

WATER QUALITY ASSESSMENT IN A GRANITE MINE – A CASE STUDY

JalakamSainath, Kumar A C

Department of mining engineering ,Godavari institute of engineering and technology, NH-16,chaithanya knowledge city ,Rajahmundry, Andhra Pradesh, india , PIN-533296

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ABSTRACT

A study carried out in a granite mining area at prakasam district at chimkurty village one of the mine was producing granite. In order to extract the granite blocks drilling machine and wire saw cutting machine are used. Because to the friction created during cutting the blocks, heat is produced. To reduce heat and stop the diamond rope from deteriorating, use water. The waste water will be sent to the sump area once the granite blocks have been cut. Sump area refers to the location where all mine water is collected. According to the requirements for its use, the chemical, physical, and biological properties of water are referred to as its quality. It is most usually used in relation to a set of criteria that may be used to measure compliance, which is typically attained through water treatment.

This sump water will contaminate the surface water as a result. The problems caused by contaminated water include chronic bronchitis, skin conditions, and long-term cancer. The contaminants that are emitted into the air and water during mining might cause certain ailments. This paper's goal is to clean up the granite mine water's pollutants. It is possible to draw a conclusion that the "SOLAR" distillation technique is utilised to lessen water pollution in granite mines. The increasing rate of water pollution and consequent increase of waterborne diseases are compelling evidence of danger to public health and all living organisms. Preservation of flora and fauna by controlling various unexpected pollution activities has become a great challenge. This work is novel because we propose a methodology that uses a mathematical function to calculate the weight values of the parameters regardless of missing values, which were randomly decided in previous work. The results of the proposed model show increased accuracy over traditional methods. The accuracy of the calculated WQI also increased to 98.3%. Additionally, we also designed a web interface and mobile app to supply contamination status alerts to the concerned authority.

I. INTRODUCTION

Owing to the high temperature of the magma, it will emerge from the Earth's crust to the surface and create igneous rock, which will reflect to the production of granite and basalt rocks. Granite is the most frequent intrusive rock in the Earth's crust. Between 2.65 and 2.75 g/cm³ is the normal granite density, and compressive strength often exceeds 200 mpa. While it is mined all throughout the world, the granite resources in Brazil, India, China, South Africa, and North America provide the most unusual hues. The granite pieces are retrieved from the deposits using cutting or spraying operations; special slicers are then utilised to transform the granite harvested pieces into portable plates. The pyramids were constructed using granite and lime stone by the ancient Egyptians. Polished granite slabs, tiles, seats, tile floors, and numerous other functional and adorning elements are employed in interior spaces. Crushed granite waste rock is utilised in the construction of roadways. Due to the fact that it must be mined from quarries and polished by professionals, granite is quite costly. The cost of transporting granite will rise if you are far from the quarry, and installing granite requires trained employees and is difficult and time-consuming. Water is a key issue across granite mines.

Due to mine water pollution some of negative impacts are occurred like agriculture land and ground water getting pollutant here are the case studies on negative impacts on mine water

[1] To assess the existing state of physicochemical pollutants and their sources in groundwater, a research was conducted in the granite mining region of Jhansi (Goramachia). A large-number of the estimated physicochemical characteristics of mining and residential regions are more or less within WHO-permitted limits[1]. Large amounts of fines are produced during the dimension stone cutting processes at quarries, and these particles

have a detrimental effect on the nearby surface waterways. As compared to the native rock, mobilised pollution reveals the abnormal presence of several metals with excess quantities. The source of this extra metal must be anthropogenic and related to mining and cutting activities[2]. Exploration of hard rock in MGM (Madhyapara Granite Mine) through full capacity, it has the potentiality to cause serious environmental impacts, mainly probability of subsidence in the mine area, ground water pollution, sound pollution as well as air pollution at the time of drilling and blasting, and lowering of ground water table due to excessive pumping of sub-surface water. Taking all the above environmental impacts and water pollution into consideration the current study attempts to assess the decrease the pollution in granite mines.

