Part 3

Briquette Test
(IMNR Research Report 2)

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INSTITUTUE FOR NONFERROUS AND RARES METALS

- S.C. I. M. N. R. S.A. BUCURESTI –

RESEARCH REPORT

PILOT PROJECT NAMED:

” PROMOTION OF HEAVY METAL RECYCLING USING EXISTING SMELTING FACILITY „

REPORT 2

- BUCHAREST -
2003

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CONTENT

CHAPTER I

1.1 Briquetting Press

Between 0.1- 0.3 2003, I.M.N.R. S.A. experiments accomplish on briquetting press realize from I.M.N.R. S.A and installed to SOMETRA S.A. Copsa Mica - ANNEX I.

1.2 Wastes Collection

	WASTE COLLECTION	TYPE	ORIGIN
a	Zn-Pb drosses	Internal waste	pumps tank - condenser I.S.P.
b	Blue Powder	Internal waste	„Gondola" - filter condenser I.S.P.
c	Dust agglomerating	Internal waste	„Dalamatic" – filter agglomeration band D.L.
d	Zn dross conical	External waste	White Zinc Plant (ZnO manufacturing)
e	Pastes	External waste	Battery used

Wastes Granulation Analysis :

(mm)	INTERNAL WASTES			EXTERNAL WASTES	
	Zn-Pb drosses	Blue Powder	Dust agglomerating	Zn dross conical	Pastes [1] (battery used)
> 5	4,99%	4,64%	-	36,26%	0,24%
5 -3	13,86%	20,42%	-	21,32%	7,77%
3-1,5	18,82%	20,68%	-	22,60%	17,44%
< 1,5	62,33%	54,26%	100%	19,82%	74,55%

[1] Pastes (battery used) - drying

Wastes Granulation Analysis for experiment no.1-12 classing under 3 mm:

(mm)	INTERNAL WASTES			EXTERNAL WASTES	
	Zn-Pb drosses	Blue Powder	Dust agglomerating	Zn dross conical (2	Pastes (1 (battery used)
3-1,5	23,19%	27,60%	-	17,89%	18,96%
< 1,5	76,81%	72,40%	-	82,11%	81,04%
0,8-0,6	-	-	17,45%	-	-
0,6-0,2	-	-	69,78%	-	-
< 0,2			12,77%		

2)Zn dross (conicle) – milling of ball mill

Wastes Granulation Analysis for experiment no.13 - 15 classing under 0,6 mm:

(mm)	INTERNAL WASTES			EXTERNAL WASTES	
	Zn-Pb drosses	Blue Powder	Dust agglomerating	Zn dross conical (2	Pastes (1 battery used
0,6-0,2	86,21%	60,00%	69,78%	75,44%	83,33%
< 0,2	13,79%	40,00%	12,77%	24,56%	16,67%

1.3 Mixtures Utilizations

	WASTE COLLECTION	A	B	C
a	Zn-Pb drosses	100%	100%	100%

	WASTE COLLECTION	1	2	3	4	5	6	7	8
a	Zn-Pb drosses	100%	-	50%	50%	50%	20%	40%	50%
b	Blue Powder	-	100%	50%	-	-	20%	10%	50%
c	Dust agglomerating	-	-	-	-	-	20%	10%	-
d	Zn dross conical	-	-	-	50%	-	20%	20%	-
e	Pastes	-	-	-	-	50%	20%	20%	-
	WASTE COLLECTION	9	10	11	12	13	14	15	-
a	Zn-Pb drosses	-	30%	30%	20%	20%	20%	20%	-
b	Blue Powder	70%	60%	40%	20%	20%	20%	40%	-
c	Dust agglomerating	30%	10%	10%	20%	20%	20%	20%	-
d	Zn dross conical	-	-	10%	20%	20%	20%	20%	-
e	Pastes	-	-	10%	20%	20%	20%	-	-

CHAPTER II

2.1 Test Briquetting Plant

Test briquetting press plant, Flowsheet fig. 1

TEST A

WASTE	Analysis, (%)								(mm)	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
100% Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45		
waste chemical composition, (%)	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	27,60%	72,40 %

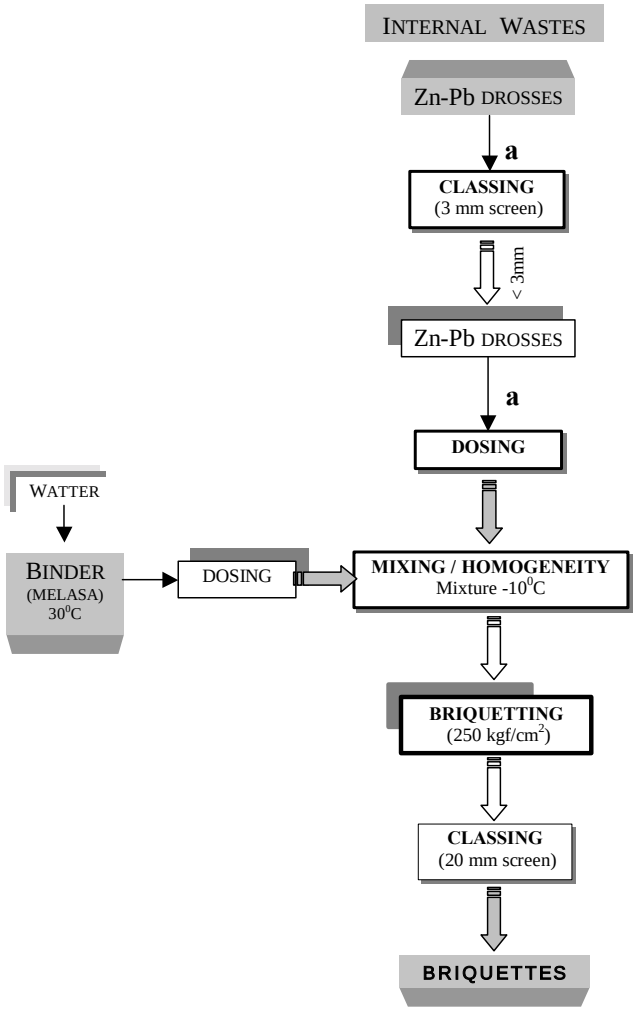
Mixture	Mixture for briquetting									Amount	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)	17,65	17,45	0,14	2,08	1,48	2,20	2,90	1,23		50,00	97,09
2.Binder, (kg)									1,00	1,00	1,94
3.Watter, (kg)						0,50				0,50	0,97
amount (kg)	17,65	17,45	0,14	20,08	11,48	2,70	2,90	1,23	1,00	51,50	-
amount (%)	34,27	33,88	0,27	4,03	2,87	5,24	5,63	2,38	1,94	-	100,00

TEST B

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
100%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45		
waste chemical composition, (%)		35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	27,60%	72,40 %

Mixture	Mixture for briquetting									Amount	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)	17,65	17,45	0,14	2,08	1,48	2,20	2,90	1,23		50,00	94,34
2.Binder, (kg)									2,00	2,00	3,77
3.Watter, (kg)						1,00				1,00	1,89
Amount (kg)	17,45	0,14	2,08	1,48	3,20	2,90	1,23	2,00	1,00	53,00	-
Amount (%)	32,92	0,26	3,92	2,79	6,04	5,47	2,31	3,77	1,94	-	100,00

