

CSF

EVALUATION OF
WASTE DISPOSAL SYSTEMS

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SUMMARY

This report consists of:

- a. An evaluation of the proposal by the American Sterilizer Company for the installation of an automatic waste handling and disposal system.
- b. An evaluation of three other alternatives for handling and disposing of waste.

Each alternative is discussed and evaluated in the report proper and a breakdown of estimated costs and savings is found in the Appendix.

The total AMSCO system was found to be the most efficient, yet the most expensive. None of the three other alternatives will completely eliminate the existing problems. However, improved management control and additional labor saving equipment will reduce or minimize the present problems and safety hazards.

If a decision is to be reached only on the basis of efficiency, speed and total elimination of potential hazards, the total AMSCO system should be chosen. If the decision is based purely on an economic basis, the total AMSCO system should be rejected.

The other three alternatives studied and evaluated, will allow Administration to compare the installation of partial AMSCO systems and the effects on the total waste handling problem.

It is felt that enough information is contained in this report for Administration to reach a sound decision.

BACKGROUND

At the request of ~~Sister Mary Leonette, R.S.M.~~, Administrator, the Systems Engineering Department undertook the evaluation of a proposal made by the American Sterilizer Company on the subject of waste handling and disposal.

As part of the project, alternate methods of handling and disposing of refuse were to be considered and evaluated.

PRESENT SYSTEM

Presently the refuse generated falls into two categories; burnable and non-burnable.

Burnable waste is transported to the incinerator room where it is burned.

Non-burnable waste is transported to outside accumulation areas where it is picked up by a Housekeeping employee and transported by truck to the city dump.

All internal transportation and handling is done by carts or barrels.

Several problems are created by the present system and will be discussed in subsequent sections of the report.

PROPOSED SYSTEM

The AMSCO proposal consists of several pulpers and water presses strategically located throughout the hospital.

All refuse would be dumped in chutes which would carry it to the pulpers and pulped. The pulp would be piped to water presses and from there it would automatically be piped to containers or a garbage truck stationed outside the building. This waste would then be transported to the city dump.

EVALUATION

The System

The proposed automatic waste handling method is an efficient system which would solve most of the problems existing under the present method.

Cost

It is estimated that the system, as proposed, would require an initial investment of approximately \$68,800.00 for AMSCO equipment.

One extra cost not included in the proposal is the necessity of purchasing or leasing a dump truck to handle the pulp. There is no Dempster Dumper System in the ~~Ann Arbor~~ area, therefore it would be necessary to obtain a used dump truck at an approximate cost of \$3,000.00.

Besides the initial investment, it would be necessary to purchase a maintenance contract from AMSCO at a cost of \$960.00 per year.

Economic Justification

Several cost savings are mentioned in the AMSCO proposal; however, only few of these are tangible savings since all the personnel involved will remain as full time employees with the exception of the incinerator operator. The other employee who would be

partially available is the truck driver who would require fewer trips per day to the dump.

The actual tangible savings created by the proposed system are estimated at \$8,740.00 per year. See Appendix B-1.

Economically speaking, return on investment of 12% does not justify the capital investment required. Refer to Appendix B-1 for economic analysis.

ALTERNATIVES

List of Alternatives

Numerous systems or combinations of systems can be considered. For brevity, the most feasible alternative will be considered. A list of these follows:

1. Total AMSCO system as proposed.
2. AMSCO equipment for Dietary only, and improve the present method for disposal of other refuse.
3. AMSCO system for disposal of all refuse except Dietary's and improvement of the method of handling Dietary refuse.
4. Continue under the present system with improvements of the handling methods and stricter controls.

Discussion of Alternatives

Alternative No. 1 - Total AMSCO system as proposed.

This alternative is discussed at length in the AMSCO proposal and its evaluation by the Systems Engineering Department was discussed in previous sections. Only a summary is necessary.

The complete automation of waste handling is the best system evaluated for efficiency and speed of operation; decrease in danger of contamination, infection, and explosion; complete destruction of refuse and ease of handling.

This system is also the most expensive in terms of disbursement of capital funds.

Alternative No. 2 - AMSCO equipment for Dietary only, and improvement of present method of disposal of other refuse.

One pulper and one water press would be required at a purchase cost of approximately \$13,190.00 and a maintenance cost of \$320.00 per year.

The other improvements on the handling of other refuse are discussed under Alternative No. 4, problems 1, 2, 3, 4, 5 and 6.

Using the AMSCO system for handling and disposing of Dietary refuse, will decrease the bulk of the present refuse by 40%.

