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JL. Teramazzo

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RAWMET COBALTOUS CONCENTRATE ROASTING

Pilot assay results

Translated from French,

by Bernard J. Maurette,
March 20, 1987.

INTRODUCTION

In order to continue the objective of diversification of the supplies for the ESTAQUE processing plant, we have tested, in our laboratory at the end of 1984 and in May 1985, the attitude to roasting of cobaltous samples called " RAWMET " (1, 2).

We have received in December 1985 a new batch of around 120 kgs to allow us verifying its attitude to roasting, this time at the pilot level.

The results of these last assays are the subject of this report.

1 - PERFORMED ASSAY HISTORY

The characteristics of all the samples have been grouped as per the presentation below:

Samples	Analyses					Gan gue %	Granulo metry D-80	Assays
	Co	As	S	Fe	Au			
Bulk	4.2	29	5.2	14.1	21 g/T	48	5 mm	Nov.84
Flotation concentrate	6.4	52.1	4.6	20.5	26 g/T	17	100 μ m	May 85 Lab.
Ore	4.1	31.6	10.6	20.6	36 g/T	33	20 mm	Dec.85 Lab.

Considering the product granulometry, the gangue percentage, and their analyses (mainly S and As), we note that the assays were performed on three samples clearly different.

2 - PRODUCT PREPARATION

The received batch was a bulk with a granulometry of maximum 15-20 mm, which we had crushed to 2.5 mm (with a cylinder crusher), followed by a fine crushing with a pendulous crusher.

Then, we performed a sieving to obtain a product smaller than 400 μ m, (as a reference, the granulometric analysis is annexed herewith).

D-80 = 330 μm

D-50 = 200 μm

which give us a granulometry slightly superior to usual conditions.

3 - LABORATORY ASSAYS

These assays have been performed for

- to verify the arsenic elimination performance,
- to establish that there was no risk of fritting on the fluidized bed.

These assays have given the following analysis:

	Fe%	As%	S%	Co%	As :Elimina- :tion %	Si :Elimina- :tion %	Loss :of :weight :%
:Raw product:	21.3	33.1	11.7	4.6			
:Roasted : 700° C	27.7	13.5	0.5	5.8	67.64	96.58	25
: Roasted : 800° C	30.8	8.0	1.5	6.3	82.48	89.83	30

As we shall see further down, these assays are similar to those performed in January and May 1985.

4 - PILOT TEST CONDITIONS

Four assays have been realized:

- two in selective regime, at 700 and 800 C,
- two in oxidizing regime, at the same temperatures.

Temperatures	Selective air/QS		Oxidizing air/QS	
700° C	No 2	0.95	No 3	1.33
800° C	No 4	1.0	No 1	1.27

5 - ATTITUDE TO ROASTING, RESULTS STUDY

As for the previous samples, the components, off gangue, as shown by the X-Ray Diffraction, are essentially (Co,Fe)As₂, FeAs₂ and FeAsS.

The exothermicity of these products is relatively low, (between 0.7 and 0.8 th/Kg) compared to that of BOURNELX (1.1 th/Kg).

The detailed results of each assay are annexed herewith. We shall evaluate here the obtained results, comparing them with the results obtained from the samples of January and May 1985.

		Ore - Dec.85	May 85	Nov.84
Regime		Selective	Oxidizing	Oxidizing
:700° C:	Arsenic elimination %	68	67	-
	Sulfur elimination %	88	90	-
	Calcine analysis:			
	Co %	5.3	5.3	-
	As %	13.8	13.8	-
	S %	1.9	1.4	-
	Au g/T	-	-	-
	As ₂ O ₃ /T - in	284	280	-
	Calcine/T - in	690	690	-
				271 kg
			747 kg	
:800° C:	Arsenic elimination %	72	76	80
	Sulfur elimination %	97	98	95
	Calcine analysis:			
	Co %	5.5	5.0	10.2
	As %	12.4	12.0	16.4
	S %	0.4	0.4	0.33
	Au g/T	80.0	-	55.0
	As ₂ O ₃ /T - in	300	317	550 kg
	Calcine/T - in	670	610	650 kg
				28
			720	

Globally speaking, we see that the assays in selective regime (air/QS around 1) and in oxidizing regime (air/QS around 1, 3) are giving very close results and that the best assays are those performed at 800° C.

