BRINGING SUSTAINABILITY IN COAL MINING OPERATIONS - I

A. Introduction – The importance of sustainable development principles has been increasing within the mining sector over the past two decades. Early work focused mainly on mining metals and commodities other than coal and energy fuels. Because sustainability, however, is an important consideration for all human endeavors now, the coal industry has become active in sustainability efforts. A number of global coal mining companies have embraced sustainability as a key aspect of corporate philosophy.

Continued production of minerals and fossil energy fuels may not fit into commonly understood definitions of sustainability. Mineral and energy extraction and reclamation operations do, however, contribute significantly to sustainability through the benefits they provide to society, when they are conducted in a manner that supports sustainable economies, social structures and environments throughout all phases of mining, including closure. Significant progress can also be made through the inclusion of sustainability concepts in the original design of the operation, as well as in ongoing operations. Innovative engineering, mining and reclamation operations can be optimized through consideration of environmental and economic sustainability goals, side-by-side with traditional technical mining engineering considerations.

B. Abate hazards in coal mining areas by promoting reclamation – Coal mining operations can result in disturbances to the land surface that burden or adversely affect commerce and the public welfare by destroying or diminishing the utility of land for commercial, industrial, residential, recreational, agricultural, and forestry purposes, by causing erosion and landslides, by contributing to floods, by polluting the water, by destroying fish and wildlife habitats, by impairing natural beauty, by damaging the property of citizens, by creating hazards dangerous to life and property, by degrading the quality of life in local communities, and by counteracting governmental programs and efforts to conserve soil,

water, and other natural resources. The predicted expansion of coal mining to meet the world's growing energy needs makes it even more urgent to establish appropriate standards to minimize additional damage to the environment and to productivity of the soil and to protect the health and safety of the public. At the same time it is important to develop programs with associated funding mechanisms to restore the utility of land damaged by past mining.

For example, China has reported it has about 13.3 million acres "derelict" lands of which four million of those acres were caused by past coal mining. This adversely impacts nearly 1/10th of China's total agricultural acreage. Although mining reclamation began in the early 1960s in China, it has not been consistently implemented and about 40,000 new hectares are presently being disturbed by coal mining activities each year. In India more than 80,000 people have to be shifted to safer places as they are residing in areas which are now considered unstable due to past unscientific mining and the coal mine fires endangering such areas. Large tracts of mined out/subsided areas of the past also require reclamation apart from dealing with fires in some of the old coalfields.

Reclamation of coal mines, returning the habitat to its natural state

i. Goals and Objectives towards better Environmental Management -

Mining becomes a temporary land use through programs of environmental management and land reclamation.

* Establish a nationwide program to protect society and the environment from the adverse effects of coal mining operations.

* Assure that the coal supply essential for any nation's energy requirements and to its economic and social well-being is provided and strike a balance between protection of the environment and agricultural productivity and the country's need for coal as an essential source of energy.

* Promote reclamation of mined areas left without adequate reclamation and which continue, in their un-reclaimed condition, to substantially degrade the quality of the environment, prevent damage of the beneficial use of land or water resources, or endanger the health or safety of the public.

ii. Management of topsoil for geo-environmental reclamation - Topsoil is an essential component for land reclamation in mining areas. It is seriously damaged if it is not mined out separately without being contaminated, eroded and protected. Systematic handling and storage practices can protect topsoil while in storage and after it has been redistributed onto the re-graded area. Removed topsoil should be reclaimed technically and its shelf-life period should be ascertained. Soil dumps of different age classes in the area were identified and analyzed critically to evaluate the deterioration of soil quality with respect to time, and compared with those of unmined areas. Changes in soil quality showed a continuous decrease every year and ultimately became biologically sterile. Biological reclamation is essential if the soil is to be stored beyond the shelf-life period.

C. Current Issues -

i. The future of coal extraction - It is widely recognized that coal is and will continue to be a crucial element in a modern, balanced energy portfolio, providing a bridge to the future as an important low cost and secure energy solution to sustainability challenges. Energy demand everywhere is expected to grow substantially. In emerging economy, most of developed and developing nations, almost every energy source is expected to grow, with coal, petroleum and natural gas dominating the energy mix. In these nations, electricity generation relies heavily on fossil fuels; coal is the dominant component which is expected to increase. As per estimation, overall, world use of coal is projected to grow by 44 % by 2025.

In addition, coal and crude oil can both be used as feed stock for conversion into liquid fuels and the choice depends on the price of feed stock. Energy economists maintain that coal liquefaction is viable for crude oil prices greater than $40 per barrel. Experts predict that Coal-to-Liquids (CTL) will be the largest contributor of “un-conventional” fuels.

ii. Corporate policies - The global coal and energy production industries have recently begun a major effort to identify and accelerate the deployment and further development of innovative, advanced, efficient, cleaner coal technologies. A number of coal producers in developed nations are also involved in sustainable development activities, including economic sup-port of communities and regions and environ-mental protection and restoration. These companies have corporate sustainable development policies in place that provide guidance for operations and some report annually on their contributions to sustainability.

Challenges facing Mining industry for sustainable development are:

* Ensuring the long-term viability of the minerals industry,

* Control, use, and management of land,

* Using minerals to assist with economic development,

* Making a positive impact on local communities,

* Managing the environmental impact of mines,

* Integrating the approach to using minerals so as to reduce waste and inefficiency,

* Giving stakeholders access to information to build trust and cooperation,

* Managing the relationship between large companies and small-scale mining,

* Sector governance: Clearly defining the roles, responsibilities, and instruments for change expected of all stakeholders.

iii. Traditional mine design considerations - Most mine designs are based on traditional mining engineering factors, such as the quality of the commodity being mined, the geology, topography, hydrology, land ownership, geography, infrastructure, etc. Currently, environmental compliance and sustainability are considered in mine design and operation as a modifying factor to those designs.

iv. Optimization - A cursory review of the available literature on engineering optimization does not reveal any focus on mine design, environmental protection associated with mines or sustainability. Mathematical multi-criteria optimization approaches, however, have previously been used in resource management. Unfortunately, there is a paucity of literature about the practice.

As with any optimization problem, mine design optimization would need to consider all constraints, system parameters and characteristics and desired outcomes in order to build a useful and reliable model. Since optimization of mine design, and in particular coal mine design, to address sustainability along with other parameters has not been widely practiced, identifying the appropriate parameters for measurement and the mathematical or logical relation-ships between these parameters is not a trivial task.

Source : http://saferenvironment.wordpress.com/2009/06/29/bringing-sustainability-in-coal-mining-operations-%E2%80%93-need-of-the-hour/