

# 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

A dirt road through a forest with sunlight filtering through the trees.

# **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.

**LAID 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,

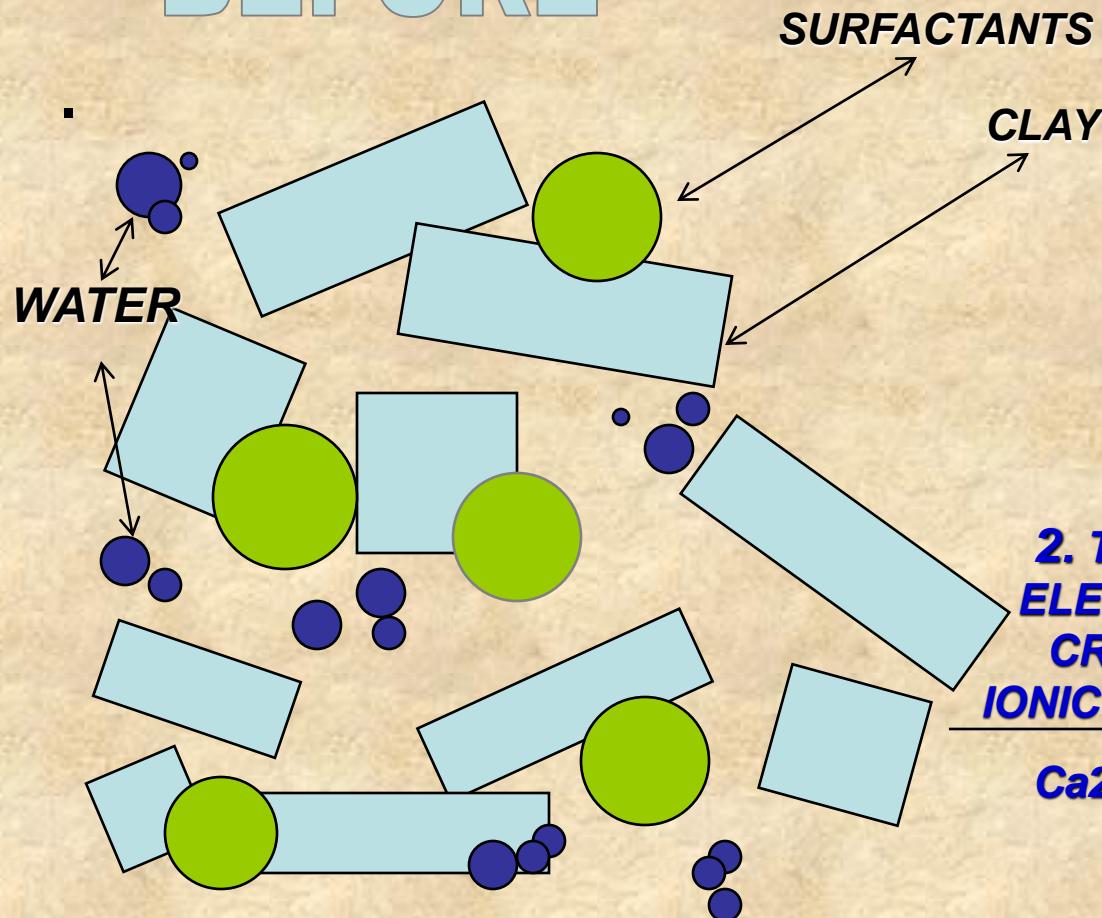
# Termites have been building with enzymes for millions of years!