The rather high content of arsenic in the calcines is due to the formation of cobalt arsenide (CoAs₂), and of iron diarsenide (FeAs₂), which it is impossible to avoid with a mix of air/QS close to 1.

This mix point is difficultly improvable considering the weak exothermicity of the product.

GRANULOMETRIC ANALYSIS

Here, we are comparing the granulometry evolution of the final bed of the assay No 3 oxidizing 700° C, of the assay No 4 selective 800° C, with the raw ore as received, (the granulometric curves appear in the annexe).

	Raw ore	Assay No3	Assay No 4
D 80	330 μm	330 μm	285 μm
D 50	200 μm	260 μm	205 μm

We note that there is no densification of the final bed, so the fluidization of this product does not present any problem.

Moreover, we note that with a fluidization speed of 35 cm/s, the diameter of the flying cut-off is 80 μm.

6 - CONCLUSIONS

The absence of fritting and densification of the final bed allow us to say that the passage of this product in fluidized bed does not present any problem.

The best results of our roasting assays have been obtained at a temperature of 800° C in selective regime (air/QS around 1); the exothermicity of this product is weak: in the order of 0.7 to 0.8 th/Kg.

The roasting of a tonne of this product should allow the recovery of 670 Kg of calcine and of 300 Kg of As₂O₃.

REFERENCES

- 1 - Report from J.Dailly, No 52.84.295.JD.dp, October 1,1984,
- 2 - Report from J.dailly, No 52.85.9.JD.bs, January 30,1985.

ANNEXES

Rawmet Ore Roasting

Assay # 3 DATE 16 1 86

CONDITIONS

Time	Speed	Flow	TEMPERATURE	Air/Ore
7 H 33 MN	35 CM/S	2.40 KG/H	700 C	1.40 NM3/KG

In

	MASS	Iron		ARSENIC		Sulfur		COBALT	
		%	KG	%	KG	%	KG	%	KG
Bed	4.70	32.90	1.55	12.10	0.57	1.00	0.05	5.80	0.27
Raw	17.80	20.80	3.70	30.40	5.41	10.00	1.78	4.10	0.73
TOTAL	22.50		5.25		5.98		1.83		1.00

Out

	Mass	Iron		ARSENIC		Sulfur		COBALT	
		%	KG	%	KG	%	KG	%	KG
O-F1	0.53	28.30	0.15	13.20	0.07	1.40	0.01	4.60	0.02
O-F2	0.53	28.20	0.15	13.60	0.07	1.40	0.01	5.10	0.03
O-F3	0.92	28.10	0.26	13.60	0.13	1.40	0.01	4.90	0.05
O-F4	1.11	28.90	0.32	14.00	0.16	1.40	0.02	5.50	0.06
O-F5	1.22	28.30	0.35	13.80	0.17	1.40	0.02	5.50	0.07
Bed	9.90	30.20	2.99	14.20	1.41	1.30	0.13	5.60	0.55
TOTAL	14.21		4.21		2.00		0.19		0.78

