THRESHOLD VALUE OF BAUXITE

Presented by

Utkal Alumina International Limited

Members:-

Pradyumna Das

S B Sahoo

P Dandia

A K Jena

23rd August 2017

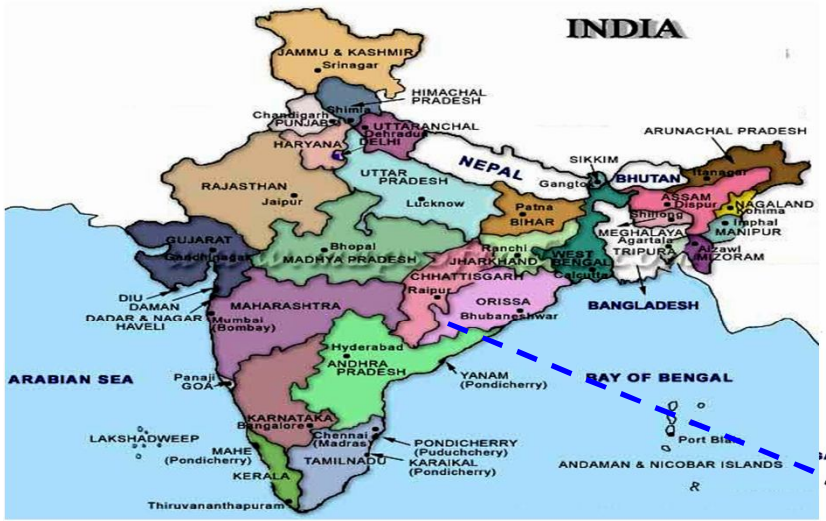
COMPANY PROFILE

Utkal Alumina International Ltd.

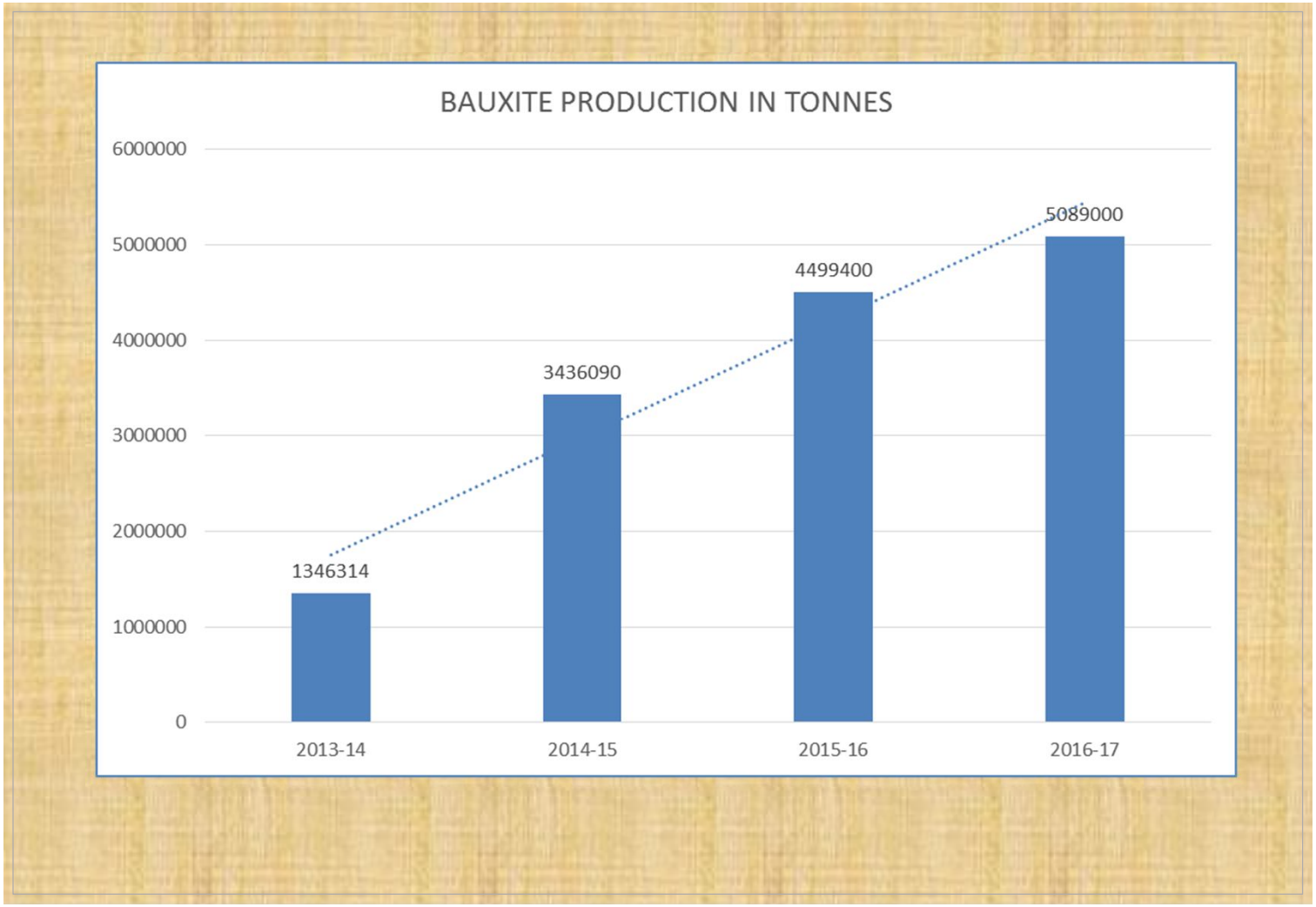
Utkal Alumina International Ltd, a 100% subsidiary unit of Hindalco Industries ltd operates an 1.5 MTPA Alumina Refinery and captive co-generation power plant of 90 MW in Rayagada district of Odisha.

