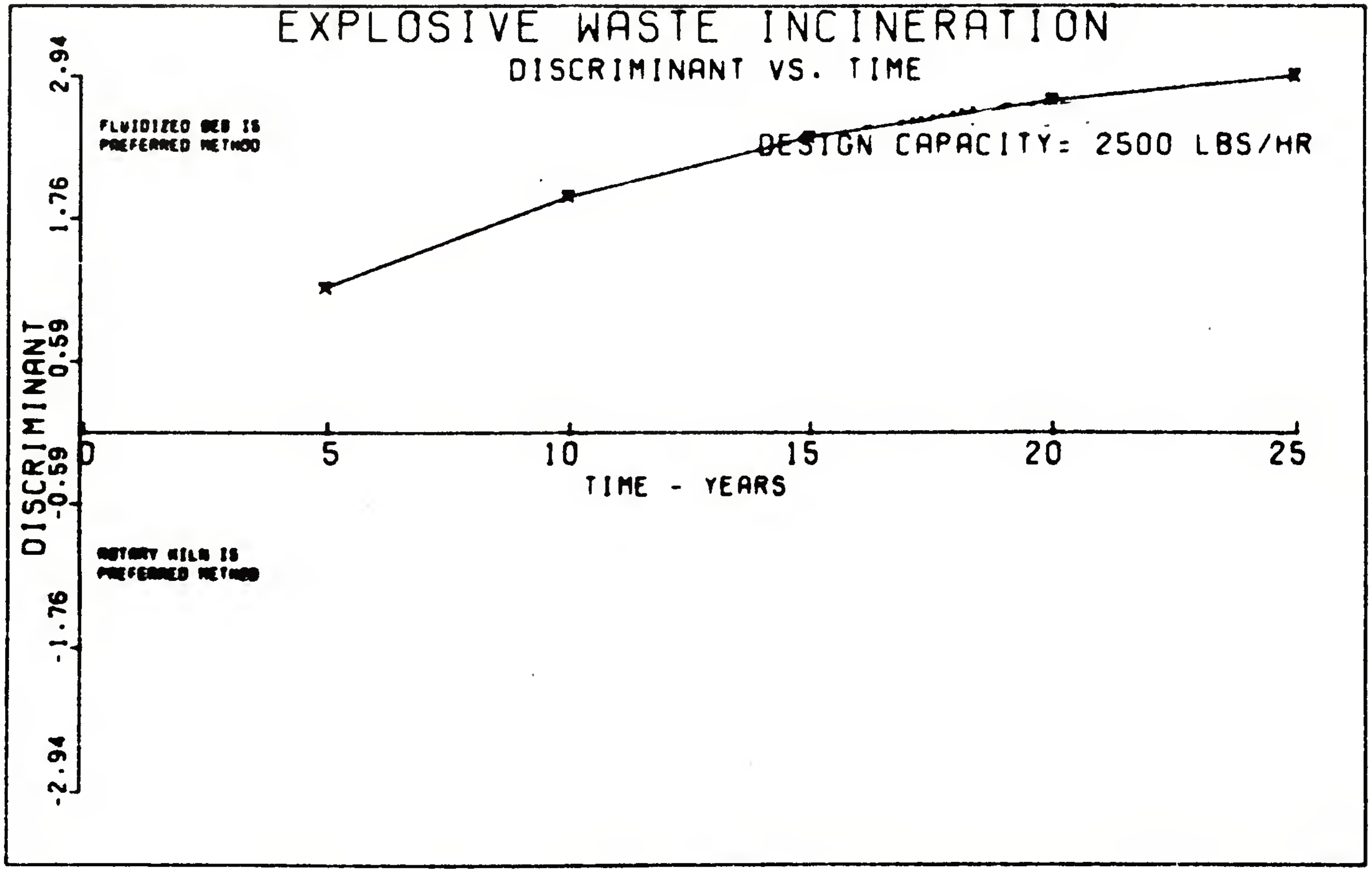

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY: 2500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
2.94
1.76
0.59
-0.59
-1.76
-2.94
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 75

