Countercurrent Decantation

Discussion of the paper of LUTHER B. EAMES, presented at the New York Meeting, February, 1917, and printed in *Bulletin* No. 120, December, 1916, pp. 2087 to 2101.

J. V. N. DORR, New York, N. Y.—I have read Mr. Eames' excellent paper on this subject with great interest, for besides being connected with the design and installation of the first modern countercurrent decantation plant, he was associated with me in the development of the thickener in the Black Hills some years earlier, and has now been operating the largest plant that has used this method of treatment. His discussion of the influence of different factors on the results obtained is quite thorough, but several features I think may not be apparent to the reader who has not studied the subject carefully.

1. *Grade of Ore That Can Be Treated.*—Mr. Eames has shown graphically that the assay of all solutions increases directly as the grade of the ore treated. He has not emphasized, however, the fact that, as most operators prefer to keep the assay of pregnant solutions down below a certain figure in order to insure complete precipitation, an increase in ore value beyond a certain point means a proportional increase in solution precipitated and therefore not only an increase in the percentage of dissolved gold recovered, but an actual descrease in tailing loss.

The importance of the influence of the percentage of moisture in the underflow on loss is made clear, and I may add that unless it is quite evident that pulp can be safely settled to 50 per cent. solids, or more, it is usually advisable to use a continuous filter at the end of a decantation plant to reduce losses in cyanide and gold.

Dissolution in Thickeners.—The influence of a change of solution on silver dissolution has long been emphasized and most gold operators have recognized the annoying way in which a gold ore after being agitated until nothing more can be dissolved will loosen up again when almost ready for the dump after the dissolved metal has been removed by decantation or filtration. Continuous decantation gives favorable conditions for this additional dissolution and a chance to recover most of what is thus dissolved. This is especially true if an extra tank is used in the series and barren solution added at the second tank from the end instead of the first, as shown in Mr. Eames' Fig. 1.

It can be calculated that the use of this tank will reduce the mechanical loss of cyanide by one-third and cut the gold loss as well; but the saving in gold or silver that may dissolve when the pulp is first diluted with weak solution may be as important.

At one plant in the Southwest, where one of the agitators was not in use as additional dissolution would not pay the cost of its operation, the

company found that 30 c. more was being dissolved in the decantation thickeners.

It has been pointed out that decantation alone should only be applied to suitable ores, but it is becoming well recognized that when filters are used one or more steps of countercurrent decantation should precede them, as the additional dissolution will more than pay operating expenses; also, the lower-grade solution going to the filter means lower filter costs and tailing losses.

The added cost of operating an additional thickener on the average ore is so low as to be difficult to estimate and may safely be placed at less than 1 c. per ton, including reasonable amortization.

Trays.—Mr. Eames has referred to the use of trays in decantation plants. I may say that one self-supporting tray giving double capacity has been in operation for some time in a 50-ft. tank and one for a 75-ft. tank has been designed.

Tanks with several trays are also in operation, so that the problem, especially apparent in cold climates, of large mill buildings for a decantation plant, is being rapidly solved.

The Function of Alumina in Slags

Discussion of the paper of CARL HENRICH, presented at the New York Meeting, February, 1917, and printed in *Bulletin* No. 119, November, 1916, pp. 2081 to 2086.

A. S. DWIGHT, New York, N. Y.—Mr. Henrich's paper is rather inconclusive as to the role that alumina really plays in slags. He gives a number of interesting instances of high alumina, with conclusions that he draws from the analyses, in the light of what he knows of the accompanying conditions, but the information given is hardly sufficient to permit intelligent criticism of these conclusions, for it is well known that the slag composition is not the only factor that can produce some of the furnace results favorable or disastrous, as the case may be, which he records. As a matter of fact, most metallurgists who have wrestled with this problem in connection with the smelting of lead and copper ores, usually arrived at some sort of a working hypothesis which met the local conditions fairly well, and then, being busy men, were inclined to leave the theoretical question very much as Mr. Henrich leaves it when he says: "A question with which I purpose dealing at some future time."

It is unfortunate that in the Golden Age of the smelting industry in the West, when we were all dealing with large tonnages of complex ores, often containing large percentages of alumina in combination with other refractory elements, the smelting companies were not generally equipped for research as they are today, and much experience that might have been