



Bergvesenet

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Rapportarkivet

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Tittel
Comments regarding flowsheet 1 for pilot plant

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Fagområde Oppredning	Dokument type	Forekomster (forekomst, gruvefelt, undersøkelsesfelt) Bidjovagge
Råstoffgruppe Malm/metall	Råstofftype Cu,	

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse
English translation of BV 7033
Description of the purpose of the flowsheet.
Purpose is bulk sulphide flotation which is supposed to give tailings with as little as possible Cu and a bulk-konc with lowest possible silicates (insolubles).

Kautokeino Kobberfelter

Comments regarding flow sheet 1 for pilot plant.

Test based on ore with following assay:

2.56% Cu		7.38% CuFeS_2
6.55% Fe	calculated	6.28% FeS_2
5.94% S	mineral	1.4 % Fe (in ankerite ^x)
76.4 % insoluble	composition	76.4 % insoluble

x) According to the assay of an ore sample with ca. 2.8% Cu there is estimated here to be 5-6% ankerite.

Sulfides in the ore amount to ca. 13 wt.%. According to batch tests it appears that most of the carbonate goes with the tailing in bulk flotation. However, since some of the silicate mineral (combined grains) float with the sulfides, the weight of the bulk conc. is estimated at 15% of the feed. The sulfides are first floated in a bulk-sulfide-conc. This bulk-sulfide-flotation is presumed to yield:

1. Tailing with the lowest possible copper content.
2. Bulk-conc. with the lowest possible content of undissolved mineral.

per. 1. Can be achieved by grinding to 65 mesh. Batch tests show in addition that the scavenger stage after rougher flotation lowers the copper content of the tailing.

per. 2. Is achieved only after grinding to 100 mesh using two cleaner stages in batch tests. The last condition is not expected to alter appreciably in continual tests in pilot scale. The cleaner tailings then go into the process as circulating loads. The pilot plant is assumed driven with a feed of 150 kg/h or 2.5 kg/min. The amount of feed is somewhat small with respect to the plants

capacity. However, in order to have as long a testing time as possible in the pilot plant, this rate of feed was chosen. The batch tests indicate that in order to obtain 2-3% undissolved in the bulk-iron, the ore must be ground to ca. 100 mesh.

Agitation and flotation time were both found to be ca. 10 minutes. With a feed of 150 kg/h and 25% solids in the overflow classifier, an agitation time has been calculated with of a little under 11 minutes in the conditions represented on the flow sheet.

Flotation time with 150 kg/h and 25% solids for the bulk-rougher flotation is calculated to 16 min. in 3.75-litre cells. Calculation here is according to gross cell volume and no consideration has been taken to cleaner tailing and scavenger conc. since these, according to batch tests, represent a relatively small amount, respectively ca. 3-4% and 2-3% of the feed. The flotation time in the scavenger stage is consequently also 16 min. and each cleaner stage has a flotation time of 6 min. Addition of water to the cleaner stages is controlled so that the tailing from the bulk-flotation contains max. 25% solids, min. 20% solids. Reduction to 20% solids in the tailing will reduce the flotation time by a little more than 3 min., from 16 to 13 min. If consideration is taken to cleaner tailing and scavenger conc., the flotation time with 20% solids in the tailing is set approximately at 10-12 min. each for the rougher flotation and the scavenger flotation. According to the batch tests this flotation time should be sufficient.

Reagents.

K-6-x, which froths pine oil, was used as collector. According to the batch tests, the following quantities are estimated:

Rougher flotation	ca. 50 g/t	K-6-x
Scavenger flotation	* 30 *	* *

The amount of pine oil must be sufficient to produce frothing in the last scavenger cell and is estimated at 30-40 g/t.

Cu-flotation.

The flowsheet for the plant is built upon the following principles: A considerable part of the chalcopyrite is floated and re-floated in a circuit with relatively high pH. The rest of the chalcopyrite is floated in a circuit with lower pH, and the portion that floats here is after cleaning brought into the first circuit with higher pH. In circuit 1 with high pH the aim is to obtain a Cu-conc. with relatively high copper content. In circuit 2 with lower pH the aim is to obtain a Fe-conc. with the lowest possible copper content.