Baphlimali Bauxite Mine is the captive mine for UAIL named after the hill Baphlimali over an area of 1388.740 hectares in Rayagada & Kalahandi district of Odisha. The lease comprises of about 200 Mt resources to cater bauxite ore to its refinery plant.

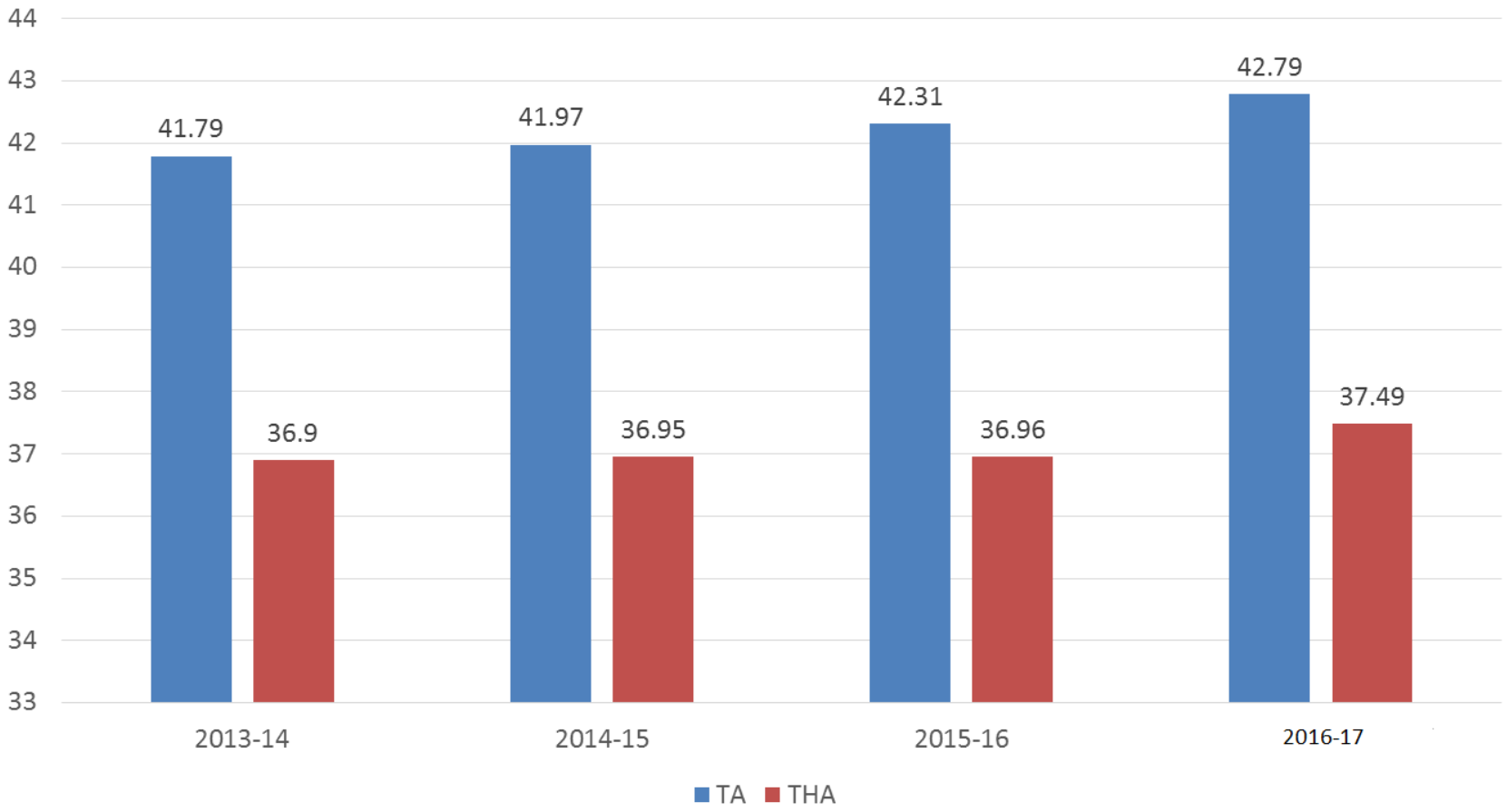
LOCATION MAP- BAPHLIMALI MINING LEASE



PRODUCTION PERFORMANCE TREND- YEAR WISE



BAUXITE QUALITY IN % (TA & THA)

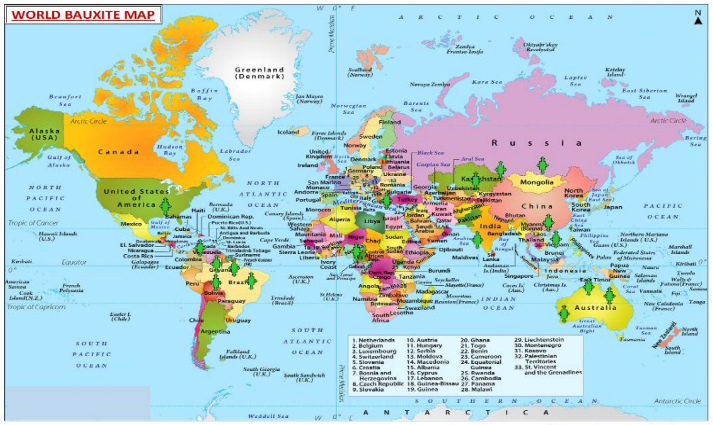


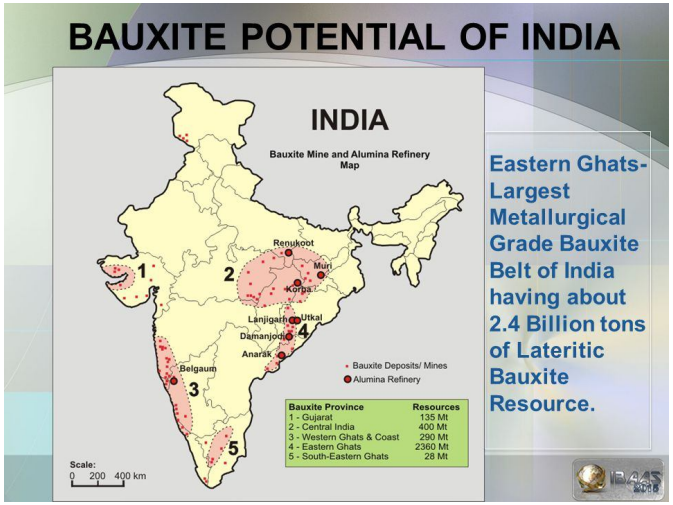
BAUXITE QUALITY IN % (T.SiO2 & R.SiO2)

