

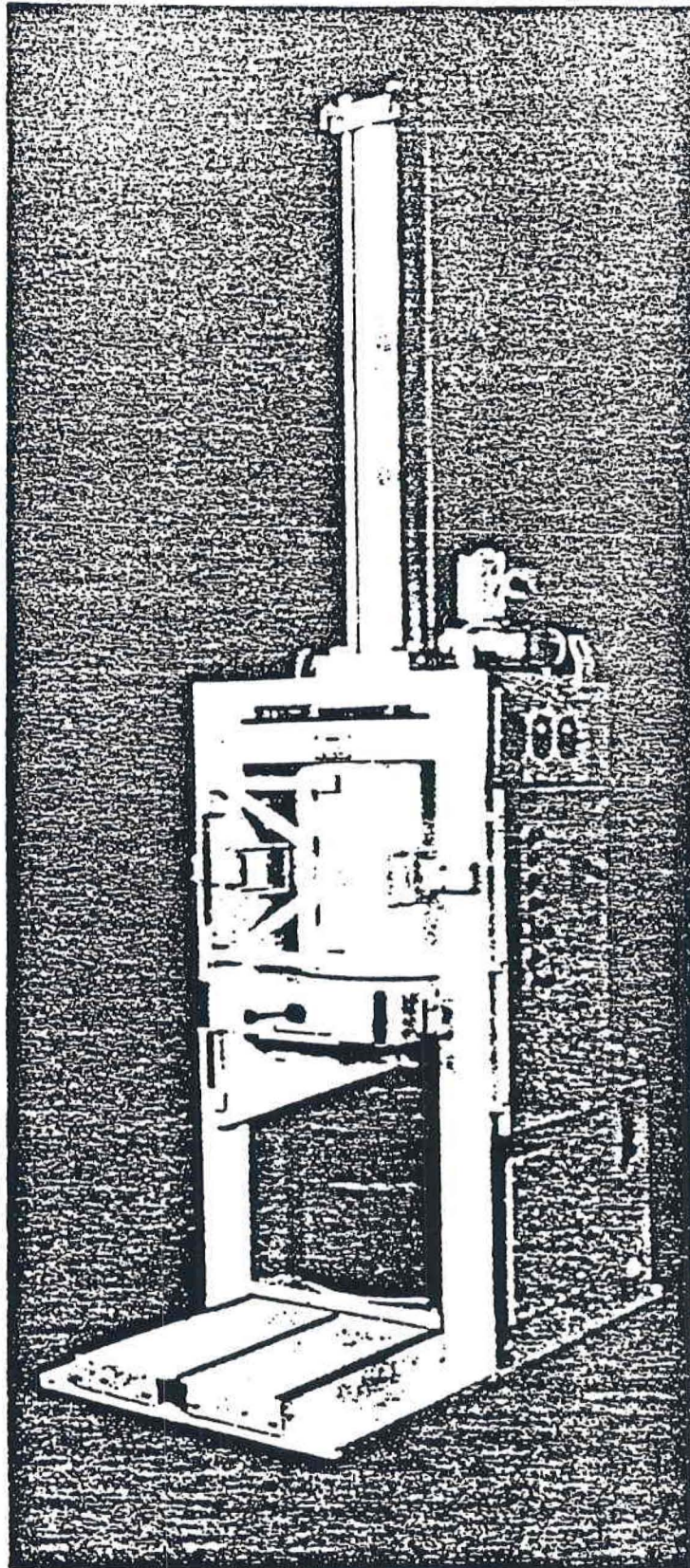
asme radwaste course

COMPACTION

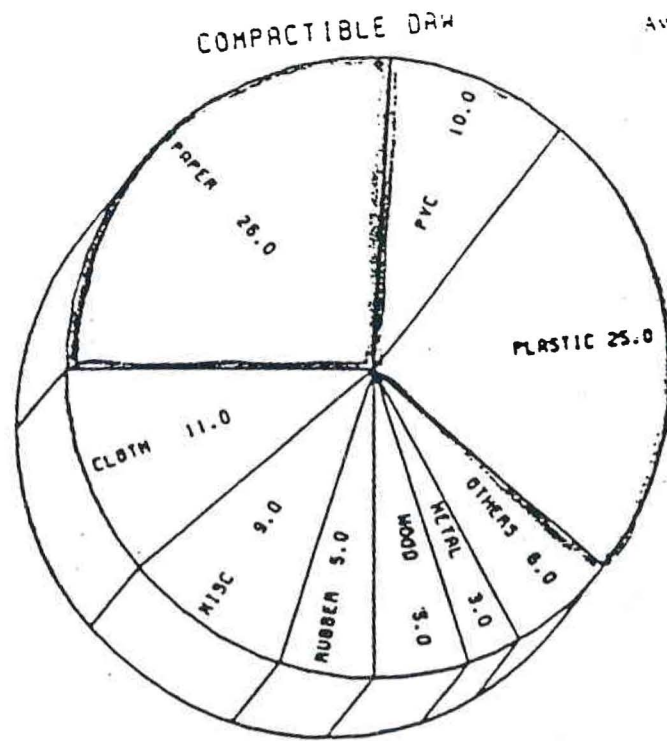
MICHAEL D. NAUGHTON / INET CORPORATION

ASME RW Systems Committee Radwaste Short Course - 1991

LRM COMPACTOR

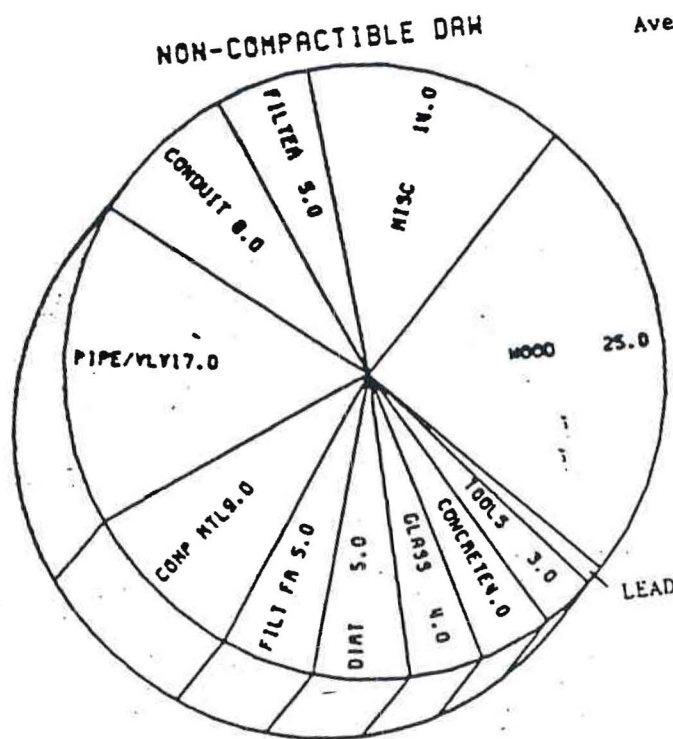


BWR: 1981 PLANT AVERAGE



Average Ft³/Unit:
15,350

35%



Average Ft³/Unit:
7,200

Figure 4-9

IN DRUM COMPACTORS

BASIC CONSIDERATIONS

HYDRAULIC MOTOR SIZE (AT FULL LOAD)