Fewer trips to the city dump would be required, thus the truck driver would be able to help the incinerator operator. This would allow the incinerator operator to remain longer at the incinerator room cleaning ashes and non-burnables.

Other improvements recommended under Alternative No. 4 would decrease danger of explosion.

This alternative would practically eliminate the problem of aesthetics of outside accumulation areas due to elimination of all Dietary refuse.

See Appendix A for breakdown of costs, and Appendix B-2 for estimated savings.

Alternative No. 3 - AMSCO system for disposal of all refuse except Dietary's, and improvement of the method of handling Dietary refuse.

The AMSCO equipment necessary to handle all refuse except Dietary's, consists of 1 water press and 3 pulpers at a purchase cost of \$ 55,610.00. The yearly maintenance cost for this equipment would amount to \$ 640.00.

Improvements on the present system of handling Dietary refuse are discussed at length under Alternative No. 4, problems 4, 6 and 7.

It should be mentioned that since under this alternative all waste presently burned would be pulped, the possibility of burning all Dietary refuse should be considered.

Wetness of the refuse is a problem that may be solved by slower and longer burning. Since the incinerator operator would not have to handle all the waste he presently collects and burns, he could spend more time in the incinerator room. The truck driver would require fewer trips to the dump, so he would help with the handling of Dietary refuse.

If this alternative is chosen, a trial period - for burning Dietary refuse - is strongly recommended.

As can be seen from the above paragraphs, there are two possible paths to follow if this alternative is chosen: to continue handling Dietary refuse in the present manner; to burn Dietary refuse.

By burning Dietary refuse in the incinerator, no savings will be realized since the incinerator operator will be occupied full time and the truck driver may have to help with the handling of refuse. However, this will eliminate most of the problems in the outside areas and will reduce the number of trips to the dump.

By handling the Dietary refuse in the same manner as presently, the incinerator operator's job will be virtually eliminated and the truck driver will devote less time to handling of garbage.

This alternative completely eliminates the danger of explosion and contamination.

See Appendix A for breakdown of costs, and Appendices B-3a and B-3b for estimated savings.

Alternative No. 4 - Continue under the present system with improvements of the handling methods and stricter control of the waste.

The AMSCO survey uncovered numerous problems. The study undertaken by the Systems Engineering Department attempts to solve these problems without large capital investments. Following is a list of the major problems uncovered and recommended steps to solve them:

1. Problem. Opening of bags by incinerator operator in order to remove non-burnable items. This is a hazard because of the danger of infection. However, according to the operator, the danger of explosion is a greater hazard; therefore, the incinerator operator risks infection to minimize the risk of explosion.

Improvement. The practice of removing non-burnables from bags should be stopped. To do this several steps should be taken:

A. Stricter control of non-burnables at the nursing units.

a. Tighter supervision. All aerosol cans, bottles of ether, etc. should be removed from the rooms after use by the nursing personnel and taken directly to the non-burnable containers in the hopper room. Housekeeping personnel should be instructed not to remove any liners containing ether bottles or cans until nursing personnel has removed these. All such instances should be reported to Housekeeping supervisors who, in turn, would report it to the Head Nurse.

B. A removable chute should be designed to fit over the door of the incinerator. The operator would drop the bags in the chute thus, if an explosion occurs, the operator is shielded. The chute would be removed after a few minutes to allow stirring of the bags. Although this method will not allow protection all the time, it will at least allow protection some of the time; if a few minutes are allowed between the

time the bags are dropped, and the time that stirring commences, the danger of explosion while stirring is decreased.

2. Problem Need for security of lab reports and medical records. Some records and reports have not been properly destroyed in the past.

Improvement It is recommended that shredders be purchased and installed in any location where security is necessary. This type of equipment sells for approximately \$100.00 each at local office supply stores. Another solution would be to accumulate all documents that need total destruction and send them to the incinerator once a week or once a month as needed.

3. Problem Supplies are sent to the using unit inside the original carton. This method creates danger of contamination and disposing of the cartons at the using unit is a problem.

Improvement It is recommended that all cartons be opened at the General Stores area and supplies be transported in portable containers which can be returned to General Stores. This added duty to the Stores Department may require several additional man-hours per week, but will relieve the nursing units of these duties.

4. Problem Cleanliness of outside accumulation areas.

Improvement There are several steps that can be taken to minimize this problem.

- A. The waste causing most of the problems is the Dietary waste which makes up for approximately 40% of all the waste hauled to the dump.

