LIGNITE RESERVES IDENTIFICATION FOR MAXIMISATION OF A MINE AND A POWER PLANT JOINT PROFITS

Leszek JURDZIAK, Witold KAWALEC
Institute of Mining Eng., Wroclaw University of Technology, Pl.Teatralny 2, 50-051 Wroclaw, Poland
leszek.jurdziak@pwr.wroc.pl, witold.kawalec@pwr.wroc.pl

(1) Overview

The methods of mineable coal reserves and mineral resources classification and reporting have been changed over the years, independently in various countries. They still have not reached the internationally valid standards despite the fact that premier mining companies carry on their mining operations worldwide. Efforts have been undertaken to develop the standardised ore and coal reserves classification among which the most successful seems to be the Australasian Joint Ore Reserves Committee (JORC) standard. The JORC code, first released in 1989 has already been accepted by Australia, Canada, South Africa, Western Europe and the USA as a basis for ore reserves reporting standards (Stephenson 2003). Also in some East-European countries their local, conservative standards (derived from the former Soviet Union's levels of orebody recognition) are being reviewed in order to meet the widely approved "Western" - JORC standards. Following the globalisation of world economy the internationally accepted standardisation of resources/reserves identification and their valuation is becoming a must for opening the local mining industry for foreign investors.

The identification of lignite reserves is difficult for two reasons. First: implementation of any standardised methods of reserves and mineral resources classification for a deposit that cannot be simply valued with one parameter like grade is not obvious, second: there is no market price for lignite (like for any metal ore or hard coal) and no valuation formula for lignite has been commonly accepted.

The growing demand for energy supply and the liberalisation of electricity market forces competitive behaviour from the energy suppliers. In order to maximise the use of natural lignite resources it is necessary to build a common strategy for both sides of a bilateral monopoly of a lignite mine and a power plant. Otherwise the Pareto efficiency cannot be achieved what threaten sustainable use of lignite resources because a suboptimal (smaller) ultimate pit will be chosen and the supply of energy will be lowered.

To avoid mentioned above threats the new method of lignite reserves and resources identification is proposed in the paper.

(2) Methods

The first step of identification lignite reserves is creating a digital, three-dimensional deposit model (structural and quality). This is the basis for building an economic model of a deposit – the model which each block has been assigned with its mining cost and – in case of lignite blocks – calculated revenue from selling the contained lignite.

The next step is the generating the ultimate pit (with the use of any acclaimed optimisation algorithms like Lerchs-Grossmann) on the basis on the economic model (Kawalec & Specylak 2000). In order to avoid the problem of lack of the market lignite price the open pit optimisation has to be carried out for several price levels what allows – with the solution of bilateral monopoly model – to obtain the unique ultimate pit maximising joint profits of a mine and a power plant (Jurdziak 2008).

It is also proposed to quantify the uncertainty connected with the lignite deposit with the use of conditional simulation – a recently developed, advanced geostatistics method of determination of volatility of deposit parameters.

(3) Results

The proposed method of identification lignite reserves (data flow, mechanism of data processing and control of the processes) have been presented below on two sheets (fig.2) with the use of IDEF0 scheme (explained on figure 1).