FIG. 1 FLOWSHEET TEST PLANT
environmental temp: (-15^{0}C) ÷ (-17^{0}C)



TEST C

WASTE	Analysis, (%)								(mm)	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
100% Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45		
waste chemical composition, (%)	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	27,60%	72,40 %

Mixture	Mixture for briquetting									Amount	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)	17,65	17,45	0,14	2,08	1,48	2,20	2,90	1,23		50,00	94,34
2.Binder, (kg)									3,00	3,00	5,66
Amount (kg)	17,65	17,45	0,14	2,08	1,48	2,20	2,90	1,23	3,00	53,00	-
(%)	33,30	32,92	0,26	3,92	2,79	4,15	5,47	2,31	5,66	-	100,00

2.2 Briquetting Press Experiments

Briquetting press experiments no. 1-7, Flowsheet fig. 2

EXPERIMENT 1

WASTE	Analysis, (%)								(mm)	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
1000 % Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45		
waste chemical composition, (%)	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	27,60%	72,40%

Mixture	Mixture for briquetting									Amount	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)	17,65	17,45	0,14	2,08	1,48	2,20	2,90	1,23		50,00	95,24
2.Binder, (kg)									2,5	2,50	4,76
Amount (kg)	17,65	17,45	0,14	2,08	1,48	2,20	2,90	1,23	2,50	52,50	-
(%)	33,62	33,24	0,27	3,95	2,82	4,19	5,52	2,33	4,76	-	100,00

briquette 98,00 g/p.c.
wastage, 105^0C/2h 1,83 %

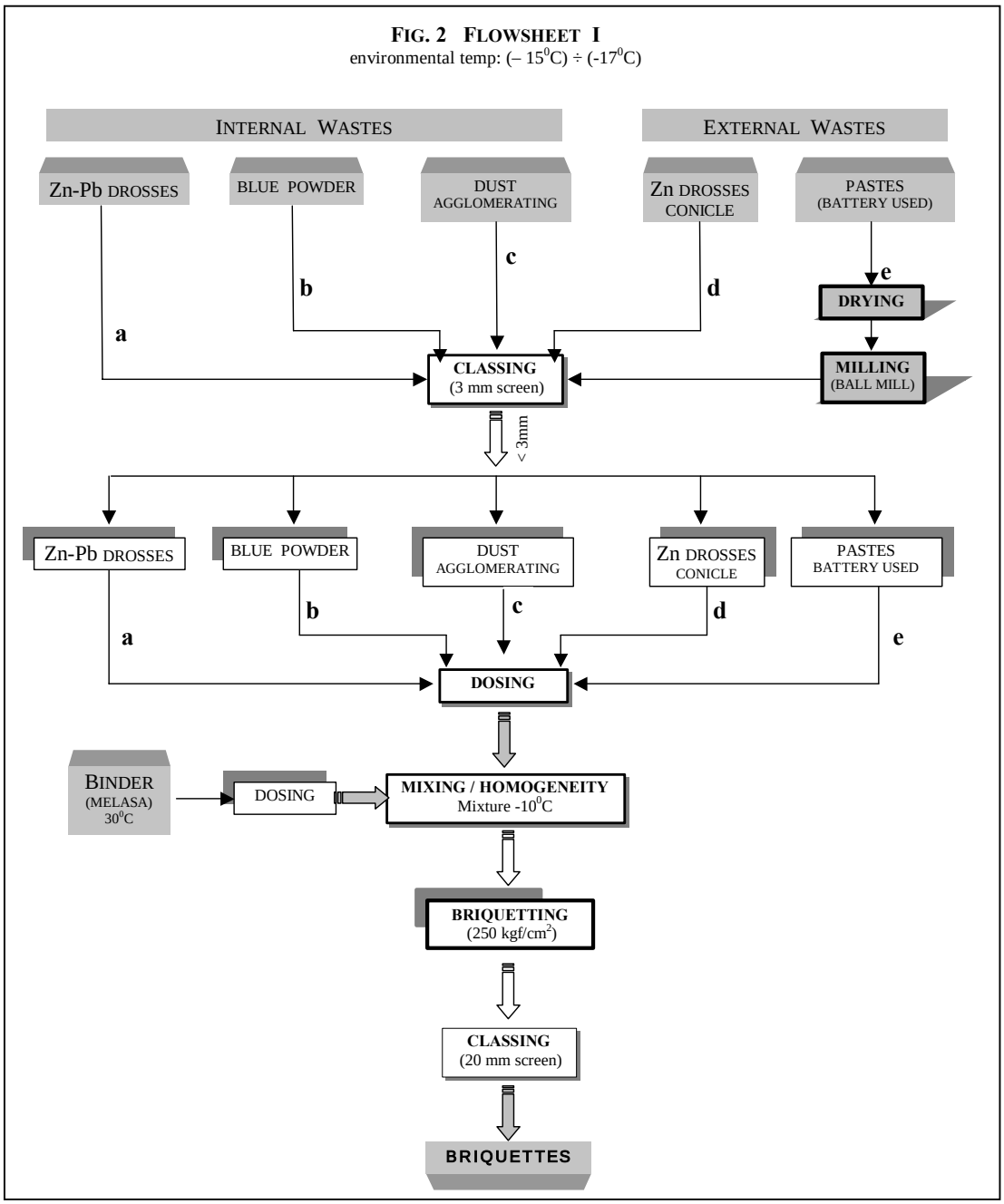
EXPERIMENT 2

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
100%	Blue Powder	23,60	38,30	0,32	2,12	8,23	22,00	2,46	2,02		
waste chemical composition, (%)		23,60	38,30	0,32	2,12	8,23	22,00	2,46	2,02	27,60%	72,40%

Mixture	Mixture for briquetting									Amount	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)	23,60	38,30	0,32	2,12	8,23	22,00	2,46	2,02		50,00	93,46
2.Binder, (kg)									3,50	3,50	6,54
Amount (kg)	11,80	19,15	0,16	1,06	4,12	11,00	1,23	1,01	3,50	53,50	-
Amount (%)	22,06	35,79	0,30	1,98	7,69	20,56	2,30	1,89	6,54	-	100,00

briquette 69,80 g/p.c.
wastage, 105^{0}C/2h 2,95 %

FIG. 2 FLOWSHEET I
environmental temp: (– 15^{0}C) ÷ (-17^{0}C)



