

Studies on Monitoring of Respirable Dust in Lime Stone Mining Area—A Case Study

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The raw ingredients for almost all structural materials are mined using open pit methods. Emissions to the atmosphere from the mining of structural materials are seldom toxic. Hence, these environmental effects have received little attention. Most of the dust emitted by the industrial mineral operations is derived from widely dispersed sources (fugitive dust) and is difficult both to quantify and control. In this work, attempts are made to carry out the studies for respirable dust analysis (n = 14), that is area sampling (n = 7) and personal sampling (n = 7) at a limestone mine situated in the newly formed Chhattisgarh State, India. The time weighted average (TWA) for respirable dust for area and personal sampling was found to be in the range of 0.160-1.170 mg/m³ and 0.250-0.670 mg/m³, respectively. These results found were much low than the prescribed TWA limits by Directorate General of Mines Safety (DGMS). The respirable dust samples were analyzed for the free silica content by using standard analytical procedures (SAP) by employing Fourier Transform Infrared Spectrophotometer (FTIR).

KEYWORD

Respirable dust, Lime stone, Mine, TWA, DGMS, FTIR.

INTRODUCTION

Chhattisgarh state of India has a very rich deposit of limestone. The rock formation of these areas belongs to lower Vindhyan system of Indian geology. The limestone beds are unfossiliferous with heterogeneous quality of limestone. The mines generally follow mechanized open cast mining method with percentage recovery of approximately 100% ore from run off mine (ROM). But mining has traditionally caused considerable environment impact owing to the obvious damage to the land from the excavations itself (Repley *et al.*, 1996; Aneja, *et al.*). Large number of communications is available regarding environmental impact of mining from the developed world (Brandt and Rhodes, 1972; Winkler and Dewitt, 1985; Whitby and Hutchinson, 1974; Trost, 1972; Panu, 1989), but in India little data is available. In this work attempts are made

to monitor the respirable dust emitted due to mining operations in an open cast limestone mine situated in the Chhattisgarh State of India. The study involves respirable dust survey in the form of area and personal samples collected from an open cast limestone mine and its subsequent analysis by FTIR spectrophotometer for the monitoring of free silica content.

MATERIAL AND METHOD

Respirable dust sampling at various locations of the mines was carried out using a portable sampler (AirChek, 2000, SKC make, USA). A sampling assembly consisting of a cassette, poly vinyl chloride (PVC) filter paper, cellulose support pad and an aluminium cyclone was attached to the pump and then this was calibrated using an electronic calibrator of DRY, CAL, DCL, BIOS make prior to sampling. Post-sampling the pump was again calibrated by the electronic calibrator. Free silica analysis was carried out using a Fourier Transform Infrared Spectrophotometer (Model: FTLA-2000 of ABB-BOMEM, Canada). The pellets were