International Journal for Modern Trends in Science and Technology
Volume: 09, Issue No: SI02, March, 2023
ISSN: 2455-3778
http://www.ijmtst.com

Optimal recovery of iron minerals from low grade iron ore taillings

Kundurthi Gopi1 | Ketha Kamal Swaroop1 |Dasari Praveen1 | pandian Balakrishnan1 |Kumar Sanjay1

Department of mining Engineering, Godavari institute of Engg. &Technology NH-16, Chaitanya knowledge city, Rajamahendravaram, A.P-533296
Corresponding Author Email ID : kumarsanjay@giet.ac.in

To Cite this Article
Kundurthi Gopi, ketha Kamal Swaroop, dasari Praveen, Pandian bala Krishnan", *optimal recovery of iron minerals from low grade iron ore tailings international journal for modern trends in science and technology* Vol. 09, Issue SI02, March 2023, pp.-68-70.

ABSTRACT

This paper mainly deals with the recovery of high-grade iron ore from tailings. This work consists of collection of iron ore tailings from the mine site and processing of tailings for recovery of high-grade ore. The ore is collected from NMDC, Bellary, Karnataka, India. After the sample is collected, the ore is prewashed to remove any impurities. After cleaning of ore, the ore is segregated for the purpose of analysis. To select the specified quantity of ore, the sample is chosen by sampling methods like cone and quartering and bulk sampling. From the sampling methods the ore sample is chosen from a bulk sampling and Cone & Quartering method is subjected to grain count analysis a total sample of around of 70 kgs and reduced to 1kg. After the sampling the ore is processed for grade identification and recovery of high grade from low grade by some of the unit operations like crushing, grinding, and ore refrigerating for specified size of particles. In the Unit operations the in initial feed size of was reduced finer size of 24 B.S.S mesh size using crushing after that the ore is further reduced to size of 200 B.S.S mesh using ball mill. Now the low-grade ore is subjected to microscopic studies for determining the grade of ore by grain count analysis of ore from the analysis. We found out the grade of iron ore tailings and the grade was estimated to be 15-20% of concentration in the sample. Now using magnetic separation, the initial concentration of ore is increased to 50% concentration. In second part, we are doing ore processing analysis, Ore treatment and recovery of high-grade ore.

KEYWORDS: *ore sampling, pre-processing, ore treatment*

I. INTRODUCTION

Iron ores are rocks and minerals from which metallic iron can be economically extracted. In mining tailings are the materials left over after the process of separating the valuable fraction from the uneconomic fraction of ore {1}. Coning quartering process is a method used by analytical chemists to reduce the sample size of a powder without creating systematic bias {2}. bulk sampling is defined as the process of extracting a small fraction of material form a large sufficiently representative for the intended purpose {3}. removing of waste Grain size analysis is a typical laboratory test conducted in the soil mechanics' field {4}. Crushing is the process of reducing the size of materials so that they can be further processed {5}. They are two types crushers are used 1) primary crusher 2) secondary crusher. Magnetic separation is the process of separating components of mixtures by using a magnetic to attract magnetic substances. a ball mill is a type of grinder used to grind and blend bulk material into QDs/nano size using different size balls. Materials to liberate the useful materials in this work we perform the pre washing of ore to remove the all the gangue materialspaper has been accepted, prepare it in two-column format, including figures and tables.

II. METHODOLOGY

Initially the ore collected from the Bellary mine, Karnataka. The ore is subjected to pre washing to remove the external waste material present in the ore. After pre washing the ore sent for grain count analysis to determine initial concentration of ore around 6% so after that we worked on mechanical unit operations in treatment in beneficiating the ore from low grade to high grade ore in this initially the ore collected after pre washing it is subjected to crushing operation where it is categorized in to two types one is primary crushing another one is secondary crushing. We use jaw crusher to reduce the infinite size to 12000mm size of ore from secondary crusher the ore reduced to mm size. After that two crushing the ore is subjected to magnetic separation, we collected the ore which is in magnetic in nature by discarding the non-magnetic particles. The magnetic particles which are collected again the concentration of recommend by using grain count analysis our concentration of ore is enhanced from 6%. After that it is again subjected to grinding operation since as which are ore tailings we are collected the enriched ore is part of particles clubbed together so hence we are operating on a liberation process again after the crushing operation it is again subjected to grinding operation with four different categories where the size of the different size balls are used (mention sizes) .After both the mechanical operations ore is segregated into magnetically susceptible and non-magnetic susceptible particles by dry magnetic separator.

