A CRITICAL EVALUATION OF THE PRODUCTIVITY OF SOUTH AFRICAN SURFACE COAL MINES

by

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SUMMARY

During 1998, the general oversupply of coal continued with a 3,7 % decrease in world coal demand and an increase in production. This resulted in the continuation of the downward trend in world coal prices which started in 1996, with coal prices dropping by another 13,8 %. With no market improvements foreseeable in the immediate future, the South African surface coal mining industry will come under severe pressure to improve its labour and capital productivity levels and to reduce its operating costs in order to maintain its competitive edge.

The current state of the South African economy will also not make these improvements an easy task. With the labour sector putting more pressure on government to protect job opportunities in an industry that has long been known as one of the greatest providers of employment in South Africa, low economic growth rates and an ever-increasing trend towards globalisation, the surface coal mines will be hard-pressed to remain competitive and economically sustainable well into the 21st century.

As part of the Coaltech 2020 research initiative into the sustainable exploitation of the Witbank coalfield, this study focused on the different overburden stripping techniques used in South African surface coal mines and evaluated their efficiencies in terms of capital invested, labour productivity, production outputs, operational expenditures and other productivity measures.

These results were used to benchmark each individual South African surface coal mine with every other mine and with selected international mines in order to identify the critical performance areas that need to be improved upon in order to make South African surface coal mines more competitive in the international market environment.

On average, the South African surface coal mining industry recorded a lower overburden stripping productivity performance as determined from the analysis of a survey of mines in the Powder River Basin, United States of America, and in New South Wales and Queensland, Australia. The low productivity performance was mainly due to moderate labour and capital productivity performance levels.

Having identified the critical performance areas that need to be improved upon in order to make South African surface coal mines sustainable and competitive well into the 21st century, it is recommended that:

- Labour productivity be improved to be in line with the best international standards
- Capital productivity be improved to be in line with the best international standards
- The basis of this study be expanded to include all the surface mines in South Africa, thus enlarging the database and allowing cross-pollination of standards to improve productivity
- Newly planned surface mines be measured using the findings of this report to establish better mining investment guidelines for mine planners
- South African surface coal mines be re-evaluated on a yearly basis in order to set the standards for management to continuously improve their operations.

DIE KRITIESE EVALUERING VAN DIE SUID-AFRIKAANSE OOPGROEFSTEENKOOLMYNE SE PRODUKTIWITEIT

deur

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SAMEVATTING

Gedurende 1998 het die internationale oorvoorsiening van steenkool verhoog hoofsaaklik weens stygings in steenkoolproduksie, met 'n gepaardgaande verlaging van 3,7 % in die steenkoolaanvraag. Dit het die afwaartse druk op steenkoolpryse, wat in 1996 ontstaan het, 'n verdere hupstoot gegee en val steenkool pryse met 'n verdere 13,8 %. Met geen onmiddelike verbetering in die internationale markstoestande binne die afsienbare toekoms nie, gaan die Suid-Afrikaanse oopgroefsteenkoolbedryf onder geweldige druk te staan kom om sy arbeids- en kapitaalproduktiwiteite te verbeter en terselfdertyd bedryfskostes te sny net om sy voortbestaan te kan verseker.

Die huidige toestand van die Suid-Afrikaanse ekonomie gaan dit geen maklike taak maak nie; met die arbeidsektor wat groter druk op die regering plaas vir die beskerming van arbeidsgeleenthede in 'n bedryf wat vir jare bekendgestaan het as een van die grootste arbeidsektore in Suid-Afrika, laer ekonomiese groeikoerse, en 'n kontinue globaliseringsdryf, gaan die Suid-Afrikaanse oopgroefsteenkoolbedryf dit moeilik vind om onder hierdie omstandighede kompeterend en suksesvol te bly.

As deel van die Coaltech 2020 navorsingsinisiatief, wat die volgehoue voortbestaan van die Witbanksteenkoolveld ondersoek, het hierdie verhandeling gefokus op die Suid-Afrikaanse oopgroefsteenkoolbedryf se prestasies ten opsigte van kapitaal geïnvesteer, arbeidsproduktiwiteit, produksie-uitset, bedryfskoste en ander produktiwiteitsmeetpunte en was dit dienooreenkomstig geëvalueer.

Die resultate van die studie is gebruik om die individuele Suid-Afrikaanse oopgroefsteenkoolmyne intern met mekaar, asook met 'n paar internasionale myne, te

vergelyk, om die kritiese areas vir verbetering uit te lig, wat Suid-Afrikaanse myne instaat sal stel om hul meer kompeterend te maak op die internasionale arena.