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



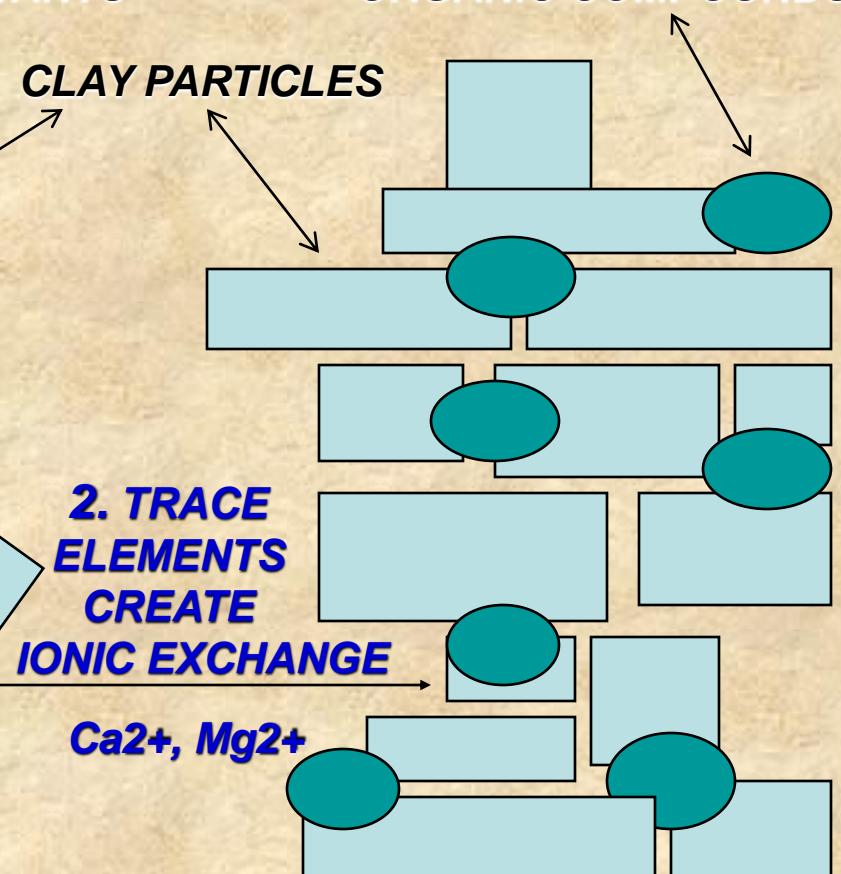
# Visual of the Molecules:

**BEFORE**



**1. SURFACTANTS DISPERSE SOIL  
AND WATER**

**AFTER  
ORGANIC COMPOUNDS**



**2. TRACE  
ELEMENTS CREATE  
IONIC EXCHANGE**  
 $\text{Ca}^{2+}, \text{Mg}^{2+}$

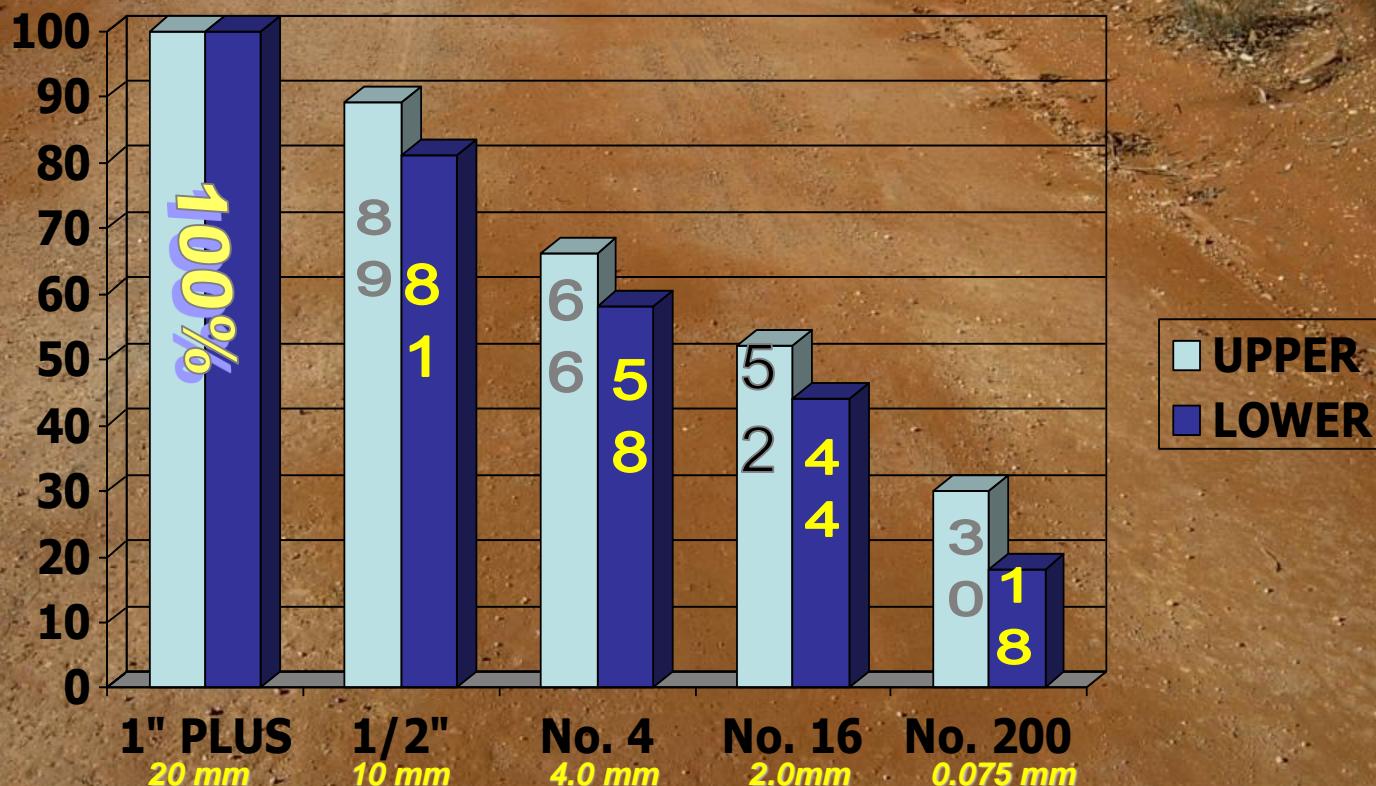
**3. ORGANIC COMPOUNDS BLANKET  
EXCESS FOR EXCHANGE POINTS**

# 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

A large white water truck is spraying a powerful stream of water onto a dry, brown dirt road. The water creates a white mist and a wet path on the ground. In the background, there are green fields, a blue sky with white clouds, and a utility pole with wires. The road is marked with white lines.