It is recommended that deep, self-dumping carts be designed to handle this waste. These carts would be filled at the inside accumulation area, transported to the outside accumulation area and left there to be hauled away to the dump.

The whole cart would be loaded in the truck, the contents dumped at the city dump, and the empty cart returned to the outside accumulation area.

This method would completely or partially solve several problems:

- a. Presently the bags are handled four times: from the barrel to the transporter; from the transporter to the ground; from the ground to the truck; from the truck to be dumped. By hauling the bags, inside the carts to the dump, the individual bags are handled only

once (thus eliminating three handlings) and aiding in the dumping procedure by dumping and handling in unit loads.

- b. All liquids would remain in the carts until dumped at the city dump. However, it would be recommended to clean these containers daily.
- c. By making these carts deeper than the present transporters, less trips from dietary to the outside accumulation area would be required.
- d. These carts will prevent the breaking of the bags during winter and if proper lids are provided, will minimize odor, contamination and insects.

- B. Daily hosing of the outside accumulation areas are presently taking place and has helped the situation.
- C. It is recommended that daily spraying of these areas with insecticide and/or disinfectants be practiced. This would alleviate the odor and insect problems and the contamination danger.
- D. Better drainage may be required in these areas in order to have better flow of liquids.

5. Problem

Removal of burnables - by incinerator operator - through the X-ray Department waiting area. The cart is loaded over capacity in weight as well as bulk. Also, carts are too large to be positioned inside incinerator room for easy unloading.

Improvement

It is recommended that shorter but deeper carts be designed. These carts would be easier to maneuver and to position inside incinerator room; a drop gate could be added in order to facilitate handling of the bags in and out of the carts. A proper cover should be part of the cart so as to avoid transporting waste in full view of patients, visitors and personnel.

6. Problem

Lack of maintenance of barrels.

Comment

During the survey conducted by the Systems Engineering Department, numerous empty barrels were observed at the outside accumulation areas. It is recommended that all unnecessary barrels be disposed of and only those required to do the job plus a few extra be kept.

The cleanliness of barrels should be the responsibility of Housekeeping Department; however a preventative maintenance program should be initiated by the Maintenance Department in order to properly maintain the paint on these barrels, check for leaks, repaint

the inside and dispose of those not worth maintaining.

7. Problem Maintenance cost of the present garbage disposal unit is high; availability of spare parts is questionable; down time of unit seems to be excessive; unit is located so as to be susceptible to damage by carts.

Comments According to ~~Mr. DiMettie~~, Director of Maintenance, this unit was repaired recently and it should be in good mechanical condition for two or three more years.

By continuing to handle and dispose of the refuse in the same manner, but implementing the improvements recommended the least capital investment would be required. It is estimated that better carts and other recommended equipment could be obtained with an investment of between \$3,000.00 and \$4,500.00.

The greatest existing problems: danger of explosion and contamination; cleanliness of outside areas; multiple handling of refuse by Dietary employees, etc., could be reduced or eliminated by better supervision and control of waste handling at the units and better transportation equipment.

See Appendix A for estimate of costs and Appendix B-4 for estimate of savings.

SUMMARY OF ALTERNATIVES

	A L T E R N A T I V E S				
	1	2	3a	3b	4
1. Approximate initial investment required	\$ 71,800	\$ 17,440	\$ 61,860	\$ 61,860	\$ 4,500
2. Approximate yearly maintenance costs	\$ 3,060	\$ 5,320	\$ 6,290	\$ 2,690	\$ 7,600
3. Will it reduce or eliminate the danger of explosion?	Eliminate	Reduce	Eliminate	Eliminate	Reduce
4. Will it reduce or eliminate the danger of contamination to:					
a. Incinerator operator	Eliminate	Reduce	Eliminate	Eliminate	Reduce
b. Other employees	Eliminate	Reduce	Eliminate	Eliminate	Reduce
c. Outside areas	Eliminate	Eliminate	Eliminate	Reduce	Reduce
d. Hopper rooms	Eliminate	Reduce	Eliminate	Eliminate	Reduce
e. Foyers	Eliminate	Reduce	Eliminate	Eliminate	Reduce
5. Will it solve the problem of security of records?	Yes	Yes	Yes	Yes	Yes
6. Will it reduce or eliminate the problem of aesthetics to outside accumulation areas?	Eliminate	Eliminate	Eliminate	Reduce	Reduce
7. Will it reduce or eliminate the problem of maintenance of:					
a. Barrels	Eliminate	Reduce	Eliminate	Reduce	Reduce
b. Incinerator	Eliminate	No	No	Eliminate	No
c. Garbage Disposal	Eliminate	Eliminate	No	No	No
8. Estimated first year savings	\$ 9,351	\$ 550	None	\$ 8,819	None