	Iron	ARSENIC	Sulfur	COBALT
Out ----- %	80.28	33.39	10.35	77.72
In				

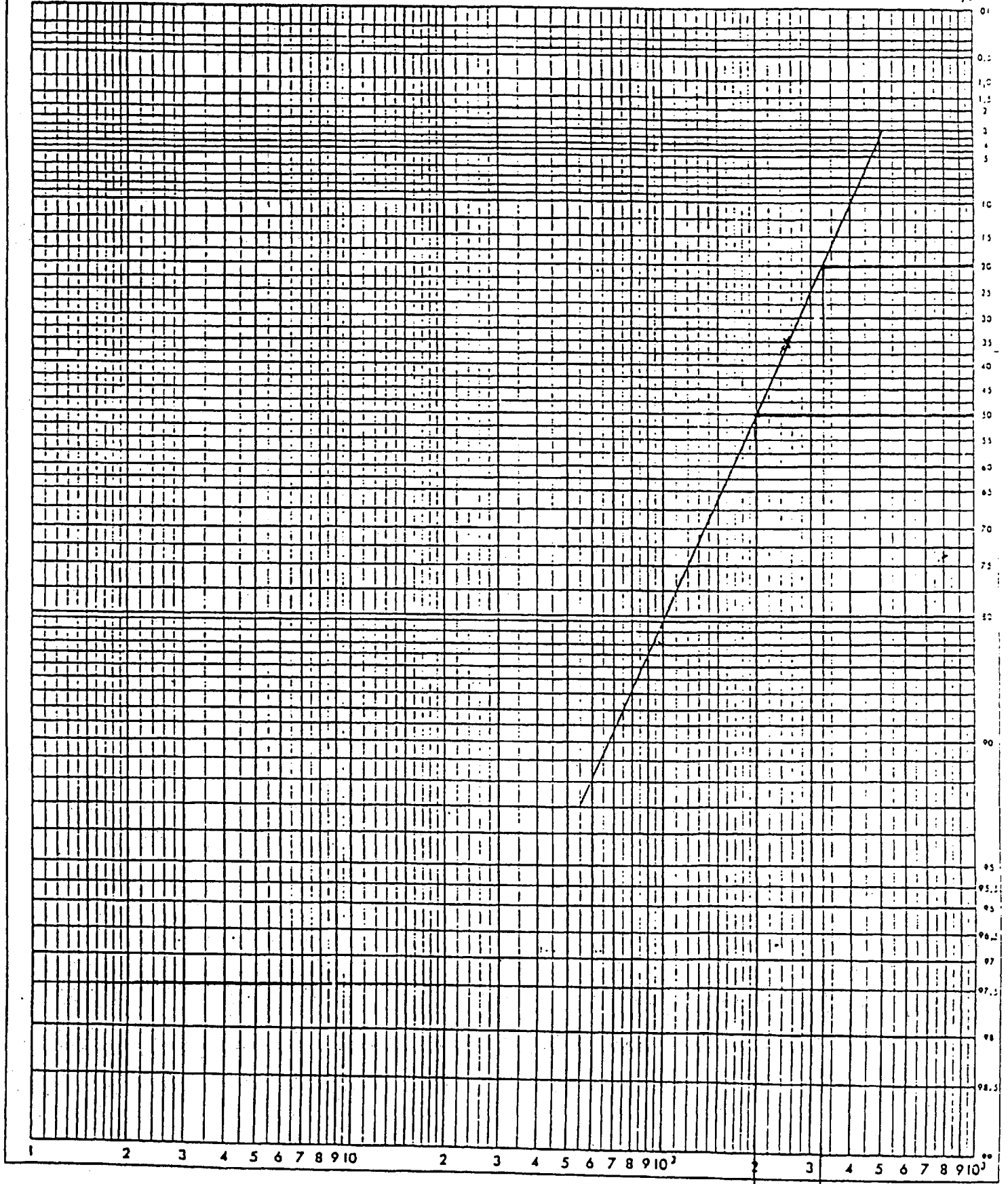
Flying Results Iron = 27.95
COBALT = 30.61