$$HP = GPM \times PSI / 1714 \times EFF. , \text{ NOTE } EFF. +0.85$$

RAM SPEED

$$V = (Q/A) \times 231 \quad V = \text{IN./MIN.}$$

$$A = \text{IN SQ.}$$

$$Q = \text{GPM}$$

EXAMPLE : 30 TON DRUM COMPACTOR, 6 INCH CYLINDER
FLOW HI/LO 15 GPM / 7 GPM @ 2100 PSI

$$HP (HI) = 15 \times 2100 / (1714 \times 0.85) = 22 \text{ HP}$$

$$HP (LO) = 7 \times 2100 / (1714 \times 0.85) = 10 \text{ HP}$$

$$V (HI) = 15 \times 231 / 28 = 124 \text{ IN./MIN.}$$

$$V (LO) = 7 \times 231 / 28 = 58 \text{ IN./MIN.}$$

PLATEN PRESSURE (WITH 55 GALLON DRUM)

$$30 \text{ TONS} = 130 \text{ PSI}$$

$$15 \text{ TONS} = 65 \text{ PSI}$$

JOG FUNCTION - REDUCED SPEED AND PRESSURE

EXAMPLE 15 IN/MIN. AT 1 TON PRESSURE

ROD SIZE - DIA. OF PISTON / DIA. OF ROD

NORMAL ROD - 2 TO 1

COMPACTION ROD - 3 TO 1 , 6 TO 5

NOTE ADDITION OF ROD STOP IS DESIRABLE

STARTERS AND CONTACTORS - NEMA PREFERRED

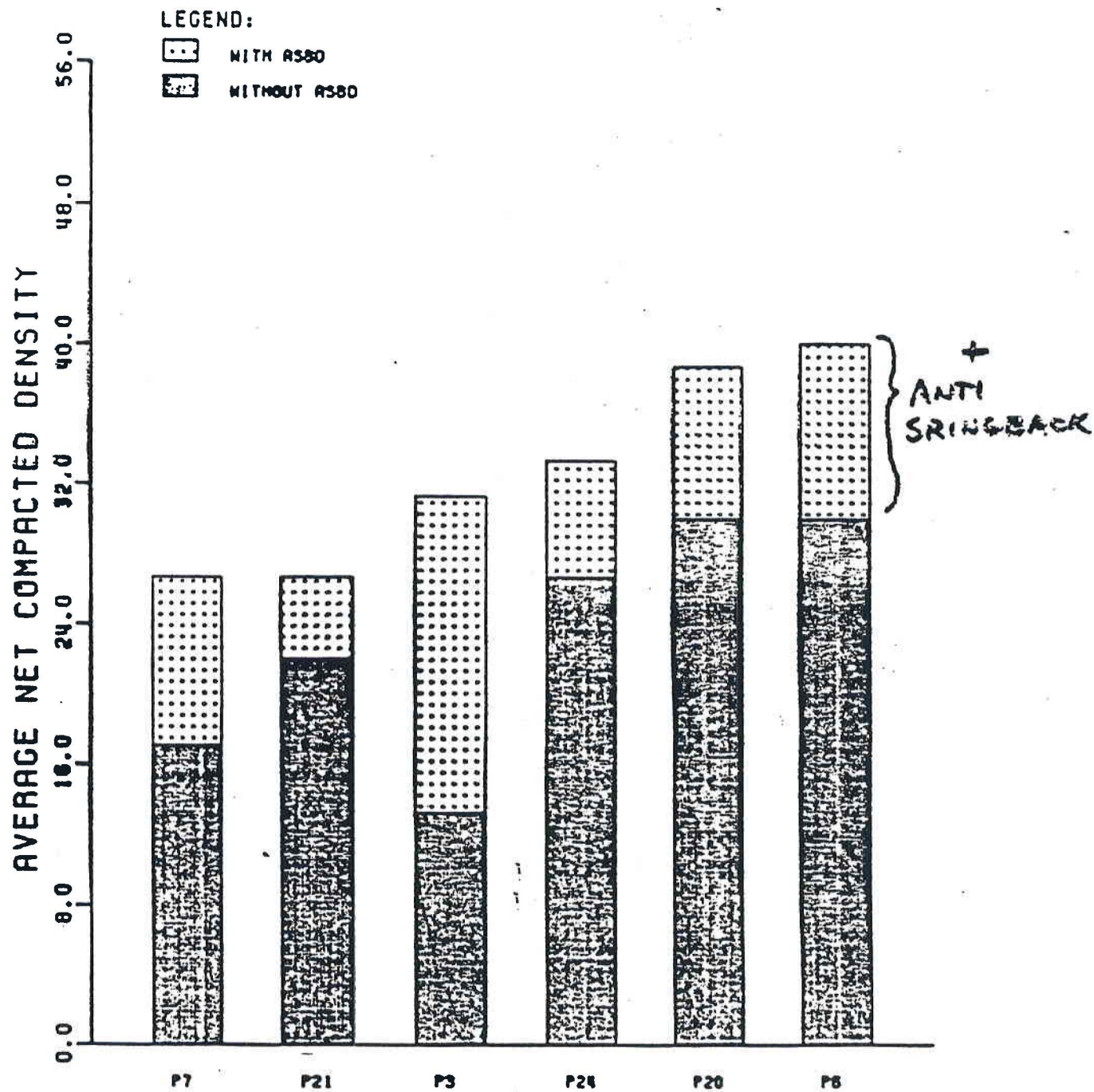
EASE OF DRUM LOADING

HEPA FILTRATION DESIGN FOR POSITIVE
AIR CONTROL

NORMAL DRUM COMPACTORS PERFORMANCE

30 TO 45 #/CU.FT.

AVERAGE DAW COMPACTION DENSITIES
WITH/WITHOUT ANTI-SPRING BACK DEVICES



PLANTS

Figure 4-9

GETTING THE MOST OUT OF A DRUM COMPACTOR

1. DEDICATED CREW
2. DETERMINE BEST ANTI- SPRINGBACK SYSTEM
3. SORTING PRIOR TO COMPACTION
4. SEGREGATION OF WASTE

BOTTOM 1/3 - PLASTIC

MIDDLE 1/3 - HERCULITE

TOP 1/3 - MISC. (HEAVY NON-COMP.)