The concentrate from the bulk flotation will amount to ca. 15% of the feed in the present sample, according to batch tests. With addition of water to the bulk-conc. with ca. 10% solids, an agitation time with CaO of a little over 16 min. is achieved. CaO is added until the pH is 11.5 (perhaps the pH should be a little higher). In Cu-rougher flotation with 10% solids in the pulp, a flotation time of a little over 8 min. is achieved. This flotation time is possibly too long, in which case the flow sheet must be arranged such that the Cu-rougher flotation can be carried out in one of the 18-1 Denver cells. The other 18-1 Denver cell, which is labeled "ingen flotation" (no flotation), must be used as a cleaned cell for the Cu-rougher concentrate. The tailing from the Cu-rougher flotation goes to a double cell with a combined cell volume of 60 l. The cell is run at a low pulp level and as much air as possible is given the cell without causing flotation. The purpose of this air blowing is in part to cause a change in the flotation properties of the pyrite particles and in part to achieve a sinking in the pH of the pulp before the Cu-scavenger flotation. A flotation time of a little over 30 minutes is assumed for the Cu-scavenger flotation. The scavenger concentrate is assumed cleaned twice in order to bring as little xanthate as possible back into the first circuit. Possibly a little collector must be added in the last scavenger cell in order to lift the last remains of the chalcopyrite and it is also possible that a little frother must be added. Addition

of water to the Cu-system is adjusted such that the system works with 10% solids in all stages.

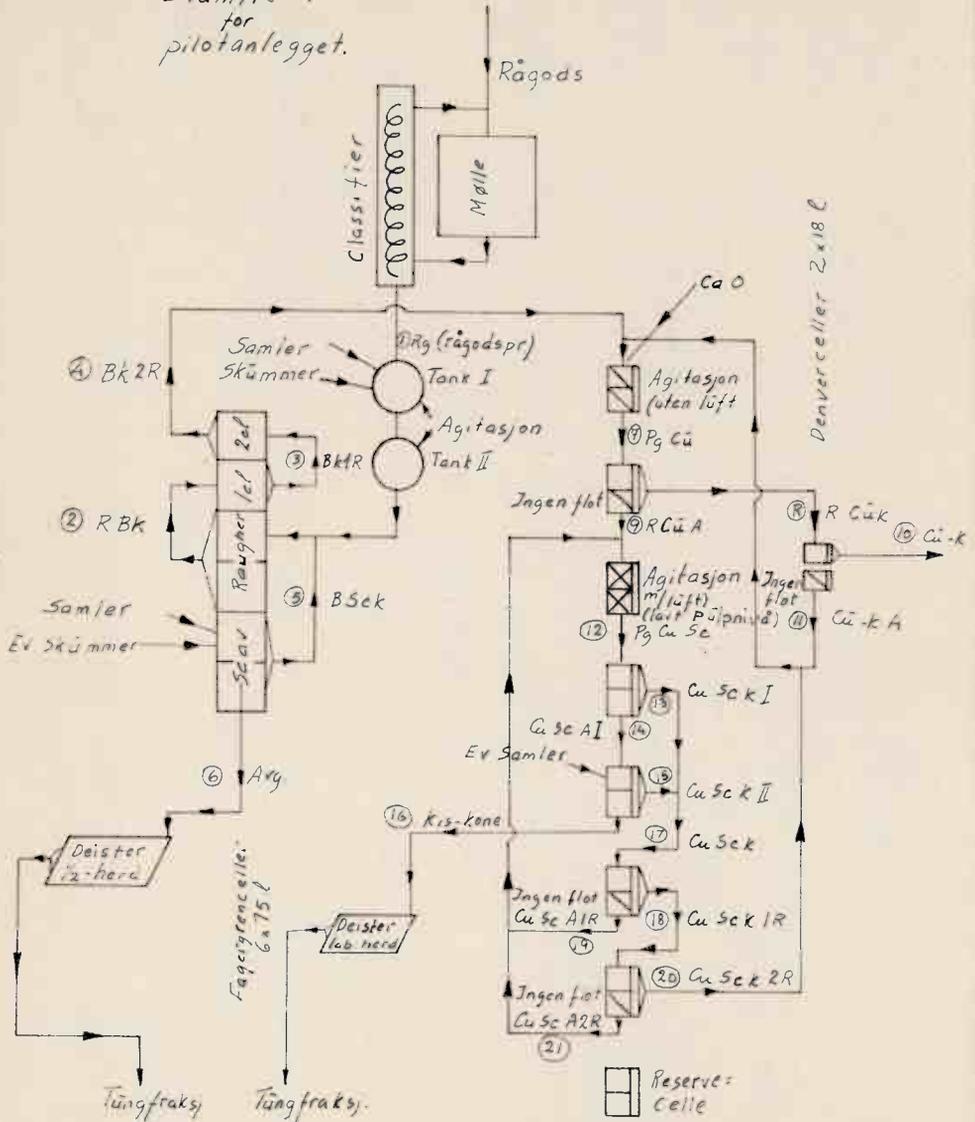
Attached is flow sheet 1 and the sampling form.

