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## CEMENT FACTORIES AND HUMAN HEALTH

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### ABSTRACT

Cement is currently the most widely used construction material throughout the world. Its production is being recognized to play a hazardous role in the imbalances of the environment and producing air pollutants in the form of various oxides, particulate matter as well as heavy metals which pose a serious threat to living world including humans, plants, animals, livestock etc. Keeping in view the hazards of cement dust it is recommendable that the cement industry management, their workers and health officials should work together to adopt scientific and technical preventive measures. The stack height must be appropriate and air pollution control devices should be installed and regularly checked so that people residing around these industries may not loss their life to fatal diseases.

**Keywords:** Cement; hazardous; workers; industries; diseases.

### INTRODUCTION

Studies on the impact of cement industries dates back to decades but the greatest bulk of research has been conducted within the past few years, not more than twenty years, when health specialists and environmentalists understood its adverse impacts on health and environment. These industries affect air quality, soil, flora and fauna of the region. Several studies have shown that the levels of SPM, NO<sub>x</sub> and SO<sub>x</sub> are resulting in higher incidences of respiratory diseases like tuberculosis, cardio-vascular diseases and asthma in the areas (Hart, R.H, 1970; Vestbo *et al.* 1990; Dockery *et al.* 1993; Schwartz, J., 2002). As a whole study of impact of cement dust pollution on human health is a relatively interesting field of study that has advanced rapidly during the past few years. There is extensive, diffused and scattered information on the subject in the literature. Due to essential changes caused by the atmospheric pollution are not only restricted to the one component, but also extend to the detrimental

effects on human health, vegetation, biodiversity, ecosystem dynamics and human welfare.

The physical properties including particle size and density, shape and penetrability, surface area of cement dust are more important than chemical properties influencing the respiratory tract's response to the inhaled agent (Morgan, 1984; Sheppard, 1990). People mostly in age group of 65 and older in developed countries and in developing countries 15-44 age group are more prone (Cropper *et al.*, 1860) and above this more effects are seen in children, (Hofmiester *et al.*, 1986) as main route of entry of cement dust particles in the body is respiratory tract or the gastrointestinal tract, (Green *et al.*, 1970) so firstly organs associated with these gets affected (Hart, R.H., 1970) with more hospital visits (Vestbo, *et al.*, 1990). The cancer risk due to cement exhibition showed a positive correlation to the duration of exposition (Maier *et al.*, 1991; Maier *et al.*, 1992) with increased risk of laryngeal cancer and predominantly related to

supra glottis cancer, chest pain, cough, and eye problems, (Yhdego, 1992; Yang *et al.*, 1993; Yang *et al.*, 1996).

Cement particles are respirable in size hence Portland cement is important as a potential cause of occupational lung disease. The population living around the cement plant exhibited increased urinary concentration of thallium level in the residents and also exhibited increased hair thallium levels with congenital abnormalities were cleft lip and palate, facial hemangioma, icterus neonatorum, swelling on the back of hands and feet, inguinal hernia, umbilical hernia, lumbar meningomyelocele and ventricular septal defect (Brockhaus *et al.*, 1981; Dolgner *et al.*, 1983) with an increased risk of liver abnormalities, pulmonary disorders, and carcinogenesis were found. Decreased antioxidant capacity and increased plasma lipid peroxidation have also been posed as possible causal mechanisms of disease with cardiovascular, cerebro-vascular mortality (Aydin *et al.*, 2010; Grau, 2009; Peters *et al.*, 2009) and skin irritation, the mucous membrane of the eyes and the respiratory system (Zelege *et al.*, 2010; Zyede *et al.*, 2010).

Besides local residents surrounding cement industries impacts on cement mill workers appeared to be less prominent initially and became more prominent at later stages, causing varied complications with diffused swelling and proliferation of sinusoidal (hepatic) lining cells, sarcoid type granulomas and perisinusoidal, nephron problems, oral mucosal inflammation, decreased oral health condition, more parodontal disease, pulmonary lesions, diminished lymphatic tissue, decreased DNA, RNA and total protein levels and also causes stomach ache due to presence of chromium in its hexa-valent form and causes laryngeal cancer (Kalacic *et al.*, 1973; Pimental and Menezes, 1978; Schaller 1980; Petersen and Henmar, 1988; Struzak and Bozyk, 1989; Bozyk and Owczarek, 1990; Amandus, 1986; Oleru, 1984; Olsen and Sabroe, 1984; Zhang, 1990; Tuominen, 1991; Vestbo *et al.*,

