TECHNICAL SESSION – I

RAW MATERIALS RESOURCE MANAGEMENT AND MINE PLANNING

Shri Sanjay Jain (left); Shri S Chatterjee (centre) ; Shri M S Rao, JD-NCB (right)

Chairman :**Shri S. Chatterjee,** Managing Director, M/s Ercom Engineers Pvt. Ltd.

Co-Chairman :**Shri Sanjay Jain,** Asst. Executive Director (Technical Services), Dalmia Cement (Bharat) Limited

Venue & Date : Zorawar Auditorium, Manekshaw Centre, New Delhi. 01-12.2015

Summary

This session comprised of five technical papers highlighting the significance of raw material resource management and mine planning in the areas of investigation of core recovery percentage at some of the limestone deposits in India, systematic exploration, statistical analysis and deposit modeling for a limestone deposit of Democratic Republic of Congo, reactivity of cement grade limestone deposit by chemical and mineralogical evaluation, utilization of slab quarry reject limestone in cement manufacture and utilization of low grade limestone in cement manufacture - an Indian perspective.

Highlights of the Presented Papers

1. An Investigation on Core Recovery Percentage at Some of the Limestone Deposits in India – A Case Study

H R Dandi, S B Hegde and S K Das, Reliance Cement Company Pvt Ltd, India

It is an attempt to understand the possible reasons and relationship for less core recovery percentage in three different geological formations of limestone. There is a definite relationship between structural/depositional discontinuities and core recovery within a particular band of limestone. The frequency of fractures, dolomitization, stylolites, stromatolities , cementing material , multiple generation crystallization of calcite have played a important role in core recovery.

It is true that structural complexities, intercalated clay bands, inappropriate drill size, improper anchoring of rigs and high rotation speeds plays a important role in core recovery but if detailed explanation of less core recovery is missing then a relationship with quality can be arrived by dividing the total formation in different litho units and understanding the genesis of the limestone basin. In order to correlate core recovery with chemical composition , nearly 5000 samples were studied in different formation. The results indicated a clear correlation between core recovery and chemical behaviour of rock.

2. Systematic Exploration, Statistical Analysis and Deposit Modeling for a Limestone Deposit, Democratic Republic of Congo (DRC)

S K Gotecha and M Choudhry, *ERCOM Engineers (P) Ltd, India,* K Govender and E Khan, *PPC Ltd, South Africa*

The paper emphasized the application of advanced technologies in exploration and evaluation of a mineral deposits. The studied deposit is situated in Central African tropical forest with thick vegetation and overburden consisting of soil, laterite, clay and marl. It was challenging for the assessment and development of the deposit as a mine, due to erratic lithological contact between the overburden and the underlying limestone ore-body. Detailed systematic exploration, deposit modeling and statistical analysis of quality and quantity (estimation of reserves) were carried out to determine the run-of mine quality during mining and estimation of reserves for the life of mine. Applications of advanced technologies in exploration and evaluation of mineral deposits have made it possible to take decisions on complicated deposits for multi-million dollar projects. These techniques are efficient, reliable, time saving as well as cost effective through optimisation of expenditure on geological investigations.

3. Reactivity of Cement Grade Limestone Deposit by Chemical and Mineralogical Evaluation

B N Mohapatra, P Sharma, M Kapoor and J P Desai, Ambuja Cements Ltd, India

The cement manufacturing process and quality of cement is characterized mainly by the quality of lime stone. The evaluation of lime stone deposit was mainly on the basis of chemical composition for lime and magnesia content. But the reactivity, burnability of lime stone and the output of the plant depends not only on the chemistry of the raw mix but also on its granulometry, mineralogy, microstructure, petrology and the minor oxide content. Conventional chemical analysis, analysis by X-ray fluorescence, Differential Thermal Analysis (DTA), Thermogravimetric Analysis (TGA), Microscopy, X-ray Diffractometry and Particle size analysis have gained importance for the characterization of lime stone deposit for cement manufacturing in present scenario.