Our objective is reduce the pollutants from the collected sample from the granite mine

According to the requirements for its use, the chemical, physical, and biological properties of water are referred to as its quality. It is most usually used in relation to a set of criteria that may be used to measure compliance, which is typically attained through water treatment. Water is a material that exists in gaseous, liquid, and solid phases and is made up of the chemical elements hydrogen and oxygen. One of the most prevalent and necessary chemicals is this one. It is a colorless, odorless liquid at room temperature with the crucial property of dissolving several other compounds. In fact, living things depend on water's adaptability as a solvent. The aqueous solutions of the world's seas are thought to have given rise to life, and living things rely on aqueous solutions for biological processes including the production of blood and digestive juices. Water also exists on other planets and moons both within and beyond the solar system. In small quantities water appears colourless, but water actually has an intrinsic blue

colour caused by slight absorption of light at red wavelengths.

II. METHODOLOGY

Before the solar procedure, the collected mine water sample was for the first time transmitted to the lab. The water quality index was constructed following the results of the mine water, and the resulting value was compared with benchmark values. After the solar procedure, both lab reports were once more compared.

Sample collected from cutting bench at a Temperature -27^o Water present from past two weeks from the date of collecting sample Date of collection 11-12-2022

Using figure 1, A 1 litre sample of water was sent to the Hyderabad-based Navega Environmental Laboratory & Consulting services.

Table-01 Granite water lab report

SI NO	DESCRIPTION OF THE PARAMETERS	UNIT	METHOD	RESULT OBTAINED	CPCB STANDARD FOR ONLAND DISCHARGE
01	PH	NU	APHA 23 rd 4500 H ⁺ B	8.28	5.5-9.0
02	TOTAL DISSOLVED SOLIDED	mg /L	APHA 23 rd 2540B	1200	2100
03	TOTAL SUSPENDED SOLIDED	mg /L	APHA 23 rd 2540 D	369	200
04	CHEMICAL OXYGEN DEMAND(COD)	mg /L	APHA 23 rd 5220 B	48	250
05	BIOCHEMICAL OXYGEN DEMAND(BOD ₃ @27 ^o C)	mg /L	APHA 23 rd 5210 B	16	100
06	CHLORIDES AS CL ⁻	mg /L	APHA 23 rd 4500 CLB	298	600
07	SULPHATES AS SO ₄ ²⁻	mg /L	APHA 23 rd 4500 SO ₄ ²⁻ E	188	1000
08	AMMONICAL NITROGEN	mg /L	APHA 23 rd 4500 NH ₃ C	<5	0.5-20
09	TOTAL NITROGEN AS N	mg /L	APHA 23 rd 4500 NORG B	<5	10
10	DISSOLVED OXYGEN	mg /L	APHA 23 rd 4500 -O C	5.6	<6

11	OIL&GREASE	mg /L	APHA 23 rd 5520 B	<1	10
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From the above date I preferred solar distillation process for reducing the pollutants

III. SOLAR DISTILLATION

Saline water desalination using direct sun energy has been studied and utilised for a while. The way that these devices often mimic the natural hydrologic cycle is by heating the salty water to stimulate the creation of water vapour (humidification). Once the water vapour condenses on a cold surface, the condensate is collected and used to create fresh water. The greenhouse solar still is an illustration of this kind of procedure. Saline water is heated in a floor basin, and water vapour condenses on the sloping glass roof that covers the basin.

After instilling the model the water was collected every day as shown in the table-02.

Table-02 collection of water from the solar process

Sino	day	Collected water per day(ml)	Average temperature c ^o
1	11-02-2023	58.8	107
2	12-02-2023	61.2	108
3	13-02-2023	59.8	108
4	14-02-2023	65	108
5	15-02-2023	56	108
6	16-02-2023	55	108
7	17-02-2023	52	108
8	18-02-2023	58	108
9	19-02-2023	56	108
10	20-02-2023	61	108
11	21-02-2023	60	108
12	22-02-2023	63.3	108
13	23-02-2023	65	108
Average		771.1	107.98

Table -03 Compare of both the lab reports

SI NO	DESCRIPTION OF THE PARAMETERS	UNIT	METHOD	RESULT OBTAINED BEFORE SOLLAR PRO	RESULT OBTAINED AFTER SOLLAR PROC	CPCB STANDARD FOR ONLAND DISCHARGE