1991; Dvorianinovich *et al.*, 1993; Jakobsson *et al.*, 1993; Abou-Taleb *et al.*, 1995; Abrons *et al.*, 1995; Shortet *et al.*, 1996; Yang *et al.*, 1996). Workers which spend more time in cement factories show prominent ill impacts (Alakija *et al.*, 1990; Abuhaise *et al.*, 1997) with high prevalence of asthma in the group with the highest dust exposure. Significant increase in total protein and calcium levels with higher prevalence of respiratory symptoms among cement workers suggested that workers in the construction industry carry an increased risk for head and neck cancer (Fatima *et al.*, 1997; Mengesha *et al.*, 1998; Alvear-Galindo *et al.*, 1999; Maier *et al.*, 1999). Workers at a Portland cement plant had experienced acute eye irritations and higher prevalence of respiratory symptoms and a reduction of FVC, FEV1 and FEV1/FVC ratio among the cement workers with increased daily mortality (Sanderson *et al.*, 1999; Noor *et al.*, 2000; Samet *et al.*, 2000).

Besides respiratory symptoms, rhinitis, conjunctivitis, cardio-pulmonary and dermatitis among the workers it was seen decrease in the mean erythrocytes, lymphocyte and monocyte count. In addition a slight decrease in hemoglobin level and chromosomal aberrations and cancer was also found with pulmonary radiographic abnormalities such as interstitial lung disease, pleural thickening and chronic bronchitis (Mishra, 1991; Dockery *et al.*, 1993; Piotrowski, 1993; Krewski *et al.*, 2000; Al-Neaimi *et al.*, 2001; Fatima *et al.*, 2001; Laraqui *et al.*, 2001; Meo *et al.*, 2002; Calistus Jude *et al.*, 2002; Laraqui Hossini *et al.*, 2002; Schwartz. J., 2002; Meo, 2003; Dietz *et al.*, 2004; Mwaiselage *et al.*, 2004; Schuhmacher *et al.*, 2004; Smailyte *et al.*, 2004; Mwaiselage *et al.*, 2006; Pope and Dockey, 2006). Fugitive dust emissions from cement plants affect health and property of house owners living adjacent to the plant and found that the people of this area are badly affected by respiratory problems, gastrointestinal diseases etc with adverse impact for vegetation, human and

animal health and ecosystems with greater risks in winter months (Anglauf *et al.*, 1986; Quiros, 2005; Sabah .A. Abdul Ahab, 2006; Adak *et al.*, 2007; Baby *et al.*, 2008).

## DISCUSSION

The aerodynamic diameter of cement particles makes it a potential health hazard as these are respirable in size and reaches in internal organs particularly lungs leading to occupational lung diseases. This size distribution would make the trachea-bronchial respiratory zone, the primary target of cement deposition. The main route of entry of cement dust particles in the body is the respiratory tract and/ or the gastrointestinal tract by inhalation or swallowing respectively (Green, 1970). Both routes, especially the respiratory tract are exposed numerous to potentially harmful substances in the cement mill environment. Besides cement dust various gaseous pollutants are also contributed by cement factories which cause pollution and ultimately affect human health. The various organ systems which get affected because of cement factories include:

**Respiratory system:** In respiratory system these causes lungs cough and phlegm production, chest tightness, impairment of lung function, obstructive and restrictive lung diseases, Pleural thickening, fibrosis, emphysema, lung nodulation, pneumoconiosis and carcinoma of lung

**Gastro intestinal system:** Oral cavity, mechanical trauma, mucosal inflammation, loss of tooth surface, periodontal diseases, dental caries, dental abrasion, liver diffuse, swelling and proliferation of sinusoidal (hepatic) lining cells, sarcoid type granulomas, perisinusoidal and portal fibrosis and hepatic lesions is caused in the gastro intestinal system.

**Stomach:** In stomach it causes stomach ache and cancer.

**Central nervous system (brain):** Usually causes headache and fatigue.

**Lymphatic system:** Spleen diminished lymphatic tissue and splenic lesions.

Other affects includes affect in eyes, skin and bones. Irritation in eyes, running eyes and conjunctivitis, skin irritation, itching, skin boil and burn, osteonecrosis, lesion of humerus, thinning of the cortex and reduction of epiphyseal cartilage.

Cement dust is a potential pollutant in the vicinities of cement producing factories creating serious pollution related diseases.

## CONCLUSION

From the study it can be concluded that cement dust consists of many toxic constituents. The residents as well as workers who are employed in the cement industries are exposed to cement dust for long periods, thus from the literature it can be concluded that there is significant increase in the various diseases particularly respiratory problems both in workers as well as in the residents and need is to take proper preventive measures so that development may not be at the cost of human lives.

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