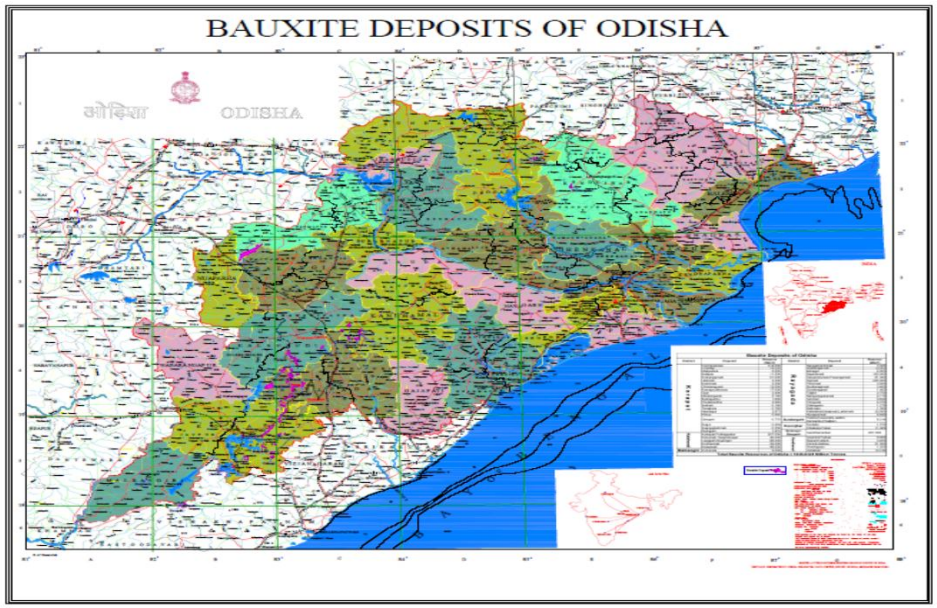
BEST PRACTICES

- Bauxite mining, crushing & supply to refinery is an integrated approach to control the bauxite ore contamination.
- Auto Sampler is being installed in the long distance conveyor to reduce sampling error.
- Use of DATAMINE, mine scheduler mine planning software for resource estimation/long term mine scheduling and pit optimization.
- Using Instant Bauxite Analyzer XRF(ED), the analysis of TA & TS becomes easier which can be effectively utilized for Quality control of Bauxite in different stages of Production.
- Use of high capacity low fuel consuming equipment in the mines.
- Exploratory drilling: - Environment friendly, highly productive vacuum suction drills which leads to zero noise, no dust and no vibration.
- Blast hole drills: - Drills with in-built vacuum cyclone dust collector & equipped with water spraying system are put in service to arrest dust generation.

