



Bergvesenet

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Rapportarkivet

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Tittel

Analysis of drillcore and preparation of samples for metallurgical testing

Forfatter

J. B. Gammon

Dato

År

09.02 1976

Bedrift (oppdragsgiver og/eller oppdragstaker)

Falconbridge Nikkelverk AS

Kommune

Sør-Fron
Gausdal

Fylke

Oppland

Bergdistrikt

Østlandske

1: 50 000 kartblad

17174,17171

1: 250 000 kartblad

Lillehammer

Fagområde

Kjemiske analyser

Dokument type

Forekomster (forekomst, gruvefelt, undersøkelsesfelt)

Espedalen

Råstoffgruppe

Malm/metall

Råstofftype

Ni

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Rapporten omhandler prosedyrer for prøvetaking i felt og videre håndtering av prøver

515 07 6 . HAK !

A/S SULFIDMALM
INTER-OFFICE MEMORANDUM

Date: 9th February, 1976

To: F. Nixon, I. Andersen

cc: W. D. Harrison, H. Rykkelid, R. B. Band,
Dir. Jahnsen

From: J. B. Gammon

Subject:

Analysis of drillcore and preparation of samples for
metallurgical testing.

Events surrounding the analysis and preparation of the metallurgical samples from Espedalen recently point to a need for a thoroughgoing overhaul of our procedures. I have attempted to investigate in detail the course of events in preparation of these samples and have the following comments to make.

1) Field procedure.

Current practice is to split standard one metre lengths of mineralized core, place all in a bag with full identification and forward to Kristiansand for analysis. This approach should be satisfactory provided attention is paid to the following points:

- 1) Ensure that the split half of the core is representative of the visible mineralization.
- 2) Ensure that all the core split off (including small pieces and powder) goes into the bag.
- 3) Particular care must be taken in identifying the samples on the bag. Some mislabelling occurred in the case of Vakkerli holes and they had to be resampled to be sure of the data. THIS MUST NOT HAPPEN AGAIN!
- 4) When mineralization distribution warrants it, standard lengths shorter than 1 metre can be sampled.

2) Procedures at the "White House" in Kristiansand.

Samples arrive from the field and are stored prior to crushing. High priority samples are taken first. The complete contents of the sample bag pass through a jaw crusher. The crushed material is then all passed through a rotating disc mill which produces a sand sized product. This is passed over a riffle type splitter, to split out a ca 200 gm sample for assay. The remaining ca 1000 gms are stored in the "White House" basement. This crushing, milling and splitting equipment was purchased and installed in the "White House" to avoid any problems of contamination from high grade nickel materials present in large quantities in the main lab.

Adequate supervision by a responsible person is essential to ensure:

- 1) Close control over sample identification during this process.
- 2) Adequate cleaning procedure of machinery between samples.
- 3) Avoidance of loss of sample material during any step.
- 4) That the sample split out for assay is truly representative.

There is no evidence to suggest that the above precautions have not been followed adequately to date but it is of paramount importance that these standards be maintained.

3) Treatment of sample for assay.

This is placed in a swing mill in the "White House" basement and pulverised to a very fine powder prior to delivery to the lab. At the lab. a ca 0.5 gm portion is taken, diluted, briquetted and analysed by XRF technique developed by I. Andersen. Any suspect results are checked by atomic adsorbtion determinations.

After discussing this whole procedure with I. Andersen the following comments are pertinent:

- 1) Analyses have been reported as "0.54% Ni" or "0.46% Ni". Apparently the technique is only reliable to one decimal point so that both the above results should have been reported as "0.5% Ni".

I. Andersen points out that the "0.54" sample does contain more nickel than the "0.46" sample but exactly how much more is impossible to say. To avoid further confusion analytical data must not be reported in future in terms of accuracy not warranted by the technique.

- 2) When asked about limits of error in the 0.2% to 1.0% Ni range I. Andersen felt that the data was reliable to - 0.1% i.e. a result of 0.5% Ni could indicate anything in the range of 0.4% Ni to 0.6% Ni. We must be quite clear over this point and take it into consideration when evaluating data.
- 3) Based on I. Andersen's original determinations, reported to 2 decimal places, the "high grade" metallurgical sample from Espedalen has a calculated average grade of 0.9005% Ni. If the data are rounded off to one decimal point, the average is not changed significantly (0.905% Ni). If the lower limit of the determinations is taken, i.e. "0.43% Ni" in DDH 1, 16-17 m should be reported as "0.4% Ni" and could be as low as 0.3% Ni, then the lowest possible average calculated grade is still 0.805% Ni, which is significantly higher than Lakefields result of 0.67% Ni. i.e. Some other source of error must be present.
- 4) When asked about this I. Andersen pointed to contamination in the Nikkelverk lab. as being the most likely cause. He pointed out that all the Vakkerli work was done on an overtime basis, after the routine determinations on matte and nickel products were finished. Due to the ban on overtime the Espedalen samples were prepared for analysis during the daytime when materials with a high Ni content were in the vicinity. Deposition of Ni containing dust on the surface of a prepared briquette could significantly effect the results obtained.
- 5) The Kristiansand's lab results have been checked by us on several occasions by running parallel samples using Sydvaranger's, Norsk Hydro's and the Institute for Atomic Energy (IFA) lab. facilities.