5. GOALS AND COMPETITION

MISC TUCKS (?) OR MINIMUM ALLOCATIONS

DEDICATED VS ROTATING CREWS
WITH/WITHOUT ANTI-SPRING BACK DEVICES

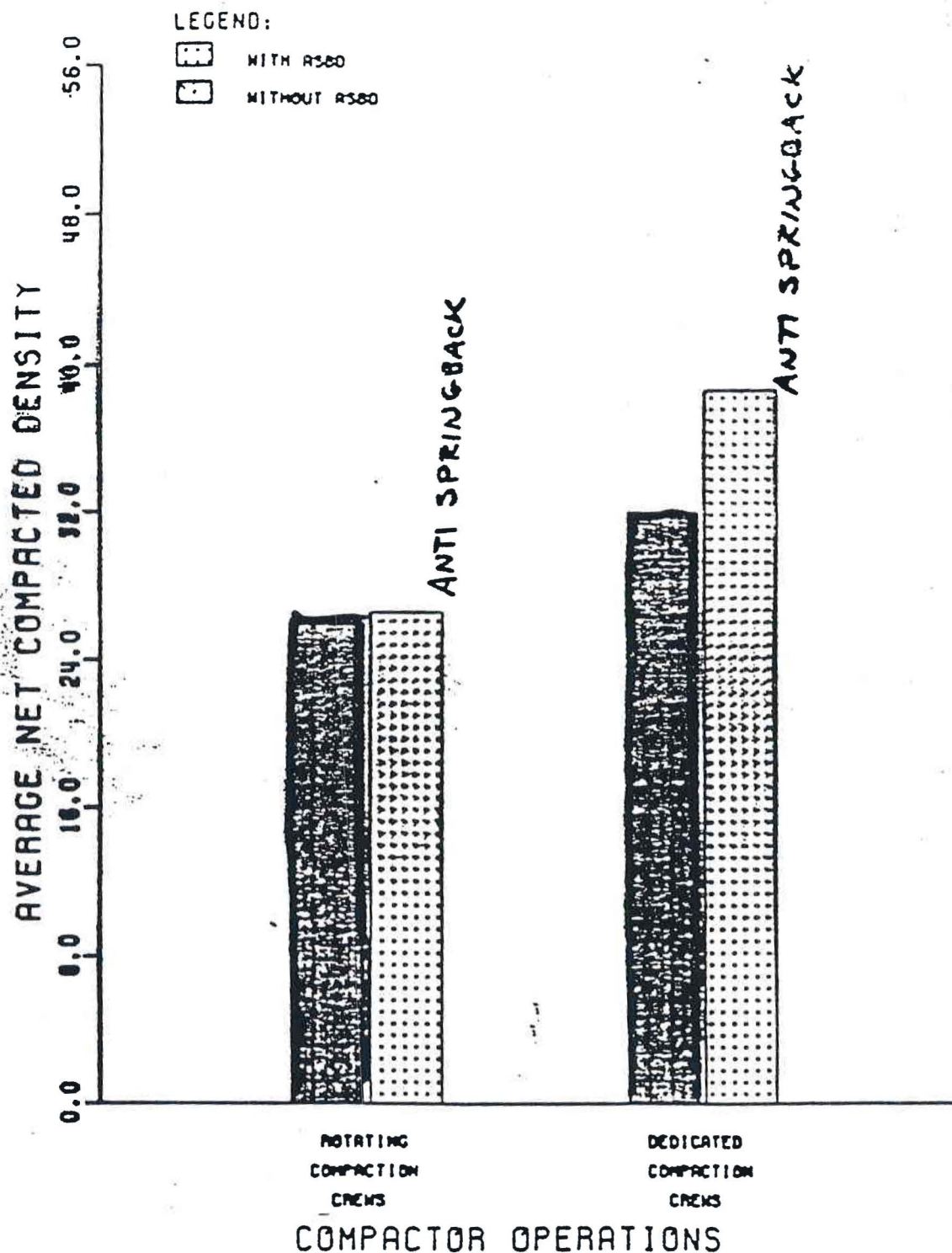
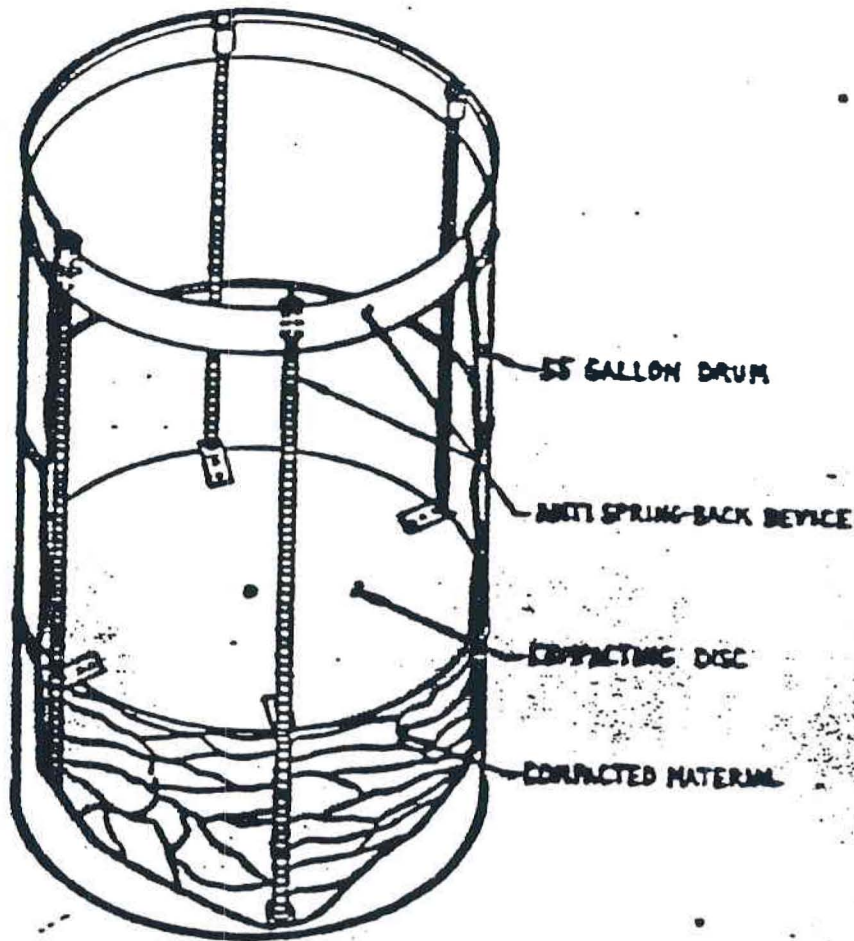


