TAILINGS DISPOSAL AND RECLAMATION AT THE COAL VALLEY MINE[1]

Dane M'Coy, Luscar Sterco (1977) Ltd. P.O. Box 5000, Edson Alberta T0E 0P0

ABSTRACT

Coal cleaning waste or tailings material is a waste stream generated by the processing plant at the Coal Valley Mine. The waste material consists of impurities that have been removed from the coal in order to meet customer specifications. The plant produces up to 1.5 million tonnes of coal cleaning waste annually. The waste has been characterized as coarse reject material and fine reject material. The waste streams have traditionally been separated during the process with the coarse material being dry and used in the backfilling of mined areas and the fine material being pumped as a liquid to mined out pits for disposal.

Previously, conventional tailings disposal used costly filter presses to dewater coal tailings. The resulting filter cake was hauled with trucks to a disposal site and the liquids were pumped to storage cells. Reclaiming these cells was difficult and expensive because up to six metres of material had to be placed over the tailings so that equipment could operate safely. Replacement of coversoil with a final 30cm cap over the rock was then completed and the area revegetated. Haul distances have increased and the cost of trucking has become prohibitive so alternatives to conventional capping were sought.

The current disposal method has eliminated the use of filter presses and production of filter cake. The coarse (dry) reject material is screened from the process and hauled to active mining areas for disposal and reclamation. The fine (liquid) reject material from the process is pumped in slurry form to a mined out disposal area. The current method of reclamation has eliminated the need to cap the tailings material with rock. The tailings material consolidates over time and after a period of dewatering, coversoil can be placed directly over the tailings material. This is carried out in winter when the upper part of the material is frozen.

Approximately 18 ha have been reclaimed using the new process. The various end land uses (forestry, wildlife, and wetlands) have d into the reclaimed landscape. Some of the area has been reclaimed successfully without the use of coversoil. The geotechnical, water quality and reclamation aspects of this experimental procedure show encouraging results and will be discussed in more detail.

INTRODUCTION

Innovative techniques for the disposal and reclamation of coal tailings at the Coal Valley Mine of Luscar Sterco (1977 Ltd.) and how they conform to the end land uses approved for the minesite are presented in this report. The Coal Valley mine is located approximately 90km southwest of Edson, Alberta in the Rocky Mountain Foothills. Current production of 1.7 million Clean Metric Tonnes of high volatile bituminous thermal coal which is supplied to domestic and export markets.

---

[1] Presented at the 21st Annual Meeting, Canadian Land Reclamation Association, Calgary, Alberta, September 18-20, 1996.

[1] Présenté a la 21ème réunion annuelle de l'Association Canadienne de Réhabilitation des Sites Dégradés, Calgary, Alberta, September 18-20, 1996.

The disposal of the coal tailings, particularly the fine materials (<0.5mm), has presented technical difficulties and costly options for handling and reclamation operations. The tailings have no economic value and their subsequent disposal increases overall production costs. Fine clays and ash material in the raw coal must be removed to achieve customer specifications. Special cleaning is required to remove the impurities to achieve customer specifications. The result is a process which generates both a coarse waste and a fine tailings stream. A two stage heavy media separation takes place producing a clean coal product, a middling product, and a coarse reject. The fine waste (<0.5mm) stream is difficult to handle and is the main focus of this paper. The past and present methods of disposal and reclamation will be discussed.

A research project was undertaken in 1988, using the old plant emergency tailings impoundment, to demonstrate, in various lab and field tests, alternatives to conventional tailings reclamation. The impoundment was the site of detailed geotechnical studies (Stahl and Sego 1992) (Thurber 1992) and biological studies (Macyk et al, 1991). The 18.2 ha area has been inactive for tailings disposal since 1989 when reclamation activities commenced. Results from this study area form the basis for future tailings reclamation where the principal objective is to reduce coal cleaning and reclamation costs, while maintaining the quality of the end product, which enables the mine .

SUMMARY AND CONCLUSIONS

Several aspects of tailings handling and reclamation have been investigated and changes have been implemented. The following summarizes this paper:

1. Processing and reclamation costs have been reduced by shutting down the filter presses, reducing the volume of semi solid wastes that require trucking, and changing the requirement for capping all tailings and rejects material with rock.

