

FALCONBRIDGE NICKEL MINES LIMITED

INTER OFFICE MEMORANDUM

MEMO TO: L.J. Connell

FROM: W.R. Hatch/L. Beky

DATE: August 8, 1979

SUBJECT: Two Stage Leaching of Giant Baghouse Dust
For Arsenious Oxide Purification PROJECT No. 201-790808

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ABSTRACT

A two stage leaching process is currently being considered for the purification of arsenious oxide from Giant baghouse dust. Leaching tests have shown that 99.2% of the soluble As_2O_3 can be leached in two stages operating #1 leach tank at saturation (70 g/L As_2O_3) and #2 leach tank at 40 g/L As_2O_3 . The remaining soluble As_2O_3 in the residue consists of occluded leach solution. It is proposed to treat this in a wash circuit with cottrell dust for removing the remaining soluble As_2O_3 .

INTRODUCTION

The purification of arsenious oxide by the hot water leach process is currently under investigation. In order to meet environmental limitations on arsenic discharge it is necessary to remove the soluble As_2O_3 in cottrell dust. Original plans were to add this cottrell dust to the baghouse dust in the arsenic leach circuit. This greatly increases the amount of solids to be handled and instead of reducing the arsenic discharge would in fact result in a wet residue containing a larger amount of soluble As_2O_3 .

Recent discussions at Giant favoured the treatment of high arsenic materials (baghouse dust) in the arsenic circuit followed by a separate wash circuit which would treat the arsenic leach residue plus the cottrell dust to remove the entrained and soluble As_2O_3 .

Testwork has been carried out to demonstrate the application of a 2 stage leaching flowsheet for high arsenic containing materials for the production of:

- a) a concentrated leach solution to be fed to the crystallizer,

(INTRODUCTION, Cont'd.)

and b) a "clean" leach residue containing entrained As_2O_3 solution to be fed to the wash circuit.

PROCEDURE

The simulation of the two stage leach process shown in Figure 1 was carried out leaching(1) baghouse dust in 40 g/L solution and leaching(2) the residue from stage 1 in 20 g/L recycle solution.

Three sets of leaching tests were carried out using various excess amounts of dust in stage 1 and leaching the residues from these in stage 2 to give a clean residue.

In test #1 forty grams of baghouse dust (A7649 - 92% soluble As_2O_3) was leached with 1.0 L of 40 g/L As_2O_3 solution at 98°C for 2 hrs at $\text{pH}^+ = 4.5$. The slurry was filtered and the filtrate volume measured and analyzed. The unwashed cake was transferred to the second stage leach in which the 22 g of wet cake was leached in 0.5 L of recycle solution (20 g/L As_2O_3) at the above conditions. The slurry was filtered and the unwashed cake containing ~30% moisture was dried and analyzed. The filtrate volume was measured and analyzed.

Test #2 was carried out in a similar manner to test #1 with the exception that a larger excess of dust (80 g/L) was added in the first stage. Only a portion of the first stage leach residue was treated in the second stage. Test #3 was a repeat of #2 but used 160 g dust/L in the first stage leach.

RESULTS

The results of the three 2-stage leaching tests were as follows.

Test #1Stage 1 Leach

| | <u>$\text{As}_2\text{O}_3(\text{g})$</u> |
|---|---|
| Input - 40 g dust at 94% soluble As_2O_3 | 37.6 |
| Feed solution to first stage (1.0 L @ 40 g/L) | <u>40.0</u> |
| | 77.6 |
| Output - Residue* (14.1 g at 82% As_2O_3 - dry basis) | 11.7 |
| Leach Solution (0.98 L at 67.2 g/L) | <u>65.9</u> |
| | 77.6 |

Stage 2 Leach

| | |
|--|-------------|
| Input - 14.1 g residue (22 g wet cake) | 11.7 |
| Feed Solution (0.5 L @ 20 g/L) | <u>10.0</u> |
| | 21.7 |

(RESULTS, Cont'd.)

Output - 2.5 g residue @ 12.3% As_2O_3
Leach solution (0.45 L @ 42.4 g/L)

 $\text{As}_2\text{O}_3(\text{g})$

0.3

19.1

19.4

Percentage Soluble As_2O_3 Leached = 99.2

* Calculated Value

Test #2Stage 1 Leach $\text{As}_2\text{O}_3(\text{g})$

Input - 64 g dust at 94% soluble As_2O_3
Feed solution to first stage (0.8 L @ 40 g/L)

60.2

32.0

92.2

Output - Leach solution (0.77 L @ 64 g/L)
Residue* (47 g @ 91.2% As_2O_3)

49.3

42.9

92.2

Stage 2 Leach

Input - 25.2 g residue (29 g wet cake)
Feed Solution (1.0 L @ 20 g/L As_2O_3)

23.0

20.0

43.0

Output - 2.5 g residue @ 11.5 % As_2O_3
Leach solution (0.99 L @ 40.8 g/L)

0.3

40.4

40.7

Percentage soluble As_2O_3 leached assuming
all material treated in second stage
= 99.1

Test #3Stage 1 Leach $\text{As}_2\text{O}_3(\text{g})$

Input - 80 g dust at 94% soluble As_2O_3
Feed solution to first stage (0.5 L @ 40 g/L)

75.3

20.0

95.3

(RESULTS, Cont'd.)

Output - Residue* (63 g at 92.5% As_2O_3)
Leach solution (0.48 L @ 77.2 g/L)

As_2O_3 (g)
58.3
37.0
95.3

Stage 2 Leach

Input - 21.2 g residue (33 g wet cake)
Feed solution (1.0 L @ 20 g/L)

As_2O_3 (g)
19.6
20.0
39.6

Output - 2.0 g residue @ 9.5% As_2O_3
Leach solution (0.99 L @ 40.4)

0.2
40.0
40.2

Percentage soluble As_2O_3 leached assuming
all material treated in second stage =
99.2

CONCLUSIONS

It is evident from these leach tests that all soluble As_2O_3 can be leached from baghouse dust in a two stage leaching process. There is considerable flexibility in the first stage leach with respect to the amount of excess dust present during leaching. In all three tests the leach solution in the second stage was between 40.4 and 42.4 g/L. The efficiency of As_2O_3 extraction depends primarily on the concentration of As_2O_3 in the second stage and the amount of As_2O_3 contributed to the final residue by occluded solution. The final residue contains $\approx 25\%$ moisture which at 40 g/L As_2O_3 contributes about 10% As_2O_3 to the residue. Underflows from a thickener will contain higher moisture levels and correspondingly greater amounts of As_2O_3 . This represents however a relatively small amount of As_2O_3 which should be effectively removed in a washing circuit with cottrell dust.

WRH/lbm
Attach.

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for W.R. Hatch

FIGURE 1: Two Stage Leaching of Giant Baghouse Dust