Figure 4-10

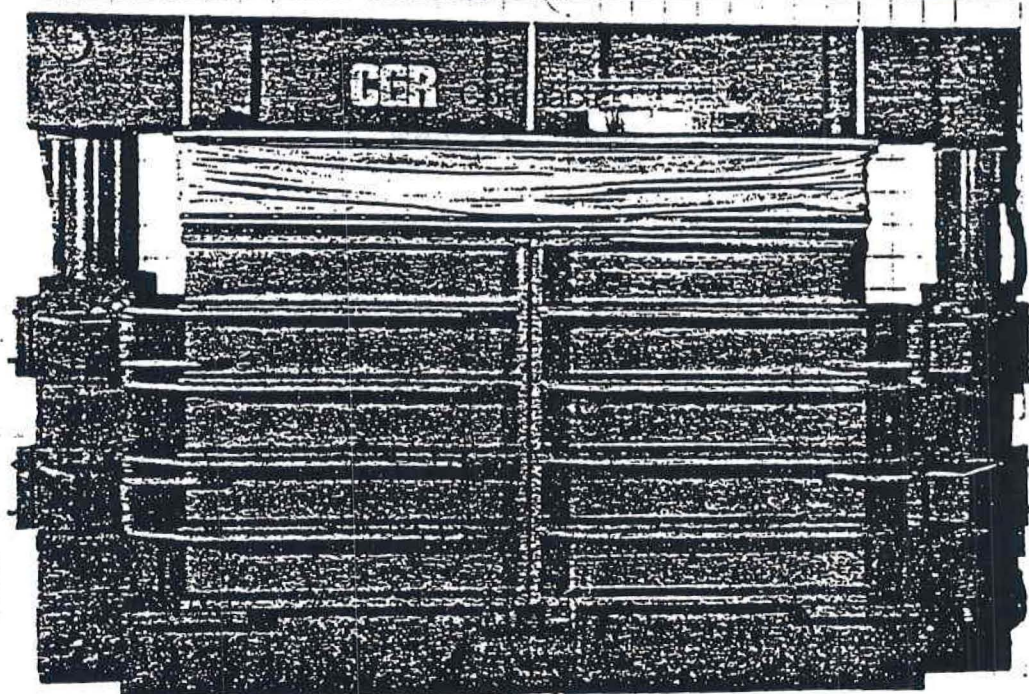
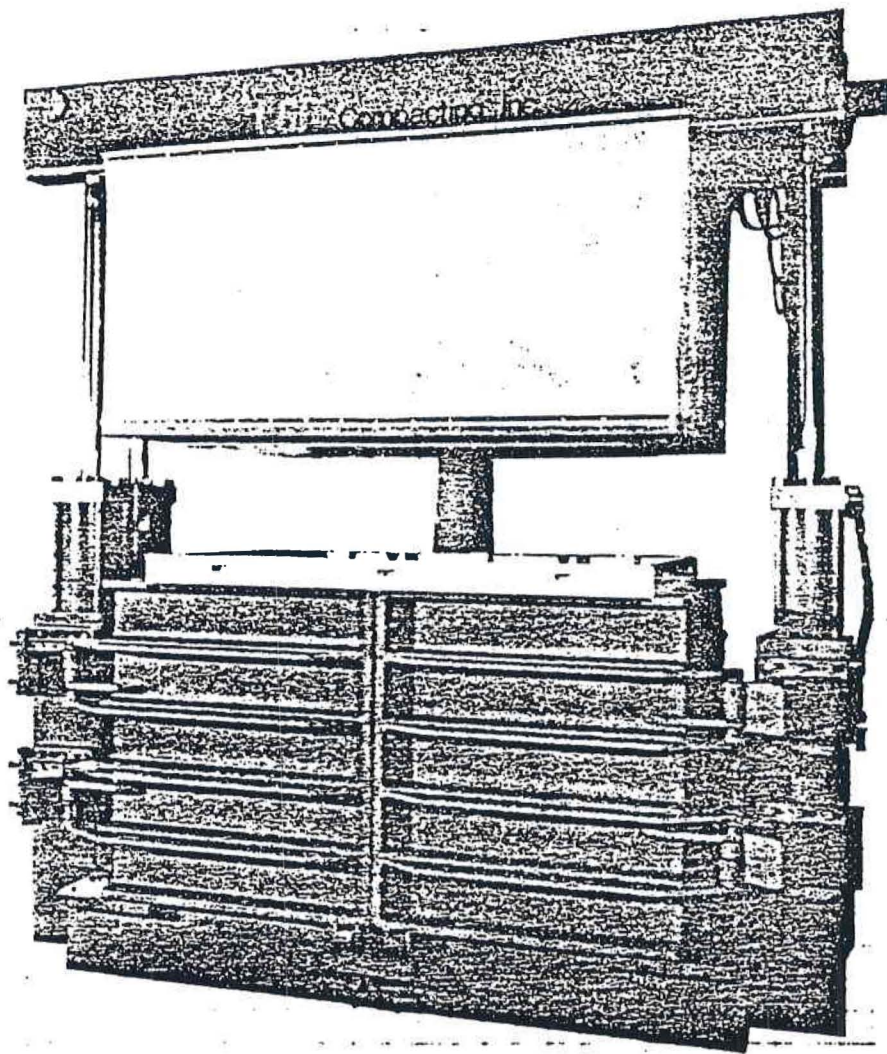
O L "Jack" Jackson
Treasurer

Phone (804) 799-7076



CUTAWAY VIEW
55 GALLON DRUM WITH ANTI SPRING-BACK DEVICE
COMPACTING DISC SHOWN IN PLACE

		Electro-Seak Systems, Inc. P.O. Box 1627 Brooksville, FL 33512	
		SPECIFICATIONS: THE DESIGNER, ENGINEER, ARCHITECT, OR OTHER PROFESSIONAL PERSON SHALL BE RESPONSIBLE FOR THE DESIGN, CONSTRUCTION, AND TESTING OF THE DEVICE. THE USER SHALL BE RESPONSIBLE FOR THE PROPER USE OF THE DEVICE. THE USER SHALL BE RESPONSIBLE FOR THE PROPER MAINTENANCE OF THE DEVICE.	
DATE	REVISION	TITLE	
DESIGNED	SPR/MS	CUTAWAY VIEW	
CHECKED	SPR/MS	DRUM W/ANTI SPRING-BACK DEVICE	
APPROVED	SPR/MS		
SCALE	4"	SIZE	REV
		A	CR 38511
			1 of 1