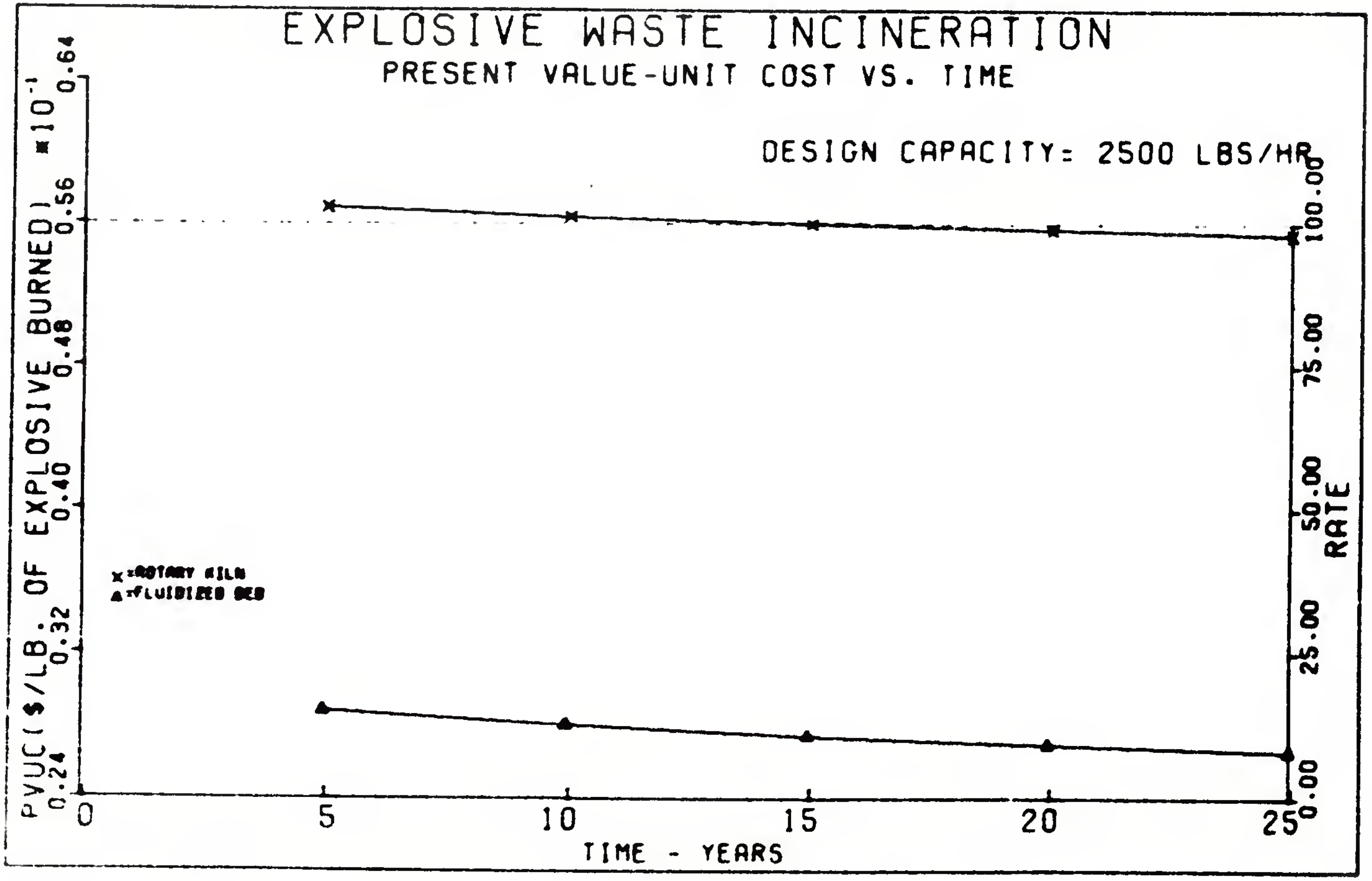

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
RATE
0.00
25.00
50.00
75.00
100.00
TIME - YEARS
0
5
10
15
20
25
X=ROTARY KILN
▲=FLUIDIZED BED

