CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

Mines Branch Investigation Report IR 60-48

USE OF SOLUTION MONITOR ON BEAVERLODGE LEACH LIQUORS

by

G. G. EICHHOLZ and J. M. LEFEBVRE

Mineral Sciences Division

Copy No. 8

May 5, 1960

Mines Branch Investigation Report IR 60-48

USE OF SOLUTION MONITOR ON BEAVERLODGE LEACH LIQUORS

by

G.G. Eichholz[A] and J.M. Lefebvre[AA]

- - -

SUMMARY OF RESULTS

To test the potential usefulness of the continuous flow monitor for the control of leach liquors at the Beaverlodge plant of Eldorado Mining and Refining Limited, a few comparative runs were carried out with pregnant and barren solutions from Beaverlodge and synthetic uranium sulphate solutions. It was found that good readings were obtained for the high grade solution, but the barren solution, which contained 0.056 g/l U_3O_8 was indistinguishable from the background. pH values were 10.2 and 11.4 for the pregnant and barren solutions respectively. The solutions had to be filtered to remove some solids that were fouling the detector cell.

[A] Head, and [AA] Technician, Physics and Radiotracer Section, Mineral Sciences Division, Mines Branch, Department of Mines and Technical Surveys, Ottawa, Canada.

INTRODUCTION

Following the description of the continuous alpha monitor for uranium solutions (1) some interest was expressed in testing it with a variety of uranium leach liquors. One request came from Mr. R.J. Tremblay of Eldorado Mining and Refining Limited who asked for a test run on two Beaverlodge leach liquors. Two carboys were received from Beaverlodge towards the end of March containing a pregnant and a barren solution with the following solution assays (Letter of March 1, 1960).

TABLE 1

Beaverlodge Solution Assays (in g/l)

	Pregnant	Barren
Na_2CO_3	45	70
$NaHCO_3$	15	-
NaOH	-	6
Solution U_3O_8	3.0	0.07
Solid U_3O_8	-	0.02
Na_2SO_4	65	65
Solids	?	?
pH	9.5	>11.5

A 2 gallon sample of each of these solutions was passed through the monitor cell using a gravity feed and it was found at once that the solids contained in the solutions were dense

enough to foul the cell and to interfere with efficient detection. Consequently a portion of the solutions was filtered with diatomaceous earth and assayed. New U_3O_8 assays gave a value of 2.88 g/l for the pregnant liquor and 0.056 g/l for the barren solution.

The solutions were then run through the monitor cell again for about 30 minutes each, and compared with distilled water, for background, and three synthetic uranium sulphate solutions, run under identical conditions. To check the effect of time constant and discriminator level, the test runs were repeated, being run first with the Measurement Engineering ratemeter model AEP 1902 A, set at 20 db attenuator, and then with the Tracerlab ratemeter model SU 34. The 6292 photomultiplier in the monitor was operated at 900 volts.

The results obtained were transcribed from the recorder trace and averaged and are presented in Tables 2 and 3. Actual pH values were 10.2 for the pregnant and 11.4 for the barren solution.

TABLE 2

Solution Monitor Run on Beaverlodge Leach Liquors
MEL Ratemeter

Date	Sample	U_3O_8 content g/l	Range	Time const. sec	Reading cpm	net count cpm
April 26	Bgd.*		1K	14	100	
	No. 1 sol.	1.68			500	410
	Bgd.				80	
	No. 3 sol.	0.46			160	80 varying
	Bgd.				100	
	No. 5 sol.	0.31			200	80
	Bgd.				140	
	No. 5 sol.	0.31			230	90
	Bgd.				140	
	No. 3 sol.	0.46			230	90
	Bgd.				140	
	No. 1 sol.	1.68			640	510
	Bgd.				130 going down	
27	Bgd.				160	
	Barren	0.056			160	0
	Bgd.				160	
	Pregnant	2.88			850	685
	Bgd.	--			170	

* Background

TABLE 3

Solution Monitor Run on Beaverlodge Leach Liquors

Tracerlab Ratemeter

Date	Sample	U_3O_8 content g/l	Range	Time const. sec	Recorder reading	Count rate cpm	net count cpm
April 29	Bgd.		1K	10	9	90	
	No. 1 sol.	1.68	1K	10	28	280	220
	Bgd.		1K	10	6	60	
	No. 3 sol.	0.46	1K	10	10	100	
	"		250	10,40	42	105	40
	Bgd.		250	40	26	65	
	"		1K	10	5	50	
	No. 5 sol.	0.31	1K	10	9	90)	
	"		250	40,10	43	107)	50
	"		1K	10	10	100)	
	Bgd.		1K	10	8	contaminated	
	"		250	40,10	24	60	
	"		1K	10	4+	42	
	Barren	0.056	1K	10	5-	48)	
	"		250	40,10	27	67)	8
	"		1K	10	6	60)	
	Bgd.		1K	10	5	50	
	"		250	40,10	25	62	
	"		1K	10	4	40	
	Pregnant	2.88	1K	2.5,10	34	340	290
	Bgd.		1K	10	7	70	

DISCUSSION OF RESULTS

It is seen that some contamination of the cell took place as indicated by the steadily rising background in the first run (Table 2). In the second run longer background runs were taken resulting in steadier background readings. Under the conditions of operation the MEL ratemeter gave higher readings throughout and slightly superior sensitivity. The response was not linear, but vaguely proportional to the total uranium content. The barren solution was a little too low in uranium content to be detected with confidence against a fluctuating background, although the results in Table 3 show a slight, but barely significant indication above background.

It is evident that further tests with a number of carbonate leach solutions of intermediate uranium content are desirable. The results are not affected by any soluble reagent or impurity in the solutions, but the nature and effect of fine solid particles on the monitor may still have to be investigated. Any particulate matter that could settle out in the cell should clearly be avoided. Given these conditions the unit should be capable of giving a total U_3O_8 assay of the solution continuously for U_3O_8 contents above 0.1 g/l.

REFERENCE

1. G.G. Eichholz, "Continuous Monitoring of Uranium Leach Solutions", Mines Branch Research Report R 59; Mines Branch, Department of Mines and Technical Surveys, Ottawa, 1960.

- -

GGE:JML/DV