CANADA

DEPARTMENT OF MINES AND TECHNICAL SURVEYS

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 62-93

CONDUCTOMETRIC TESTS ON NORANDA LEACH PULP

by

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MINERAL SCIENCES DIVISION

COPY NO. 25

NOVEMBER 12, 1962

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SUMMARY OF RESULTS

A sample of Noranda leach pulp was tested in the pH range from 11.5 to 12.0 to establish the possibility of using the conductometric probe to control the concentration of lime in the pulp. Two runs were conducted at a temperature of 20°C and showed good correlation between pH and conductometric differential voltage. The sensitivity of the system appeared adequate to effect control at pH 11.8 to better than $\pm$ 0.1 pH. No excessive coating of the probe was observed, whereas the pH electrodes needed frequent washing and restandardizing.

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INTRODUCTION

At the request of Mr. B.P. Wallace, Assistant Metallurgist, Noranda Mines, Limited, tests have been done to determine the sensitivity and general suitability of a conductometric probe monitor, as compared to a pH meter and controller, in the treatment of pulp in the pyrite retreatment circuit.

A pulp sample was received on November 2, 1962, contained in a large polythene flask. The pulp had settled out solidly and was reconstituted almost completely after several hours of agitation on a set of heavy rollers. After that the sample was split into several parts, with each separate slurry sample being kept stirred until the end of the test work.

Typical composition of the liquid in such samples was given in a letter from Mr. Wallace, dated October 10, 1962 as follows (Table 1).

TABLE 1

Typical Circuit Solution Analyses

Assay		Jan. 27, 1960	Sept. 4, 1962
Au	oz/ton	trace	trace
Ag	"	0.0013	trace
Cu	gpl	< 0.02	0.0016
Fe	"	< 0.1	0.02
Na	"	0.125	0.064
K	"	0.063	0.015
Ca	"	0.11	0.71
Mg	"	n.d.	0.003
S	"	0.17	0.703
S^{--}	"	--	0.011
SO_4^{--}	"	0.17	0.60
S_2O_3	"	0.05	--
CO_3^{--}	"	0.040	0.23

The lime addition to the circuit was stated to vary between 20 and 50 lb/ton of circuit feed; the temperature range of the circuit is 60-80°F.

DETAILS OF TEST WORK

The solution was tested in a laboratory system similar to that used previously and shown in Figure 1. The main differences from those shown were the use of a compact transistor oscillator, delivering 3 watts, the use of a Brown circular chart recorder-controller with an input sensitivity of 35 mV full scale, and the employment of a temporary amplifier of gain 100, consisting of a Hewlett-Packard vacuum-tube voltmeter followed by a George A. Philbrick Researches Inc. operational amplifier type GAP/R Model K2-X. (Work is in progress to replace this amplifier combination by a simple, stable transistor amplifier). The conductometric probe itself had a primary of 25 turns and a secondary of 10,000 turns. It was coated only with clear Tygon paint.

The sample under test was placed in a 4-litre glass beaker, stirred constantly with a plastic stirrer and maintained at a temperature of 20° ± 0.5°C (68°F) by means of a constant temperature bath.

