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**MINING ENVIRONMENTAL ACTIVITIES OF APMDC
A CASE STUDY**

BY

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CORPORATION LIMITED, HYDERABAD**
ANDHRA PRADESH, INDIA

FOR

ENVIRONMENTAL MANAGEMENT CAPACITY BUILDING
TECHNICAL ASSISTANCE PROJECT, SUB-COMPONENT
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- A CASE STUDY**

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The Andhra Pradesh Mineral Development Corporation (APMDC) was incorporated in the year 1961 as a wholly owned undertaking of the Government of Andhra Pradesh.

Objectives of APMDC

- Development of mineral resources including exploration, exploitation, beneficiation.
- Development of mineral based industry with private participation.
- Identification of best technology and investment for holding mining leases and development of mineral resources – in line with the “Target-2000” – New Industrial Policy of Government of Andhra Pradesh, 1995”.

ACHIEVEMENTS :-

Past

APMDC carried out exploration and exploitation of various minerals like Iron ore, Asbestos, Barytes, Quartz, Ball Clay, Fire Clay, Limestone, Copper ore, Marble, Graphite and Rock Phosphate.

Present

APMDC is currently engaged in Commercial exploitation of :

- ◆ Barytes
- ◆ Black granite

Development of minerals with private participation:

Existing:

- ◆ Rock phosphate
- ◆ Galaxy granite
- ◆ Limestone

New:

- Bauxite
- Heavy Mineral Beach Sands
- Silica/Moulding Sand

APMDC holds mining leases for

- **Barytes** at Mangampeta village [(N14⁰01':E79⁰19') Topo No:57N/8], Obulvaripalle Mandal, Cuddapah district, A.P. (Extent : 160.691 hectares)

- **Calcite** at Nimmalapadu village ((N18°10'30" : E82°56'00") (Topo No. 65 J/16)), Ananthagiri Mandal, Visakhapatnam district, A.P.(Extent : 46.615 hectares)
- **Limestone** at Rally R.F., Devapur village (N19°00'15" to 19°03'16" : E79°18'30" to 79°21'44"), in Kasipet Mandal, Adilabad district, A.P. (Extent : Total 798.26 hectares & Forest clearance obtained over 210 hectares.). Reserves estimated are 84.5 million tonnes (as 24 million tonnes are already used for cement manufacture) (40 million tonnes in measured category and 44.5 million tonnes in inferred category). At present producing 3.0 million tonnes per annum is produced & supplied to M/S Orient Cements to produce 2.0 million tonnes per annum of cement clinker.
- **Silica/Moulding sand** at Varagalli hamlet of Momidi village, Nellore district, A.P.
- In addition, APMDC also holds quarry leases for **Black Granite** in Warangal, Nalgonda, Khammam Districts of A.P. and for **Galaxy Granite** in Chimakurthi village, Prakasham District, A.P.

Barytes is the main stay of APMDC and contributes to more than 90% of the revenue from its opencast mechanized mines at Mangampeta village, Cuddapah District, A.P.

APMDC also established a grinding facility near the mines in order to cater Barytes powder requirements of ONGC and Oil India in priority sector.

The Mangampet Barytes deposit is situated in the crescent shaped Cuddapah Basin of Proterozoic Age in the Indian Shield and is the single largest deposit in the World with over 25% of reserves. Also this deposit with its estimated reserves of over 65mill. Tons of Barytes holds about 98% of the total reserves in the Cuddapah Basin and 87%of the country's reserves.

APMDC has been mining Barytes from its leaseholds in Mangampeta village, Obulavaripalli Mandal in Cuddapah district since the year 1975. The opencast mining activity at first started in semi-mechanized way and mechanization was introduced from 1985 onwards.

The leaseholds extend over a total extent of 160.6321 hectares.

The lease area is situated at about a kilometer Northwest of Mangampeta village, adjacent to Cuddapah-Thirupathi State Highway at about 80 kms., Southeast of Cuddapah district Headquarters and 9 kms., Northwest of Kodur, the nearest Railway station on Southern Railway Division. Thirupathi is the nearest Airport (69-km) and Madras is the nearest Seaport (190-km).

