

## **OCCUPATIONAL HEALTH HAZARDS vis-à-vis INDUSTRIAL SAFETY AND ENVIRONMENTAL DEGRADATION – CASE STUDIES**

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### **ABSTRACT**

The development of a country depends on its industrialization. But industry, whatsoever it may be is polluting the environment very promptly and deeply, in the form of air, water, flora, fauna, landscape etc. Due to this pollution, ecological imbalance occurs resulting in different kind of health problems. World health organization (WHO) has recommended the standards of permissible pollutants and if it exceeds then precautionary or preventive measures have to be taken to improve the quality of life. For example, in drinking water different toxic and non-toxic elements are present so certain standards have fixed up. Based on their socio-economic conditions and immunity level of the local residents, the permissible limits varies from country to country. Similar types of recommendation are for maintaining air quality. Case studies are initiated to measure the different pollutants and their effect on human health.

Likewise, we learn more about the complex interaction among psychological, psycho-social and physical factors in the etiology of work-related illness and injury. Risks to health and safety in the industry posed by longer shift lengths, higher workloads, less task variation and decision latitude have not really been well researched. Heavy physical workloads and stresses are still areas of concern. The contribution of slips, trips and falls and increasing age of miners to manual handling injuries are still not clear. In some cases sedentary work and the operation of machinery has completely replaced heavy physical work. The issues of machinery design for operations and maintenance and whole-body vibration exposures when operating machines and vehicles are becoming more critical. The link between prolonged sitting, poor cab design and vibration with back and neck pain are being recognized but have yet to be addressed in any systematic way.

Using the principle “prevention is better than cure” the emphasis is laid to change to a broader occupational health and safety (OHS) focus. Longer work hours are part of a drive for greater worker productivity. In this paper, case studies were conducted to analyze different working conditions considering longer shifts, stress and fatigue, more task variety, jobs conditions etc. while finding out to reduce accidents and to enhance industrial safety.

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Keywords: occupational health hazard, environmental management, environmental protection.



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# Introduction

The development of a country depends upon its industrialization and agricultural conditions. But industry, whatsoever it may be polluting the environment either directly or indirectly. Men cannot realize the extent/nature of pollution at the time of generation. It is also true that human being, has recognized the possible consequences of their failure to take steps to control their natural environment and that actions are necessary now to save themselves and their civilization.

It pollutes the environment in various ways such as releasing CO and other noxious gases; producing dust, noise, vibration etc which in turn, considered being cause of ecological imbalance. As a control measure for dust and noise, generally arrester or absorber is used. Deforestation and subsidence are the two additional unavoidable problems in mining industry.

Though proper control is not possible as industrialization cannot be reduced to maintain the smooth life of the miner-residents. This pollution control can be done in different ways, viz. through environmental management plan, environmental monitoring system and industrial safety through the rigorous study of Ergonomics.

# MINE ENVIRONMENT SYSTEM AND ITS EFFECT ON MAN

Various types of pollution viz., air, water, noise are degrading the quality of lives of miners by different means.

For example, water gets polluted due to increased concentration of toxic metals in water, which welcomes the rise of various peculiar diseases. Days have come to think about the pollutant released by the mining industries and to think about the protection of miners' health through legislation and social consciousness. Release of pollutants (especially toxic metals in water) and their effects on human health are discussed.

# IMPACT OF WATER QUALITY ON HUMAN HEALTH

Parameter	USA	Japan	Russia	UK	France	South Africa	Australia	India
Arsenic	100	50	50	50	40	50	50	100
Barium	1000	800	4000	1000	700	900	1000	700
Cadmium	10	12	10	15	10	50	15	5
Chromium	50	60	100	60	65	60	60	60
Copper	1000	10000	100	100	1000	1000	10000	5000
Lead	50	100	100	100	40	50	40	50
Mercury	n.a.	1	5	2	4	n.a.	2	1
Selenium	10	n.a	1	10	8	10	8	6
Zinc	5000	100	1000	5000	2000	5000	3000	500

Table 1: Drinking water quality criterion for trace metals which might affect public health

*\*All results are in ppb level.*

## Metallic Released disease pollutants

Arsenic: Vomiting, diarrhea, nausea, abdominal pain, skin, eruption problem in vision, bronchial disorders