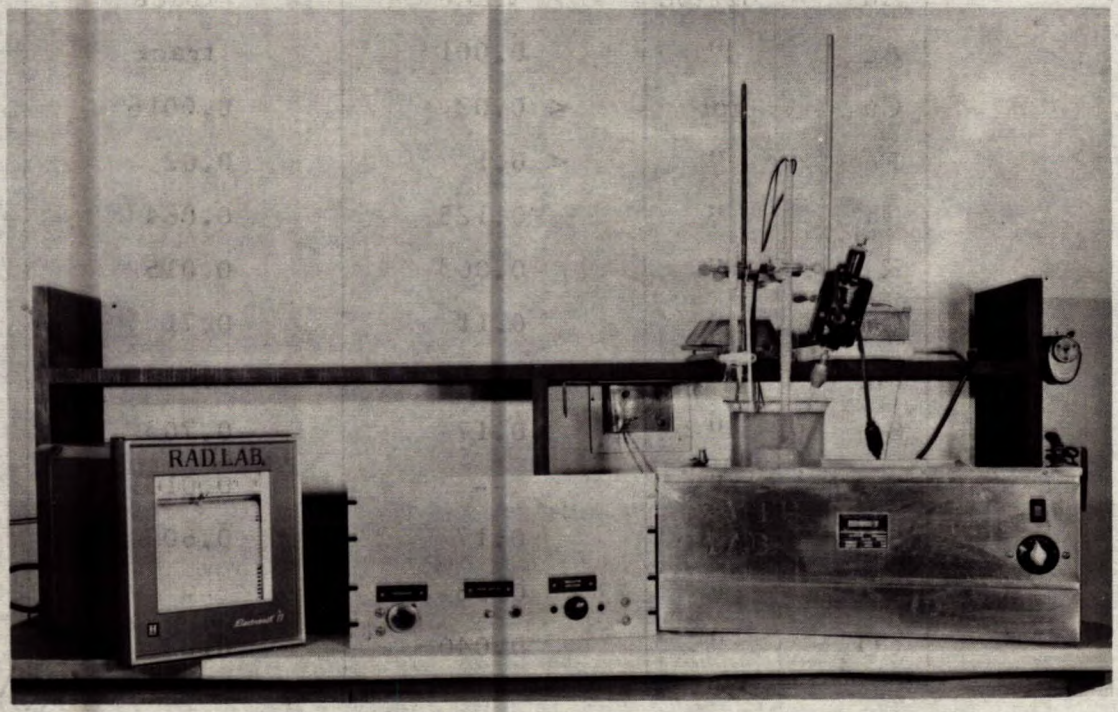

Figure 1. Photograph of typical laboratory test assembly.

The conductivity of the solution and sensitivity required were found to be comparable to those needed for control of lime in typical cyanide solutions encountered at various gold mines, on which work has been in progress. Previous difficulties with excessive drift of the equipment have been overcome, and Figure 2 shows the high stability in probe output obtained with the Noranda slurry, taken over a 16-hour period.

Two extended conductometric tests were done on two slurry samples. In both cases lime was added in aqueous solution in aliquots equivalent to 0.05 g/l. pH readings were obtained at intervals and marked on the recorder chart. Figure 3 shows the chart record of the second test run, done on November 7, 1962. In both cases variations in conductometric output were found equivalent to about five small chart divisions per 0.1 pH value. The changes in conductivity are well marked in both tests and clearly resolved from equipment noise and fluctuations, the first run being slightly superior in this respect. The pH readings were rather more difficult to obtain, as it was found that the slurry tended to cake on the electrodes, and the electrodes had to be restandardized frequently.

One feature that was observed in both tests was a consumption of the lime soon after addition, with a consequent fall in conductometric and pH readings, when working with a fresh slurry sample. After several further lime additions, the readings would tend to remain constant at the new pH and voltage level established, with some decrease in sensitivity to further lime additions.