The area has all infrastructure facilities.

APMDC has an Administrative Office building (780 meters from Mine Pit in NW direction), Pulverization Mills (450 meters from Mine Pit in WNW direction), diesel/petrol pump in the vicinity of Mine pit and a Colony housing 44 quarters with about 176 residents (780 meters from Mine Pit in NW direction).

The leasehold area is a gently undulating plain country with an RL of 180m above m.s.l. but now dug for winning barytes resulting in an open pit of

250m length, 110 to 170m width and a depth of about 60m. The area is hedged on the East by a prominent hill which rises to a height of 165m with steep slopes and peak at 365m above m.s.l. and forms the Southeastern part of hill range running for over 20 kms., in a Northwesterly direction. Another hillock, standing at about 60m above ground level and 260m above m.s.l. lies to the Northwest of the village.

The working pit in the area is partly filled with underground seepage water. The region in 5 km. Radius from the leahold abounds in many tanks, which resulted from impounding several rills rising from the adjacent hills.

Geology: Barytes in Mangampeta area is associated with tuff and crystal tuff sequence of the Pullampeta Formation of the Nallamalai Group of Cuddapah Super Group of rocks of Proterozoic age. Following is the pit section indicating the lithounits.

<u>Lithounits</u>	<u>Exposed thickness (m)</u>
Soil	0.5 to 6.0
Tuff (Hanging Wall)	38 – 50
Barytes with intercalated Tuff	21 – 41
Dolomite (Foot Wall)	+1

Mineralization: Barytes occurs as 2 distinct entities – the Northern Lens and the Southern Lens – separated by a distance of about 700m. The Northern Lens has a strike length of 1200m in NNW-SSE direction and dipping 15° to 30° ENE/NE direction with a maximum width of 900m and average thickness of 21m. It occurs as doubly plunging syncline. The Southern Lens spans a strike length of 300m with a maximum width of 220m and a thickness of 4 to 10m.

The mineral occurs in two distinct varieties viz., the granular type and the lapilli-rosette type. The Granular variety is most prominent in quantity and economically important due to its high specific gravity of 4.32 and BaSO₄ content of 94%. It is light grey in color, massive, bedded, granular/saccharoidal and occupies the bottom portion of the barytes bed. It is commercially referred as "A" Grade variety. The lapilli rosette barytes overlying the granular type is commercially divided into 3 varieties viz., "B" Grade with specific gravity of 4.22 to 4.32, "C" Grade with a specific gravity of 4.0 to 4.22 and "D" Grade with specific gravity of 3.6 to 4.0.

Mineable Reserves:

'A' Grade – 56,90,170 tonnes

'B' Grade – 16,54,768 tonnes

'C' Grade – 26,14,205 tonnes

'D' Grade – 12,79,472 tonne

Total - 112,38,615 tonnes

The ratio of barytes Ore to waste by volume worked out to be 1:7.1 and the ratio of barytes Ore to waste by weight works out to 1:3.6

Mining Aspects: Open cast, mechanized method of mining is currently in progress in the area by developing 6m height benches in a NW-SE direction with progress towards Northeast from Southwest. A 10m wide haulage road

with gradient of 1 in 20 from surface in to the pit touching all the benches. The mineral and the waste rock (tuff) will be broken by deep hole blasting, using wagon drills of 100m dia. The broken material will be loaded into 10tonne capacity tippers by hydraulic excavators for transportation. Mining involves handling of about 16,000 tonnes (3500 tonnes of barytes and 13,000 tonnes of waste /day) to meet the targeted generation of 4.5 m.t. of material/annum. APMDC produced 8.85 lakh tonnes of barytes by excavating 26.03 lakh CBM of Overburden in the year 2001-2002.