FIGURE NO. 76

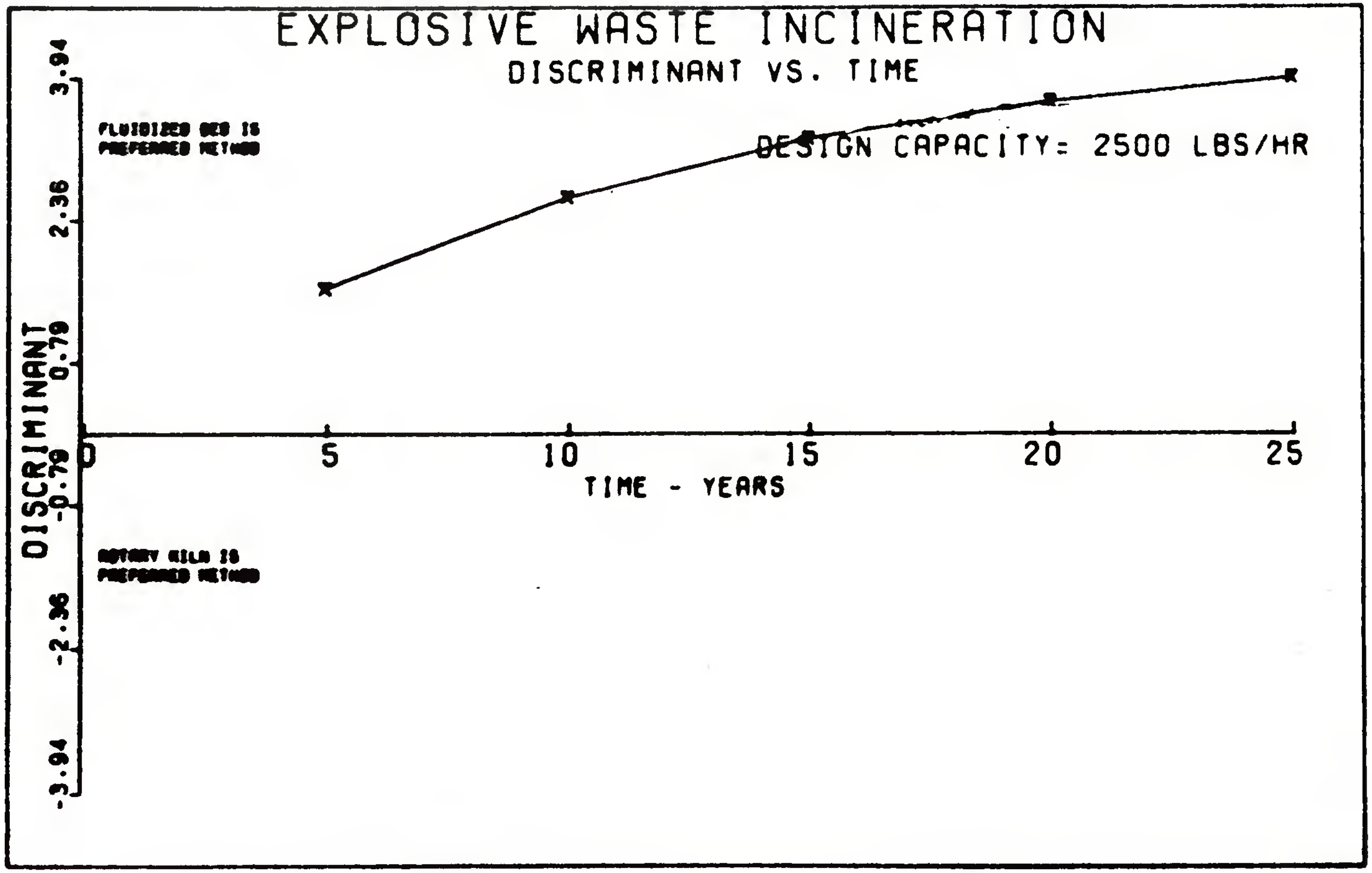

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
3.94
2.36
0.79
-0.79
-2.36
-3.94
0
5
10
15
20
25
TIME - YEARS