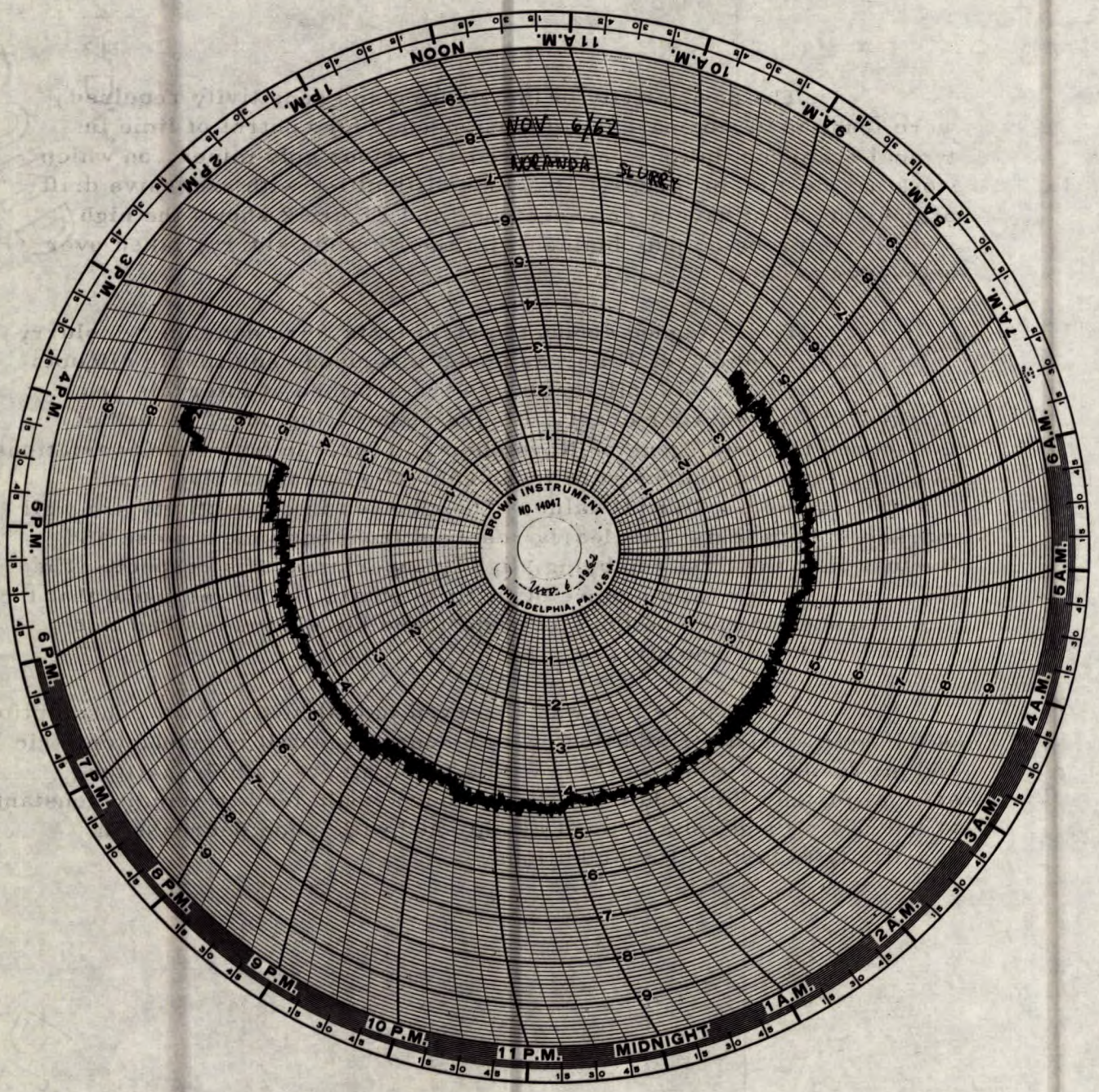

Figure 2. Overnight run, Noranda slurry, showing freedom from drift.

