ABSRACT

Mining discharges toxic pollutants, fumes and dust into the environment that endanger human as well as faunal, floral and aquatic life. Some mining companies including Bindura Nickel Corporation (BNC) developed environmental management systems (EMSs) for combating the environmental impacts of their operations. This research evaluated the effectiveness of effluent, sulphur dioxide, oil and dust management programmes at Trojan Nickel Mine (TNM) and Bindura Smelter and Refinery (BSR). Data for 2003 from EMS records were compared with data for 2004 from field measurements and set targets to detect trends in performance of the environmental management programmes.

Questionnaires, observations, interviews and field measurements were used for collecting primary data while a checklist and data sheets were used for secondary data at TNM and BSR. The findings were presented in tables and graphs while descriptive statistics were used in data analysis. Confidence levels of proportions at 0.05 were used to calculate lower confidence limits.

The study found that EMS components were critical in EM at TNM and BSR but did not involve some of the key stakeholders. The effluent management programme realised zero discharge in three out of five streams and the remaining two had a decline in discharge by 50% in 2004. The amount of pollutant concentrations in surface and ground water declined in 2004. Wastewater from the mining concern did not affect crops and livestock in the neighbourhood. The success of the effluent EMP was attributed to wastewater recycling, treatment and monitoring of the level of pollutants. Oil separation was 99% effective and about 24% (67,454 litres) of total oil input was recovered from January 2003 to April 2004. Oil consumption declined by 3,4% yet the target was to 50%. The Oil Farm showed that oil contaminated soils were improving with age.

The research revealed that sulphur dioxide emissions exceeded the target of 30mg/m^3 by 3 times at the workplace and slightly in the nearby areas. The implications were that the precipitator did not perform well and the +/-40m high stacks were not able to disperse all the gas to the upper atmosphere. Nearby farms and residential areas were not affected by the gas during the study period. All the workers who were interviewed, 100% of 85, confirmed that the gas affected their health while 100% of the farmers indicated that it affected them and damaged their crops when the wind blew towards them. The study also found out that the dust management programme failed to achieve the intended target of 5mg/m^3 and 2mg/m^3 for atmospheric and respirable dust respectively. However 2004 levels were lower than those for 2003. The poor performance was attributed to frequent breakdown of the dust collection and recovery units whose spare parts were reported to be hard to comeby.

The study concluded that there was an active EMS at TNM and BSR that got full support from management and was based on recycling of waste materials. Although targets were not achieved in some of the EMPs, the state of the environmental conditions was continually improving. However SO_2 management was yet to contain excessive emissions at source. The research recommends that all the performance indicators need to perform well for the environmental management programmes (EMPs) to achieve the set objectives. It is also recommended that Bindura Nickel Corporation needs to explore ways of combating emissions at source for effective EMP implementation and to reconsider zero effluent discharge.

ACKNOWLEDGEMENTS

Thanks to Mr T. P. Z. Mpofu, my supervisor, and to Mai Mbengo for helping me develop some insights into how to go about the research. I need to express my gratitude to Dr Murwira for taking me through the confidence levels that were used in data analysis. I am grateful to my friend, Talent Murwendo, with whom I shared field experiences. I would also want to thank Mr M. Masocha for helping with the maps and Mr Hunguru of Chinhoyi University for doing the tests for my oil samples.

I am indebted to Bindura Nickel Corporation for allowing me to carry out the research on their premises. Thanks to Mr Nyawo and Mr Mashindi from the Training Department who facilitated the conduct of the research. I need to thank Mr S. Mseka, the Group Environment Manager and Ms M. Mukabeta, TNM and BSR Environment Officer, for helping in preparing a data collection programme at the mine. I wish to thank Mr J. Chiripanyanga, BSR senior lab analyst, Messrs J. Mugozhi, K. Nyamutora, L. Mangadze, Chipungu, T. Tsuro, S. Mapepa, R. Machemba, T. Lukas, Tembo, W. Zenda and R. Tom for the part they played in making data collection at the company premises possible. I wish to extend my gratitude to Mr A. Chiworeka, a Bindura University Student who helped me in measuring sulphur dioxide.

I wish to thank my family for bearing with me throughout the difficult study period. I will make it up for you guys. I wish to express my profound gratitude to my wife, Mimi, who took care of the family when I was away.

DEDICATION

To my wife, Mimi and my boys; Ray, Roy and Rodney

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Acronyms and Abbreviations

BNC	: Bindura Nickel Corporation
BSR	: Bindura Smelter and Refinery
Cons	: Concentrates
ECIs	: Environmental Performance Indicators
EM	: Environmental Management
EMP	: Environmental Management Programme
EMS	: Environmental Management System
g/l	: grams per litre
GOZ	: Government of Zimbabwe
ILO	: International Labour Organisation
km	: kilometre
LCL	:Lower Confidence Limit
m	: metre
mg	: milligrams
MOH	: Ministry of Health
MPIs	: Management Performance Indicators
NO_x	: Nitrous oxides
NRs	: Natural Resources
OPIs	: Operational Performance Indicators
ppm	: parts per million
PRY	: primary
SAZ	: Standards Association of Zimbabwe
SEC	: secondary
SO_2	: Sulphur Dioxide
SO_x	: Sulphurous Oxides
TNM	: Trojan Nickel Mine
UCL	: Upper Confidence Limit
UN	: United Nations
W.H.O.	: World Health Organisation