				CESS	ESS	
01	PH	N U	APHA 23 rd 450 OH ⁺ B	8.28	4.24	5.5-9.0
02	TOTAL DISSOLVED SOLIDED	mg /L	APHA 23 rd 2540B	1200	39	2100
03	TOTAL SUSPENDE D SOLIDED	mg /L	APHA 23 rd 254 0D	369	<5	200
04	CHEMICAL OXYGEN DEMAND(C O	mg /L	APHA 23 rd 522 0B	48	100	250
05	BIOCHEMIC AL OXYGEN DEMAND(B OD ₅ @27°C)	mg /L	APHA 23 rd 521 0B	16	35	100
06	CHLORIDDE S AS CL ⁻	mg /L	APHA 23 rd 450 0CL ⁻ B	298	15	600
07	SULPHATES AS SO ₄ ²⁻	mg /L	APHA 23 rd 450 0 SO ₄ ²⁻ E	188	5.3	1000
08	AMMONICA L NITROGEN	mg /L	APHA 23 rd 450 0NH ₃ C	<5	<5	0.5-20
09	TOTAL NITROGEN AS N	mg /L	APHA 23 rd 450 0N _{ORG} B	<5	<5	10
10	DISSOLVED OXYGEN	mg /L	APHA 23 rd -45 00-O C	5.6	4.67	<6
11	OIL&GREAS E	mg /L	APHA 23 rd 552 0 B	<1	3.92	10

By this method we can remove the impurities in the water by the help of natural energy sources Sun.

This method can be installed in the top of the mine area where there is a free from the shadow and sun rays directly touch the model

The chimakurty massif consists of granite rock which occupies an area of 26,000 km² in prakasam in central India

The present area of the according to survey of India is 5,024 km². karimnagar is one of the important granite mining centres in the region. In granite is obtained mainly through the open cast mining. , (i)

it requires less mining investments, (ii)

mechanization is likely to prove inefficient, (iii)

availability

IV. CASE STUDY

The research study was conducted in a mechanized open cast colour granite salable rough block granite. The mining lease arecomprises over extent of 5.38 Hectares. They produce 56521

Cba/Annum of colour granite salable rough blocks. All the mining operations are done by development of heavy earth moving machinery like dumpers, excavators, drill machines, dozers, wire saw cutting machines, Present mining is operated in 3shifts beginning from 6:00AM to 2:00PM and 2:00PM to 10:00PM and 10:00PM to 6:00AM. In additional there is general shift which is from 9:00AM to 5:00PM. Geo Co-ordinates of the area is East Longitude 95^oE and North Latitude:55^oN. they have HEMM permission cutting of slides used by the wiresa method

V. RESULT AND DISCUSSION

On an average of every 24hrs 60.5 ml condensation water was collected on average temperature on 107^oThe composition of ground water varies widely with local geological conditions. Neither groundwater nor surface water has ever been chemically pure, since water contains small amounts of gases, minerals and organic matter of natural origin. Mining is widely regarded as having adverse effects on environment of both magnitude and diversity. Some of these effects include erosion, formation of sinkhole, biodiversity loss and contamination of groundwater by chemical from the mining process in general and open pit mining in particular. Physico-chemical investigation of the water samples in the mining areas of chimakurthy that the parameters such as pH, turbidity, fluoride, DO and chloride contents were within the acceptable limits for human consumption. The EC, TDS, hardness, alkalinity and nitrate contents were found to have exceeded the prescribed acceptable limits. Analyses of the water samples for the presence of heavy metals indicated that the groundwater sources in the areas were polluted with lead and manganese. It is thus, evident from the foregoing experimental results that the groundwater quality in the study areas of Bijauli is a matter of great concern as a source of drinking water. Long term use of the

water may pose serious health problems for and 108°. After 12 days 7.7lts of water was collected. By this method we can remove the impurities in the water by the help of natural energy sources Sun. This method can be installed in the top of the mine area where there is a free from the shadow and sun rays directly touch the model

Ph of water is in acid condition after adding Noh solution to the collected water the distilled water was ready, and that can use in car batteries to produce energy.

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