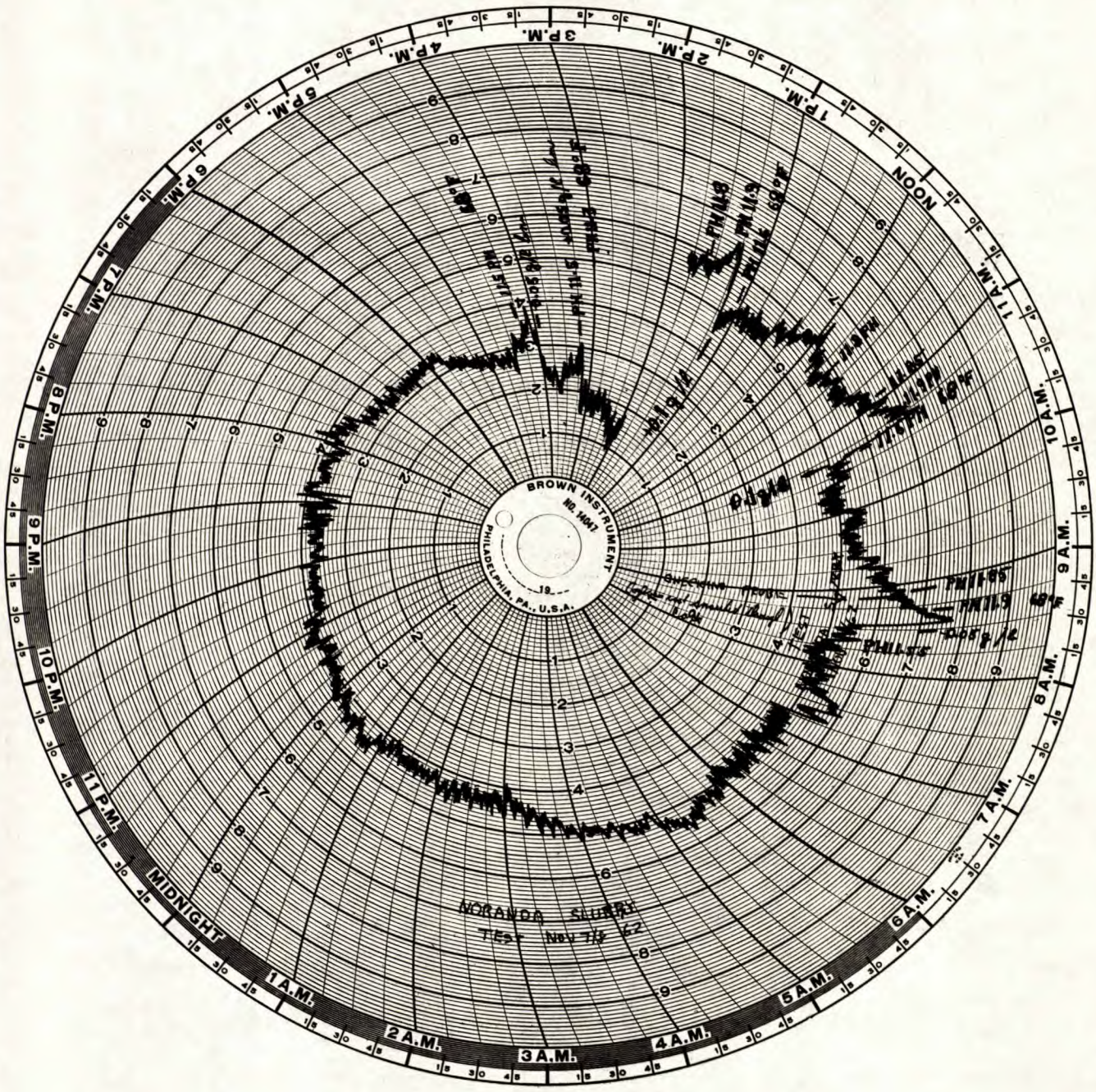

Figure 3. Chart record, test run No. 2, Noranda slurry.

CONCLUSIONS

The tests have demonstrated that the conductometric probe may be used to advantage to measure and control the addition of lime to pyrite treatment solutions of the type submitted. Both sensitivity and stability of the conductometric system were adequate for the purpose and superior to an equivalent pH meter over the pH range 11.5 to 12.0 employed. While the solution was being agitated there was no undue deposit of pulp on the probe itself and no deterioration of performance on that score. No difficulty would be expected in installing an industrial conductometric controller of comparable performance.

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