BOX COMPACTORS

BASICS

1. COMPACTION FORCE - RANGE 50 TO 250 TONS
2. COMPACTION VOLUME - APPROX. 90 CU. FT.
3. PLATEN PRESSURE - 30 TO 150 PSI

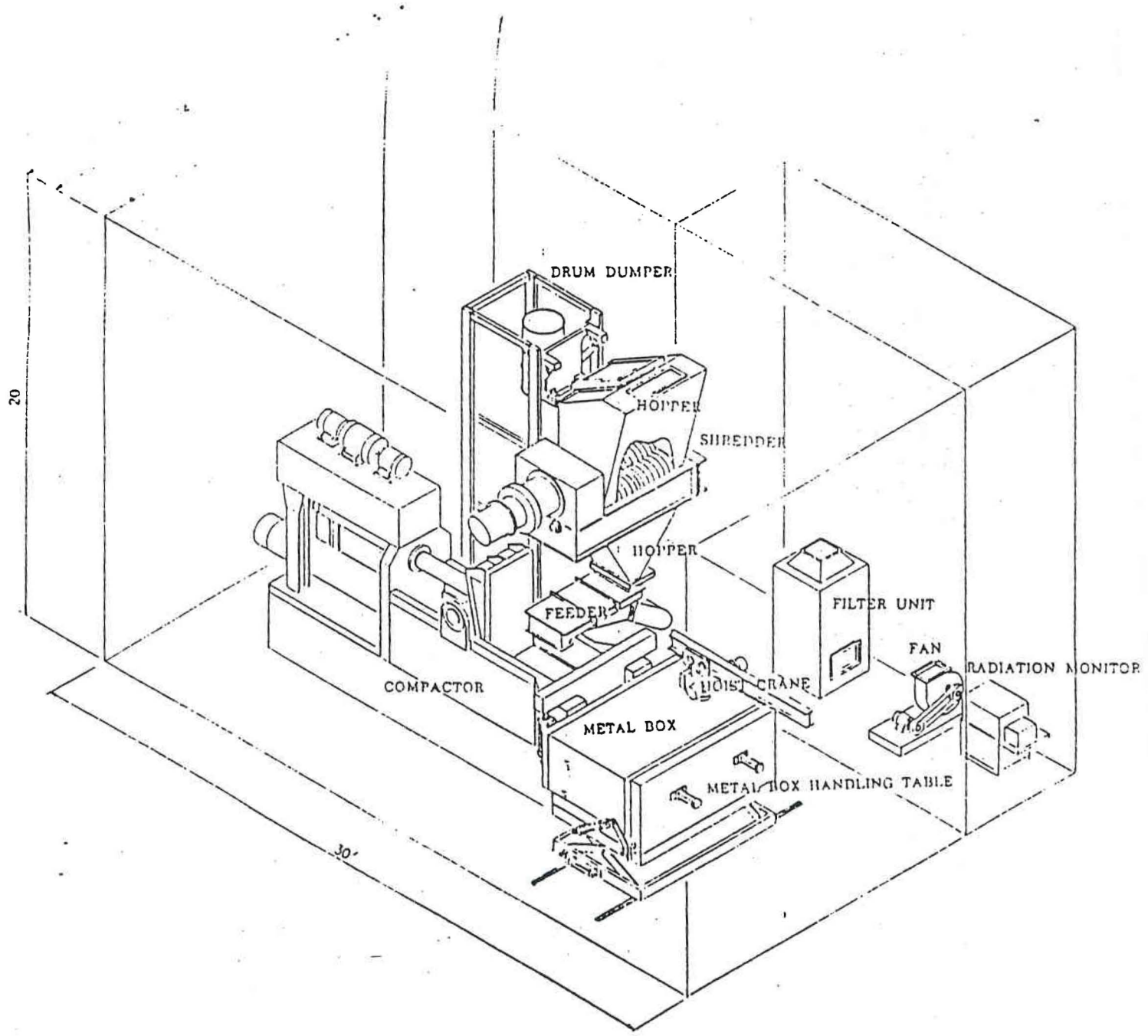
ADVANTAGES

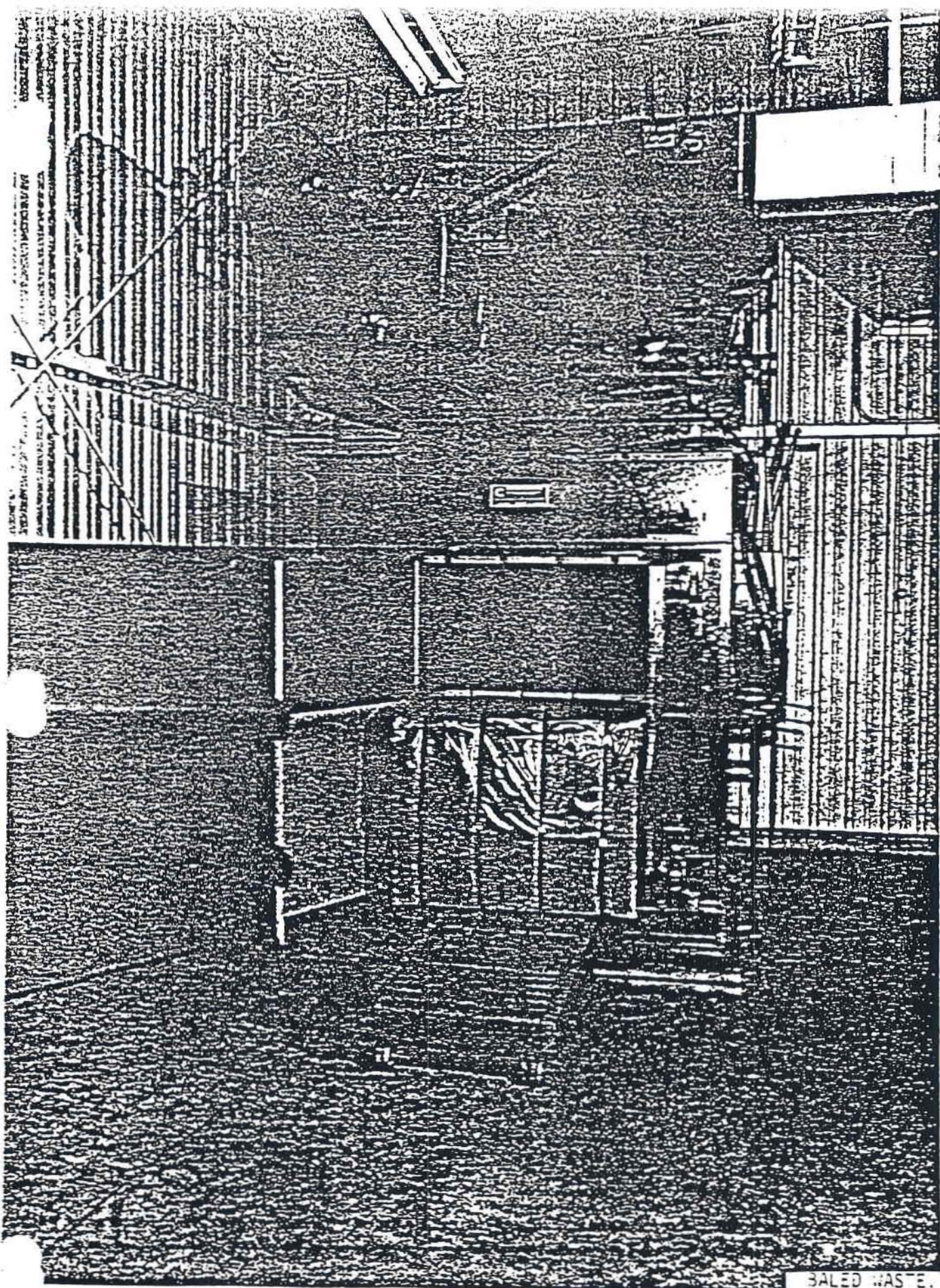
1. LARGE LABOR SAVINGS - DUE TO NO. PACKAGES
2. REDUCTION IN SHIPPING (FACTOR OF 10)
3. SAVINGS IN STORAGE SPACE (SAME DENSITY)

PERFORMANCE

NORMAL OPERATING RANGE 30 TO 37 #/ CU.FT.

DRUM DUMPER PRESSURE COMPACTOR





SALED WASTE.