2. Coal tailings are capable of supporting adequate vegetative cover having similar vegetative characteristics to coversoiled areas. This may negate the need for 30cm of coversoil placement which in the past has been difficult and expensive to achieve even under frozen ground conditions.

3. Geotechnical results indicate that bearing capacities and shear strengths are increasing with time in the reclaimed areas including areas of reject fines. A number of natural surface processes particularly freeze thaw cycling has lead to the dewatering and strengthening of the tailings materials allowing vegetation to establish on tailings. Once established, vegetation will further aid in the dewatering and structural enhancement of the tailings as root zones develop.

4. The reclaimed tailings area blends into the natural landscape by incorporating approved end uses into the plan. A combination of forested land, wildlife habitat and wetlands can be created which will comply with existing operating approvals.

These studies were focused on reducing coal processing and tailings disposal costs. They have demonstrated that coal tailings can be reclaimed without capping the tailings with costly backfilling. The program also demonstrates that the area can be successfully reclaimed to a condition comparable to the pre-mining landscape ensuring long term sustainability.

The regulatory agencies have been extremely receptive to employing new and innovative technologies. The proposed changes are significant and without the foresight and willingness of the

regulators to participate, particularly Alberta Environmental Protection and Energy and Utilities Board (formerly ERCB), these changes would not have been possible. As such, companies in Alberta can employ new technologies and reclamation techniques allowing them to remain competitive and effective.

REFERENCES

Latimer, R.C., Brinker, C.J. and Kintzi, R.P. 1988. Tailings Disposal Options at the Coal Valley Mine. IN: 90th Annual General Meeting of Canadian Institute of Mining and Metallurgy, 43 p.

Macyk, T.M. 1993. Characterization and Reclamation of Coal Tailings Materials. IN: Proceedings of Planning, Rehabilitation, and Treatment of Disturbed Lands, Sixth Billings Symposium 1993, Billings, Montana, U.S.A., 21-27 March 1993.

Macyk, T.M., Nikiforuk, F.I. and Widtman, Z.W. March, 1990. Characterization and reclamation of coal tailings materials. Environmental Research and Engineering Department report prepared for Luscar Sterco (1977) Ltd. and Obed Mountain Coal Company Ltd.

Macyk, T.M., Nikiforuk, F.I. and Widtman, Z.W. December, 1991. Characterization and reclamation of coal tailings materials. Environmental Research and Engineering Department report prepared for Luscar Sterco (1977) Ltd. and Obed Mountain Coal Company Ltd.

Sego, D.C., 1990. Use of Freeze-Thaw to Assist in Reclamation of a Coal Tails Pond, Submitted to Luscar Sterco (1977) Ltd. 27 p.

Stahl, R.P. and Sego, D.C. 1992. Influence of Natural Surface Processes on Reclamation of the Coal Valley Tailings Impoundment. IN: Proceedings of Second International Conference on Environmental Issues and Management of Waste in Energy and Mineral Production, Calgary, Alberta, Canada, 1-4 September 1992.

Stahl, R.P. and Sego, D.C. 1992. Freeze-Thaw Dewatering and Structural Enhancement of Fine Coal Tails. Paper presented at Geotechnical Conference in Saskatoon, Saskatchewan 1993.

Stahl, R.P. and Sego, D.C. 1995. Influence of Natural Surface Enhancement Processes on Bearing Capacity and Reclamation of Fine Coal Tails. Paper submitted for review to the Canadian Institute of Mining and Metallurgical Bulletin, December 1995.

Stahl, R.P. and Sego, D.C. 1996. Characterization and Dry Landscape Reclamation of Mine Tailings. Paper presented at 3rd International Symposium on Environmental Geotechnology, 10-12 June, 1996.

Thurber Engineering Ltd., 1992. Coal Valley Mine Site Tailings Reclamation Research Project, Geotechnical Report. Submitted to Luscar Sterco (1977) Ltd.