EXPERIMENT 3

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
50%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
50%	Blue Powder	23,60	38,30	0,32	2,12	8,23	22,00	2,46	2,02	27,60%	72,40%
mixture wastes chemical composition, (%)		29,45	36,60	0,30	3,14	5,60	13,20	4,13	2,24	25,39%	74,61%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		14,73	18,30	0,15	1,57	2,80	6,60	2,07	1,12		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	14,73	18,30	0,15	1,57	2,80	6,60	2,07	1,12	3,00	53,00	-
	(%)	27,78	34,53	0,28	2,96	5,28	12,45	3,90	2,11	5,66	-	100,00

briquette 71,67 g/p.c.
wastage, 105^0C/2h 1,78 %

EXPERIMENT 4

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
50%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	27,60%	72,40%
50%	Zn dross conicle	75,60	0,74	0,002	0,21	0,00	0,30	0,09	0,04	53,28%	46,72%
mixture wastes chemical composition, (%)		55,45	17,82	0,14	2,18	1,48	2,35	2,94	1,24	40,44%	59,56%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		27,73	8,91	0,07	1,09	0,74	1,18	1,47	0,62		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	27,73	8,91	0,07	1,09	0,74	1,18	1,47	0,62	3,00	53,00	-
	(%)	52,31	16,81	0,13	2,06	1,40	2,22	2,78	1,17	5,66	-	100,00

briquette 85,30 g/p.c.
wastage, 105^0C/2h 1,83 %

EXPERIMENT 5

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
50%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
50%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	18,96%	81,04%
mixture wastes chemical composition, (%)		19,86	57,92	0,16	2,35	5,50	3,10	3,98	1,74	21,08%	78,92%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		9,01	26,28	0,07	1,07	2,50	1,41	1,81	0,79		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	9,01	26,28	0,07	1,07	2,50	1,41	1,81	0,79	3,00	53,00	-
	(%)	17,00	49,58	0,14	2,01	4,71	2,66	3,41	1,49	5,66	-	100,00

briquette 95,00 g/p.c.
wastage, 105^0C/2h 1,71 %

EXPERIMENT 6

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
20%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
20%	Blue Powder	23,60	38,30	0,32	2,12	8,23	22,00	2,46	2,02	27,60%	72,40%
20%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	-	100,00%
20%	Zn dross conicle	75,60	0,74	0,002	0,21	0,00	0,30	0,09	0,04	23,19%	76,81%
20%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	27,60%	72,40%
mixture wastes chemical composition, (%)		35,29	31,93	0,25	2,91	7,30	5,65	2,47	1,51	20,32%	79,68%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		17,65	15,97	0,12	1,45	3,65	2,82	1,23	0,75		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	17,65	15,97	0,12	1,45	3,65	2,82	1,23	0,75	3,00	53,00	-
	(%)	33,29	30,12	0,24	2,74	6,89	5,33	2,33	1,42	5,66	-	100,00

briquette 80,67 g/p.c.
wastage, 105^0C/2h 2,66 %

EXPERIMENT 7

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
40%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
10%	Blue Powder	23,60	38,30	0,32	2,12	8,23	22,00	2,46	2,02	27,60%	72,40%
10%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	0,00%	100,00%
20%	Zn dross conicle	75,60	0,74	0,002	0,21	0,00	0,30	0,09	0,04	53,28%	46,72%
20%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	27,60%	72,40%
mixture wastes chemical composition, (%)		35,87	33,53	0,21	2,73	5,24	4,30	3,13	1,56	28,21%	71,79%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		17,94	16,77	0,11	1,37	2,62	2,15	1,56	0,78		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	17,94	16,77	0,11	1,37	2,62	2,15	1,56	0,78	3,00	53,00	-
	(%)	33,84	31,63	0,20	2,58	4,95	4,05	2,95	1,47	5,66	-	100,00

briquette 85,92 g/p.c.
wastage, 105^0C/2h 1,42 %

Briquetting press experiments no. 8-10, Flowsheet fig. 3

EXPERIMENT 8

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
50%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
50%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	27,60%	72,40%
mixture wastes chemical composition, (%)		28,28	37,07	0,25	3,62	5,10	2,81	3,65	1,90	25,39%	74,61%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		14,14	18,53	0,12	1,81	2,55	1,40	1,82	0,95		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	14,14	18,53	0,12	1,81	2,55	1,40	1,82	0,95	3,00	53,00	-
	(%)	26,68	34,97	0,23	3,41	4,81	2,65	3,44	1,79	5,66	-	100,00

briquette 80,00 g/p.c.
wastage, 105^0C/2h 2,76 %

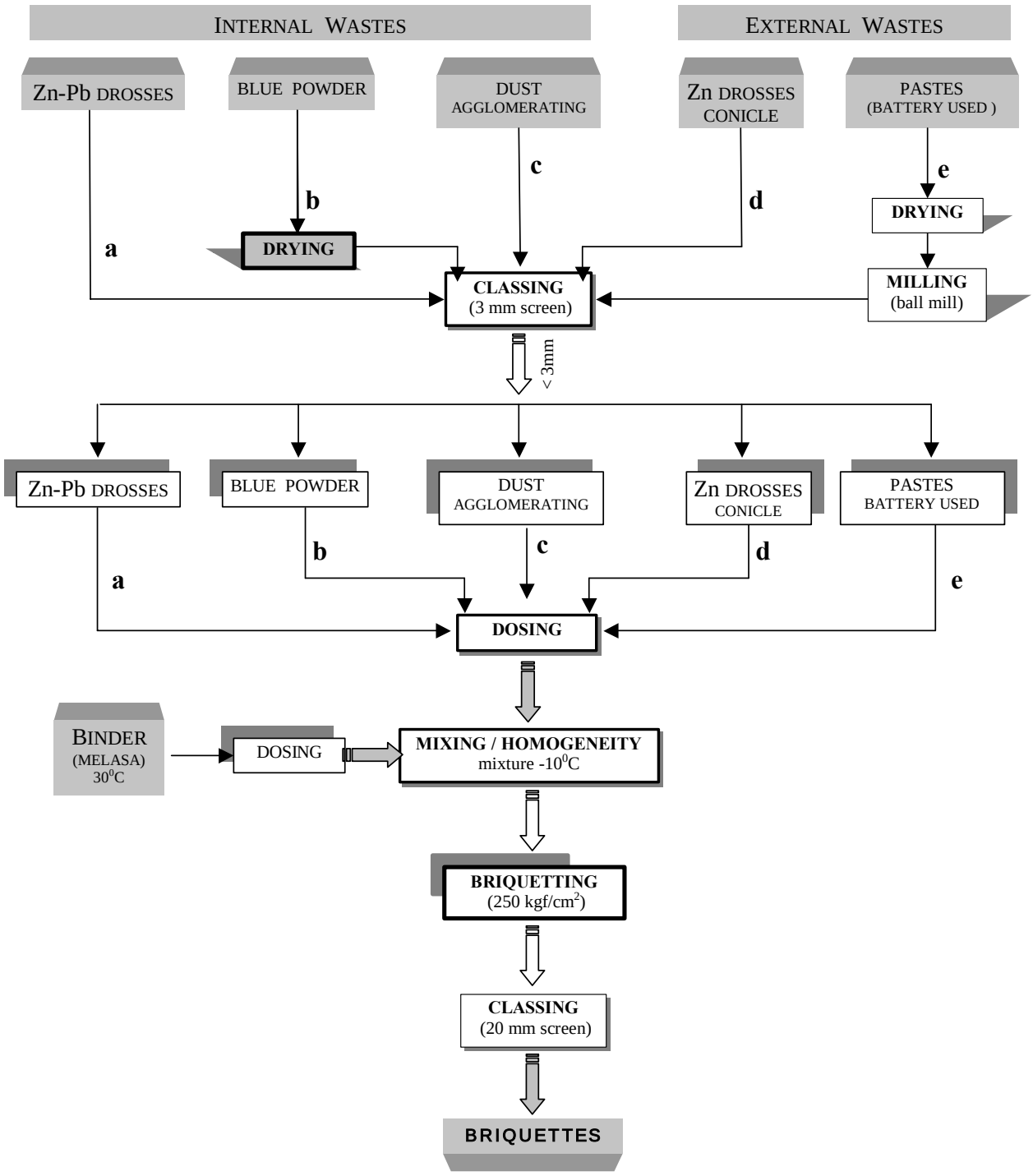
EXPERIMENT 9

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
70%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	27,60%	72,40%
30%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	-	100,00%
mixture wastes chemical composition, (%)		27,24	32,11	0,34	4,54	10,55	0,94	1,82	1,63	19,32%	80,68%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		13,62	16,06	0,17	2,27	5,28	0,47	0,91	0,82		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	13,73	17,78	0,14	1,94	3,53	1,04	1,45	0,89	3,00	53,00	-
	(%)	25,91	33,55	0,26	3,67	6,66	1,96	2,73	1,67	5,66	-	100,00