**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

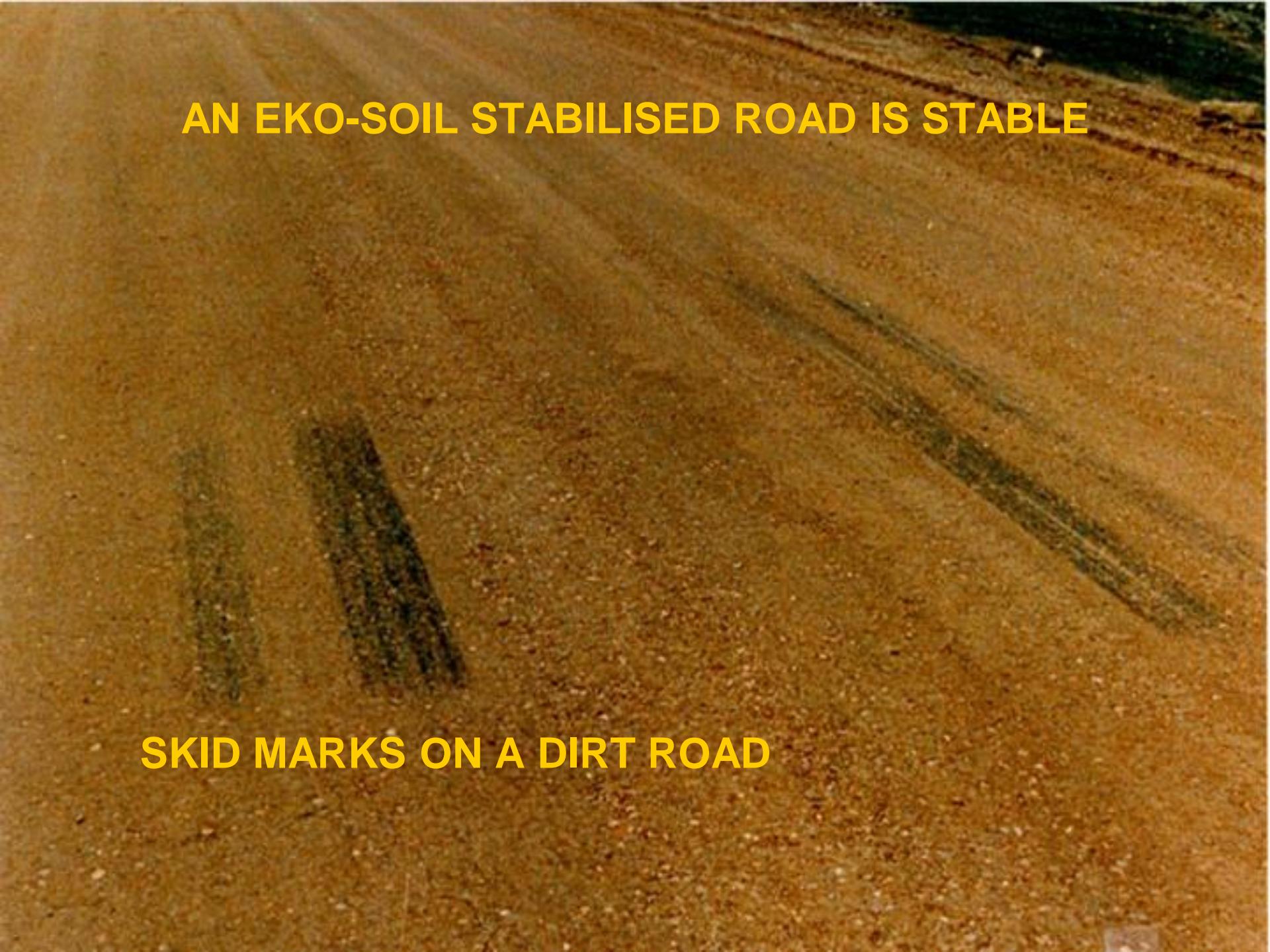
- GRADATION (*NOTE MINIMUM REQUIREMENTS*)
- PLASTIC INDEX (*MINIMUM PI of 6%*)
- MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE (*FOR CALCULATING WATER VOLUME*)
- pH SHOULD BE IN THE RANGE 4.5 – 8.0

## THEN

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

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

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

A photograph of a dirt road. The surface is a mix of brown and tan soil with some darker, possibly organic, material. A distinct, dark, diagonal line of skid marks runs from the bottom left towards the top right. The background is out of focus, showing some greenery and a few small buildings.

**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

A photograph of a coastal road during a flood. The road is elevated on a dark, textured embankment. In the background, a white protective wall or levee runs along the water. The water is a light blue-green color, with visible ripples and some debris floating on the surface. A yellow diamond-shaped road sign is mounted on a pole on the embankment. The sky is overcast and hazy.

**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 dirt. On the right side, there is a large, light-colored mound of soil, which is identified as EKO soil. The forest consists of tall, thin trees with green leaves. The sky is clear and blue.

**FOR UNPARALLELED 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



# **EKO-SOIL SOIL STABILISER**

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**ENZYMES IN THE CONSTRUCTION INDUSTRY**

**EKO-WATER**

A scenic river flows through a lush green forest. The water is clear and reflects the surrounding greenery. Sunlight filters through the dense canopy of trees, creating bright highlights on the water and the surrounding foliage. The river bed is visible, showing rocks and pebbles. The overall atmosphere is peaceful and natural.

