

Enzymes in the Construction Industry

Enzymes are organic catalysts which occur naturally in the environment.

This presentation looks at two enzyme applications which can contribute positively, in both economic and environmental terms, to constructions related projects



EKO-SOIL

Soil Stabiliser

“The 21st Century Road Building Technology”

Presented by:

Norwood Hall (Asia) Pty Ltd

Australian distributor for EKO-SOIL

IN 1998 A WESTERN AUSTRALIAN QUARRY REBUILT ITS ACCESS ROAD



QUARRY ACCESS, FLYNN'S ROAD, WUNDARRIE W.A.

**LAI IN 1998, THIS ROAD HAS HAD NO
MAINTENANCE IN 10 YEARS, DESPITE 120 “B
DOUBLE” MOVEMENTS DAILY**



FLYNN'S ROAD WUNDARRIE, 2006

EKO-SOIL

Soil stabiliser

- **A Unique**
- **Multiple enzyme based stabiliser**
- **Fermented from organic materials**
- **Environmentally safe & 100% biodegradable**
- **Non-toxic & non-hazardous**
- **Now used in over 30 countries world wide**
- **Made in the USA**

WHAT DOES EKO-SOIL DO?

- **Increases soil density & load bearing capacity**
- **With less compaction effort**
- **Decreases the need for costly aggregates**
(Allowing for the use of existing cheaper materials)
- **Lowers permeability**
- **Results in savings of up to 50% on conventional construction costs**

HOW DOES IT WORK?

- *EKO-SOIL Soil Stabiliser* interacts with clay changing the soil's molecular structure
- This accelerates the cohesive bonding of soil particles
- *EKO-SOIL* uses less water than normally needed in bonding
- Finally producing a dense permanent base,

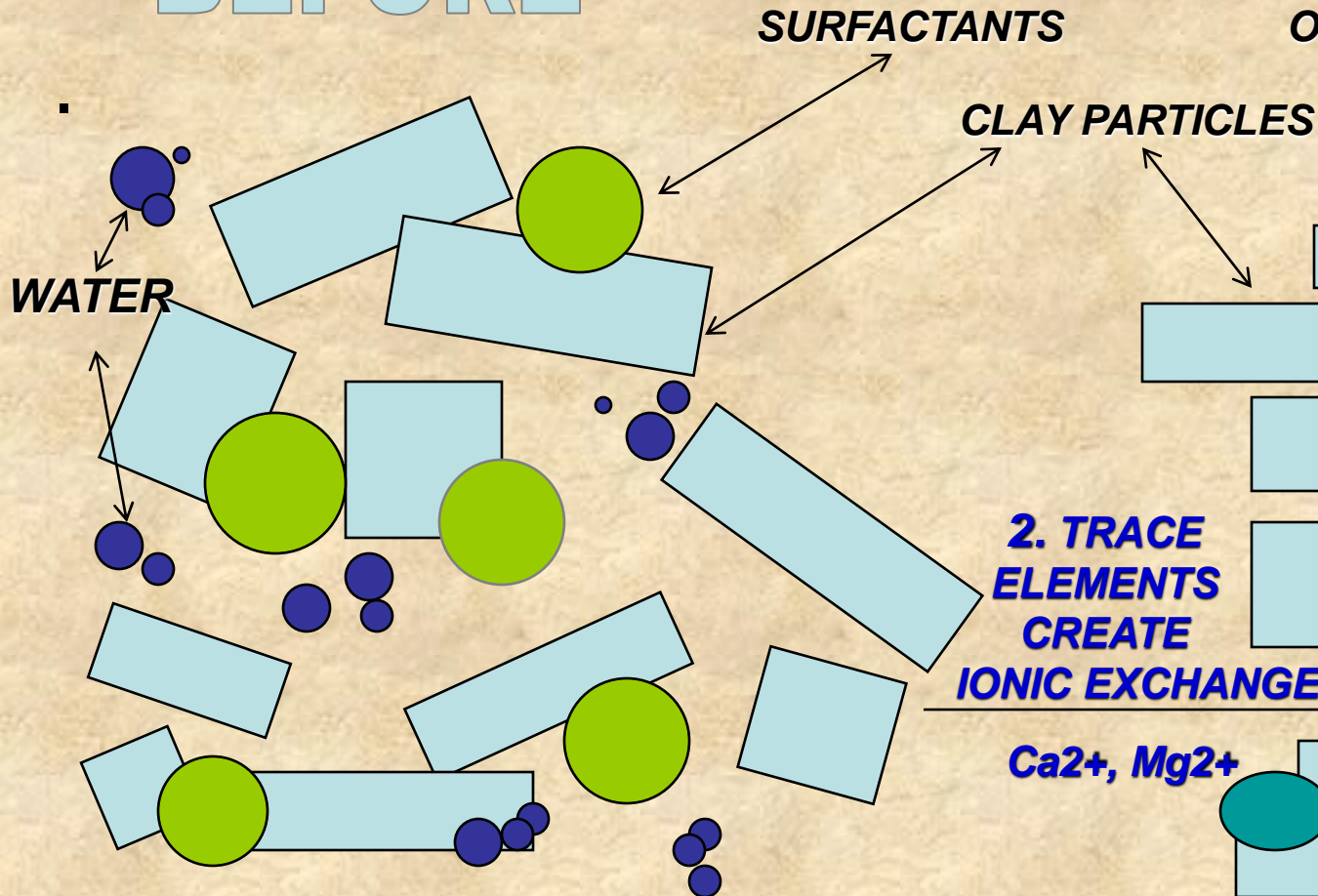
Termites have been building with enzymes for millions of years!