briquette 66,50 g/p.c.
wastage, 105^0C/2h 1,43 %

FIG. 3 FLOWSHEET II
environmental temp: (-15^{0}C) ÷ (-17^{0}C)



EXPERIMENT 10

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
30%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
60%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	27,60%	72,40%
10%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	-	100,00%
mixture wastes chemical composition, (%)		27,47	35,56	0,27	3,89	7,06	2,08	2,90	1,77	23,52%	76,48%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		13,73	17,78	0,14	1,94	3,53	1,04	1,45	0,89		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	13,73	17,78	0,14	1,94	3,53	1,04	1,45	0,89	3,00	53,00	-
	(%)	25,91	33,55	0,26	3,67	6,66	1,96	2,73	1,67	5,66	-	100,00

briquette 72,13 g/p.c.
wastage, 105^0C/2h 2,88 %

Briquetting press experiment no. 11, Flowsheet fig. 4

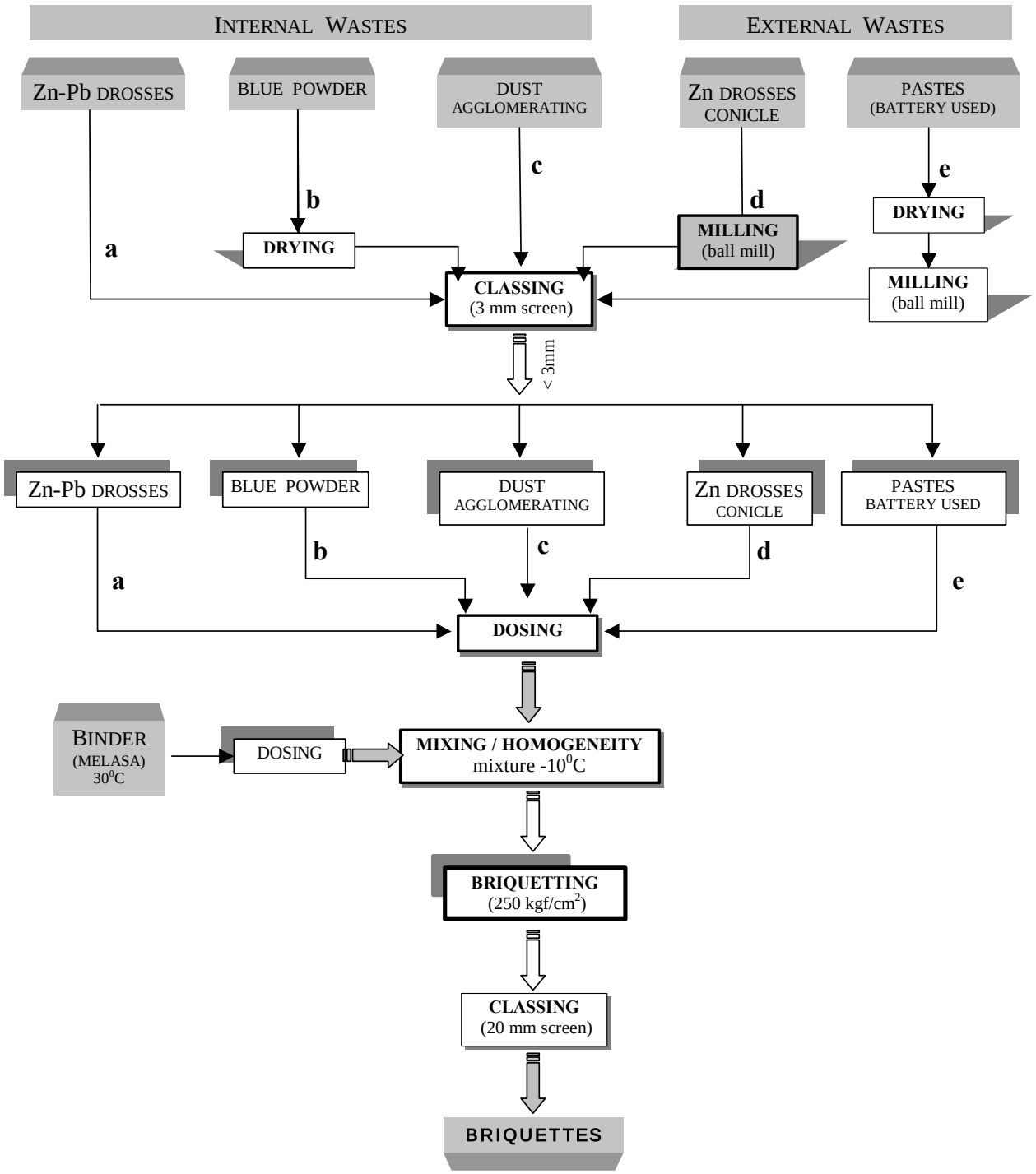
EXPERIMENT 11

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
30%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
40%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	27,60%	72,40%
10%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	-	100,00%
10%	Zn dross conicle	75,60	0,74	0,002	0,21	0,00	0,30	0,09	0,04	17,89%	82,11%
10%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	18,96%	81,04%
mixture wastes chemical composition, (%)		30,85	34,81	0,23	3,30	6,31	1,99	2,75	1,58	21,68%	78,32%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		15,42	17,40	0,12	1,65	3,16	0,99	1,37	0,79		50,00	94,34
2.Binder, (kg)										3,00	3,00	5,66
Amount	(kg)	15,42	17,40	0,12	1,65	3,16	0,99	1,37	0,79	3,00	53,00	-
	(%)	29,10	32,84	0,22	3,12	5,96	1,87	2,59	1,49	5,66	-	100,00