**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



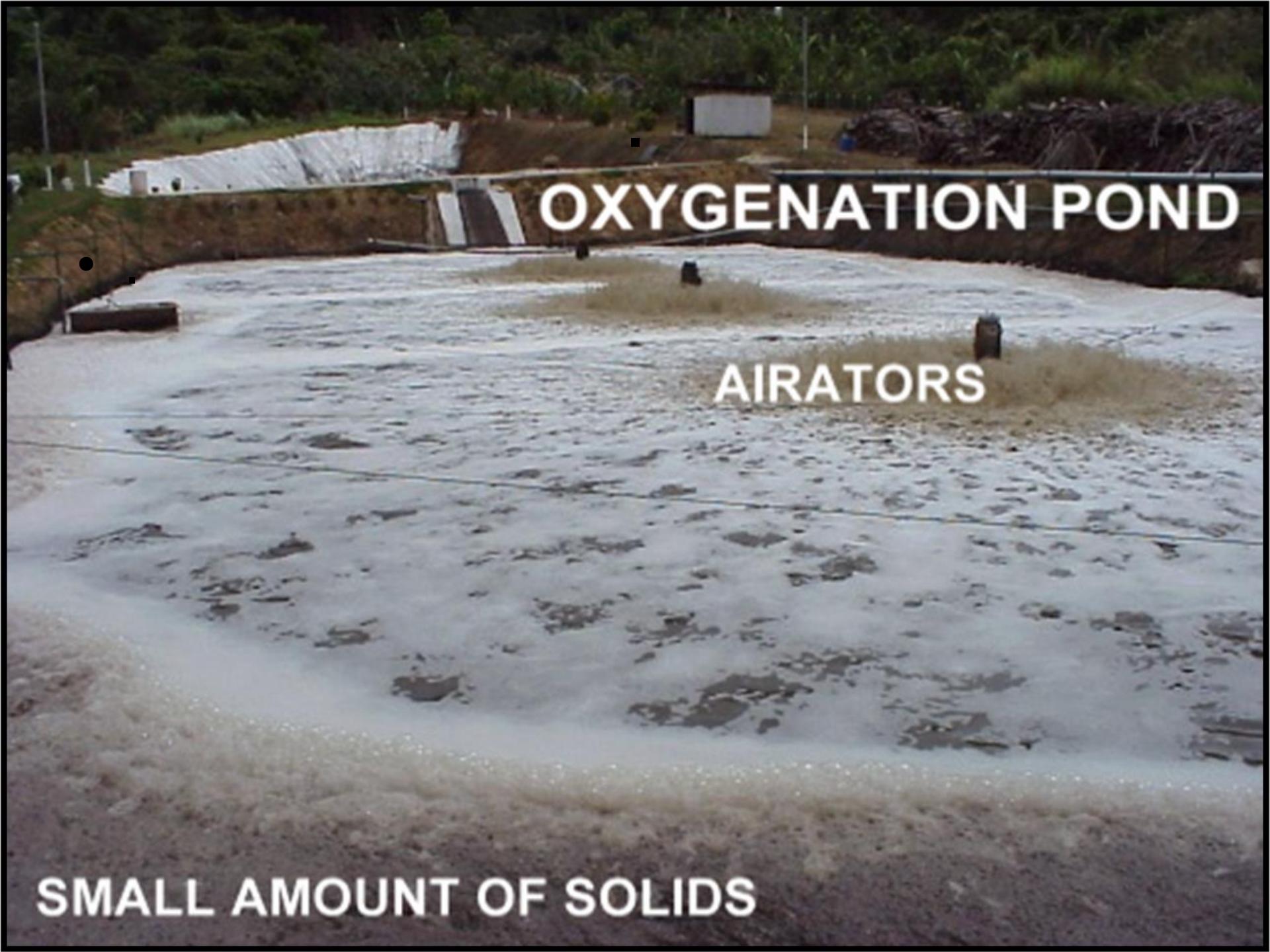
Eko-Water should be added to the system in a collection tank, where the wastewater is most turbulent, for thorough mixing.

## 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**



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