ABSTRACT

The role of productivity in increasing national welfare has acquired a new sense of urgency particularly in the developing countries where rapid growth of population, poverty, unemployment and inflation coexist with unplanned policies. Productivity improvement thus has a major influence on economic phenomena of developing industrial world.

The importance of coal in the Indian energy sector and the ambitious target set for coal production in coming decades warrant a fresh perspective to evaluate the capabilities of surface coal mining production units and create a favourable outlook towards the utilisation of the acquired system for higher production and improved productivity. It is of extreme importance in Indian mining sector to introduce an effective Productivity Monitoring System to assess the influence of external and internal factors on the utilisation of available production resources. The present study is a modest attempt to develop and implement a methodology for monitoring the productivity of surface coal mining industry with maximum emphasis on equipment productivity measures.

In the first phase of the study, the literature on various measures related to productivity and productivity measurement models highlights the inadequacies and limitations of existing approaches and the relevant mining literature provides the motivation for the work. In next phase, the analysis of mining subsystems both for underground and surface coal production units evolves a logical framework for understanding the influence of external and internal subsystems on productivity of the lowest level of operation. It also highlights the flow of information in a large surface mine with due emphasis on the production processes creating, reviewing, updating them. The aim is to identify the data for the use of a productivity monitoring system. In the third phase, a Delphi Study was carried out to elicit the opinions of Indian mining experts towards two aspects of performance measurement; first, the important causes of performance variation, second, the topical areas responsible for the variation. In absence of any literature for understanding the important causes of performance variation, their opinion were hypothesized to reflect the expectations of

the mining community. In the three rounds of study, four topical areas and a total of eight important causes of performance variation in each topical area of importance were highlighted by the experts. The indicators alongwith the weightages, synthesized from the Delphi Study are the basic strength of the productivity monitoring system. In the fourth phase of the study, an approach to measure productivity through a set of indicators depicting the state of various factors like the automation level, geological conditions, efficiency of mine management is presented to arrive at the composite productivity scores (CPS). CPS is the weightage aggregation of individual indicators and it is useful to compare the performance of mining organisation with standard, over time periods or between two units in the hierarchy. A case study is also presented to measure the performance of seven Indian coal mining organisation over a period of 7 years. The next phase concentrates on the development of resource allocation model for the use of coal mining organisation to plan for additional production using composite productivity scores. The allocation of resources is made through a goal programming model where the objectives include maximisation of production and productivity and minimisation of investment. The approach also considers the positive effect, in terms of productivity gain if two prodjects in a mine are selected. The last phase of the study focuses on the monitoring and improvement of productivity of mining machineries and skilled labour. A case study is presented for identifying a set of improvement programmes to achieve a target level of productivity.