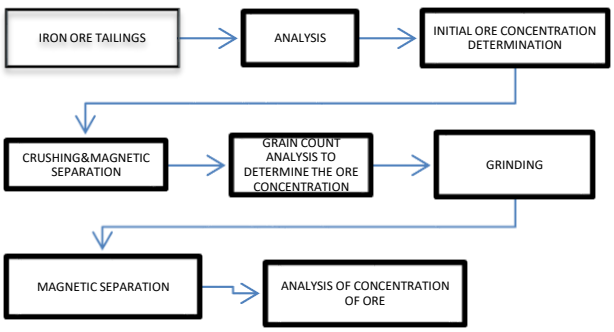


Fig1; flow chart of methodology

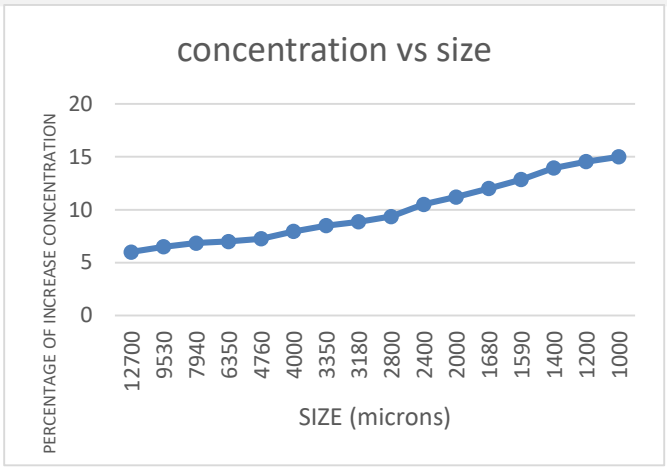


Fig2; A graph plotted between size and concentration for primary crushing

A graph plotted between size and concentration for primary crushing, from the above we can determine that the ore concentration is increased with reduce in size from 12000 to 1000 microns as the initial ore is adsorbed with gangue particles as a result the magnetic particles are not properly liberated and the magnetic separation efficiency is reduced

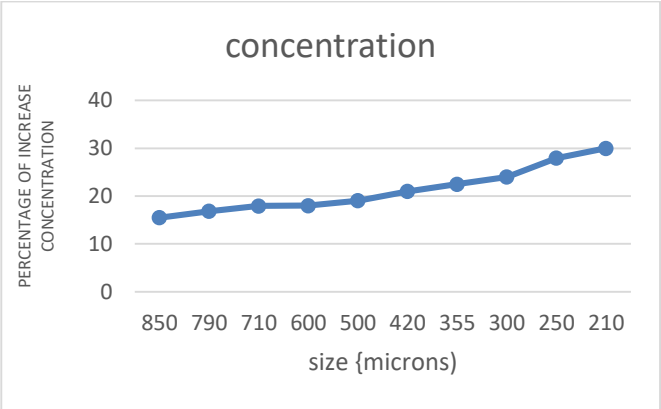


Fig3; A graph plotted between size and concentration for secondary crushing

A graph plotted between size and concentration for secondary crushing, from the above we can determine that the ore concentration is increased with reduce in size from 850 to 210microns as the initial ore is adsorbed with gangue particles as a result the magnetic particles are not properly liberated and the magnetic separation efficiency is reduced

