BRINGING SUSTAINABILITY IN COAL MINING OPERATIONS - II

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.

D. Suggested approach – In order to optimize the design of coal mining and reclamation operations, traditional mining engineering considerations and environmental and sustainability goals must be accounted for simultaneously. It is essential to identify all of the parameters, relationships, constraints

and desired outcomes related to the widely varying factors that contribute to mine design, as well as the additional factors that should be considered as a part of a new, sustainable design approach.

i. Parameters - For successful optimization of mine design, required parameters must be identified and measured as part of mine design and planning. To build an accurate model of those operations, data must be collected on ongoing operations. This data accounts for the modification of long-term designs as a part of permitting and the acquisition of information during mine operation. The design and operation of current coal mining properties should be evaluated by looking both at permitting documents and additional data which obtained from mining companies and other public and private sources. This data reflects the mining engineering, geologic, economic and other considerations currently integrated into the design and planning process.

It can then be determined how legal, policy, environmental protection and sustainability should be incorporated in mine design. Whenever possible, the effect of environmental and post-mining land use considerations on mine design and operation needs to be quantified in economic terms, so as to be on par with other engineering considerations.

ii. Relationships- Once sufficient data is collected, it will be necessary to determine if and how these parameters influence one another and the desired outcomes for the specific mining operation. These relationships may be apparent based on scientific, engineering or other considerations, or may require detailed statistical analysis in order to determine them. It may not be possible to state the precise interrelationships between numerous parameters, particularly given the lack of complete independence of many of them. It may be possible, however, to derive qualitative rather than quantitative models for those relationships.

iii. Desired Outcomes- In most cases, the ultimate desired outcomes are the profitability and long-term stability of the site. These are driven by corporate realities as well as the concern for long term liability. Coal mining is, after all, a business focused on profitability and long-term economic benefit for the shareholders or other owners. Additional out-comes for community economic benefits, enhanced environmental quality, and corporate image are also significant for many mining companies and in many locations.

The optimization approach must address the relative importance of these outcomes in order to weight them in the development of optimized models. For example, in an area with low avail-ability of safe drinking water, protection of hydrologic resources may prove to be of primary significance, and thus of higher weight in the models, since it will greatly impact the feasibility and long-term profitability of the operation as well as the post-mining health of the community.

The factors related to sustainability in the minerals industry, identified above, can serve as the basis for desired sustainability outcomes. The first factor, industry viability, is ad-dressed primarily through consideration of the economic profitability of an operation. Giving stakeholders access to information; defining the roles, responsibilities and instruments for change; managing the relationship between companies of different scales; benefiting local communities; and, promoting efficient use of minerals, are social factors which may be more difficult to measure and may not directly impact the design and operation of a specific mining property.

However, managing the environmental impact of mines and the control, use and management of lands are both more easily quantified and related to accepted practices and legal frameworks. Future work should focus on the parameters related to these goals. Many of these parameters may already be routinely measured as a part of environmental or other compliance mechanisms.

reclamation_2E. Nation's Mission To Protect Environment by Enacting Laws– It is of national interest, Governments of every country should be dedicated to protecting the environment of the nation. In other words, to protecting the health and safety of the miner and to protecting the life, health, and property of citizens who are affected by mining or mining activities through the enforcement of suitable state mining and reclamation laws. The laws should ensure that the environment is protected during coal mine operations, and that lands mined for coal are adequately reclaimed after mining is completed. It allows alternative or experimental reclamation practices to encourage technological advances in mine reclamation and innovative post-mining land uses.

i. Environmental Impact Assessment (EIA) - Some form of Environmental Impact Assessment (EIA), and accompanying procedures for information disclosure, public participation and judicial or administrative review, have become widely adopted as part of the project and/or policy review process in most countries.

The US government introduced EIAs as an "action-forcing mechanism" to identify, assess, and mitigate environmental and human impacts of government actions in the United States. Since then, EIAs have spread to well over 100 countries, and have been enshrine in Principle 17 of the Rio Declaration, gaining worldwide legitimacy as a critical element of environmental management. EIAs have grown in both strength and scope and are now one of the premiere tools in environmental management in most countries. EIAs should address some of the basic factors listed below:

* Meteorology and air quality. Ambient levels of pollutants such as sulphur dioxide (SO2), oxides of nitrogen, carbon monoxide (CO), suspended particulate matters, should be determined. Additional contribution of pollutants at the locations are required to be predicted after taking into account the emission rates of the pollutants from the stacks of the proposed plant, under different meteorological conditions prevailing in the area.

* Hydrology and water quality

* Site and its surroundings

* Occupational safety and health

* Details of the treatment and disposal of effluents (liquid, air and solid) and the methods of alternative uses.

* Transportation of raw material and details of material and details of material handling.

* Impact on sensitive targets.

* Control equipment and measures proposed to be adopted including post-mining reclamation.

Preparation of environmental management plan is required for formulation, implementation and monitoring and of environmental protection measures during and after commissioning of projects. Planning for closure and reclamation should begin during the earliest stages of project development, before operations start at a new site, and continues throughout the mine life. Goal is to minimize the disturbance of land in all phases of the mine life and to provide a post-closure land use which is compatible with traditional uses or provides sustainable advantages to the local communities.

ii. Coal Mining Permit Process – Before commencement of coal mining operations, a mining and reclamation permit must be obtained from the Govt. departments. A coal permit should be issued when the mine operator submits an acceptable application and posts adequate bond to cover reclamation costs, should it be necessary for a third party to complete the reclamation process. The operator's permit application must include the requirements for legal and financial compliance, the safeguard of environmental resources, and an operation and reclamation plan. Before opening the site, the employees of the coal mining operation must be trained and certified in accordance with state and federal safety regulations. Mining practices, reclamation, and health and safety procedures are monitored on a regular basis by the Departments' field inspectors.

iii. Following goals, in general, should be accomplished Through Permit Process -

* Reviewing permit, revision, field amendments applications for completeness and technical adequacy.

* Ensuring that adequate bond to complete reclamation is posted by the permittee.

* Conducting complete and partial inspections on coal permits as required by state and federal rules and regulations and the specific requirements of the approved permit such that non-compliance items are identified and appropriate abatement measures implemented.

* Conducting annual and mid-term permit reviews in compliance with statutes and regulations.

* Conducting bond release inspections in compliance with statutes and regulations.

* Conducting citizen complaint inspections in compliance with statutes and regulations.

* Gathering evidence and testifying at hearings as required by statutes and regulations.

* Conducting Student Outreach Programs at local area schools to provide students and teachers with a better understanding of the mining process.

* Receiving on-going training and information concerning current technical advances and trends in mining, safety, and reclamation.

F. Summary and Conclusion - 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. In response, the global coal and energy production industries have 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 are also involved in sustainable development activities, including economic support of communities and regions, environmental restoration and social well-being.

The designer of coal mining operations needs to simultaneously consider legal, environmental and sustainability goals along with traditional mining engineering parameters as an integral part of the design process. The role of coal in the global energy supply mix makes this of primary importance. There is a need for research into the parameters for mining design that allow the building of models for optimization, the relationships between those parameters, and the desired outcomes that the system is being optimized to produce. In addition to quantifying the economic viability of the operation, a number of sustainability goals should be built into the model and the relative importance of those goals determined.

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