APPENDIX - A

ESTIMATED COSTS

A L T E R N A T I V E

Initial Investment	1	2	3a	3b	4
AMSCO System	\$ 68,800	\$ 13,190	\$ 55,610	\$ 55,610	-
Dump Truck	3,000	3,000	3,000	3,000	-
Other Equipment*	-	1,250	3,250	3,250	\$ 4,500
Total Initial Invest.	\$ 71,800	\$ 17,440	\$ 61,860	\$ 61,860	\$ 4,500

A L T E R N A T I V E

Yearly Costs	1	2	3a	3b	4
Maintenance:					
AMSCO System	\$ 960	\$ 320	\$ 640	\$ 640	-
Incinerator	200	350	350	350	\$ 350
Dump Truck	400	400	400	400	-
Other Equipment*	-	-	100	100	250
Fuel	1,500	4,250	4,800	1,200	4,000
Total Yearly Cost	\$ 3,060	\$ 5,320	\$ 6,290	\$ 2,690	\$ 4,600

Estimated First Year Cost:

- Alternative 1 - \$ 74,860
- Alternative 2 - \$ 22,760
- Alternative 3a- \$ 68,150
- Alternative 3b- \$ 64,550
- Alternative 4 - \$ 9,100

*** Other Equipment Includes:**

- 1 - New carts for Dietary
- 2 - New carts for incinerator operator
- 3 - Shredders
- 4 - Waste containers
- 5 - Removable chute for incinerator

APPENDIX B-1
CAPITAL EXPENDITURE ANALYSIS

I. SUBJECT OF ANALYSIS

Total AMSCO system (Alternative 1) versus present system.

II. REQUIRED INVESTMENT

1. Installed cost of project (net cost)	\$	<u>71,800</u>
2. Disposal value of assets retired by project	\$	<u>-</u>
3. Capital additions in absence of project	\$	<u>500</u>
4. Investment released or avoided by project (2+3)	\$	<u>500</u>
5. Net investment required (1-4)	\$	<u><u>71,300</u></u>

III. FIRST YEAR ADVANTAGE FROM PROJECT

	INCREASE	DECREASE
6. Direct labor (including fringe)	\$ _____	\$ _____
7. Indirect labor (including fringe)	_____	<u>7,400</u>
8. Maintenance and repairs	<u>1,560</u>	<u>400</u>
9. Materials and supplies	_____	_____
10. Fuel and power	<u>1,500</u>	<u>4,000</u>
11. Down time	_____	_____
12. Other	_____	_____
13. Total	\$ <u><u>3,060</u></u> A	\$ <u><u>11,800</u></u> B
14. Net first year decrease in operating costs (13B-13A)		\$ <u><u>8,740</u></u>
15. Return on investment (14-5)		<u><u>12</u></u> %
16. Pay back period* (5-14)		<u><u>8.2 yrs.</u></u>

* Present worth of capital not included in calculations.

APPENDIX B-2

CAPITAL EXPENDITURE ANALYSIS

I. SUBJECT OF ANALYSIS

AMSCO system for Dietary (Alternative 2) versus present system.

II. REQUIRED INVESTMENT

1. Installed cost of project (net cost)	\$	<u>13,190</u>
2. Disposal value of assets retired by project	\$	<u>-</u>
3. Capital additions in absence of project	\$	<u>-</u>
4. Investment released or avoided by project (2+3)	\$	<u>-</u>
5. Net investment required (1-4)	\$	<u><u>13,190</u></u>

III. FIRST YEAR ADVANTAGE FROM PROJECT

	INCREASE		DECREASE
6. Direct labor (including fringe)	\$		\$
7. Indirect labor (including fringe)			<u>1,470</u>
8. Maintenance and repairs		<u>1,070</u>	<u>400</u>
9. Materials and supplies			
10. Fuel and power		<u>4,250</u>	<u>4,000</u>
11. Down time			
12. Other			
13. Total	\$	<u><u>5,320</u></u> A	\$ <u><u>5,870</u></u> B
14. Net first year decrease in operating costs (13B-13A)			\$ <u><u>550</u></u>
15. Return on investment (14-5)			<u><u>4</u></u> %
16. Pay back period* (5-14)			<u><u>24</u></u> yrs.

* Present worth of capital not included in calculations.