Ore Dressing Laboratory, March 19, 1959

Sign.

Käutokeino kobberfelter

Stamtreen 1
for
pilotanlegget.



Reserve-
Celle

Sala celler
8 (2x30l)

Oppdr. lab. N.T.H.
9/3-59

114

Kautokaino kobberfelter

Stamtreet for pilotanlegget.

Skjema for prøvetaking:

Prøve		Produkt	Anm.	For beregn. utv.
Nr.	mrk			
1	Rg	Ragods	Bulke-flotasjon	x Rg
2	R 3k	Rougner Bulke kone		
3	Bk 1R	Bulke-kone, rensset 1g		
4	Bk 2R	" " " " 2"		
5	Bsck	Bulke flot scavanger kone		
6	Avg	" " avgang		
7	Pg Cu	Pagang Cu-flot.	Cu-flotasjon	
8	R Cu k	Rougner Cu-kone		
9	R Cu A	" " Cu flot-avgang		
10	Cu-k	Cu-kone (renset 1g)		
11	Cu k A	Avg. 1g. Cu-rensing		
12	Pa Cu Sc	Pagang Cu-Scavanger flot		
13	Cu Sc k I	Cu-scavkone celle I		
14	Cu Sc A I	" " flot Avg. " I		
15	Cu Sc k II	" " kone celle II		
16	Kis-kone	" " flot-avg. celle II		
17	Cu Sc k	ε Cu scavkone (celle I og II)		
18	Cu Sc k 1R	Cu Scavkone ε rensset 1g		
19	Cu Sc A 1R	" " flot avg. 1 rensing		
20	Cu Sc k 2R	Cu scavkone rensset 2g		
21	Cu Sc A 2R	" " flot avg. 2 rensing		

Avg. og Kis-kone til hver sin herd for å vaske ut en tung fraksjon
Cu-kone og nevnte tung fraksjoner samles op for senere undersøkelse

Flg. formler kan settes op for beregning av Cu-fordelingen i produktene. Beregning på gr lag av Cu-analyse av produktene:

Utvinning Cu:

$$i \text{ Cu-kis-kone: } R_{Cu} = 100 \frac{(Rg - Avg) Cu_k (Bk - Kis)}{Rg (Bk - Avg) (Cu_k - Kis)} \%$$

$$i \text{ S-kis-kone: } R_{Kis} = 100 \frac{(Rg - Avg) Kis (Cu_k - Bk)}{Rg (Bk - Avg) (Cu_k - Kis)} \%$$

$$i \text{ avgang: } R_A = 100 \frac{Avg (Bk - Rg)}{Rg (Bk - Avg)} \%$$