CANADIAN LAND RECLAMATION ASSOCIATION

ASSOCIATION CANADIENNE DE RÉHABILITATION DES SITES DÉGRADÉS

Conservation and Reclamation:

An Ecosystem Perspective

Canadian Land Reclamation Association's
21st Annual Meeting

Calgary, Alberta
September 18-20, 1996

Conservation and Reclamation:

An Ecosystem Perspective

Canadian Land Reclamation Association's
21st Annual Meeting

Calgary, Alberta
September 18-20, 1996

This report may be cited as:

Powter, C.B., M.A. Naeth and D.A. Lloyd (compilers), 1996. Conservation and Reclamation: An Ecosystem Perspective. 21st Annual Meeting, Canadian Land Reclamation Association, Calgary, Alberta. 153 pp.

ACKNOWLEDGEMENTS

The compilers acknowledge the assistance of Jamie Legarie, Alberta Environmental Protection, Land Reclamation Division in preparing the manuscript. We also thank the authors for providing their papers on short notice.

The compilers edited some of the papers for format and length. We apologize for any errors that may have resulted.

TABLE OF CONTENTS

LIST OF SPONSORS vi

INDUSTRIAL FACILITIES

Industrial Site Decommissioning in Alberta 1
Walter J. Ceroici

Changing Knowledge Needs for Wellsite Reclamation 3
Jim Smith

The Orphan Facilities and Pipeline Program: An Industry/Government Responsibility 7
David Lloyd and David Sandmeyer

In-Situ Amelioration of Sodic Mine Spoil Using Sulfur, Gypsum and Crop Management ... 11
Jeff J. Sansom, M. Anne Naeth, and David S. Chanasyk

Bioremediation of Contaminated Sites 13
Christopher Schneider

Contaminant Metal Concentration in Alberta Soils Under Different Land Uses 17
Gerry Lutwick, Gordon D. Dinwoodie, David Gower and G. E. Nason

Waste Disposal Guidelines from a Testing Lab's Perspective 19
John Ashworth

Reclamation of a Former Heavy Oil Plant in Northeastern Alberta 23
Tim R. Bossenberry, J. Jeffrey Wilson, David Evans, Darrell Chollak and George Walker

Nutrient and Metal Levels and Dynamics on a 30-year Revegetated Copper-Nickel Tailings Site at Copper Cliff, Ontario 27
Jeremy Niemi, John Giffen and Keith Winterhalder

FORESTS

Land Application of BCTMP Mill Waste Research in Alberta 31
Terry M. Macyk

Reclamation to Native Forest Ecosystems in the Oil Sand Region 33
Steve Tuttle

Land Capability Classification for Forest Ecosystems 37
Leonard A. Leskiw, Steve Tuttle and Earle Anderson

Forest Land Restoration on Vancouver Island 39
David Polster

Lichen Diversity in the Reclaimed Areas of Sudbury, Ontario 43
S. Wainio and Peter Beckett

MOUNTAINS

Application of Population Biology, Conservation Biology and Succession Theory to the Reclamation of a High Elevation Coal Mine 47
Clint R. Smyth

Plant Community Changes in Response to Anchor Chaining and Seeding on Pinyon/Juniper Sites in Central Utah 51
J. Gregory Sutor

Tailings Disposal and Reclamation at the Coal Valley Mine 53
Dane McCoy

In-Pit Disposal Program for Acid Generating Waste Rock 57
Jamie Quesnel and S. W. Stogran

Reclamation, Trans Canada Highway Twinning, Banff National Park 63
Otto Hammer

GENERAL ISSUES

Railway Reclamation: Issues and Opportunities 67
Chris B. Powter and David A. Lloyd

Experiences in Reclaiming Railways Under Alberta's new Reclamation Guidelines 71
Mark Polet

Pipeline Abandonment: A Discussion Paper 73
Karen Etherington

Legal Perspectives on Land Reclamation 75
Gilbert Van Nes

Liability for Reclamation: Enforcement at Common Law 77
Adrian Currie

WATER AND WETLANDS

Coursier Reservoir: The Planning and Costs Associated with the Reconstruction and Revegetation of a Subalpine Lake 81
J. Leah Jackson

Spray Lakes Reclamation Project 85
Margwyn R. Zacaruk

The Pine Coulee Project: Linking Reclamation Planning to Impact Assessment 89
Ron Middleton

