

## **A Study on Sampling in Iron Ore Deposits**

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### **Abstract**

The results of analysis (Fe) of the blast samples and the channel samples collected during prospecting of iron ore deposit of Bailadila, are compared metre by metre and the corresponding statistical parameters determined. It is generally observed that in the iron ore portion of the excavation, the comparison is good, but in the shaly portions there is wide variation.

Excavations connected with prospecting operations in the Bailadila Iron Ore Deposit No. 5 during the pre-production stage has provided opportunities to draw a comparison between the different methods of sampling usually practiced in a mineral deposit. In this particular case comparison has been drawn between channel sampling and bulk sampling as drawn in a prospecting excavation. Both horizontal and vertical excavations have been used for this purpose.

Horizontal excavations referred to are adits, two of which have been driven within the deposit, one to a length of 85 metres and the other upto 155 metres. Samples have been drawn only in the undercut portions of the adits. During excavation samples were drawn from the material of each blast by the usual method. The samples were screened at 12.5 mm. and the relative proportion of plus and minus fractions noted. Representative portions of the two fractions were analysed for Fe and later the overall Fe content in the R.O.M. was computed. Simultaneous with the advance of the adits, horizontal channels were put in both walls, each of 1 metre length, 10 cm. width and 4 cm. depth. Channel samples also were analysed for Fe and the results for the two channels in the two walls were averaged to obtain the overall grade for the corresponding portion of the adit. While channels were cut for each metre of advance, blasting faces were unevenly spaced and as such each blast sample represented different length intervals of the adit. These therefore were computed for each metre of length corresponding to the length represented by the channel samples. The results for channel and blast samples were now ready for comparison.

Vertical excavations represent pits, 4 of which have been taken for this study. The pits were sunk along pre-existing bore holes to obtain a comparison between bore hole samples and bulk samples for the same area. This comparison is rather unfavourable owing to poor core recovery in drilling. However, channels, were put simultaneous with pit excavation and these provided comparison with the blast samples. In this case 4 channels were put in the 4 walls of the pits for each metre of depth and the average assay value was taken into consideration. Blast samples were collected in the usual way and computation for each metre of depth as per the channel samples were made to obtain the required comparison.

In order to obtain a comparison in each data set, variance ratio test has been conducted between the channel and blast samples for testing the population conformity. For individual sample variation, a chi-square test has been carried taking the channel sample results as 'expected' and the blast sample results as 'observed'

values and assuming the loss of one degree of freedom. Linear correlation coefficient was also determined to test the variation conformity in the two types of data.

For the sake of brevity individual data pertaining to each sample pair are not mentioned here. The summarised data along with the test results are given in Table I and II.

TABLE I (Adit No. 1)

	No. of sample	Mean of channel sample Fe%	Mean of blast sample Fe%	Variance channel sample	Variance blast sample	Variance ratio (F)	Chi-square	Linear correln. coeff. (R)
Adit No. 1	57	62.53	62.08	82.89	80.67	1.007	3.224	+0.82
Adit No. 2	121	56.13	57.38	173.30	243.42	1.40	165.97	+0.94
Pit samples	30	59.24	60.94	142.73	146.43	1.02	5.21	+0.96

TABLE II (Adit No. 2)

Metreage	No. of sample	Mean of channel sample Fe%	Mean of blast sample Fe%	Variance channel sample	Variance blast sample	Variance ratio (F)	Chi-square	Linear correln. coeff. (R)
0- 45	36	40.83	43.58	112.22	112.80	1.005	44.21	+0.69
45- 58	13	64.33	66.37	355.24	368.89	1.04	1.91	+0.79
58- 69	7	39.04	55.17	349.27	595.51	1.40	67.91	-0.80
69-120	47	65.42	64.63	115.84	302.64	2.61	20.81	+0.72
120-127	5	51.76	35.70	681.17	589.44	1.15	30.60	+0.12
127-141	13	67.70	68.12	385.00	386.36	1.003	0.33	+0.75

It will be seen that in the case of Adit No. 1 and pit samples, the sample variance is relatively small, values obtained by variance ratio tests and chi-square tests show a low significance, indicating that channel samples and bulk samples show good conformity. In the case of Adit No. 2 where the variance is relatively larger, the variance ratio test still show low significance, but chi-square test shows a highly significant difference. In order to locate the areas of this difference, the entire data from Adit No. 2 has been split into different parts, each of which show some uniformity among themselves.

Similar tests (Table No. II) conducted with each part-data-set show that the differences lie usually in the shale rich zones, while the ore zones (of whatever grade they may be) show less significant difference between channel sample and blast sample results. Linear correlation coefficient as worked out for these zones also show a

relatively low figure. For ore zone this figure usually lies above 0.7 while shale-rich zones yield figures less than this. In one case interestingly (metreage 58-69) a negative correlation coefficient was obtained. The reason of this significant difference in the shale zones seems to be due to irregular enrichment of such zones causing considerable point to point variation.

This study provides a comparison between a bore hole sample (with assumed 100% core recovery) and a bulk sample collected from the same place. The volume of sample collected from an NX size bore hole of 1 cm length is 38.5 cm<sup>3</sup> while that from the channel of the dimensions mentioned above is 40 cm<sup>3</sup>. In terms of sampling, therefore, a channel could be taken as similar to a NX size bore hole.

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#### Reference

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## Reconnaissance geochemical exploration for Copper in the central part of the Chitradurga schist belt, Karnataka, India

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#### Abstract

An area of about 115 Sq km was sampled on a 0.4 km spacing grid. The samples, collected from the bed rock, after removing the thin soil cover, were analysed for Cu, Zn, Pb and Co by the emission spectrograph using indium as internal standard. The Cu concentration map of the area shows nine zones of anomalous Cu content, the highest giving a value of 4000 ppm. Of these, four zones of highly anomalous Cu content (2000 ppm - 4000 ppm) are very promising and are recommended for detailed geochemical exploration.

#### Introduction

Sulphide mineralization in the central part of the Chitradurga schist belt has been traced over a distance of 35 km in a N-S direction from near Yarehalli to Chikkanna-halli. Although old workings for copper on the Belligudda hill near Ingaldhal were known since a long time, it was only recently the deposit has been taken up for commercial exploitation. (Radhakrishna, 1967, Radhakrishna & Sundararajan, 1972).

The gravity and aeromagnetic data have indicated considerable thickness (8 km) of metavolcanics in the region (Naqvi, 1973, 1974). The geochemistry of the meta-

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