APPENDIX B-3a
CAPITAL EXPENDITURE ANALYSIS

I. SUBJECT OF ANALYSIS

AMSCO system for all refuse except Dietary's - and burn Dietary refuse (Alternative 3a) - versus present system.

II. REQUIRED INVESTMENT

1. Installed cost of project (net cost)	\$	<u>55,160</u>
2. Disposal value of assets retired by project	\$	<u>-</u>
3. Capital additions in absence of project	\$	<u>-</u>
4. Investment released or avoided by project (2+3)	\$	<u>-</u>
5. Net investment required (1-4)	\$	<u><u>55,160</u></u>

III. FIRST YEAR ADVANTAGE FROM PROJECT

	INCREASE	DECREASE
6. Direct labor (including fringe)	\$ <u> </u>	\$ <u> </u>
7. Indirect labor (including fringe)	<u>-</u>	<u>-</u>
8. Maintenance and repairs	<u>1,450</u>	<u>400</u>
9. Materials and supplies	<u> </u>	<u> </u>
10. Fuel and power	<u>4,800</u>	<u>4,000</u>
11. Down time	<u> </u>	<u> </u>
12. Other	<u> </u>	<u> </u>
13. Total	\$ <u><u>6,250</u></u> A	\$ <u><u>4,400</u></u> B
14. Net first year decrease in operating costs (13B-13A)		\$ <u><u>-1,850</u></u> (increase)
15. Return on investment (14-5)		<u>no return</u> %
16. Pay back period* (5-14)		<u>no pay back</u> yrs.

* Present worth of capital not included in calculations.

CAPITAL EXPENDITURE ANALYSIS

I. SUBJECT OF ANALYSIS

AMSCO system for all refuse except Dietary's - and continue to handle Dietary refuse as presently (Alternative 3b) - versus present system.

II. REQUIRED INVESTMENT

1. Installed cost of project (net cost)	\$	<u>55,160</u>
2. Disposal value of assets retired by project	\$	<u>-</u>
3. Capital additions in absence of project	\$	<u>500</u>
4. Investment released or avoided by project (2+3)	\$	<u>500</u>
5. Net investment required (1-4)	\$	<u><u>54,660</u></u>

III. FIRST YEAR ADVANTAGE FROM PROJECT

	INCREASE		DECREASE
6. Direct labor (including fringe)	\$	<u> </u>	\$
7. Indirect labor (including fringe)		<u>-</u>	<u>6,215</u>
8. Maintenance and repairs		<u>1,450</u>	<u>400</u>
9. Materials and supplies		<u> </u>	<u> </u>
10. Fuel and power		<u>1,200</u>	<u>4,000</u>
11. Down time		<u> </u>	<u> </u>
12. Other		<u> </u>	<u> </u>
13. Total	\$	<u><u>2,650</u></u> A	\$ <u><u>10,615</u></u> B
14. Net first year decrease in operating costs (13B-13A)			\$ <u><u>7,965</u></u>
15. Return on investment (14-5)			<u><u>14.6</u></u> %
16. Pay back period* (5-14)			<u><u>6.9</u></u> yrs.

* Present worth of capital not included in calculations.

APPENDIX B-4
CAPITAL EXPENDITURE ANALYSIS

I. SUBJECT OF ANALYSIS

Improvement of present system (Alternative 4) versus present system.

II. REQUIRED INVESTMENT

1. Installed cost of project (net cost)	\$	<u>4,500</u>
2. Disposal value of assets retired by project	\$	<u>-</u>
3. Capital additions in absence of project	\$	<u>-</u>
4. Investment released or avoided by project (2+3)	\$	<u>-</u>
5. Net investment required (1-4)	\$	<u><u>4,500</u></u>

III. FIRST YEAR ADVANTAGE FROM PROJECT

	INCREASE		DECREASE
6. Direct labor (including fringe)	\$	<u> </u>	\$
7. Indirect labor (including fringe)		<u>-</u>	<u>-</u>
8. Maintenance and repairs		<u>600</u>	<u>400</u>
9. Materials and supplies		<u> </u>	<u> </u>
10. Fuel and power		<u>-</u>	<u>-</u>
11. Down time		<u> </u>	<u> </u>
12. Other		<u> </u>	<u> </u>
13. Total	\$	<u><u>600</u></u> A	\$
			<u><u>400</u></u> B
14. Net first year decrease in operating costs (13B-13A)			\$ <u><u>- 200</u></u> (increase)
15. Return on investment (14-5)			<u>no return</u> %
16. Pay back period* (5-14)			<u>no pay back</u> yrs.

* Present worth of capital not included in calculations.