African termites make rock hard structures with the enzymes in their saliva acting on the clay content of soils.



Visual of the Molecules:

BEFORE



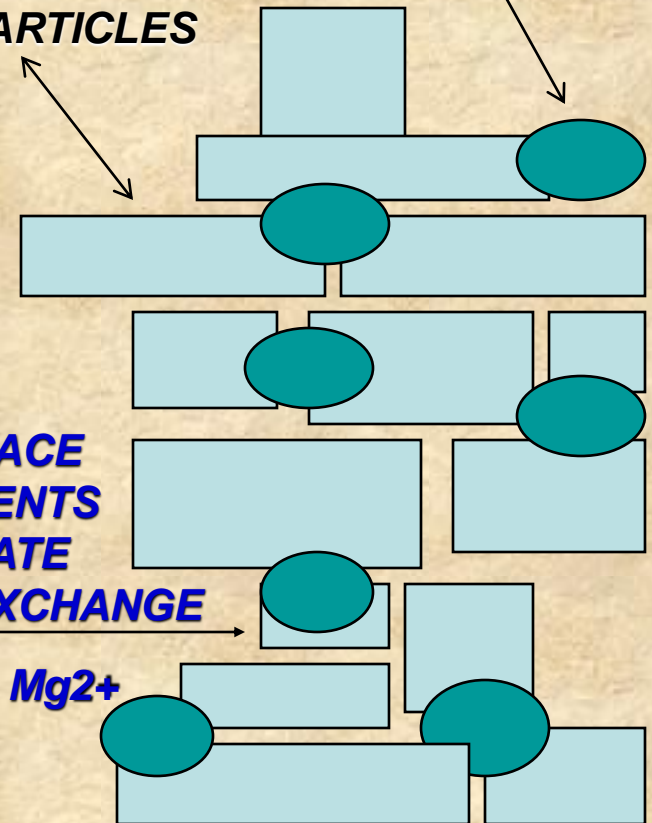
1. SURFACTANTS DISPERSE SOIL AND WATER

AFTER
ORGANIC COMPOUNDS

CLAY PARTICLES

**2. TRACE
ELEMENTS
CREATE
IONIC EXCHANGE**

Ca²⁺, Mg²⁺



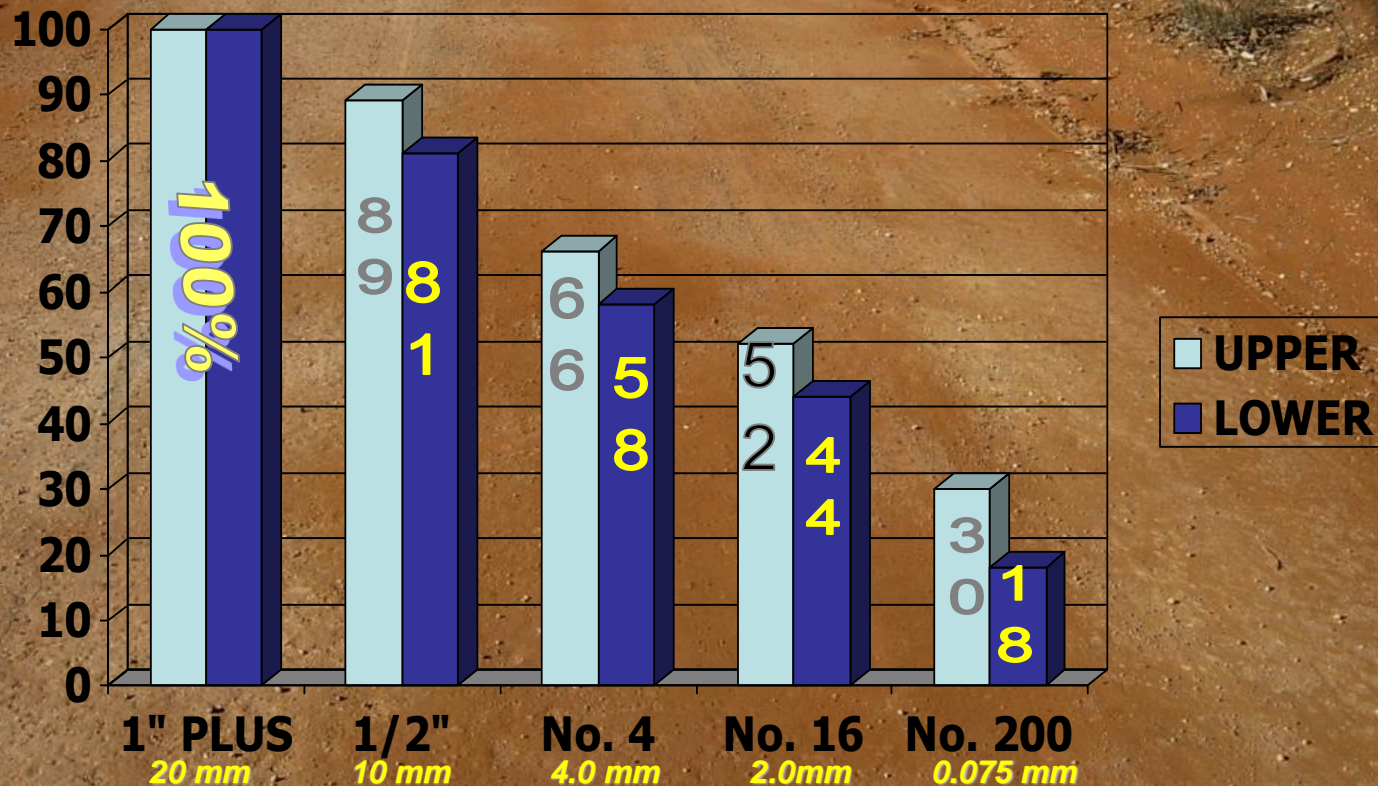
**3. ORGANIC COMPOUNDS BLANKET
EXCESS FOR EXCHANGE POINTS**

STEP 1.

THE PRE-REQUISITES: SOILS ANALYSIS

**1. GRADATION, INCL AT LEAST 18% COHESIVE FINES
PASSING THE 75 MICRON SCREEN**

2. MINIMUM PLASTIC INDEX OF 6%



STEP 2.

RIP THE SOIL

ITS JUST LIKE BUILDING A CONVENTIONAL ROAD
- RIP & SHAPE EXISTING ROAD BASE



ROAD PREPARATION - SHAPE EXISTING ROAD BASE

STEP 3

LIGHTLY WATER

AND MIX THROUGH THE BROKEN SOIL

STEP 4

ADD EKO SOIL
TO A STANDARD WATER TRUCK AND MIX AGAIN
THROUGH THE SOIL

ADD PERMA-ZYME WITH WATER AND APPLY TO BASE MATERIAL

STEP 5

PROCEED TO SPREAD
COMPACT
AND SHAPE