Environmental aspects: -

APMDC's mining operations started in 1961. During the period, people were not very serious about the environmental impacts, which resulted from mining activities whereas the basic objective was production. Only with the threat of deterioration of Ecology at an alarming rate, did the Nation awake. Till that time, in general, the provisions and statutes prevailing and followed are the Mines Act, 1952 under which the Mines Rules, 1955 were framed and as amended from time to time, the Metalliferous Mines Regulations, 1961 and related DGMS Circulars, the Mines and Minerals (Regulation & Development) (MMRD)

Act, 1957 under which Mineral Concession Rules (MCR), 1960 and Mineral Conservation and Development Rules (MCDR), 1988. The said Acts and Rules has only general environmental preventive or control measures which is to be followed in any mine, whether underground or open cast. APMDC has also been following these provisions in obtaining leases and operating all their mines.

Pursuant to the United Nations Conference on the human environment held in Stockholm in June, 1972, India being a member to the summit, had enacted the following acts and regulations concerning to protect and improve the environment for the citizens particularly in respect of environmental management of mining operations:

- The **Water** (Prevention & Control of Pollution) Act, 1974 and Amendments thereon.
- The **Air** (Prevention & Control of Pollution) Act, 1981 and Amendments thereon.
- The **Forest** (Conservation) Act, 1980 with Amendments.
- The **Environment** (Protection) Act, 1986 with Amendments thereon.
- The Mines & Minerals (Regulation & Development) Act, 1957 has been modified and the new Mines & Minerals (Development & Regulation) Act, 1999 was came into affect from 18-12-1999 which has specific Chapter (Chapter - V) on environment protection and conservation.

Keeping the above-mentioned Legislations in view, APMDC being a responsible public sector made efforts to take all possible steps to check pollution and take all appropriate environmental measures in

their existing mines for Barytes at Mangampet (v), Cuddapah district and proposed new mine for Calcite at Nimmalapadu (v), Visakhapatnam district, with the main objective of complying to all the National Environmental Regulations. APMDC has a mission of optimizing production capacity with improvement in productivity and profitability to itself and also to the state government by way of giving additional revenue in the form of payment of royalty for the ore that is dispatched and by payment of dividends as a profit making public sector as a primary objective and without causing much adverse effects on environment due to the mining operations simultaneously by means of available resources.

APMDC, by utilizing the expertise of consultants, has got all the environmental studies made as required by Environmental (Protection) Act, 1986 and the necessary Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) prepared for the existing Mangampeta Barytes mine at Cuddapah district. Based on the said EIA/EMP report, APMDC is continuously monitoring the environmental parameters as stipulated and required in a timely manner and also taking all possible mitigative measures for reducing the impact of mining of barytes and other related activity including at its pulverization plant also in respect of air, noise, water etc., some of which are mentioned below. As part of this environmental control and mitigative measures, overburden material is dumped separately and stabilized suitably. Air, Noise and Dust suppression measures are taken by way of raising plantation near O.B. dumps, haulage roads, colony and administrative building. Mine water is sprinkled on the haulage roads to reduce dust emanation regularly. A nursery with the local plantation suitable for quick growth is raised with the help of State Forest Officer.

Rehabilitation of local people, effected by mining activity by providing suitable compensation as fixed by State Revenue Department is also being done by APMDC.

New Projects:-

APMDC also got prepared RAPID EIA/EMP for their **Calcite** mine in Visakhapatnam district and propose to carry out mining as per environmental measures given in the said EIA/EMP report.

Table 1.0 indicating the water quality that is available in the mine site is enclosed, where in it may be seen that the water is suitable for industrial and domestic purpose. Figure-1 indicates the Ambient Air Quality in respect of SPM and SO₂ are given wherein it may be seen that both are within the prescribed limits.