FIG. 3

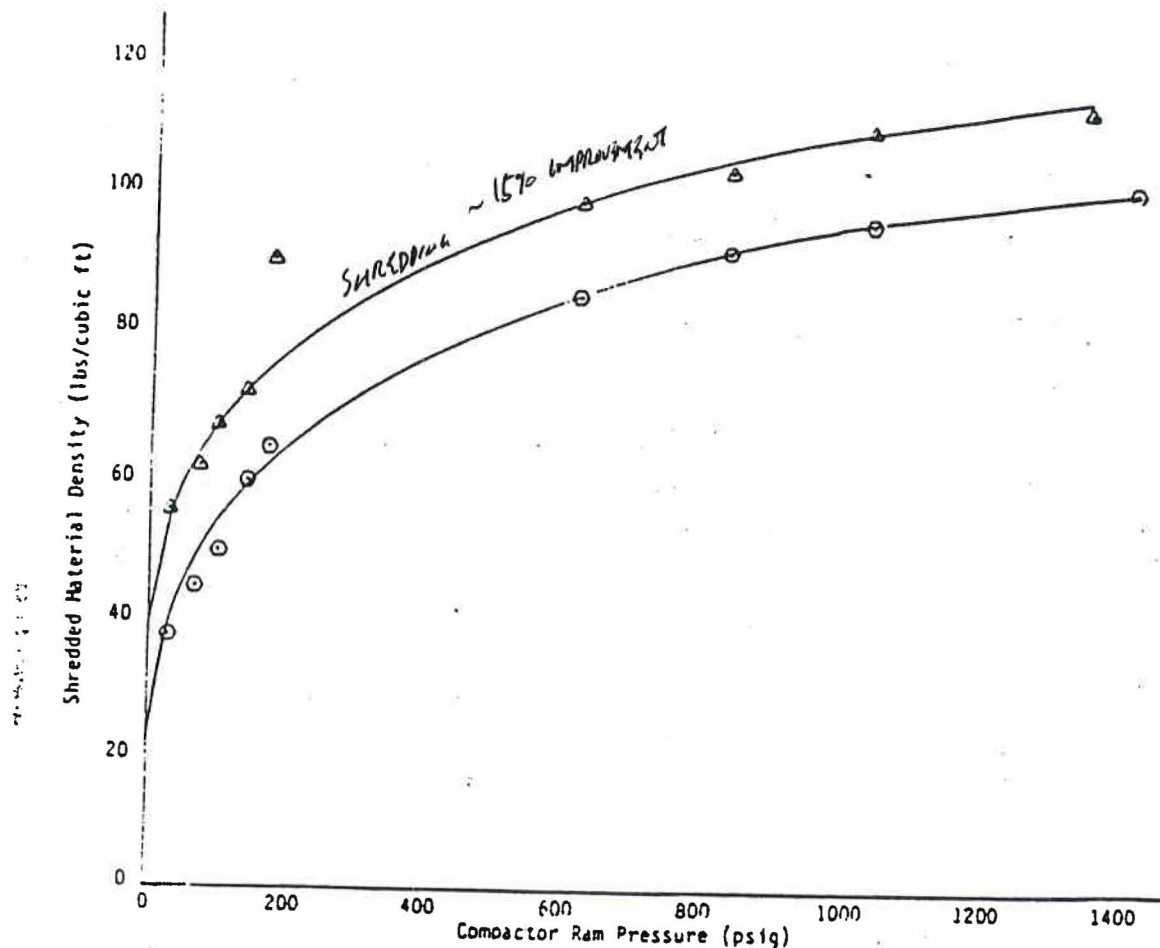


Fig. 1. Shredded Material Density Versus Compactor Ram Pressure.

TABLE I
EPRI 1981 BWR PLANT Average Waste Composition

Compactible - 68% of total

Rubber - (insulation off wire)
 Plastic - (sheets, rolls, buckets)
 Paper - (sheets, cardboard, sheetrock)
 PVC - (pipes, tubes)
 Metal - (small pipes, sheets)
 Wood - (small pieces of boards, plywood)
 Cloth - (canvas, threaded plastic)
 Others & Misc. - (tin, barrels, wiring, trailer underpinning)

Noncompactible = 32% of total

Wood - (larger boards, wood frames, pallets)
 Lead - (lead sheets, bricks)
 Tools - unable to process through shredder
 Conduit - (long metal pipes)
 Concrete - (blocks, asphalt)
 Glass - (broken fluorescent tubes)
 Dirt - (soil placed in bags)
 Filters - (unused HEPA filter)
 Filter Frames - (AC unit, metal/paper units)
 Composite Materials - (chairs, cushions)
 Pipe - (large/long metal pipes)
 Misc. - (3-ply copper tubing/rubber, ladders)

1500 Ton Press Compaction Density - Lbs/Cu. Ft.

	<u>Waste Only</u>	<u>Waste/Drums and Overpack</u>
Wood - Soft Pine *	80	93
Silica Sand *	114	123
Steel Chips *	281	270
Onionskin Paper	85	98
PVC Sheet	59	74
Check Paper #24, Type 2	78	91
Clay Paper, Type 1	58	73
Tagboard	77	90
Shop Rags	88	100
Computer Paper	82	94
Glass	131	138
Concrete Rubble *	<u>119</u>	<u>127</u>
Average of the Above	104	115

* "Non-Compactable in Conventional Equipment"

	<u>Waste Only</u>	<u>Waste/Drums and Overpack</u>
Compactable	82 lb/cu. ft.	95 lb/cu. ft.
Non-Compactable	148 lb/cu. ft.	153 lb/cu. ft.

	<u>Conventional Lb/Cu. Ft.</u>	<u>1500 Ton Lb./Cu. Ft.</u>	<u>Volume/Reduction</u>
Compactable	20 to 40	74	1.85 to 3.7
Non-Compactable	30	133	4.4

SUPERCOMPACTORS

RANGE OF FORCE - 1,000 TO 2,200 TONS
(5,000 TONS) ^{SEG}

DIMENSIONS (PRESS) HEIGHT 11 TO 15 FT.

BASE 5 TO 8 FT.²

WEIGHT 30 TO 50 TONS

HYDRAULIC SYSTEM PRESSURE - 3,000 TO 4000
PSI

PUMPS - GEAR, GEAR + PIST

DIMENSIONS - 8 X 8X 8 FT.

CONTROL SYSTEM - PLC CONTROLLED, MANUAL

PROCESS RATE - MACHINE RATE APPROX 2.5 MIN.
PER DRUM

NORMAL OP. APPROX 5 MIN.
PER DRUM

PLANT SERVICES - ELECTRICAL 200 AMPS

PLATEN PRESSURE - 5 TO 10,000 PSI

PERFORMANCE RANGE - 60 TO 120 #/CU.FT.