SPREAD AND SHAPE MATERIAL, THEN COMPACT

COMBINED MIXING VEHICLE AND WATER TRUCK FURTHER REDUCES CONSTRUCTION TIME



OTHER APPLICATIONS

**HIGH IMPERMEABILITY DRAMATICALLY REDUCES
LOSS DUE TO SEEPAGE**



STABILISED LAGOON CONSTRUCTION (Nevada USA)



LAGOON IN CONSTRUCTION

AFTER
FILLING



ON COMPLETION (6 YEARS
LATER)

LANDFILL COVER AND TOXIC DUMPS



MINIMUM DATA REQUIRED

SOILS ANALYSIS

- GRADATION (*NOTE MINIMUM REQUIREMENTS*)
- PLASTIC INDEX (*MINIMUM PI of 6%*)
- MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE (*FOR CALCULATING WATER VOLUME*)
- pH SHOULD BE IN THE RANGE 4.5 – 8.0

THEN

- GRADER WITH RIPPER
- WATER TRUCK
- ADEQUATE SUPPLY OF WATER
- STEEL DRUM ROLLER

A photograph of a dirt road. The road surface is a mix of light brown and tan soil. On the left side, there is a strip of green grass and some dark, leafy vegetation. In the background, a small black mailbox is visible on a post. The road appears to be a transition from a treated surface to an untreated one.

