

Brief write-up on S&T (Mines) completed projects

Project Title: Status report on work carried out nationally and internationally on red mud to benchmark the future investigation in the country (S-28).

File no: Met4-14/10/2017-Metal IV/ Record cell

Objective:

- To prepare status report on work carried out nationally and internationally on red mud.
- Identify the most promising and economical viable solution for bulk utilization of red mud.

Background: Red mud is an insoluble product generated during the Bayer's process of alumina production. Generally, 1-2.5 tonnes of red mud is generated per tonne of alumina produced. Red mud is alkaline in nature due to processing of bauxite with caustic soda solution at elevated temperatures which poses a serious environmental hazard. Present worldwide generation of red mud is about 150 million tonnes while about 2.5 billion tonnes of the bauxite residue remains stored in the landfills. Owing to its disposal in huge amount, it has become difficult to handle and manage in a sustainable way. JNARDDC has prepared a detailed status report on work carried out nationally and internationally on red mud to benchmark the future investigation in the country. It will help the industry to explore possible bulk scale utilization of red mud and better waste management by avoiding repetitive R&D work.

Outcome:

- The major obstacle in bulk use / long term storage of red mud is due to its complex mineralogical & chemical composition, extreme fineness, poor settling, poor dewatering characteristics, highly alkaline nature, seepage of alkali into groundwater thereby posing environmental threat.
- **Extensive work on lab scale has been done in manufacturing bricks and blocks. Only a few have been tried at pilot scale level. R&D funding should henceforth be limited to the pilot plant level projects with a view to commercialize the production and use of bricks / blocks with techno-economic feasibility. Emphasis should be on projects / plants which can be set up in near vicinity to the alumina refinery with a view to mitigate the transportation cost of red mud.**
- **Govt policies / guidelines need to be put in place on similar lines of fly ash utilisation with a view to take up production and sale / distribution of red mud bricks / blocks. It could also be taken up as a corporate social responsibility (CSR) by the concerned industry. Certain subsidies may be given to the user industry by the government as an environmental sustainable initiative.**

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- **There is sufficient scope for sustainable use of red mud for road construction as an embankment landfill, soil stabilizer, as an additive/durability enhancer e.g. sand manufacturing, special cement, refilling the abandoned bauxite mining open pits. Construction and cement industry should be encouraged for utilizing red mud in above applications.**
- **Research programs can be encouraged to explore the possibility of use of red mud in vegetation cover.** Use of red mud in agriculture may improve the water retention capacity of sandy soils.
- Similarly a lot of work on lab scale has been undertaken for recovery of iron, titanium and rare earth valuables from red mud. **The focus should shift to pilot scale trails to evaluate the techno-economy feasibility of recovery of metals.**
- There is a need to focus more on the safe storage of red mud. **Proper disposal strategies should be implemented by the alumina refineries** and an audit of disposal ponds should be done by an authorised agency appointed by the government.
- **Red mud should be categorized into two groups namely iron rich red mud and moderate Fe₂O₃ and TiO₂-rich red mud and the decision to undertake further R&D work should be based on the above classification.**
- **Workshops and awareness programs** should be conducted by various agencies including JNARDDC with the support of industry **to encourage people for using red mud related materials.**
- **Centralized data regarding red mud generation and its utilization** on a yearly basis should be compiled.