FIGURE NO. 77

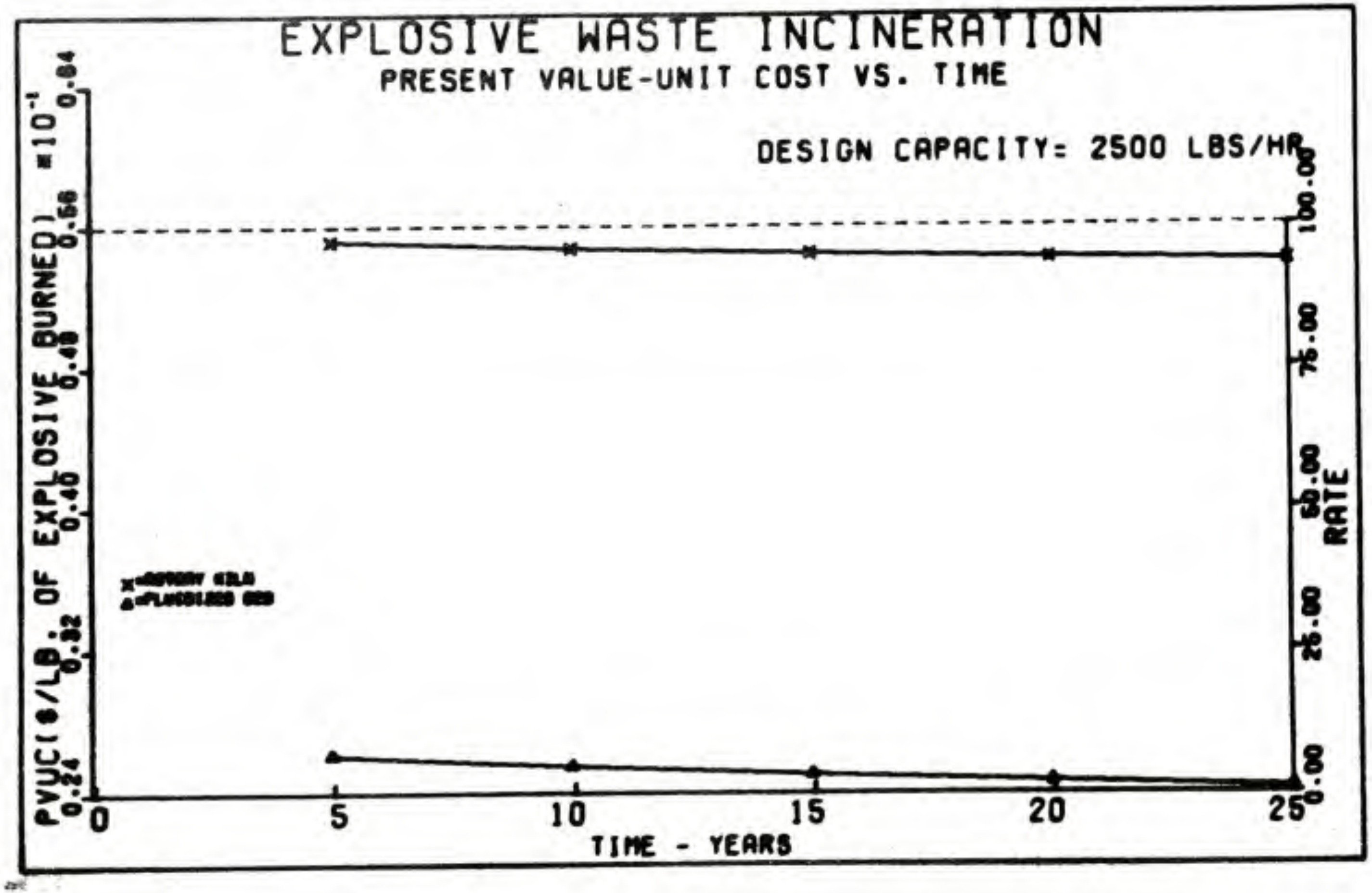

EXPLOSIVE WASTE INCINERATION
PRESENT VALUE-UNIT COST VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
PVUC($/LB. OF EXPLOSIVE BURNED) *10⁻¹
0.24
0.32
0.40
0.48
0.56
0.64
X=ROTARY KILN
Δ=FLUIDIZED BED
0
5
10
15
20
25
TIME - YEARS
RATE
0.00
25.00
50.00
75.00
100.00

