APPLICATION OF ELECTRONIC DATA PROCESSING IN THE PLANNING OF RECLAMATION IN OPEN CAST MINE SITES

A. K. Jha

Department of Zoology, Hislop College, Nagpur, Maharashtra, India
E-mail : knakj@rediffmail.com, Mobile: 9860408195

Abstract

Reclamation is defined as creating a site, which will support organisms in approximately the same percentage and number after the reclamation process is completed, as it did before mining began. Reclamation after mining reduces off-site impacts, mitigates aesthetic damage to disturbed soil, reconstructs topography and hydrologic patterns, and develops soil pedogenic process over time making it similar to its pre-mining morphology. Reclamation comprises complex measures to move huge amounts of earth in short periods while at the same time long planning periods are to be covered. To master this, electronic data processing will turn out to be an indispensable planning instrument whereby especially system analysis and modeling are applied. The computer programme can be used during exploration stage, open cast mine design, ranking of priorities of measures of the reclamation and afforestation on the basis of cost - benefit - analysis. The technological implementation will give the possibility to shorten the time needed for analysis, to economize geological capacity and to apply the programme system rationally in the case of recurring geological – technological studies for the preparation and operation of open cast mines.

Keywords: Reclamation, electronic data processing, computer programme.

Introduction

Reclamation of open cast mine sites is defined as creating a site, which will support organisms in approximately the same percentage and number after the reclamation process is completed, as it did before mining began. Reclamation after mining reduces off-site impacts, mitigates aesthetic damage to disturbed soil, reconstructs topography and hydrologic patterns, and develops soil pedogenic process over time making it similar to its pre-mining morphology. Reclamation comprises complex measures to shift huge amounts of earth in short periods while at the same time long planning periods are to be covered. To master this, electronic data processing will turn out to be an indispensable planning instrument whereby especially system analysis and modeling are applied.

To rationalize the interpretation of the voluminous data material of the exploration and sampling of the deposits, a data bank on the basis of electronic data processing for mining are already established and is constantly being upgraded. The computer programmes used are further developed to a programme system that can be used not only during exploration stage but also during the later open cast mine design and technological implementation stage. This will gives the possibility to shorten time needed for analysis and will further economize geological capacity. It will also help to apply the programme system rationally in the case of recurring geological-technological studies for the preparation and operation of open cast mines (Hildebrandt *et. al.*, 1982). Further ranking of priorities of measures of the reclamation and afforestation on the basis of cost - benefit – analysis will be optimized depending upon the site and other ecological factors.

Methods

The section presents methodology used for reclamation. Different models were selected and separately discussed to evaluate reclamation potentiality.

1. Simulation Method For Top – Soil Management:

Simulation method for top – soil management is a simulation model for a favourable operating procedure in open – cast mines with belt transport and was developed by Hildmann (1983). The model assort the varieties of soil and extract them selectively, that helps to entail a reduction of the capacity of the whole system of overburden mining and dumping.

2. Business and Economic Simulation (BES):

The management game BES has been developed at the Humboldt University, Berlin by Gernert and Kolzow (1974). It aims at a simulation of the production process in order to support the training in the fields of business administration, finance, and theory of national economy studies.

3. SONCHES (Simulation System of Non-linear Hierarchic Ecosystems):

Another model is SONCHES, describing the dynamics and stability of complex ecosystems as agro, forest and aquatic ecosystems and for designing policies and short – and – long – term management activities in order to control ecosystem.

4. Block Structure Model:

Further on in connection with the utilization of the recultivated areas of agricultural production, the computer model was developed by Moller (1984); for fertilization and irrigation can be considered. The model consists of 2 parts:

- simulation of the conveyor bridge movements and according to this division of the area to single area mosaic elements and

- calculation of yield losses per influence factor and of the whole yield loss by inclusion of time deviations.

Result and Discussion:

Simulation method for top – soil management allows optimizing the operations and fulfilling the requirements of top soil management (Hilimann, 1983). This simulation is applicable to all open-cast mines working with belt transport. Minor changes are necessary due to the principally differing technologies in different open cast mines.

