

WATER POLLUTION REDUCTION IN MINES

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ABSTRACT

A study carried out in a granite mining area at Guntur district at murukupudi village One of the mine was producing granite. In order to extract the granite blocks drilling machine and wire saw cutting machine are used. While cutting the blocks heat is generated due to friction, heat is decreased by using of water to prevent the wear and tear of diamond rope. After cutting the granite blocks the waste water will transfer to sump area. The collection of all mine water at one place is called sump area.

Due to this sump water surface water will get polluted. Chronic bronchitis, skin diseases, lung cancer, are the diseases coming from the pollutant water. There are diseases that can come from the pollutants that are released into the air and water during the mining process. The aim of this paper to reduce the impurities of granite water. It can be conclude with "SOLAR" distillation process is used to reduce the water pollutants in granite mine. That condensation water can be used in car batteries and also used in home inverters batteries for producing power.

KEYWORDS: Sump area, Chronic bronchitis, lung cancer, Distillation, Condensation

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I. INTRODUCTION

Mining is the process of extracting useful substances from the earth. Mining can affect the surrounding surface and groundwater. Without proper precautions, unnaturally high concentrations of chemicals such as arsenic, sulfuric acid, and mercury can spread to any significant extent in surface or underground waterways. The large amounts of water used in mine drainage, mine cooling, water extraction, and other mining processes increase the potential for these chemicals to contaminate groundwater and surface waters. Due to the high temperature of magma, it will come out from the earth crust to the surface area and forms igneous rock and it reflect to the granite and basalt rock formation like this granite is formed, granite is most common intrusive rock in Earth crust. the average density of granite is between 2.65 and 2.75 g/cm³ and the compressive strength usually lives above 200Mpa

It is mined worldwide but most exotic colors are derived from granite deposits in Brazil, India, China, South Africa and North America. This rock mining is a capital and labor intensive process the granite pieces are removed from the deposits by cutting or spraying operation special slicers are used to cut granite extracted pieces into portable plates.

This granite used as ancient Egyptians built the pyramids from granite and lime stone. It is used in interior spaces for polished granite slabs, tiles, benches, tile floors and many other practical and decorative features. The waste granite rock is crushed and it is used to construct the road ways.

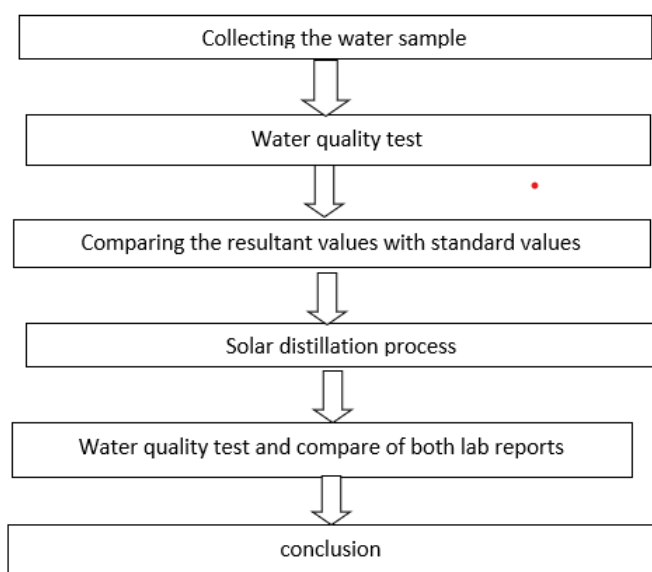
Granite is very expensive because it has to be obtained from quarries and polished by experts. When you are away from quarry, the transportation cost of granite will increase, for granite instillation, required skilled workers and it is very complicated and time consuming. In granite mines water is major problem in everywhere.

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

A study was carried out in granite mining area in Jhansi (Goramachia) to evaluate the current status of physico chemical contaminants and their sources in groundwater. many of the estimated physico chemical parameters of mining and residential areas are more or less with the permissible limits of WHO[1]. The cutting operations of dimension stone at quarries produce a large amount of fines that in turn, cause a negative environmental impact over local surface waters. mobilized contamination shows the anomalous presence of some metals, whose concentrations are in excess when compared to the natural rock. This excess metal amount must be attributed to an Anthropogenic source associated to mining and cutting operations[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[3].