ARSENIC Sulfur
ELIMINATION on last O-F : 66.64 89.71
on final bed : 67.83 91.05

GRANULOMETRIC ANALYSIS
ANALYSE GRANULOMETRIQUE

ECHANTILLON : RAWMET CRU

Refus %



D50 D80

GRANULOMETRIC ANALYSIS
 ANALYSE GRANULOMETRIQUE

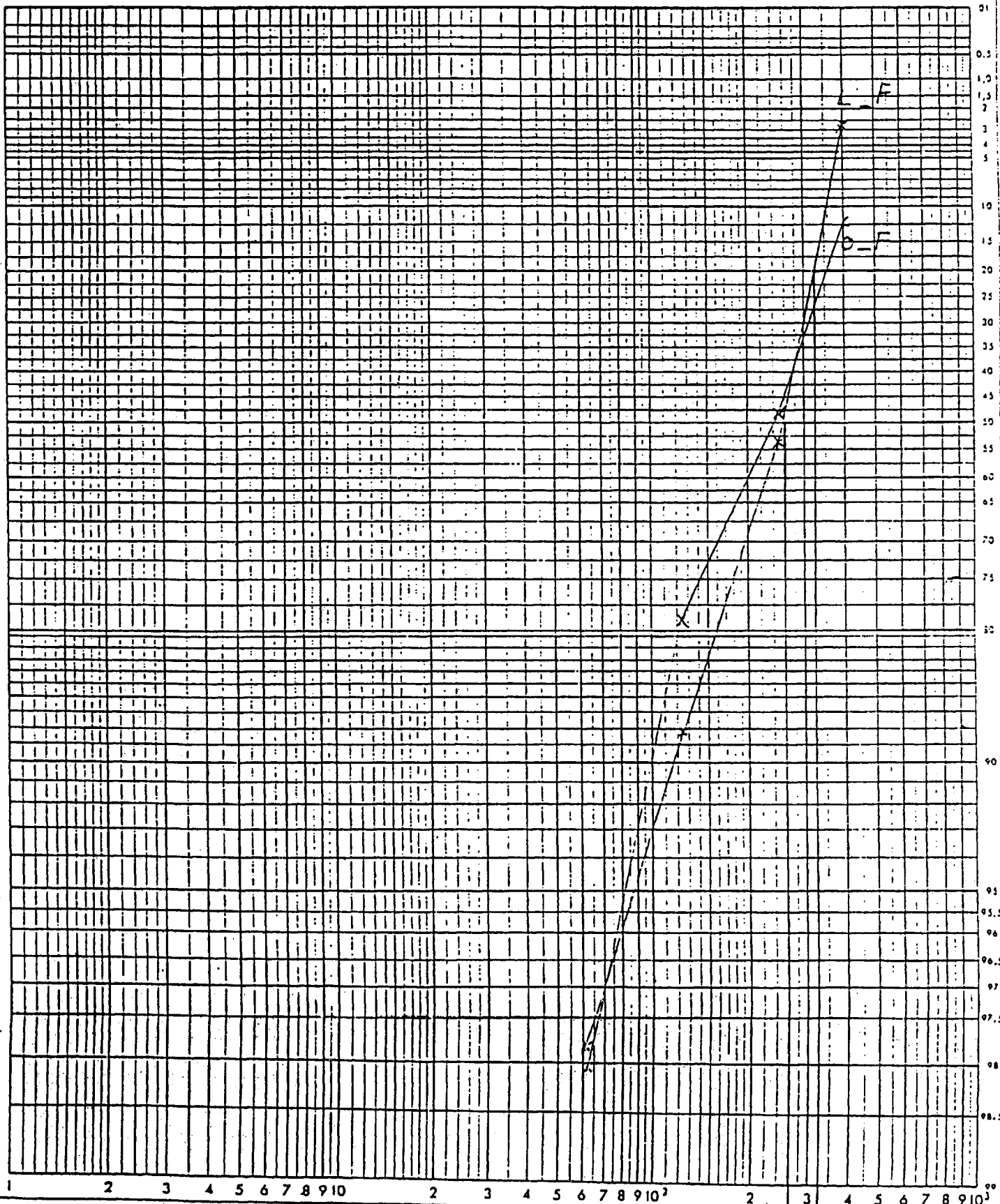
O-F over flow

L-F ~~the~~ finnet

FINAL BED

ECHANTILLON : RAWMET Essai 3

Refus %



D50 D80