briquette	75.13	g/p.c.
wastage, 105^0C/2h	1,46	%

FIG. 4 FLOWSHEET III
Environmental temp: $(-15^0C) \div (-17^0C)$



Briquetting press experiment no. 12, Flowsheet fig. 5

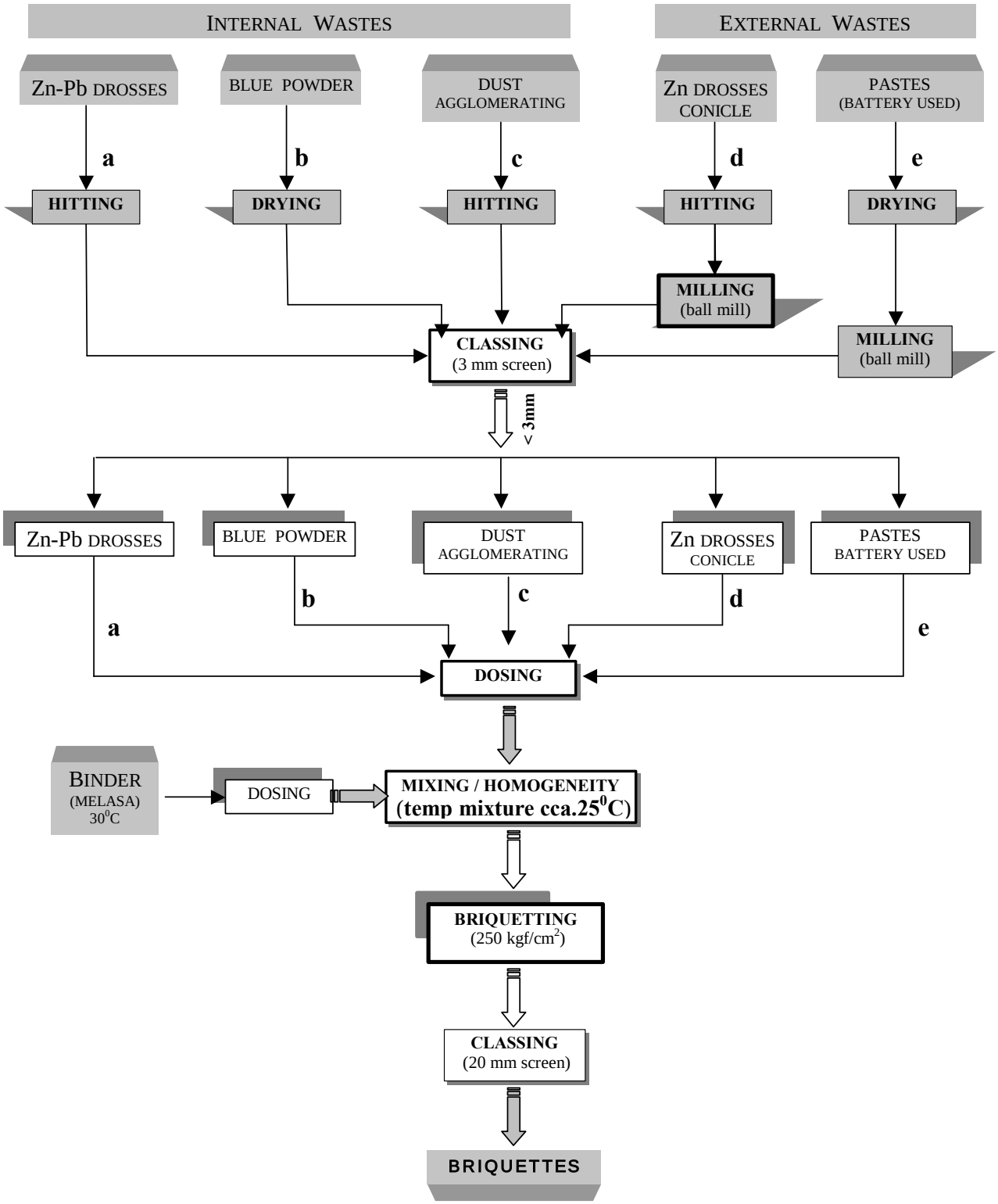
EXPERIMENT 12

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	3-1,5	<1,5
20%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	23,19%	76,81%
20%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	27,60%	72,40%
20%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	-	100,00%
20%	Zn dross conicle	75,60	0,74	0,00	0,21	0,00	0,30	0,09	0,04	75,44%	24,56%
20%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	83,33%	16,67%
mixture wastes chemical composition, (%)		34,82	32,12	0,23	3,10	7,10	1,49	2,28	1,37	41,91%	58,09%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		12,19	11,24	0,08	1,08	2,49	0,52	0,80	0,48		35,00	92,11
2.Binder, (kg)										3,00	3,00	7,89
Amount	(kg)	12,19	11,24	0,08	1,08	2,49	0,52	0,80	0,48	3,00	38,00	-
	(%)	32,07	29,58	0,21	2,85	6,54	1,37	2,10	1,26	7,89	-	100,00

briquette 81,56 g/p.c.
wastage, 105^0C/2h 0,65 %

FIG. 5 FLOWSHEET IV
environmental temp: (-8^{0}C) ÷ (-13^{0}C)



Briquetting press experiment no. 13 and 14 - Flowsheet fig. 6

EXPERIMENT 13

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	0,6-0,2	<0,2
20%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	86,21%	13,79%
20%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	60,00%	40,00%
20%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	84,53%	15,47%
20%	Zn dross conicle	75,60	0,74	0,00	0,21	0,00	0,30	0,09	0,04	75,44%	24,56%
20%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	83,33%	16,67%
mixture wastes chemical composition, (%)		34,82	32,12	0,23	3,10	7,10	1,49	2,28	1,37	77,90%	22,10%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		12,19	11,24	0,08	1,08	2,49	0,52	0,80	0,48		35,00	92,11
2.Binder, (kg)										3,00	3,00	7,89
Amount	(kg)	12,19	11,24	0,08	1,08	2,49	0,52	0,80	0,48	3,00	38,00	-
	(%)	32,07	29,58	0,21	2,85	6,54	1,37	2,10	1,26	7,89	-	100,00