FIGURE NO. 78

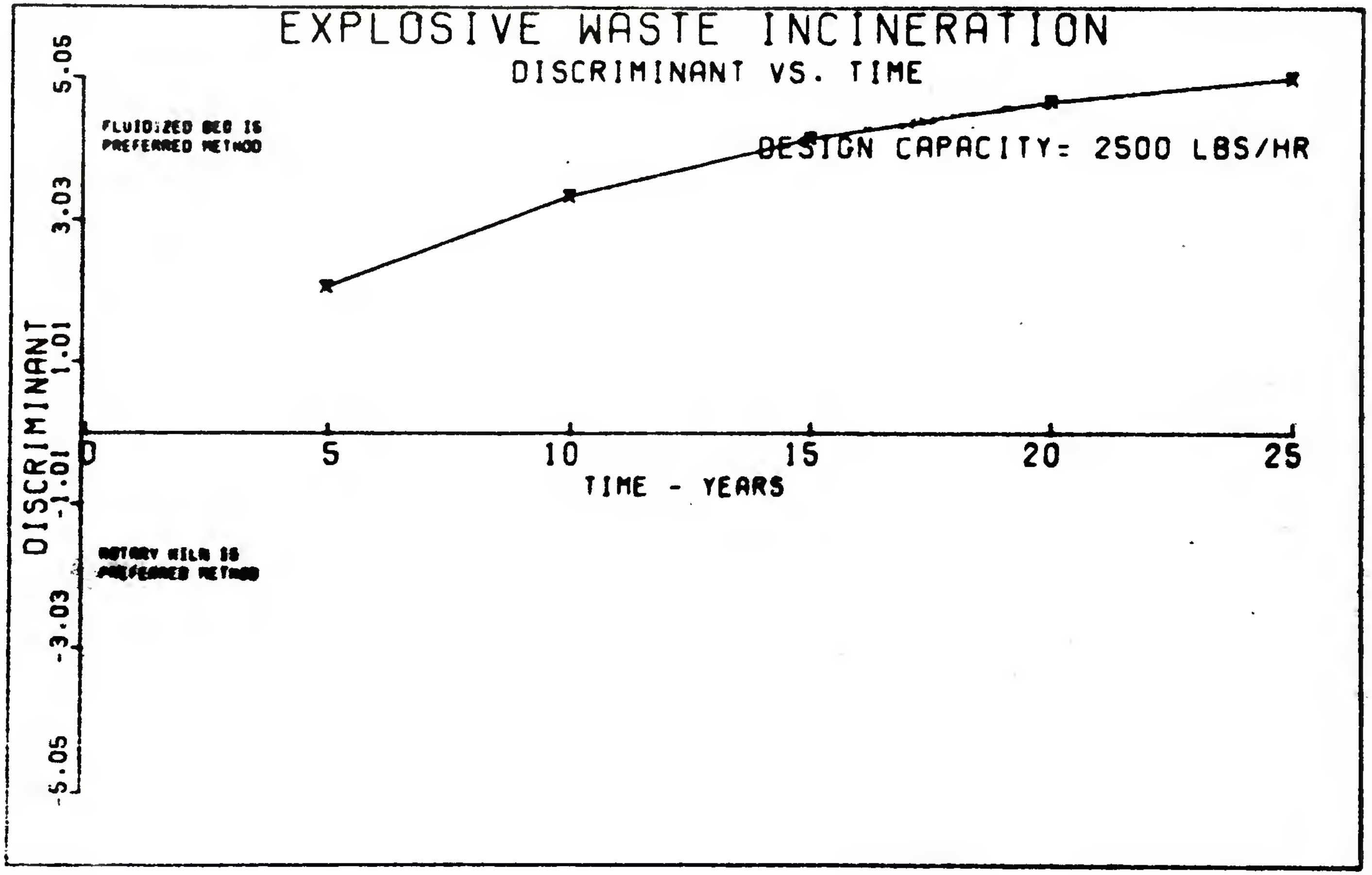

EXPLOSIVE WASTE INCINERATION
DISCRIMINANT VS. TIME
DESIGN CAPACITY= 2500 LBS/HR
FLUIDIZED BED IS PREFERRED METHOD
ROTARY KILN IS PREFERRED METHOD
DISCRIMINANT
5.05
3.03
1.01
-1.01
-3.03
-5.05
TIME - YEARS
0
5
10
15
20
25

FIGURE NO. 79

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