Barium: Pneumonites, cardiac strain and heart disease

Cadmium: Kidney, lever, gastro-intestinal tract disorder

Chromium: Apnea, respiratory failure, Paralyse

Copper: Hypertension, sporadic fever, uremia, Coma, brain tissue attack

Lead: Loss of appetite, convulsion, brain damage, mild anemia

Mercury: Growth retardation, sexual impotence, muscular fatigue eye blindness

Selenium: Dullness, erosion of joints, selenosis, stiffness, lameness

Zinc: Vomiting, renal damage, cramps, fever, pneumonites consumption

Table 2: Effects of various metals on human health

# ENVIRONMENT VS POPULATION CUM TECHNOLOGY VS QUALITY OF LIFE

Environmental pollution can be said to be the result of three factors- population size, per capita consumption and an environmental impact index which measures, in part, how wisely we apply the technology that accompanies evaluation of man-environment condition in mine.

Thus an equation can be established as follows:

Environmental deterioration = population size \* per capita consumption \* environmental impact/unit of production

The significance of the population size in the well being of the human environment can be further realized through the following equation:

$$\text{Standard of Living (SL)} = \frac{\sum \text{Production} - \sum \text{Losses}}{\text{Population}}$$

$$\text{SL} = \frac{\text{SL} + \text{Service} + \text{Experience}}{\text{Population} * \text{Time}}$$

As material comforts increase, it is likely that “the good quality of life” (QLI) will be defined to a greater degree by services, such as pertaining to health, education, recreation, transport etc. As services become more abundant, the emphasize may shift towards experiences. Services may well increase but quality of many experiences may also decline, especially if the environmental deteriorates seriously.



Thus, the Quality of Life Index (QLI) at any place at any period of human history can be represented by conceptual equations as given below:

- $QLI \propto \text{Acquisitions} / \text{Desires}$
- $QLI \propto \text{Material Resources (M)} * \text{Energy Resources (R)} * \text{Nutritional and health facilities (N)} * \text{Geographical factors (G)} * \text{Ingenuity (I)} / \text{Population (P)} * \text{Historical factor(H)}$

The plans and strategies for development can be regarded as a kaleidoscopic arrangement of these factors with their inter-connections and inter-dependencies.

# WORKING CONDITION BASED CASE STUDIES

Human factor analysis for underground work emphasizes to evaluate the man-environmental condition whose fundamental principle is that the environmental component must suit the human component and not the other way round. Steps to be followed for this purpose are as follows:

- Overall human body performance and its limitations.
- Psychological adoption in the typical working conditions and use of auto control system in the human body (known as immune).
- Performance evolution in the critical conditions, its reliability, operational characteristics of the individual human body components.
- Change in life style with this composite system of environment and their effect on human health.

## How do we do that?

- Analysis of Underground activities.
  - *Task analysis, Work site analysis, work safety analysis.*
- Changes in mining work practices
- Role of ergonomics modelling
- Machinery and vehicle cab design standards
- Whole-body vibration exposures in mining (rough rides)

# CASE STUDIES

A number of case studies are conducted in the mining areas. The observations are presented below:

- QLI in the mining industries was monitored and it was observed that QLI and QEI (Quality of Environment Index) decreases with increase in APGR (Allowable Pollution Generation Rates). As a result, SP (Social Pressure) increases.
- As soon as QLI increases, DR (Death Rate) decrease so SP automatically decreases. To increase this QLI, government has to take steps for IPC (Investment on Pollution Control).

# SUGGESTIVE MEASURES

Some models are developed by considering the typical situation for the third world countries where low social awareness is prevailing. Though several anti-pollution laws along with government machinery implement them exists but seldom is any law rigorously implemented. It is assumed that as the social pressure builds up the government responds by insisting the mining industry to take proper care on pollution control and also job safety and work safety analysis.

# CONCLUSION

The consequences of wide spread environmental problems continuing into the twenty first century are unknown. Some predict dire catastrophic: crime, starvation, war anarchy and drastic deterioration of environment and man's life. If this is allowed to continue in mining sectors then the miner will be faced with ultimate cost i.e., the cost of extinction. Thus to improve the better life in the mining industry, it has become mandatory to make aware of the miners regarding their environmental condition through social consciousness such as safety education and training, which finally will result in better 'quality of life' . Death rate due to longstanding mine workings will reduce, if periodical medical check-up systems will be adopted and as per their health positions preventive medicines will be supplied free of cost. Installation of pollution control equipment, monitoring and analyzing the pollution data and tax will improve the quality of life miners.



Thank you

Any ???????