The industrial enterprise stimulated by BES 1 model is characterized by its production line, marketing conditions, fixed and current assets and manpower (Gernert and Kolzow, 1974). In one stimulation period decision are taken in the following fields:

- purchase of raw material
- manpower, working conditions
-investment and rationalization
-production,
-turnover,
-profit appropriation.

At the beginning of every run each team of players has printed form containing about 400 items that characterize the situation at the end of preceding period, i.e. at the end of the preceding run. On the basis of these 400 items and additional instructions the team have to make 36 decisions. The programme of the model which is fed into computer calculates the next set of 400 items will contain about 1700 changeable parameters. The results of the stimulation process are given in printed form to each team. 80 of the 400 items are stored in the computer to initiate the starting position for the next run.

The expected functions of SONCHES are:

- Support and communication among ecosystems scientists in order to understand their problems better and to make them transparent.

- Support of further developments of ecosystem theory by means of quantitative and qualitative investigations of real and theoretical models.

- Aiding modelling in simulation of real system: model building, rebuilding, evaluation studies of time – and – space dependent process in ecology. With this SONCHES is based on both the general characteristics of ecosystem and practical needs of the experimenter and modeler (Bellmann *et al.*, 1984).

The application of Block structure model is also possible for determination of the ranking of priorities of measures of the reclamation and recultivation on the basis of cost – benefit – analysis (Moller, 1984). They are also applied for the management of ground water regime in landscapes following mining activities and modeling of water and air pollutants for the purpose of reclamation (Fig.-1).
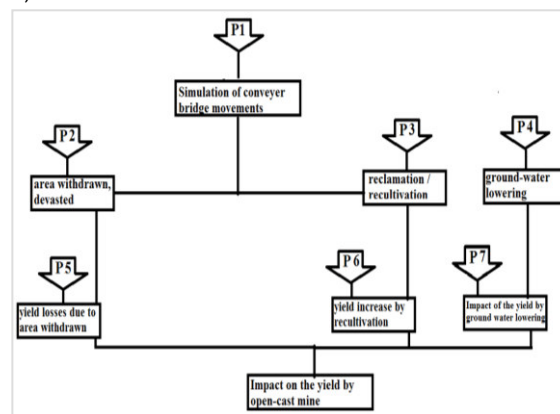

Fig -1: Block structure of the model (after Moller, 1984). Input parameters and initial values: P1 – Open-cast mine border, turning point, turning direction, P2 – agriculture effective area parts, devastated parts of the area, mining year, factor area per raw material, P3 - agriculture effective area for reclaiming according to the site type, P4 – parts of natural ground-water sites, lowering depths in intervals, P5 – average yield per ha/year, P6 – duration of recultivation, site type, P7 – average yield level/year.

Conclusion

All those models can be applicable as single models or as model system on computers and can also be used in disassembled form on small computers under the specific conditions in every country thus providing flexibility in the proposed approach. Thus electronic data processing can be used effectively to present reclamation situation and give solution to reclamation problem.

References

1. Bellmann, E., Katzur, J. and Lorenz, W. D. (1984): Wiedernutzbarmachung schwefelhaltiger Kipprohboden. Humboldt, Universitat zu Berlin, Pp. 99.

2. Gernert, H. and Kolzow, W. (1974): Ein betriebliches Simulationsmodell (Planspiel zur Aus- und Weiterbildung von Wirtschaftswissenschaften). Ekonomicko-matematicky obzor, Vol. 11(1): Pp. 42-53.

3. Hilderbrandt, R., Voisgtsberger, R. and Waltemate, G. (1982): Erkundung und Aufschlub neuer Braunkohlenlarger, Statten in der DDR. Vol 12(11): Pp 641-645.

4. Hilldmann, E. (1983): Anwendung von simulationonsverfahren zur Entscheidungsfindung fur eine optimal Kulturbodenwirtschaft im Rahmen der Kapazitats, Entwicklung von Bandbertriben in Braunkohlentagebauen. Manuskript des Vortrages.

5. Moller, H. (1959): Die fischereiliche Nutzabarmachung der Restgewasser des Braunkohlenbergbauses. Sitzungs berichte der Deutschen Akademie der Landwirt. Schaftswissenschaften zu Berlin. Pp. 41.

❖❖❖❖