4. Utilization of Slab Quarry Reject Limestone in Cement Manufacture – A Case Study

D K Panda, N K Sharma, A K Dubey, Richa Mazumdar and A K Mishra, National Council for Cement and Building Materials, India.

The paper depicted the recovery of limestone from a limestone deposit dump belonging to Kurnool System of Indian stratigraphy, located in South India where large scale slab quarry operations had already been carried out. The qualitative and quantitative assessment of the dumps have been carried out through geological field investigations followed by topographical survey, review of the exploration of borehole analysis, chemical analysis of representative surface and bulk samples collected from dump site, determination of bulk density of the dumped material and the recovery factor analysis by adopting dry mineral processing. From the detailed systematic and scientific qualitative and quantitative assessment of the dumps comprising of limestone of different qualities, it was observed that up to 80% of the total dumped material can be utilized for cement manufacture subject to adopting screening and blending techniques. Similar studies can be carried out for all such dumps to utilize huge quantities of slab quarry rejects for cement manufacture, thus conserving mineral resources and cleaner environment.

5. Utilization of Low Grade Limestone in Cement Manufacture: An Indian Prospective

G C Mishra, N Shukla and A K Soni, AKS University, India

The paper emphasized the urgent need for detailed exploration of limestone deposits in India to establish more limestone reserves as per UNFC classification from the existing resources. A systematic mine planning and multi mine scheduling is essential to maximize the use of quarry rejects. More studies on the dry beneficiation technique for enrichment of low grade limestone is essential. The encouragement for production of belite cement and sulfoaluminate (C_4A_3S) cement in India will provide a better solution for this burning

issue. These cements are best suitable for the construction in the coastal areas owing to their sulphate resistant properties. More over there is enough potential for utilization of low grade limestone as well as various industrial waste for eco friendly cement manufacture.

Chairman and Co-Chairman Remarks

The Chairman Sh. S Chaterjee emphasized the significance of limestone considering the fact that global cement production of around 4.5 billion tonnes is mainly dependent upon the raw material i.e. limestone. He raised the issue of little success achieved in substituting limestone as raw material and even whatever is being substituted, it is at very low scale. He briefed that NCCBM in association with IBM has been compiling National Inventory for cement grade limestone. Based on the exploration data generated at present, total available limestone reserves are 124 billion tonnes which appears to be huge. Further, out of these total limestone reserves, only 26 % i.e. 32 billion tonnes are under proved category. Out of 32 billion tonnes, 31 % are under forest cover, 17 % have infrastructural impediments like roads, bridges, overhead lines, habitation etc. Hence only rest are available under proved category which can sustain for only 18 years considering 8 % growth rate of Indian cement industry. Thus action plan is required to tackle this critical situation focusing on following points a) Use available limestone judiciously by proper mine planning, evaluation of deposits and mixing low and high grade limestone b) Carrying out more and more explorations in order to bring probable and possible reserves into proved category and development of cost effective dry beneficiation technique to upgrade the low and sub marginal grade limestone for use in cement manufacture. c) Efforts to be made to release some blocks under forest cover and infrastructural impediments for cement industry d) Renewed thrust is necessary in order to produce greener , blended cement for reducing clinker component in cement and conserve limestone thereby reducing carbon footprint.

Co-chairman Sh. Sanjay Jain appreciated the authors who made good attempt to highlight the need for proper mine planning, proper investigation of resources, careful drilling to minimize core recovery losses, conservation of mineral resources and utilization of low grade limestone/rejects. He also mentioned about the usage of petcoke which helps in utilization of low grade limestone. For overburden usage, slab quarry limestone can be upgraded by crushing & screening. Overburden can also be used as aggregates. Apart from mines being used as a source of water reservoir, vast area of mines can be utilized for energy crop plantation which can be a good alternate fuel for kilns. Co-chairman also raised the issue of CO_2 mitigation acknowledging the fact that calcination of limestone is a major source of CO_2 emission in clinker production contributing around 60 % of total CO2 which can be controlled by increasing usage of blended cement and capturing CO_2 emissions and using it to produce chemicals.