- 1 National laboratory test program
Waste: range of test drums containing various materials, e.g. metal, plastic, rubble, etc.
- 2 Nuclear fuel facility operating waste material
Waste: mixed waste material, e.g. plastic, paper, etc.
- 3 U.S. BWR nuclear power plant
Waste: mixed waste, e.g. high plastic, paper, etc.
- 4 Waste broker facility
Waste: mixed waste from institutional and smaller nuclear waste generators
- 5 U.S. BWR-1 nuclear power plant waste first campaign.
Waste: mixed waste, e.g. high plastic, paper, etc.
6. Spanish BWR power plant - inefficient overpacking
Waste: mixed, waste, e.g. plastic, paper, small fraction of metallic waste material
- 7 Italian BWR power plant
Waste: mixed waste, e.g. plastic, paper, and a significant fraction of metallic waste material which was mixed into the other waste material being compacted.
- 8 U.S. BWR-1 nuclear power plant waste second campaign.
Waste: see Item 5.
- 9 U.S. BWR-1 nuclear power plant waste third campaign
Waste: see Item 5; input drums 52 gallon
- 10 U.S. PWR-1 nuclear power plant first campaign
Waste: mixed waste, e.g. plastic and paper
- 11 National laboratory test program utilizing grout
Waste: mixed waste, e.g. plastic, paper. Crushed drums were grouted into large overpacks.
- 12 German BWR power plant
Waste: mixed, waste; however, this plant incinerates paper, plastic, etc. and the waste material supercompacted has significant fraction of metallic waste material.
- 13 Waste broker facility
Waste: mixed waste from institutional and smaller nuclear waste generators.
- 14 U.S. PWR-1 nuclear power plant second campaign
Waste: see Item 10
- 15 U.S. DOE fuel facility first campaign
Waste: mixed waste
- 16 U.S. DOE fuel facility second campaign
Waste: high fraction of scrap metal

SUP FACTOR RESULTS

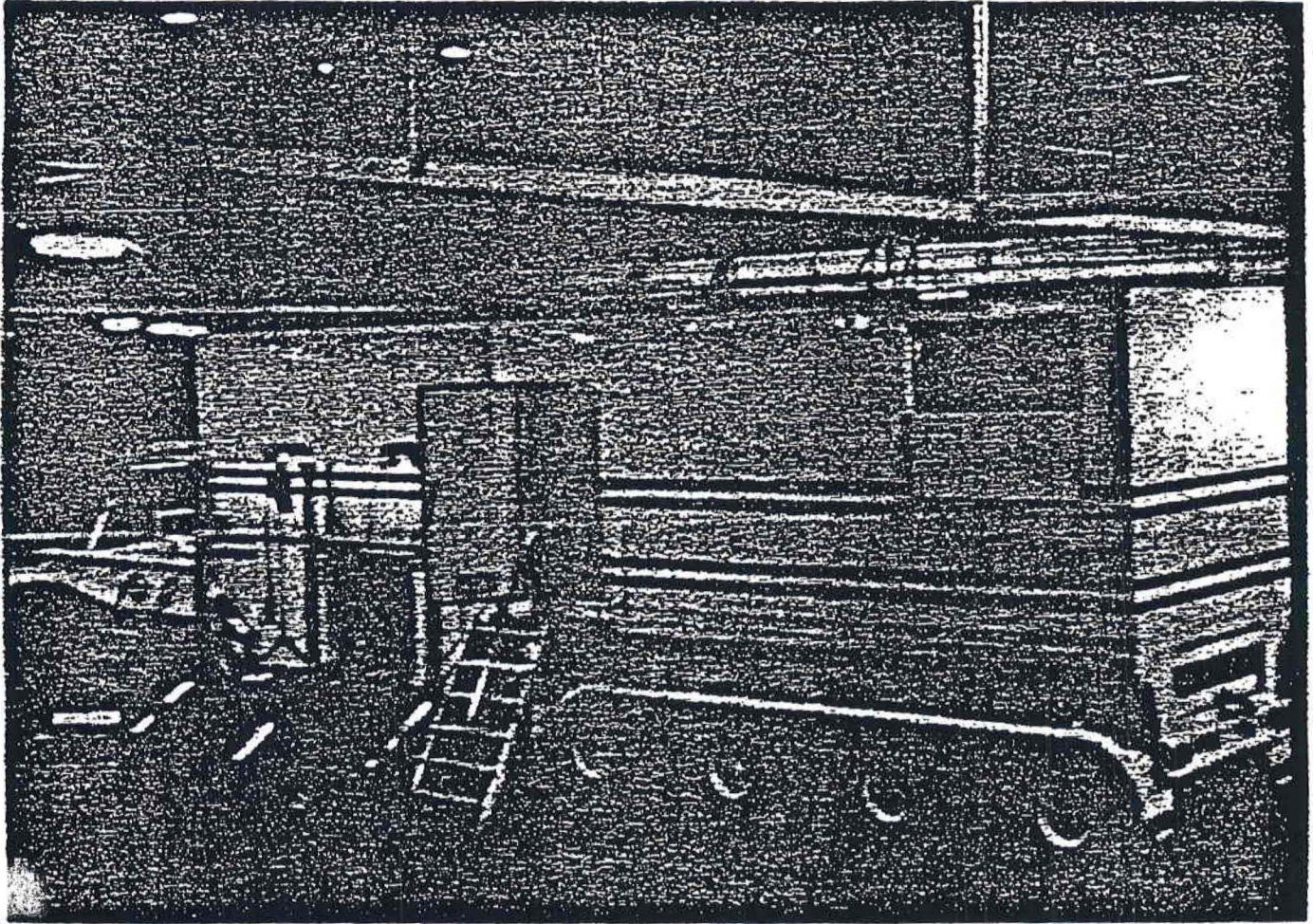
<u>Campaign</u>	<u>No. Of Drums</u>	<u>Input Drums (Gals.)</u>	<u>Average Waste Density Start (Lb/Ft³)</u>	<u>Average Gross Weight (Pounds)</u>	<u>Average*** Waste Density Final (Lb/Ft³)</u>	<u>VRF Pucks</u>	<u>VRF Burial</u>	<u>Over-Pack (Gals.)</u>
1	23	55	21	207	141	6.7:1	3.7:1	83
2	40	55	20	144	112	5.6:1	3.4:1	83
3	552	52	24	194	67	2.8:1	2:1	55 & 46
4	637	55	28	262	92	3.3:1	2.2:1	89
5	1053	55	28	258	73	2.6:1	1.9:1	80 & 95
6	1383	58	40	348	96	2.4:1	2.2:1	83
7	1000	58	18	185	70	3.88:1	2.9:1	83
8	475	55	28	261	76	2.7:1	*	80 & 95
9	207	52	30	250	62	2.1:1	*	55
10	674	52	25	207	60	2.4:1	2.1:1	55
11	300	55	12	143	66	5.5:1	2.9:1	125 Gro
12	5000	52	25	206	110	-	3.65:1	55
13	349	55	-	-	-	-	2.6:1	79
14	713	52	24	199	55	-	2.1:1	55
15	4000	55	-	-	-	-	3.19:1	79
16	1200	55	57	475**	142	-	2.5:1	79

*Over-pack Filled with Contaminated Dirt.