Also, APMDC has got prepared Rapid EIA/EMP for the 3 deposits of **bauxite** (between N18°10' and 18°18'24": E 82°50' and 82°50'28" in Topo No. 65 N/3, N/4, J/15), near Araku, Visakhapatnam District, heavy mineral beach

sands deposit near Bhimili Coast of Visakhapatnam and Vizianagaram Districts (a joint sector project of APMDC, Indian Rare Earths Limited and NMDC) as a part of getting Environmental Clearances from MOEF, Government of India as required under F.C. Act, 1980 and E.P. Act, 1986 and for further grant of mining leases under MCR, 1960 and propose to take up mining of these deposits in a eco-friendly way after grant of these leases. Table 2.0 indicates baseline data like Air (SPM, NO_x, SO₂), Water (Surface and Ground Water) and Noise (Leq day and night) parameters at different locations collected for the rapid EIA/EMP for the Bauxite deposits near Araku of Visakhapatnam district wherein it may be seen that all parameters are within the prescribed limits.

Conclusion:-

The first step for any industry to run its business is to comply with the regulations of the land. So APMDC, being a responsible corporate citizen of India is in compliance with all major environmental regulations of the land. There has been a change in the attitude of the management to minimise adverse environmental impact through environment friendly mining methods, improved technology, damage limiting practices, effective rehabilitation measures, integrated planning and measures of social awareness and sensitivity. Earlier concept of cleaning up technology has since been changed to clean technology and is being gradually introduced into the APMDC's mines. Implementation of environmental management systems, environmental audit, accounting, etc., is some of the new areas, which are being given importance.

Table 1.0 indicating the water quality available in the mine site for Calcite in Nimmalapadu village, Visakhapatnam District.

S.No.	Particulars	Value
1.	pH	7.45
2.	Turbidity (N.T.U.)	1.4
3.	Conductivity (mmhos)	250
4.	Total Solids (mg/l)	170
5.	Total dissolved solids (mg/l)	165
6.	Total Suspended Solids (mg/l)	5
7.	Alkalinity (mg/l)	140
8.	Acidity (mg/l)	Nil
9.	Total Hardness as CaCO ₃ (mg/l)	116
10.	Calcium as Ca (mg/l)	28
11.	Magnesium as Mg (mg/l)	12
12.	Chlorides as Cl (mg/l)	25
13.	Sulphates as SO ₄ (mg/l)	Traces
14.	Fluorides as F (mg/l)	0.45
15.	Total Iron as Fe (mg/l)	0.1
16.	Nitrates (mg/l)	2.4
17.	Manganese (mg/l)	n.d.
18.	Residual Chlorine (mg/l)	Nil
19.	M.P.N/100 ml.	20
20.	Total plate count/ml	4

N.B. Minor treatment would be required such as chlorination for drinking purposes.

Table 2.0 indicating Baseline Data like Air (SPM, NO_x, SO₂), Water (Surface and Ground Water) and Noise (Leq day and night) parameters at different locations collected for the rapid EIA/EMP for the Bauxite deposits near Araku of Visakhapatnam District.

AMBIENT AIR QUALITY:

Station	SPM			NOX			SO2		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
1. Araku valley	46.3	119.7	84.2	6.24	39.17	21.6	2.6	9.15	3.84
2. Bisupuram	61.7	105.3	87.6	1.75	28.08	7.47	2.18	7.62	3.92
3. Ganela	74.3	154.2	118.9	1.38	34.1	13.77	2.41	12.02	4.81
4. Hattaguda	52.8	175.9	86.3	2.09	34.01	14.17	2.72	12.36	6.92
5. PeddaGanguguda	33.9	102.6	84.9	1.11	17.5	7.9	1.59	5.45	3.18
6. Sunkarametta	26.5	99.9	54.8	1.39	31.45	11.23	2.35	9.74	4.23
7. Ananthagiri	62.5	113.4	86.8	2.46	35.86	15.12	1.92	15.56	5.03

Note: - All concentrations in ug/m³. It can be seen that the ambient air quality in the locations is within the standards by the CPCB Standards.