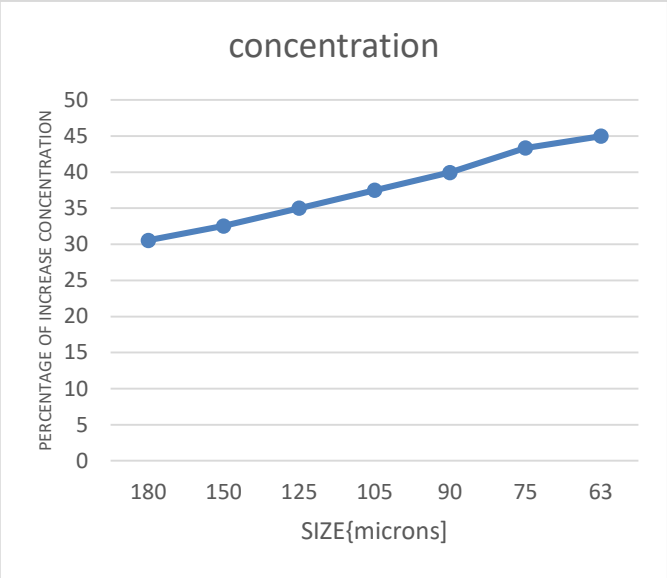
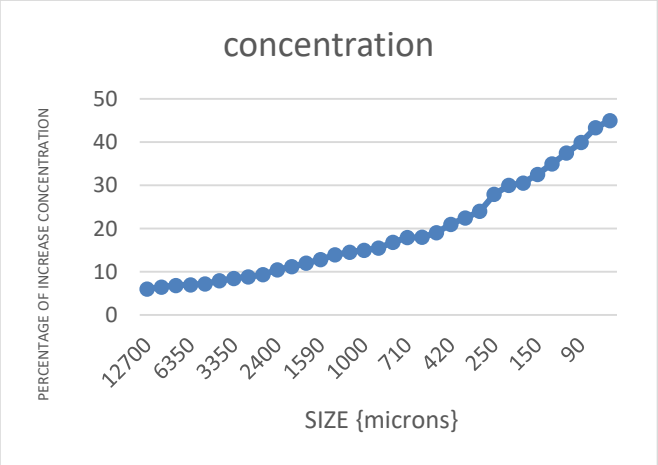


Fig4; A graph plotted between size and concentration for grinding

A graph plotted between size and concentration for grinding, from the above we can determine that the ore concentration is increased with reduce in size from 180 to 63 microns as the initial ore is adsorbed with gangue particles as a result the magnetic particles are not properly liberated and the magnetic separation efficiency is reduced



III. RESULT & CONCLUSION

In this work the iron ore tailings with low concentration of iron enriched to industrial acceptable concent5ration of around 40-50%. When the tailings are subjected to pre washing the gangue materials are removed. After this the enriched ore is liberated using mechanical unit operations like crushing and grinding. The ore collected after both primary and secondary crushing is segregated into various sizes using sieves ranging from 12000 microns to 37 microns size. The various sized ore particles is subjected to magnetic separation of particles to classify the segregated particles into magnetically suspect able and nonmagnetic suspect able particles. The magnetic particles collected from each sieve of specified size is collected. The ore concentration is determined by microscopic studies using the grain count analysis to determine the ore concentration. From the work we observed that the ore concentration is enriched from 5-6% to around 47% as initially the tailings are adsorbed with the gangue materials.

REFERENCES

1.Gu, Fuquan, et al. "Facile route for preparing refractory materials from ferronickel slag with addition of magnesia." ACS Sustainable Chemistry & Engineering 6.4 (2018): 4880-4889.

2. Alves, Adilson Rangel, and Aparecida dos Reis Coutinho. "Life cycle assessment of niobium: A mining and production case study in Brazil." Minerals Engineering 132 (2019): 275-283.

3.Bezzera, Carolina Goulart, et al. "Feasibility of iron-rich ore tailing as supplementary cemeniatious material in cement pastes." Construction and Building Materials 303 (2021):

4. Duarte, Marlo Souza, et al. "Influence of mechanical treatment and magnetic separation on the performance of iron ore tailings as supplementary cementitious material." Journal of Building Engineering 59 (2022): 105099

5. Almada, Bruna Silva, et al. "Evaluation of the micro structure and microeconomics properties of structural mortars with addition of iron ore tailings." Journal of Building Engineering (2022):105405

6. Ferreira, Igor Cress, et al. "Reuse of iron ore tailings for production of meta-kaolin-based polymers." Journal of Materials Research and Technology 18 (2022): 4194-4200.

7. Zhang, Shushi, et al. "Enrichment of Nb and Ti from carbonatite pyrochlore ore via calcining slaking followed by gravity separation." International Journal of Mining Science and Technology (2022).

8. Sá, Thomas Schatz Mayr Welp, et al. "Use of iron ore tailings and sediments on pavement structure. Construction and Building Materials 342 (2022): 128072.

9.wu, Xinhua. A corpus-based construction grammar analysis of the Mandarina constructions. University of Hawai'i at Manoa, 2022

10. Chen, Tao, et al. "The geo chemical and mineralogical controls on the release characteristics of potentially toxic elements from lead/zinc (Pb/Zn) mine tailings." Environmental Pollution (2022): 120328