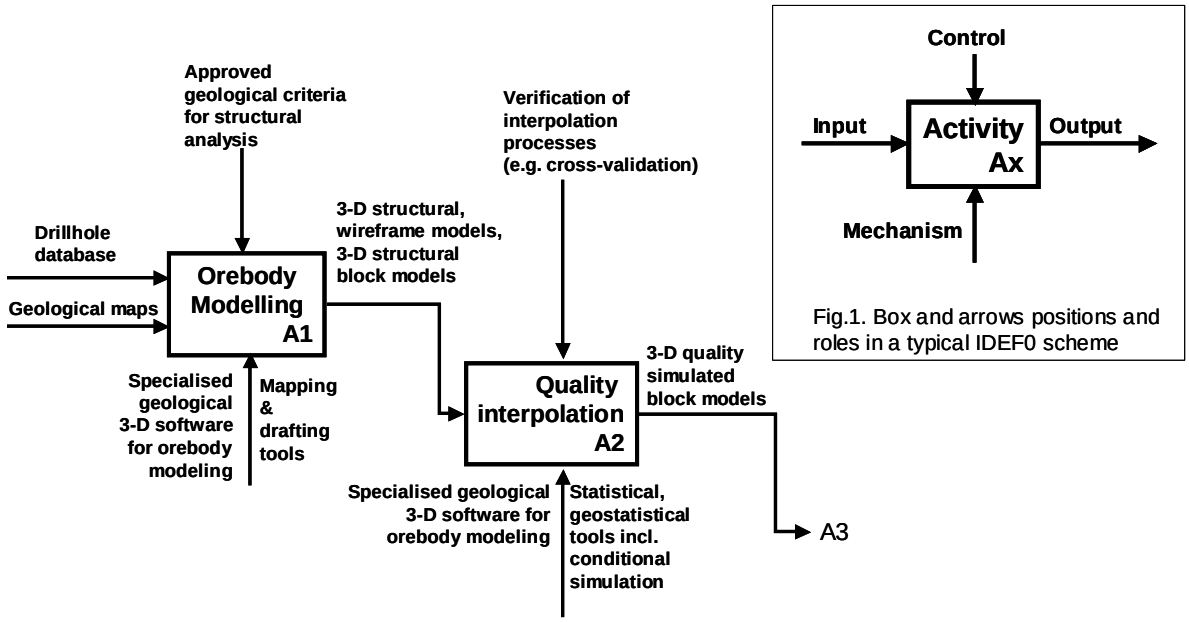

Fig.1. Box and arrows positions and roles in a typical IDEF0 scheme

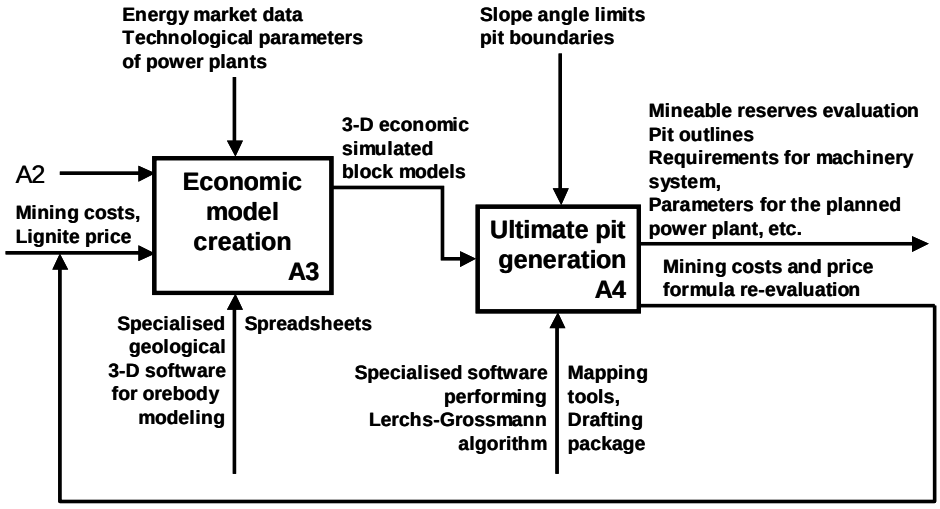

Fig. 2: The proposed, new method of mineable coal reserves identification (the IDEF0 scheme)

(4) Conclusions

The proposed method can be applied also for all mine-mouth power plants. Moreover, the implemented valuation of coal seems to be more sustainable than market price of coal as it can maximise the use of natural resources.

References

Leszek Jurdziak, (2008)) "Benefits of vertical integration of lignite mines and power plants", *Bridging Energy Supply and Demand: Logistics, Competition and Environment. 31st IAEE International Conference*, June 18-20, 2008, Istanbul.

Witold Kawalec Joanna Specylak, (2000), "Open pit optimisation of a lignite deposit". *Mine Planning and Equipment Selection*, Balkema, Athens

Patrick R.Stephenson, (2003), The JORC Code – Maintaining the Standard, *The CIM Mining Conference and Exhibition*, Montreal.