

Bentonite Production (Maputo)

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9ª CONFERENCIA DA COMUNIDADE DE MINERACAO
ARTESANAL E DE PEQUENA ESCALA (CASM)

8 a 10 de Setembro, 2009

Maputo - Mocambique

Introduction

Bentonite is a natural occurrence material dominantly the clay mineral montmorillonite. It is one of the mineral of the Smectite group having a layered structure that possesses high swelling properties and high cation exchange capacities. When in contact with water it expands up to fifteen times its dry volume.

Depending on the dominant exchangeable cations present the clay may be referred to as calcium bentonite or sodium bentonite, the two varieties exhibiting markedly different properties and thus uses.

The Company Minerais Industriais de Mocambique Lda (MIMOC) has been producing bentonite from Mafuiane quarries (outside Maputo in Mozambique) for many years.

MIMOC employs 35 peoples, which contributes for poverty alleviation of circa 175 peoples (each family with 5 members).

The product are supplied to several customers throughout South Africa, Zimbabwe and Mozambique; only 25% is used in local industry, mainly for drilling construction and small foundry industries. Sales per year are estimated 13,000 tones of different grades, which turnover of about 300,000 United Dollars.

Ownership: Private + State

The concession is valid for 25 years, and can be renewed.

Location

The mine and processing plant is located at Mafuiane area, Namaacha District, some 10 km from the railway line and about 45 km SW from Maputo city, capital of Mozambique and Port. The plant is 32 km to the south of the new tar road within the Maputo Corridor. The plant is also connected to the National Road 2 linking Maputo and Swaziland. The location provides good transport facilities to the adjacent SADC states and to Europe.

Geological Occurrence

Many of the world's largest commercial bentonite deposits formed by alteration of fine-grained volcanic debris deposited over relatively large areas. Other bentonites formed by *in situ* hydrothermal alteration of coarser igneous rock. Because certain chemical trace-elements are usually retained when an igneous rock alters to clay. Plots of ratios of these elements on a geochemical grid can often indicate the composition of the parent igneous material.

The topography of the MIMOC bentonite deposit is almost flat, and covered by dense vegetation covered to thicket in some places.

The bentonite deposit has a North-South direction and was disrupted by almost North-South trend, locally developed faults. Probably these faults are responsible of subdividing the deposit into small blocks and may be the variation of the thickness of the orebody and the overburden is due to the same faults. Minor folds were observed on the outcrops and the walls of an old stone crusher.

The bentonite deposit is connected to the volcanic rocks of the karroo formation and the bentonite is originated from the metamorphism of the rhyolitic rocks, tuffs and volcanic glass of the second eruptive phase. The thickness of the bentonite layer is varying considerable and is between 2.1 m to 10.6 meters. The overburden from 0.9 to 6 meters.

Mining and Processing

Mining

The mine and processing plant have operated for many years. Currently the company has two large areas under licence ensuring customers on adequate supply for many years.

Bentonite is extracted in open pit workings, by opencast methods in which the overburden is dumped into worked out sections of the pit.



In year 2000 the mine was flooded because of rain that affected the southern region of Mozambique, which caused flood.



Processing

Processing is essentially to modify its properties for specific industrial applications rather than to increase its smectite content. The major products groups are:

- ◆ Ca-bentonite (fine powders and granules)
- ◆ Na-bentonite and Na-exchanged bentonite
- ◆ Acid-activated clays
- ◆ Specialty clays (white bentonite and organoclays).

Processing of Ca-bentonite consists of drying and grinding, the dried clay being either screened and marketed in the granular form or milled to a fine powder, size grading being carried out by air-classification.

Two products are currently available. These are coral bentonite a milled sodium activated bentonite (sold in 50 kg sacks) and bulk screened bentonite;

Users and Applications

Bentonite has many uses in the industrial, technical, environmental and other fields. The following are some of the uses to which bentonite can be applied:

- ✓ *Sealing*
- ✓ *Plasticizer*
- ✓ *Suspending Agent*
- ✓ *Drilling Mud*
- ✓ *Land Fill*
- ✓ *Pelletizing and Briquette manufacture*
- ✓ *Foundries*
- ✓ *Welding Rods*
- ✓ *Thickner*
- ✓ *Absorbents*
- ✓ *Agriculture*

Ceramic

Future Plans

- Exploration program for evaluation and selection mining in order to increase the production of raw bulk bentonite
- Cleaning the quarry
- Rehabilitation to expanding the processing plant
- Improvement quality control of all stage of production until final product
- Build up some infrastructures, acquire some equipment and search market.

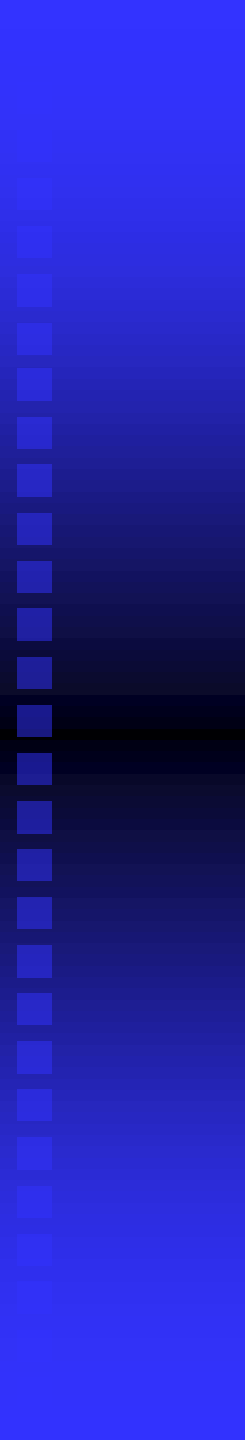
Infrastructures and equipment needed are the constructions of shade, drier for bentonite, trucks, front and loador, excavator, transformer and new mill for bentonite.

- Elimination of dust emissions to reduce negative impact in environmental by setting up filters in the plant.



THANK YOU!

OBRIGADO!



CONSTRAINS

Financing problems

The amount of investment in the first phase is about USD 1,500.000.

We will welcome the assistance of any organization or partnership.

References

1. Mozambique – Rehabilitation and Expansion of the Lucinada Bentonite Mine and Beneficiation Plant, September 1989. IDU/SCFM/10. Industrail Development Unit, Commonwealth Fund for Technical Co-operation, Commonwealth Secretariat, Marlborough House, London SW1.
2. Consultant on Exploration and Ore Beneficiation Methods on Bentonite for peopl's Republic of Mozambique. United Nations Department of Technical Co-operation for Development, Project: MOZ/86023. Prepared by: Gordon Presley, Consultant, Mineral Project Development, 8581 E.Dry Creek Place, Englewood, Colorado, USA 0112.
3. BOANE BENTONIT-MOZAMBIQUE – Final Report, CDI/CDE FILE No. *MOZ/004702EO*, By VIV STUART-WILLIAMS, 2001, Centre for the Development of Industry 52 av. Herman Deborah, 1160, Brussels, Belgium.
4. Insustrial Minerals Laboratory manual – Bentonity Technical Report WG/9320, Mineralogy and Petrology Series, By S D J Inglethorpe, D J Morgan, D E Highley and A J Bloodwoth, Mineralogy and Petrology Group, British Geological Survey Keyworth, Nottingham – United Kingdom NG125GG
5. Bentonite Project, Mafuiane – Mozambique, by Luis Jossene, May 2004.