briquette 73,58 g/p.c.
wastage, 105^0C/2h 0,86 %

EXPERIMENT 14

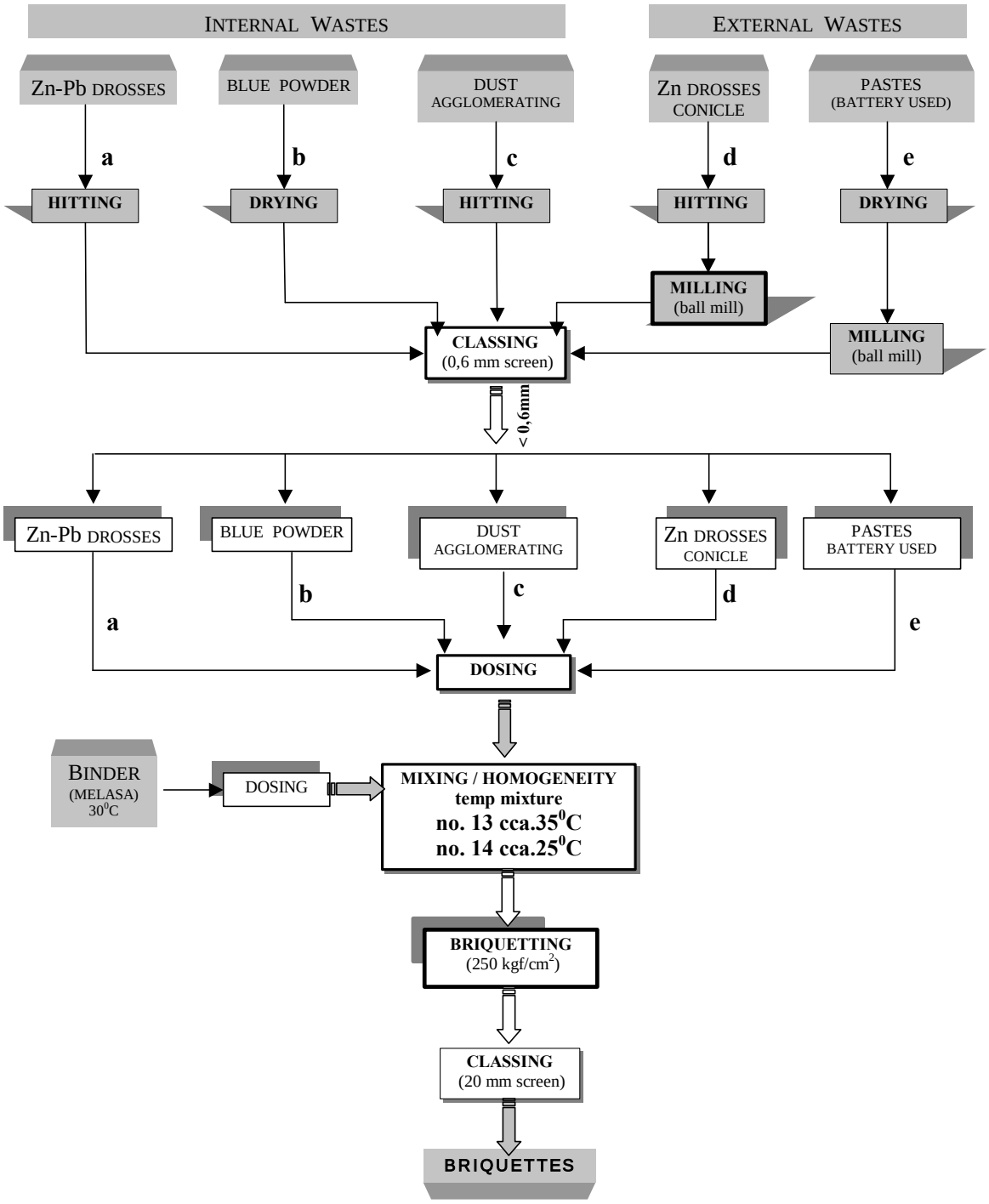
WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	0,6-0,2	<0,2
20%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	86,21%	13,79%
20%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	60,00%	40,00%
20%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	84,53%	15,47%
20%	Zn dross conicle	75,60	0,74	0,00	0,21	0,00	0,30	0,09	0,04	75,44%	24,56%
20%	Pastes	0,75	70,22	0,02	0,12	7,02	1,23	1,42	0,71	83,33%	16,67%
mixture wastes chemical composition, (%)		34,82	32,12	0,23	3,10	7,10	1,49	2,28	1,37	77,90%	22,10%

Mixture	Mixture for briquetting									Amount	
	Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)	12,19	11,24	0,08	1,08	2,49	0,52	0,80	0,48		35,00	92,11
2.Binder, (kg)									3,00	3,00	7,89

Amount	(kg)	12,19	11,24	0,08	1,08	2,49	0,52	0,80	0,48	3,00	38,00	-
	(%)	32,07	29,58	0,21	2,85	6,54	1,37	2,10	1,26	7,89	-	100,00

briquette 73,86 g/p.c.
wastage, 105^0C/2h 0,92 %

FIG. 6 FLOWSHEET V
environmental temp: (-8^0C) ÷ (-13^0C)



Briquetting press experiment no. 15 - Flowsheet fig. 7

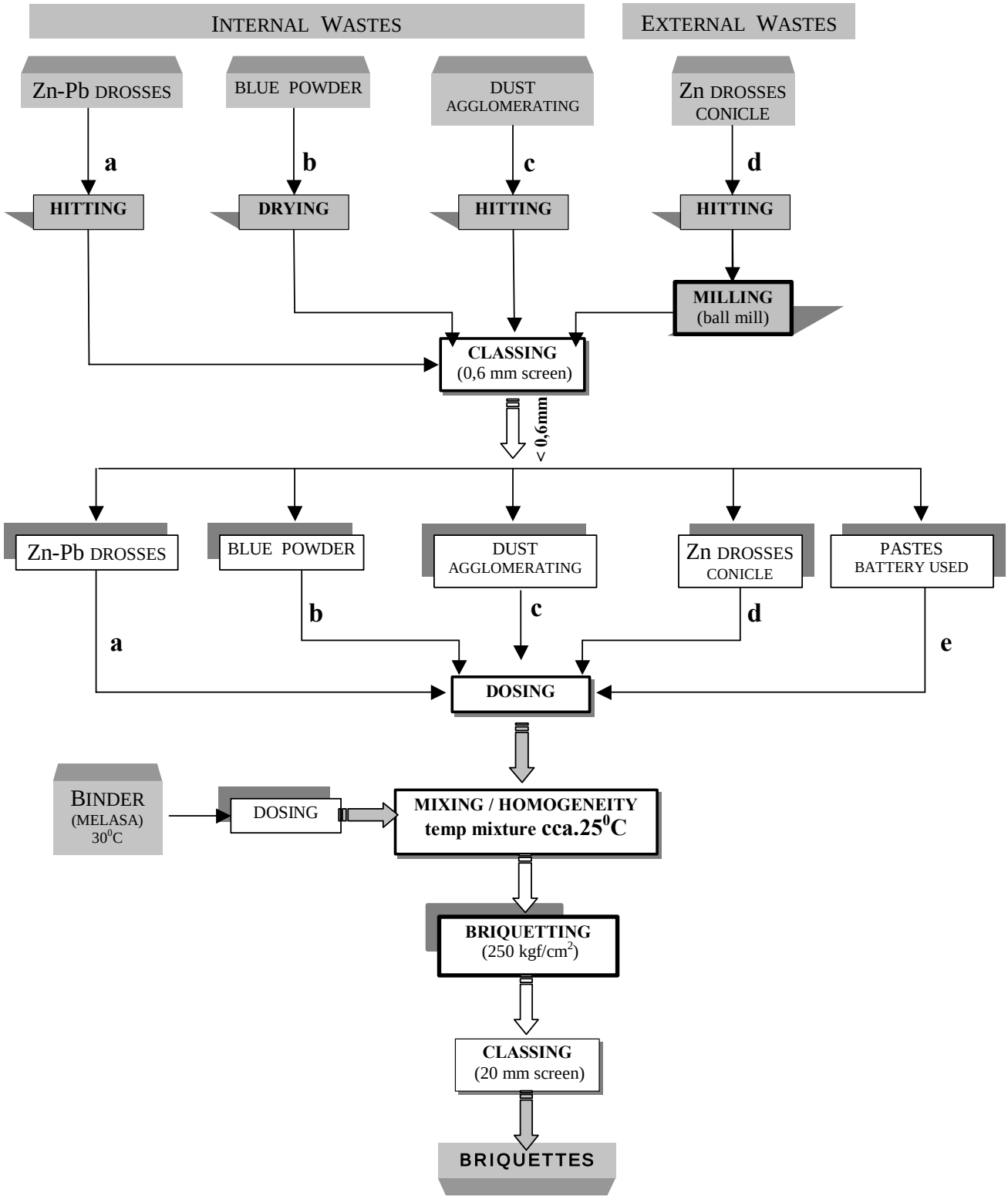
EXPERIMENT 15

WASTE		Analysis, (%)								(mm)	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	0,6-0,2	<0,2
20%	Zn-Pb drosses	35,30	34,90	0,28	4,15	2,96	4,40	5,80	2,45	86,21%	13,79%
40%	Blue Powder	21,26	39,23	0,21	3,08	7,23	1,21	1,50	1,34	60,00%	40,00%
20%	Dust agglomerating	41,20	15,50	0,63	7,93	18,31	0,30	2,58	2,31	84,53%	15,47%
20%	Zn dross conicle	75,60	0,74	0,002	0,21	0,00	0,30	0,09	0,04	75,44%	24,56%
mixture wastes chemical composition, (%)		38,92	25,92	0,27	3,69	7,15	1,48	2,29	1,50	73,24%	26,76%