Gemiddeld was die Suid-Afrikaanse myne se deklaagstropingsproduktiwiteit laer as die van geselekteerde myne in die Powder River Basin, Verenigde State van Amerika en New South Wales en Queensland in Australië. Die laer prestasie kan hoofsaaklik toegeskryf word aan die ondergemiddelde prestasies op arbeids- en kapitaalproduktiwiteit-vlakke.

Na die identifiseering van daardie kritiese meetpunte wat verbeter moet word om te verseker dat die Suid-Afrikaanse steenkoolbedryf kompeterend en mededingend gaan bly in die 21ste eeu, is die volgende aanbevelings gemaak:

- Arbeidsproduktiwiteit moet verhoog word om in lyn te kom met internasionale standaarde.
- Kapitaalproduktiwiteit moet verhoog word om in lyn te kom met internasionale standaarde.
- Die invloedsfeer van die studie moet vergroot word om alle Suid-Afrikaanse oopgroefmyne in te sluit, om sodoende die kruisbestuiwing van standaarde te bewerkstellig en tot verbeterde prestasie aanleiding te gee.
- Die bevindinge van die verslag moet met nuutbeplande oopgroefmyne vergelyk word om beter kapitaalinvestingsriglyne vir mynboubeplanners daar te stel.
- Die Suid-Afrikaanse oopgroefsteenkoolbedryf moet op 'n jaarlikse basis herevalueer word met die doel om bestuur by te staan met die standaarde benodig vir aaneenlopende verbeterings.

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Abbreviations

CAPEX	Capital expenditure
ERM	Exposure Rate Measurements
GPS	Global Positioning System
IT	Information Technology
KPI	Key Performance Indicators
NSW	New South Wales (Australia)
OEM	Original equipment suppliers
OPEX	Operating expenditure
PFP	Partial Factor Productivity
PRB	Powder River Basin
QLD	Queensland (Australia)
ROM	Run-of-mine
TPF	Total Productivity Factor
USA	United States of America

Symbols

h	hour
km	kilometre
m^3	cubic metre
Rm	rand million
t	ton

Nomenclature/Definitions

BCM: Bank cubic metre

Blast gain: Material moved by chemical energy and never touched by any other equipment. It must be deswelled or expressed as a percentage.

Blasting: The activity of harnessing chemical energy in the form of explosives to fracture or break the in situ rock into a manageable size fragmentation

Bucket factor: Ratio between the available bucket capacity and the amount of the available bucket capacity that is filled with material during one pass, expressed as a percentage

Bush clearing: The activity of removing all groundcover vegetation prior to mining, including the removal of tree stumps and roots

Coal exposure rate: Linear advance over the cut width of the pit, measured in square metres

Coal removal: The activity of removing the coal in order to expose the parting or interburden in multi-seam operations

Digging availability: Operational and mechanical availability of the dragline to dig

Digging index: Effective utilisation of each cubic metre of bucket capacity, measured over every passing hour

Doze-over gain: Blasted material that is dozed to its final resting position (expressed as BCM)

Drilling: The activity of creating a shot hole by means of rotary and/or percussion drilling equipment

Hards: Material that requires chemical energy to break in order for it to be handled by standard mining equipment.

Haul distances: The distance that haul trucks travel from the shovel loading point to the dump site

Highwall control: The activity of controlling the highwall stability by means of chemical or mechanical energy

LCM: Loose cubic metre

Parting removal: The activity of removing the parting or interburden in order to expose the underlying coal seam in multi-seam operations

Powder factor: Mass of explosives used per BCM rock blasted

Pre-stripping: The activity of removing blasted material that cannot be accommodated by the primary stripping tool

Primary stripping: The activity of removing blasted material in order to expose coal

Rehabilitation: The activity of levelling and/or profiling before revegetating the spoil material

Rehandle: Material that is handled by the same equipment for a second time

Softs: Material that can be freely dug or can be removed by mechanical means without the use of chemical energy

Subsoil removal: The activity of removing all soft material other than topsoil

Swell factor: Percentage increase in volume when in situ rock is subjected to mechanical or chemical energy

TCM: Total cubic metres for equipment only (LCM + rehandle)

Topsoil stripping: The activity of removing topsoil as per the definition of topsoil contained in the Minerals Act, 1991

Total BCMs: Sum of coal and waste BCMs mined

Truck spotting time: Time (in seconds) taken from when a haul truck arrives at the loading shovel until it has positioned itself at the shovel ready for loading