

Extractive & Process Technologies

CASE STUDY

Enhanced Tailings Disposal (ETD)

Ciba® RHEOMAX™ 9060 (ETD) - Aids land rehabilitation

Overview

After thickening most mineral tailings are transported as slurry to a designated storage area. In some cases tailings are used as mine back fill or in the rehabilitation of a surface mine.

Recent advances in tailings management have focussed on thickening the tailings prior to deposition. This approach relies on thickened slurry being deposited in relatively thin layers on a sloped bed to allow consolidation, via both gravity drainage and solar drying.

Over the past decade significant advances have been made in the technology associated with thickening dilute slurries. Thickeners have become more efficient and flocculants more effective and the production of high density pastes is now possible with developments in mechanical systems that can both produce and pump high density material.



Ciba Specialty Chemicals has developed a range of rheology modifiers, which play an important role in this type of tailings management process. Ciba® RHEOMAX™ ETD products, added at a controlled dose, modify the surface properties of the tailings, producing a high yield stress material with controllable stacking and rapid water release and recovery. The use of these products maximises the existing disposal area and enhances the co-disposal of coarse and fine material. Of particular interest is the promotion of better land rehabilitation and vegetative growth (upon seed introduction).

Process description

The surface of a tailings heap is prone to capping.

Substrate capping or sealing occurs when aggregate breakdown results in the formation of reduced sized pores within the surface layer. Fine particulate material migrates within the surface layers, further blocking the pores immediately below the surface, forming an impermeable layer termed the 'washed out zone'.

The processes involved are similar to those identified in the formation of surface caps in soils.

Issue

The consequences of capping within tailings substrates are similar to those reported for agricultural soils, namely decreased infiltration and increased runoff of rainfall and applied irrigation, resulting in poor germination and subsequent plant growth.

Solution

Synthetic polymers are known to improve the stability of soil aggregate and reduce soil sealing. Ciba® RHEOMAX™ ETD products generate a similar effect in that fine and colloidal particles are bound/immobilised within the Ciba® RHEOMAX™ ETD aggregated structure and therefore have reduced availability to participate in the substrate capping processes. This can lead to a significant increase in water permeability at the substrate surface and enhance/ improve vegetative rehabilitation, through improved seed germination and crop viability, without the need to rework the substrate surface.

Technical Service

It should be noted that the level of salts or metals within a particular tailings substrate will dictate the ease and longevity of vegetation growth and sustainability. Full technical service and advice in all aspects of product selection, laboratory tests and plant trials will be provided.

Health & Safety

Detailed information on handling and any precautions to be observed in the use of the product(s) described in this leaflet can be found in our relevant Health and Safety information sheet.

Results

UNTREATED

TREATED with
Ciba® RHEOMAX™ 9060 (ETD)

DAY 4



DAY 7



DAY 11



DAY 30



Highlights of Ciba® RHEOMAX™ 9060 (ETD) performance

- Even particle size distribution
- Water permeable surface
- Improved re-vegetation
- Viable land rehabilitation

Ciba® RHEOMAX™ ETD

Operational Benefits	Economic Benefits	Environmental Benefits
<ul style="list-style-type: none"> • Maximise life of existing disposal area 	<ul style="list-style-type: none"> • Less land required for new tailings disposal 	<ul style="list-style-type: none"> • Quicker rehabilitation of land
<ul style="list-style-type: none"> • Less land required for new tailings disposal 	<ul style="list-style-type: none"> • Reduced disposal area management costs 	<ul style="list-style-type: none"> • Reduced fresh water replenishment
<ul style="list-style-type: none"> • Improved recovery of quality liquor 	<ul style="list-style-type: none"> • Lower water costs 	<ul style="list-style-type: none"> • Less land required for new tailings disposal
<ul style="list-style-type: none"> • Enhanced co-disposal of coarse sands and slimes 	<ul style="list-style-type: none"> • Reduced mine closure costs 	<ul style="list-style-type: none"> • Reduced water loss to evaporation
<ul style="list-style-type: none"> • No reworking of disposal area 	<ul style="list-style-type: none"> • Lower insurance cost 	<ul style="list-style-type: none"> • Faster trafficable surface
<ul style="list-style-type: none"> • Faster trafficable surface 	<ul style="list-style-type: none"> • Reduced energy consumption 	<ul style="list-style-type: none"> • Lower energy consumption
<ul style="list-style-type: none"> • Less pipeline wear 	<ul style="list-style-type: none"> • Lower capital investment 	

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