NOISE:

Station Name	Leq (dB) Day	Leq (dB) Night
Chittamgondi Bauxite deposit site	42	32
Nandivalasa (v)	45	35
Galikonda Bauxite deposit site	45	30
Bisupuram (v)	55	35
Araku valley Road (10 km away)	60	42
Sunkarimetta Checkpost	50	38
Gannela (v)	40	35
Borra Limestone caves	50	30
Similiguda	45	30

WATER: 1.SURFACE WATER:

S.No.	Parameters	Sampling locations			
		Spring water, Chittamgondi	Spring Water, Galikonda	Stream water, Bisupuram (d/s)	Spring fall, Rakthakonda
1.	PH	7.0	6.3	6.9	6.8
2.	EC	89	79	71	122
3.	Total solids	64	56	91	119
4.	TDS	64	56	53	84
5.	TSS	NIL	NIL	38	36
6.	DO	7.2	7.2	7.0	6.4
7.	Chlorides	17.3	13.5	9.9	22.0
8.	Flourides	0.1	0.1	0.1	0.2
9.	Nitrates	0.24	0.43	0.31	0.43
10.	COD	BDL	BDL	8.5	8.2
11.	BOD	-	-	4.7	4.7
12.	Total Hardness	18.7	20.0	21.6	30.2
13.	Calcium Hardness	14.5	16.8	16.8	23.4
14.	Magnesium Hardness	4.2	3.2	4.8	6.8
15.	Total Alkalinity	32.5	31.9	32.2	59.2
16.	Sulphates	1.92	1.44	1.92	1.92
17.	Phosphates	0.16	0.24	0.24	0.24
18.	Sodium	10.1	9.6	5.0	12.8
19.	Potassium	1.9	1.2	2.1	5.5
20.	Coliform	Absent	Absent	Absent	Absent
21.	Al	0.02	0.02	0.02	0.02
22.	Fe	0.05	0.21	0.06	0.02
23.	Cu	0.05	0.05	0.05	0.05
24.	Cd	BDL	BDL	BDL	BDL
25.	Pb	0.01	0.02	0.02	0.01
26.	Zn	0.05	0.05	0.05	0.18

Note:- All values are expressed in mg/l. BDL : Below Detectable Level.

.2. GROUND WATER QUALITY:

S.No.	Parameters	Sampling locations			
		Open Well, Hattaguda near Chittamgondi	Borewell, Araku valley	Open well, Sunkarametta , near Galikonda	Bore well, Ananthagiri near Rakthakonda
1.	PH	7.2	8.1	6.8	7.8
2.	EC	131	128	135	
3.	Total solids	101	78	117	
4.	TDS	83	78	91	
5.	TSS	18	NIL	26	
6.	DO	5.8	5.7	5.8	
7.	Chlorides	19.2	19.2	20.5	
8.	Flourides	0.1	0.1	0.2	
9.	Nitrates	1.24	0.43	1.24	
10.	COD	6.2	BDL	6.4	BDL
11.	BOD	3.4	BDL	3.2	BDL

12.	Total Hardness	31,8	27.7	41.3	27.7
13.	Calcium Hardness	24.2	23.4	31.0	23.4
14.	Magnesium Hardness	7.6	4.3	10.3	4.3
15.	Total Alkalinity	57.8	56.2	61.8	56.2
16.	Sulphates	4.81	4.81	4.16	3.74
17.	Phosphates	0.51	0.31	0.31	BDL
18.	Sodium	13.8	11.9	10.1	13.8
19.	Potassium	3.1	2.7	3.1	2.7
20.	Coliform	Absent	Absent	Absent	Absent
21.	Al	0.02	0.01	0.02	0.01
22.	Fe	0.05	0.03	0.05	0.05
23.	Cu	0.05	BDL	BDL	BDL
24.	Cd	BDL	BDL	BDL	BDL
25.	Pb	0.01	BDL	BDL	BDL
26.	Zn	0.06	0.13	0.08	0.20

Note:- All values are expressed in mg/l. BDL : Below Detectable Level.

Parameter such as sulphates, nitrates, sodium and potassium were observed to be well within the IS specifications for Drinking water IS 10500 –1983. Because of the influence of mineral deposits and lateritic soil in the region few samples of the surface waters contained detectable concentrations of heavy metals. Metals like Aluminium and Iron were observed in all samples and Copper, Lead and Zinc were within the prescribed limits or below detectable level. All the samples were observed to be free from Coliform contamination