In all cases agreement was good. Agreement with Lakefield on Vakkerli results was acceptable. In addition the Ni:S ratio of all Espedalen samples has been fairly constant leading to increased acceptance of the results as being reliable. It would be useful if part of the sample determined by Lakefield could be sent to Norway for assay at the Nikkelverk lab.

- 6)
 - a) To change, on a routine basis, to "accurate chemical determinations" it is estimated by I. Andersen that only 5 or 6 samples a day could be run and would involve employing a full time analyst.
 - b) To avoid some of the contamination problems briquetting could be carried out in the "White House". Purchase of such equipment is estimated at kr 30,000.
 - c) Our samples could be accumulated until there were sufficient for a day's work of briquetting, in the existing facilities, under conditions prevailing prior to the ban on overtime. This would lead to considerable delays in obtaining results.
- 7) I would greatly appreciate comments from the lab. on how we can obtain reliable results on a routine basis without major items of expenditure.
- 8) To evaluate how critical the problem really is I would like to take the "high grade" metallurgical sample as a test case. The following should be done:
 - a) F. Nixon sort out the 20 individual samples of the "analytical splits" returned from the lab to the "White House" for storage. I. Andersen prepare new briquettes (under "clean" conditions) and determine Ni, Cu and S again. The balance of the samples should be forwarded to IFA for Ni-Cu-S assays as an independant check. This check is very urgent as our whole Espedalen programme is based on assay results to date.

- b) I. Andersen should attempt to obtain, if possible, more rigorous, quantitative data on the limits of error of his XRF technique at different concentration levels. For our purposes the 0.4%Ni range is very critical.
- c) When the above results are available the exploration group should meet with the lab people to agree on future procedures.

4) Preparation of metallurgical Sample.

J. B. Gammon, F. Nixon and D. Ellen agreed that two samples from Espedalen should be submitted for metallurgical testing. One ("high grade") should consist of the higher grade mineralization representative of DDH6 while the other ("low grade") should represent the "background" material running ca 0.4% Ni to see whether any useful product could be obtained. Our best estimate of grade (using a 0.4% Ni cut off) is ca 0.6%-0.7% Ni and thus should fall between the two extremes chosen for testing.

D. Ellen set up two lists of samples which would provide ca 20 kg of each of the two test samples. These were reported in F. Nixon's telex to L. C. Kilburn of 15/1/76.

The bags containing the crushed material remaining after the original sample had been split off for analysis were sorted out and turned over to the lab. From each of 20 bags 1000 gms were weighed out to make the "high grade" sample. In preparing the "low grade" sample insufficient material was available in 4 of the bags and smaller amounts were weighed out. The weighted average calculated grade of the two samples was 0.9005% Ni and 0.402% Ni respectively. These samples were NOT HOMOGENISED prior to despatch to the Toronto office.

In the light of subsequent events the following should be observed:

- 1) Future samples should be sent in Individual bags marked with hole no, depth of intersection and Ni, Cu, S assays. Bulk samples will then be prepared by Lakefield as required.

- 2) Since the 1 kg portions were weighed out of the bags rather than split out of the total contents a minor possibility exists that gravity settling had occurred in the contents during the 4-12 week storage period. If a sulfide fraction had sunk to the bottom of the bag the first 1000 gms taken out may have been unrepresentatively low in Ni-Cu values and have lead to the discrepancy determined by Lakefield.

To check on this the remaining portion of the samples should be run. If settling has occurred then these should return significantly higher values than before due to an increase in Sulfide content.

- 3) When the 1000 gms were weighed out to make the bulk samples an additional 5 gms were taken and placed in a separate sample. If less than 1000 gms were available then the size of this "mini-sample" was reduced proportionately. The resulting "mini-bulk sample" was well mixed and assayed. Both I. Andersen and F. Nixon have mislaid their copies of this result, but it is recalled that the "high grade" sample returned exactly 0.80% Ni and was the cause of F. Nixon referring to ca 0.8-0.9% Ni in the "high grade" sample in the covering letter he sent to Toronto. This should have been explained more clearly.