**All Metal

***Density Without Waste Container Weight

1/19/88



MOBILE SUPERPACK^R SYSTEM

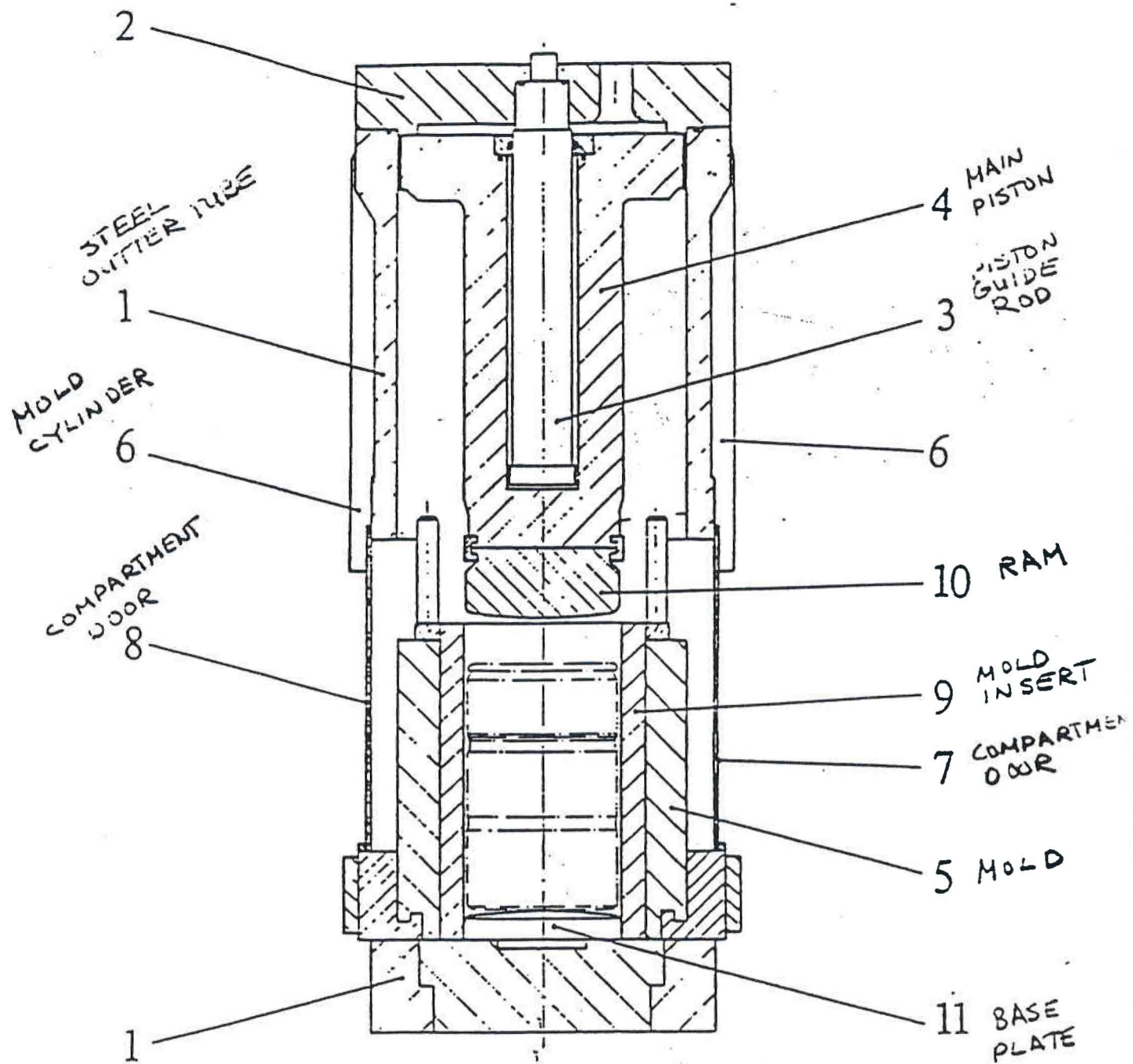
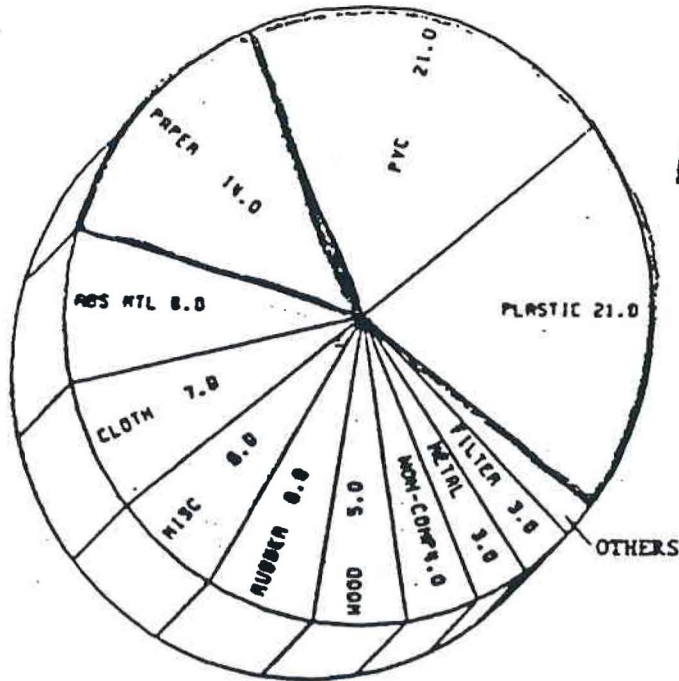


Fig. 1 High Force Compactor (HIFOC)



COMPACTIBLE DAW

Average Ft³/Unit:
5,800



42%

NON-COMPACTIBLE DAW

Average Ft³/Unit:
6,150

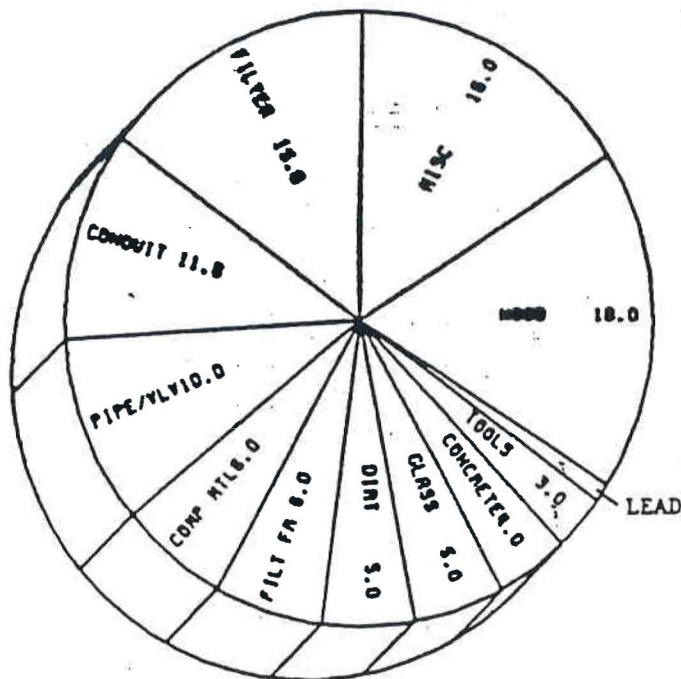


Figure 4-3