DISTRIBUTION OF BAUXITE

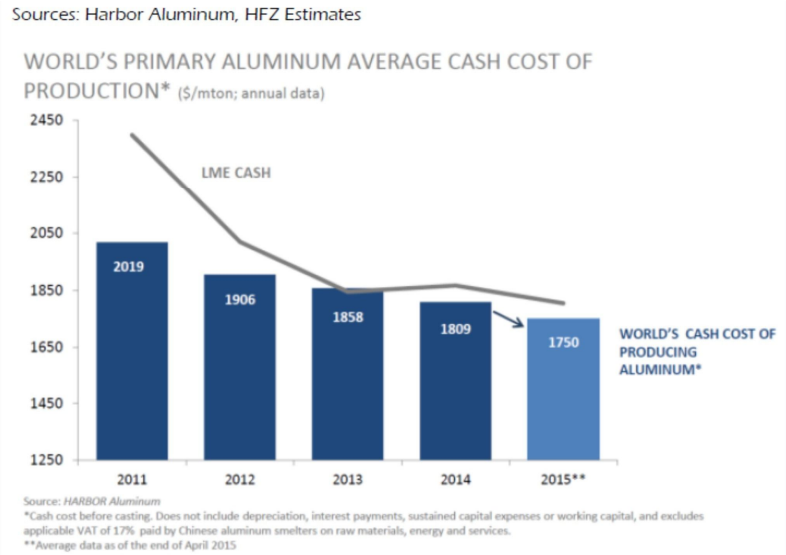


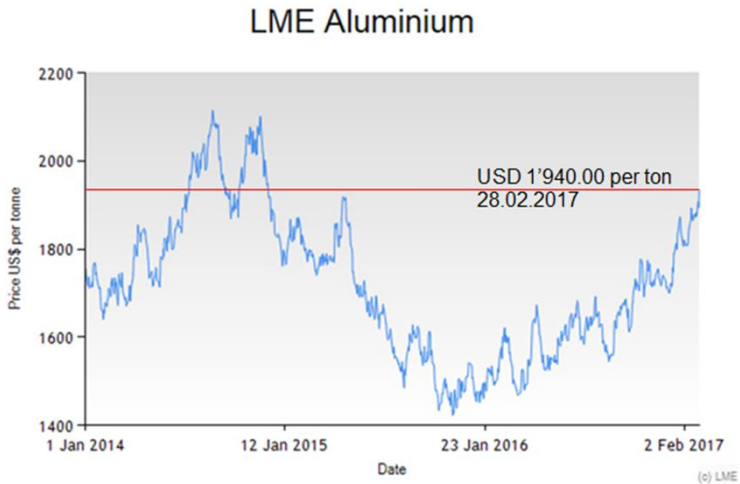


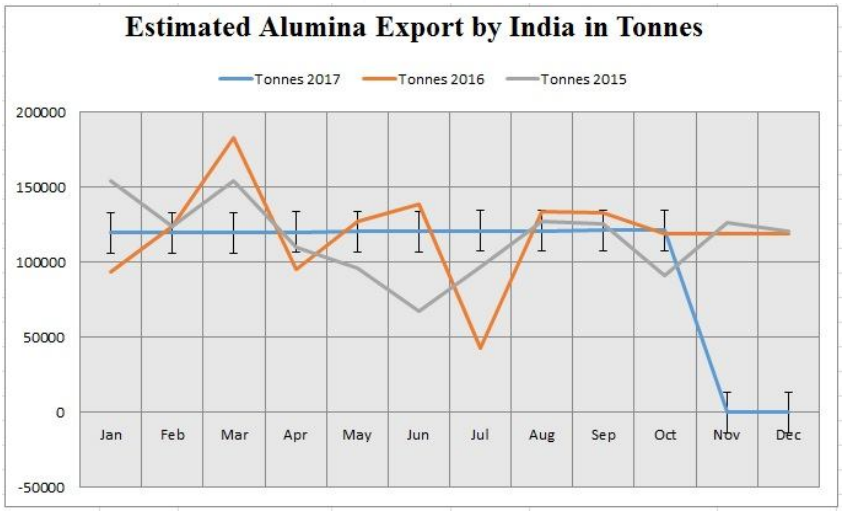


GENERAL INFORMATION

Sources: Harbor Aluminum, HFZ Estimates







THRESHOLD VALUE

- “Threshold Value of minerals” means limit prescribed by the Indian Bureau of Mines from time to time based on the beneficiability and or marketability of a mineral for a given region and a given time, below which a mineral obtained after mining can be discarded as waste.“

- National Mineral Policy 2008 in relation to mineral resources focuses on mineral conservation, sustainable & judicious uses of minerals resources. Hence the threshold value plays a vital role for the economic development of the country.