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

II. METHODOLOGY



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 2-12-2022

The collected mine water sample was sent to the lab for the first time before the solar process. After the results of mine water the water quality index was calculated and comparing the resultant value with standard values. After solar process and again compared the both lab reports collected water sample from cutting bench The sample water of 1liter was sent to the Navega Environmental Laboratory & Consultancy services which is located in Hyderabad.

Table-01 Granite water lab report

SI NO	DESCRIPTI ON OF THE PARAMETE RS	US IT	METH OD	RESU LT OBT AINE	CPCB STAN DED FOR ONLA ND DISCH ARGE
01	PH	N U	APHA 23 rd 4500 H+B	7.28	5.5-9.0
02	TOTAL DISSOLVED SOLIDED	m g/L	APHA 23 rd 2540B	1100	2100
03	TOTAL SUSPENDED SOLIDED	m g/L	APHA 23 rd 2540 D	345	200
04	CHEMICAL OXYGEN DEMAND(C OD)	m g/L	APHA 23 rd 5220 B	51	250
05	BIOCHEMIC AL OXYGEN DEMAND(B OD ₅ @27°C)	m g/L	APHA 23 rd 5210 B	18	100
06	CHLORIDDE S AS CL ⁻	m g/L	APHA 23 rd 4500 CL-B	292	600
07	SULPHATES AS SO ₄ ²⁻	m g/L	APHA 23 rd 4500 SO ₄ ²⁻ E	184	1000
08	AMMONICA L NITROGEN	m g/L	APHA 23 rd 4500 NH ₃ C	<4	0.5-20
09	TOTAL NITROGEN AS N	m g/L	APHA 23 rd 4500 N _{ORG} B	<6	10
10	DISSOLVED OXYGEN	m g/L	APHA 23 rd -450	5.8	<6

		L	0-O C		
11	OIL&GREAS E	m g/L	APHA 23 rd 5520 B	<1	10

From the above date I preferred solar distillation process for reducing the pollutants

2.1 SOLAR DISTILLATION

The use of direct solar energy for desalting saline water has been investigated and used for some time. These devices generally imitate a part of the natural hydro logic cycle in that the sun’s rays heat the saline water so that the production of water vapor (humidification) increases. The water vapor is then condensed on a cool surface, and the condensate is collected as a fresh water product. An example of this type of process is the greenhouse solar still, in which the saline water is heated in a basin on the floor, and the water vapor condenses on the sloping glass roof that covers the basin. As shown in the figure-1

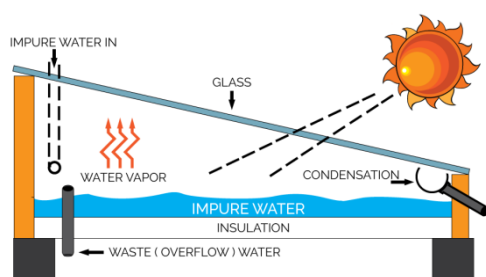


FIG-1 shows that Diagram of a solar still [4]

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

Table-02 shows that collected water from solar still

S.no	Day	Collected Water Per day(ml)	Average temperature c ^o
1	1	58.8	107
2	2	61.2	108
3	3	59.8	108
4	4	59	108
5	5	56	108
6	6	55	108
7	7	52	108
8	8	58	108
9	9	57	108
10	10	61	108
11	11	60	108
12	12	58.3	108
13	13	59	108

From the above data the average amount of water for daily collection is 59ml of water and the average temperature of water inside the take is 108^o.after 13 days the total amount of water is 8.5ml including the lab water also.