Design and Construction Management Aspects of Constructed Wetlands 93
Bernard Amell and Kim Eastlick

Natural Revegetation of an Alberta Peatland after Horticultural Peat Extraction 97
Wayne S. Tedder and Larry W. Turchenek

RUNOFF/EROSION

Computer Modelling of Soil Erosion from Reclaimed Land 101
Les Sawatsky, Wes Dick and Senarath Ekanayake

Runoff and Sediment Yield under Grazing in Foothills Fescue Grassland of Alberta 103
M. Anne Naeth and David S. Chanasyk

Runoff Curve Numbers for Two Reclaimed Watersheds in Central Alberta 107
Ted E. Harms and David S. Chanasyk

Vegetation Characteristics, Grazing Disturbance and Soil Erosion 111
Suzanne I. Gill, M. Anne Naeth, David S. Chanasyk and V. S. Baron

PRAIRIE

Renewing the Ecological Integrity of Disturbed Native Prairie 113
Heather S. Gerling

Mixed Grass Prairie habitat Restoration Project: Landscape Restoration in the Moist Mixed Grass Prairie 117
Dean Nerberg

Native Prairie Regeneration After Pipeline Construction: A Comparison Between Topsoil Stripping versus No Topsoil Stripping During Construction 119
Gordon Dunn and Gina Fryer

Restoration of Native Sandhills Vegetation after Pipeline Construction in the Great Sand Hills Region of Saskatchewan 123
David G. Walker, Laurier Kremer and Wayne Marshall

The Effects of Grazing, Mowing, Glyphosate and Burning on Smooth Brome in Fescue Grassland 125
D. J. Brown and M. Anne Naeth

VEGETATION

Avoiding Downy Brome When Buying Seed 127
Kerby Lowen and Sarah Foster-Stubbs

Biodiveristy and Reclamation: How Many Species do we Need in a Seed Mix? 131
Dana Bush and M. Anne Naeth

Germination and Survivability of Selected Native and Introduced Grasses and Legumes 133
William E. Pelech and M. Anne Naeth

Road Maps for Repairing Ecological Damage 135
Andy Hammermeister

Ecovar Developments in Western Canada 137
Les Wetter and Brent Wark

Plant Growth on Aggregated Oil Sands Processing Wastes 139
Xiaomei Li, Jim Storey, Paul Y. P. Yeung and Martin Y. P. Fung

The Clover Bar Landfill: A State of the Art Landfill Reclamation Process 141
Ann Smreciu, Nolan Turner and Don Barron

BULK DENSITY

A Method of Characterizing the Bulk Density of Compressible Particulate Material 145
D. Guenther, Stacy Schaub and J. Leonard

Near-Surface Compaction Under Grazing of Annual and Perennial Forages 149
Dennis Twerdoff, David S. Chanasyk, M. Anne Naeth and V. S. Baron

Grazing Impacts on Bulk Density and Soil Strength in the Foothills Fescue Grasslands of Alberta, Canada 151
David S. Chanasyk and M. Anne Naeth

Computer Modelling of Soil Erosion from Reclaimed Land 155
Les Sawatsky, Wes Dick and Senarath Ekanayake

LIST OF SPONSORS

Diamond Level

Alberta Environmental Centre
TransCanada Pipeline Limited

Gold Level

AGRA Earth & Environmental Limited
CHEMEX Labs Alberta Inc.
Government of the Northwest Territories
TransAlta Utilities Corporation

Silver Level

Canadian Energy Pipeline Association
Cardinal River Coals Ltd.
Inco Limited
Olds College
Imperial Oil Resources

Bronze Level

Alberta Treasury Branches
Cigar Lake Mining Corporation
Enron Oil Canada Ltd.
Estevan Coal Corporation
Hudson Bay Mining & Smelting Co. Ltd.
Inland Industrial Materials
Manalta Coal Ltd.
Nelson Dynes & Associates Inc.
NOVA Gas Transmission Ltd.
PanCanadian Petroleum Limited

Iron Level
EnviResource Consulting Ltd.
Morgan Hydrocarbons Inc.
Petroleum Industry Training Service
Western Ecological Systems Management Consulting Inc.