Mixture		Mixture for briquetting									Amount	
		Zn	Pb	Cu	Fe	S	H_2O	SiO_2	CaO	binder	kg	%
1.Waste, (kg)		15,57	10,37	0,11	1,48	2,86	0,59	0,92	0,60		40,00	89,89
2.Binder, (kg)										4,50	4,50	10,11
Amount	(kg)	15,57	10,37	0,11	1,48	2,86	0,59	0,92	0,60	15,57	44,50	-
	(%)	34,99	23,30	0,24	3,32	6,42	1,33	2,06	1,35	34,99	-	100,00

briquette 62,33 g/p.c.
wastage, 105^0C/2h 1,36 %

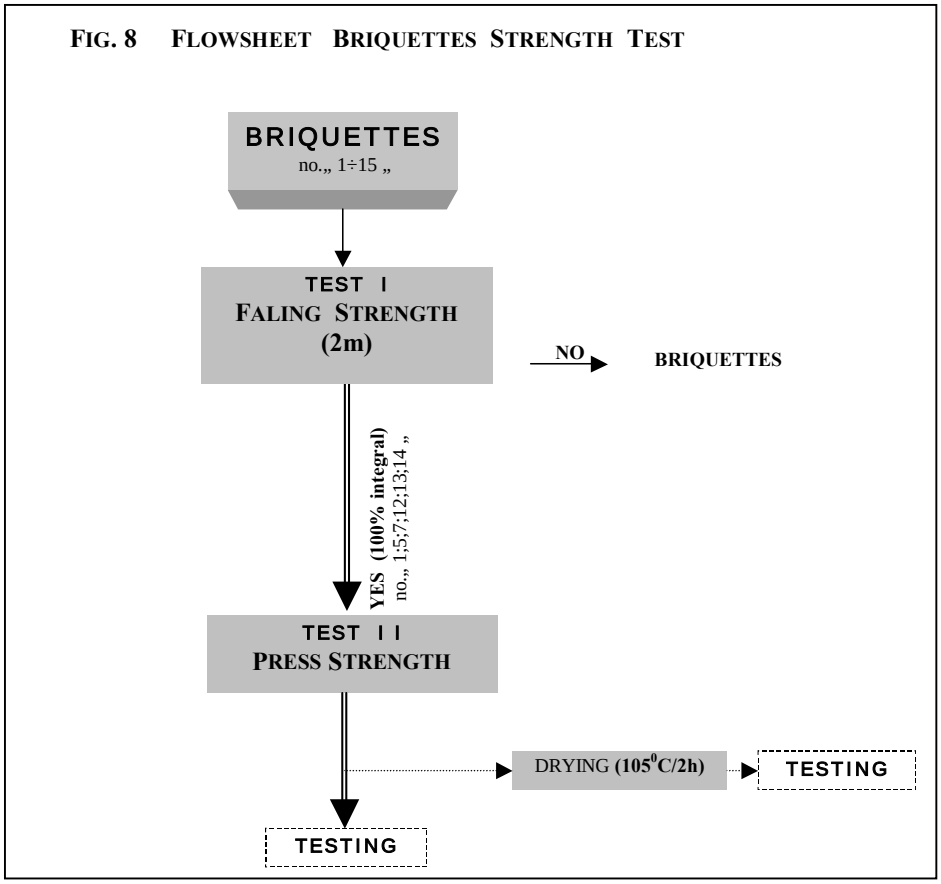
FIG. 7 FLOWSHEET VI
environmental temp: (-6^{0}C) ÷ (-10^{0}C)



CHAPTER III

3.1 Briquette Test Strength

FIG. 8 FLOWSHEET BRIQUETTES STRENGTH TEST



Rasult of test I

briquette no.		**1**	2	3	4	**5**	6	**7**	8
a	Zn-Pb drosses	100%	-	50%	50%	50%	20%	40%	50%
b	Blue powder	-	100%	50%	-	-	20%	10%	50%
c	Dust Agglomerating	-	-	-	-	-	20%	10%	-
d	Zn dross-conical	-	-	-	50%	-	20%	20%	-
e	Pastes	-	-	-	-	50%	20%	20%	-
1	mixture wastes, kg	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0
2	binder, kg	2,5	3,5	3,0	3,0	3,0	3,0	3,0	3,0
	mixture for briquetting, kg	52,5	53,5	53,0	53,0	53,0	53,0	53,0	53,0
test I -faling strength (2m)		**yes**	no	no	no	**yes**	no	**yes**	no

briquette no.		9	10	11	**12**	**13**	**14**	15
a	Zn-Pb drosses	-	30%	30%	20%	20%	20%	20%
b	Blue powder	70%	60%	40%	20%	20%	20%	40%
c	Dust Agglomerating	30%	10%	10%	20%	20%	20%	20%
d	Zn dross-conical	-	-	10%	20%	20%	20%	20%
e	Pastes	-	-	10%	20%	20%	20%	-
1	mixture wastes, kg	50,0	50,0	50,0	35,0	35,0	35,0	40,0
2	binder, kg	3,0	3,0	3,0	3,0	3,0	3,0	4,5
	mixture for briquetting, kg	53,0	53,0	53,0	38,0	38,0	38,0	44,5
test I -faling strength (2m)		no	no	no	**yes**	**yes**	**yes**	no

Result of test II

Briquette no. **PHOTO ANNEX II**	**1**	**5**	**7**	**12**	**13**	**14**
Mixture wasstes						
a. Zn-Pb drosses	100%	50%	40%	20%	20%	20%
b. Blue powder	-	-	10%	20%	20%	40%
c. Dust Agglomerating		-	10%	20%	20%	20%
d. Zn dross-conical	-	-	20%	20%	20%	20%
e. Pastes	-	50%	20%	20%	20%	-
Press strength (daN/p.c.) - Briquette						
briquette no.1	275	210	170	76	50	48
briquette no.2	262	220	172	70	46	45
briquette no.3	230	164	165	71	52	50
briquette no.4	270	218	170	74	60	50
briquette no.5	265	185	160	72	55	52
average	**260,4**	**199,4**	**167,4**	**72,6**	**52,6**	**49**
Press strength (daN/p.c.) – Briquette (105^0C/2h)						
briquette no.1	212	110	98	46	40	32
briquette no.2	220	108	103	52	32	30
briquette no.3	205	112	97	42	36	30
briquette no.4	207	108	100	50	26	34
briquette no.5	212	107	95	51	34	32
average	**211,2**	**109,0**	**98,6**	**48,2**	**33,6**	**31,6**