Table-03 shows that lab report after solar distillation process

SI NO	DESCRIPTI ON OF THE PARAMETE RS	U SI T	METH OD	RESU LT OBTAIN ED AFTE R SOLL AR PROC ESS	CPCB STAN DED FOR ONLA ND DISCH ARGE
01	PH	N U	APHA 23 rd 4500 H+B	5.24	5.5-9.0
02	TOTAL DISSOLVED SOLIDED	m g/L	APHA 23 rd 2540B	89	2100
03	TOTAL SUSPENDED SOLIDED	m g/L	APHA 23 rd 2540 D	<5	200
04	CHEMICAL OXYGEN DEMAND(C OD)	m g/L	APHA 23 rd 5220 B	90	250
05	BIOCHEMIC AL OXYGEN DEMAND(B OD ₅ @27 ^o C)	m g/L	APHA 23 rd 5210 B	32	100
06	CHLORIDD ES AS CL ⁻	m g/L	APHA 23 rd 4500 CL-B	17	600
07	SULPHATES AS SO ₄ ²⁻	m g/L	APHA 23 rd 4500 SO ₄ ²⁻ -E	5.7	1000
08	AMMONIC AL NITROGEN	m g/L	APHA 23 rd 4500 NH ₃ C	5.3	0.5-20
09	TOTAL NITROGEN AS N	m g/L	APHA 23 rd 4500 N _{ORG} B	5.8	10
10	DISSOLVED OXYGEN	m g/L	APHA 23 rd -450 0-O C	4.67	<6
11	OIL&GREAS E	m g/L	APHA 23 rd 552 0 B	3.92	10

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After the solar process the pollutants was reduced as we can see on the table -03. know we can compare the both lab reports of mine water and solar

2.2 CONSTRUCTION

The metal tank was chosen to be made of MS because it is suitable for the operation as concerns its strength and thermal conductivity, also it is readily available on the market. A glass plate of 1000mm*500mm was used to cover the tank to minimize heat loss. Appropriate measures were taken to increase or decrease heat transfer rate wherever necessary. MS steel pipes were used to make the stand. The list of materials used in the construction of equipment as shown in the table-4

Tabel-4 list of materials

S.NO	MATERIALS
1	MS SHEET
2	Two PVC Pipes
3	Glass
4	Thermometer
5	Black Paint
6	Rubber Blocks
7	Measuring Jar

After the metal sheet was cut down into the required pieces, a welding technique was used to put all the five pieces together and form a tank. Here specifically, Arc welding was used because it can with stand pressure offered by water inside the tank and also because of instability compared to gas welding. After welding the pieces, we found a countable number of very small holes which might allow transfer of mass and there by heat con aimed by it if they were left so. Hence, we marked them all carefully and then closed them properly using the gas welding. The tank was cleaned and the inner and outer surfaces were made rough before coating the tank with red axes. Rubber blockers were stuck to the outside surfaces of the tank with the help of gun glue, for the purpose of insulation. Rubber blockswere stuck to the surfaces in such a way that the tank was well covered and the edges of one inch to place the glass plate. At down place one plate is attached for collecting water drop plates and sending out side through outlet PVC pipe.Opposite to the place which means the back side of plate another PVC pipe was attached for send water and checking temperature of water.Finally the glass was placed at the top of tank.

By using gun glue the glass was attached on the rubber blockers without any air gaps. The water was collected from the same mine upto13liters. In solar tank 10lts of water was taken into the tank through the feed line. Then the tank was allowed to stay without any disturbances. Then the tank and the water in it was heated by the radiation coming from the sun. The thermometer had shown a gradual increase in temperature of the moisture inside the tank. The water inside the tank evaporated, raised up and was struck by the glass plate. When the vapor struck the glass plate, they were immediately condensed. This happened because the glass plate continuously losses heat to the atmosphere and therefore it is colder than water vapor. The water drops which formed on the inner surface of the glass plate side down of the glass plate because of inclination. The drops were collected into a tray from which they flowed down to the tank. The water drops flowing out of the tank were put into a measuring jar. The tank was drained. The temperature of moisture and ambient temperature along with the cumulative volume of water collected in the measuring jar was noted for every 1hr interval.

2.3 CASE STUDY

The research study was conducted in a mechanized open cast color granite salable rough block granite mine.The mining lease are comprises over extent of 5.38 Hectares. They produce 56521 Cba/Annum of color 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 80^o-05'23.21"E and North Latitude:16^o02'53.55"N.

III. CONCLUSION

On an average of every 24hrs 59.5 ml condensation water was collected on average temperature on 107^o and 108^o. After 13 days 8.5lts of water was collected. Buy 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 modelPh 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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