BAUXITE OF DIFFERENT TYPE

Siliceous Laterite

Ferruginous Laterite

Pink Bauxite

Yellow Bauxite

Brown Bauxite

Dark Brownish/Reddish black Bauxite

Red Bauxite

Lithomarge

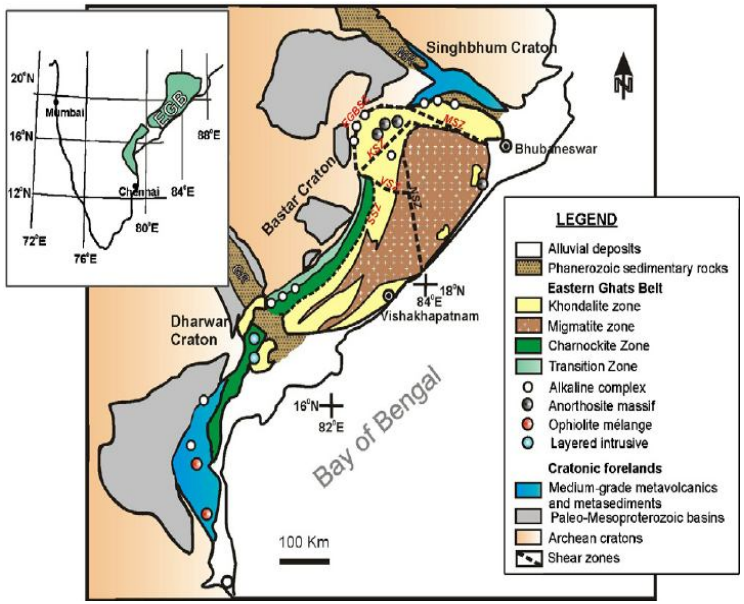
Partly Altered Parent Rock

EAST-COAST BAUXITE

- The **Eastern Ghats Mobile Belt** (EGMB) occupies an area of over 15,000 sq.km for a distance of about 900 kms with a maximum width of 300 kms in the northern parts of Odisha.
- The dominant rock assemblage:
- 1. **Khondalites**

  (quartz-garnet-potash-feldspar-sillimanite gneisses)
- 2. **Charnockites**

  (hypersthene-diopside granulites).



- **<u>Bauxitisation Process:-</u>**

When alumina-rich igneous rocks/metamorphic rocks weather the feldspars of such rocks are usually kaolinized, but under tropical monsoonal conditions, the weathering goes a step further and results in residuum rich in hydroxides of aluminum together with oxides of iron, manganese and titanium. Where there is a sufficient concentration of the aluminum hydroxides, economic deposits of bauxite originate.

CHEMICAL CONSTITUENTS OF BAUXITE

- **Bauxite** = Aluminum oxide + Aluminum hydroxide + Haematite + Goethite + Kaolinite , etc

- Aluminum oxide mineral is **Gibbsite** - Al(OH)3.
- Aluminum hydroxide minerals are **Boehmite-** AlO(OH) and **Diaspore** -AlO(OH).

- **<u>Profile of East Coast Bauxite;</u>**

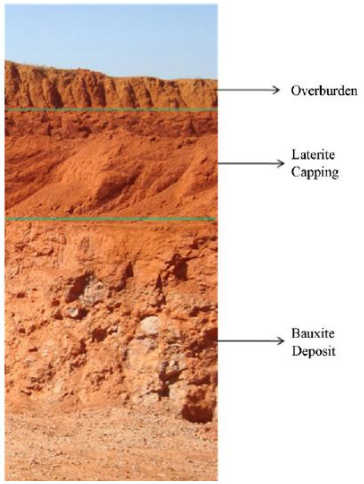
  Lateritic soil

  Aluminous Laterite

  Bauxite

  PLK/PKK

  Khondalite



CUT-OFF GRADE

- Average cutoff grade of East Coast Bauxite as per present plant requirement.