Observations						
FLOWSHEET no.	I	I	I	IV	V	V
mixture wastes, (kg)	50,0	50,0	50,0	35,0	35,0	4,.0
binder, (kg)	2,5	3,0	3,0	3,0	3,0	4,5
mixture for briquetting, (kg)	52,5	53,0	53,0	38,0	38,0	44,5
binder, (%) in mixture	4,76	5,66	5,66	7,89	7,89	10,11
environmental temp (^{0}C)	-17	-17	-17	-10	-10	-8
mixture temp (^{0}C)	-10	-10	-10	35	25	25
Wastes under 3 mm						
Wastes under 0,6mm						

3.2 Briquette and I.S.P. Technology to SOMETRA

Raw material to I.S.P. blast furnace is sinter.

The sinter discharge in I.S.P. blast furnace- SOMETRA is cca. 19,79 t/h.

Sinter chemical composition at SOMETRA is following (%)

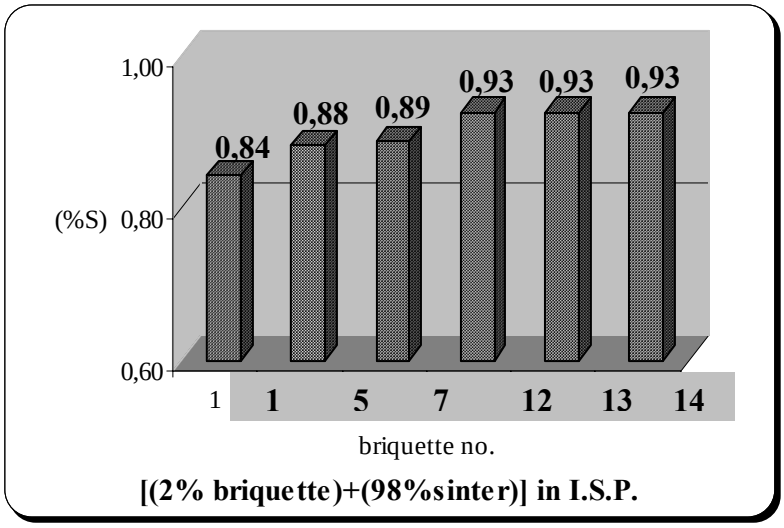
Zn	Pb	Cu	Fe	S	CaO	SiO2
42,00	19,00	0,60	8,20	0,80	5,40	4,60

I.S.P. technology – **chief** condition : raw material for I.S.P. blast furnace - **max. 1% S**

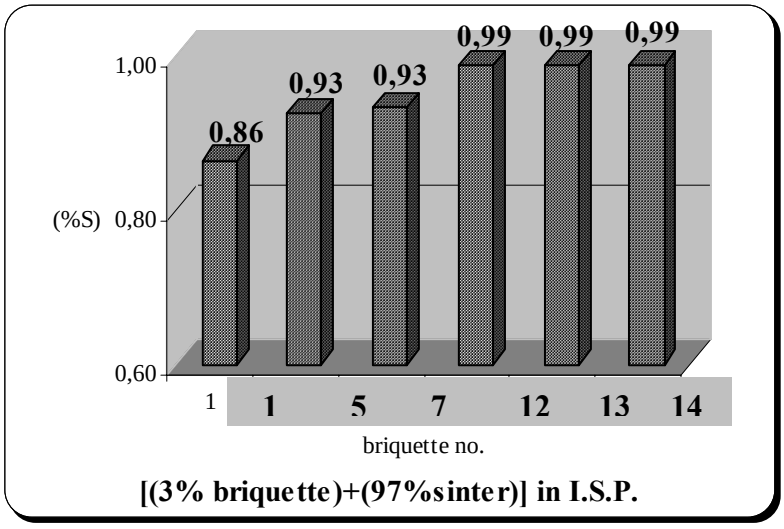
Utilize briquettes, **chief** condition : raw material **[(%briquettes)+(%sinter)] ≤ 1% S**

Internal wastes utilized to mixture for briquetting have high and very high sulphur content, but and pastes battery used (external waste) have high content (cca. 6%S)

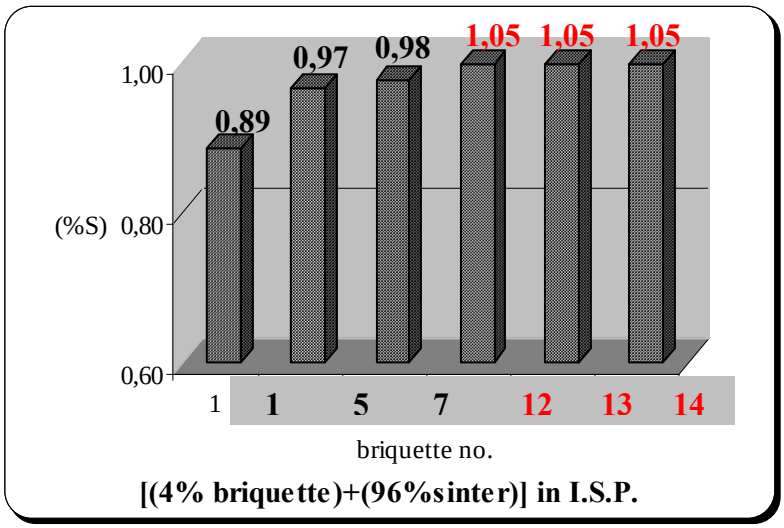
	(%) S					
Briquette no.	1	5	7	12	13	14
(2%briquettes) + (98%sinter)	0,84	0,88	0,89	0,93	0,93	0,93
(3%briquettes) + (97%sinter)	0,86	0,93	0,93	0,99	0,99	0,99
(4%briquettes) + (96%sinter)	0,89	0,97	0,98	1,05	1,05	1,05



[(2% briquette)+(98%sinter)] in I.S.P.



[(3% briquette)+(97%sinter)] in I.S.P.



[(4% briquette)+(96%sinter)] in I.S.P.

FIG. 9

CHAPTER IV

4.1 CONCLUSIONS

The tests realized in the period January-march due to cold briquetting with binder demonstrate follower:

For the preliminary tests perform at the environmental temperature (-150C) on a various kind of mixtures type shows that crushing strength is the high limits approaches to the crushing strength of the cocks. From point of view of the briquetting process the problem that occurs was the bonding phenomena of the row materials on the alveoli wall. By heating of row materials and the pressing machine, and bringing them at the normal temperatures (25 C) for the mixtures and 9-10 C for the environment we have obtain superior briquettes (90% briquette materials, 10% partially briquette) at the same values of the crushing strength.

The experiment also shows that high values of the crushing strength can be obtain when we use min 50% Zn-Pb waste.

Proposals

We have to continue the cold experiments when the temperatures of the environment will be at least 10-15 C to briquette the existents materials.

The both sides will establish when the hot briquetting experiments will continue.