**SAMPLE ROAD, MORNINGTON, VICTORIA,
AUSTRALIA**

**SHOWS CHANGE FROM TREATED ROAD
TO UNTREATED ROAD**

A photograph of a dirt road with visible skid marks. The road is a light brown color and shows signs of wear. There are two sets of dark, parallel marks on the road surface, one set in the lower left and one set in the lower right. The text "AN EKO-SOIL STABILISED ROAD IS STABLE" is overlaid in yellow at the top.

AN EKO-SOIL STABILISED ROAD IS STABLE

SKID MARKS ON A DIRT ROAD

UNAFFECTED BY TEMPERATURE

40° C DAYTIME TEMPERATURE -5° C OVERNIGHT

CONSOLIDATED COAL MINE HAUL ROAD. OPERATES 24 HRS/DAY 7 DAYS/WEEK. AFTER 3 MONTHS OF USE WITH NO BASE OR SURFACE FAILURE, A DOUBLE CHIP SEAL COAT WAS ADDED (AFTER PICTURE WAS TAKEN) . EMERY COUNTY, UTAH



RESISTS WATER DAMAGE

HOLDS UP TO REPEATED FLOODINGS

A photograph of a dirt road winding through a forest. The road is made of reddish-brown soil and is flanked by tall trees and dense foliage. The scene is brightly lit, with shadows cast across the road surface.

FOR UNPARALLED ECONOMY

- EKO SOIL WILL HELP YOU BUILD THE STRONGEST**
- MOST DURABLE DIRT ROAD**
- WITH LESS IMPORTED MATERIALS**
- ZERO ENVIRONMENTAL IMPACT**
- AND NEGLIGIBLE LONG TERM MAINTENANCE**

A photograph of a dirt path or driveway, likely in a rural or wooded area. The path is made of light brown soil and is dappled with sunlight and shadows from nearby trees. To the right of the path, there is a strip of green grass and some small plants. In the background, more trees and foliage are visible. The overall scene is bright and natural.

EKO-SOIL

SOIL STABILISER

Contact: Brian O'Donnell +61 (0) 409 683 537

ENZYMES IN THE CONSTRUCTION INDUSTRY

EKO-WATER



EKO-WATER

WASTE WATER TREATMENT

“The 21st Century Water Treatment Technology”

EKO-WATER

Water Treatment

- **A Unique**
- **Multiple enzyme based additive**
- **Fermented from organic materials**
- **Environmentally safe & 100% biodegradable**
- **Non-toxic & non-hazardous**
- **Now used in over 30 countries world wide**
- **Made in the USA**

WHAT DOES EKO-WATER DO?

- Eliminates odor to as little as 3 PPM (*and less!*)
- Greatly facilitates growth in resident bacteria populations by making nutrients more available.
- Facilitates separation & settling, reducing suspended solids (*precipitates particles, clarifies water*)
- Buffers drastic swings in the pH
- Reduces use of costly and voluminous pH additives
- Helps protect resident biomasses
- Improves BOD & COD in final wastewater

HOW DOES IT WORK?

**SPEEDS UP AND INCREASES BACTERIAL ACTION
AND BIODEGRADATION**

HOW IS IT APPLIED?

- **SIMPLY ADD ECO-WATER TO THE TURBULENT WATER** *(an automated system is suggested).*
- **CALCULATE AT 3-5 PARTS PER MILLION FOR INFLUENT STREAM.**
- **FOR A QUICKER START UP , THE LAGOONS OR TANKS MAY ALSO BE “CHARGED” BY DIRECT, MANUAL SPRAYING.**
- **IF FOR ODOUR REMEDIATION, SURFACE SPRAYING WITH A LOW PRESSURE HOSE & DISPENSING NOZZLE IS VEY EFFECTIVE.**
- **CONTINUE TO CHECK AND ADJUST pH AS REQUIRED.**

ADD ECO-WATER TO TURBULENT WATER
Here..... or here



Eko-Water should be added to the system in a collection tank, where the wastewater is most turbulent, for thorough mixing.

PROBLEM LAGOONS MAY BE “TOP SPRAYED” FOR ODOUR AND INSECT CONTROL

Lagoons may be surface sprayed with Eco-Water in order to control odor and insects or directly “charged” in the lagoon to help precipitate solids and improve the water quality.

This will also give a “push” to the resident bacteria population.





OXYGENATION POND

AIRATORS

SMALL AMOUNT OF SOLIDS

TREATED WATER IS RETURNED TO THE RIVER

CLEAN RIVER
Rio Limpio

FINAL LAGOON
La Ultima Laguna



EKO-WATER

WATER TREATMENT



Contact: Brian O'Donnell +61 (0) 409 683 537