    - **T.Al2O3 (Total Alumina) - >= 40%, Total Silica<=5%**

- **FACTORS:-**
- Total Alumina does not take part in direct digestion process.
- Total Available Alumina for digestion = THA + MHA, which depends on other constituents of the ore body as given an example below:
- Regression equations for estimation THA & R.Silica of one East Coast Bauxite Deposit.

- **THA (Gibbsitic) = LOM * 1.6850 - Fe2O3 * 0.2091 - TiO2 * 1.0521 – SiO2 * 0.9582 – Al 2O3 * 0.0326 + 9.26**
- **Reactive silica = LOM * 0.7693 + Fe2O3 * 0.7943 + TiO2 * 0.6962 + SiO2 * 1.6006 + Al2O3 * 0.8038 – 78.6.**

- **Threshold value** is the beneficiability and or marketability of a mineral for a given region and a given time, where as **cut-off grade** is the level below which material within an ore body does not contain sufficient value to economically justify processing into a final saleable form.

EXISTING AND PROPOSED THRESHOLD VALUE

- **<u>Threshold Value As per IBM notification 2009.</u>**

BAUXITE- (i)FOR ALUMINOUS LATERITE: Al2O3 - 20% (MIN)

(ii) FOR BAUXITE: Al2O3 - 30% (MIN) AND SILICA (REACTIVE) - 5% (MAX)

- **<u>Proposal For Revision Of Threshold Value.</u>**
- Threshold value of Bauxite: >=40% T.Al2O3 and <=5% T.Silica.
- Mineral rejects/ SG : +35 to -40% T.Al2O3 and <=5% T.Silica.
- Aluminous Laterite : +20% T.Al2O3 and >=5% T.Silica.

JUSTIFICATION FOR PROPOSAL.

- Bauxite Deposit in India has derived from different source rock like Khondalite, Charnokite, Basalt, Shale, etc. hence shows a different characteristics in its formation & chemistry at various locations.

  Ex.- Gibbistic deposit of East Coast Bauxite differs with Bohemitic deposit of Central India.

- Uniformity of Bauxite quality in one specific deposit varies within a meter.

- The total Al2O3 content in bauxite is not usable by Indian Alumina Plants due the fact that nearly 4-5 % Al2O3 out of total available Al2O3 content is not recoverable due to presence of reactive silica, other impurities associated and with technologies being used in India.

  e.g. In 40-45 % of total Al203, only 35-40% Al203 is gets available for Alumina extraction due to the reasons mentioned above.

JUSTIFICATION FOR PROPOSAL continued..

- Contents of Reactive Silica plays an important role to define Bauxite.

- Determination of Reactive Silica cant not be carried out in ROM stage rather calculated during digestion stage with Caustic Soda.

- 5% of R.Silica is equivalent to 6.7% of Total Silica, which may go up to to 7-8% during mining as both top & bottom profile of bauxite are highly undulating in nature.

  So every 1% excess of R.Silica results more consumption of caustic soda and creates digestion problem.

- Hence, threshold value of Silica in bauxite ore should be based on T. Silica content (<5%), rather than R.Silica which can also be controlled during mining.

- Keeping +30% of T.Al2O3 of ROM, which generally does not take part in the blending process will need more spaces for stacking and re-handling. In addition to, consumption of +30% Al2O3 will increase more red mud generation.

OUR VIEWS …..

- Based on the prevailing scenario and technology of Indian Alumina Refinery and the complicacies of bauxite occurrences, we would like to suggest a change in Threshold value of Bauxite Particularly in East Coast region as follows:

- Threshold value of Bauxite: >=40% T.Al2O3 and <=5% T.Silica.
- Mineral rejects/ SG : +35 to -40% T.Al2O3 and <=5% T.Silica.
- Aluminous Laterite : +20% T.Al2O3 and >=5% T.Silica.

WAY FORWARD …..

- 100% coverage of ML area by Exploratory Holes.
- Scientific study towards recovery of Iron & Alumina from sub grade ores (aluminous laterite & PLK/PKK) as well as precious metal (Ti & Va) recovery from Red Mud.
- Application of SURFACE MINER.

Thank You.