ENSOL 1000

FARM EFFLUENT TREATMENT

ENSOL 1000 - A revolutionary new liquid agricultural waste treatment which allows waste, such as dairy effluent, to be aerobically digested with amazing beneficial flow on effects.

DISTRIBUTED BY

Bio Magic LTD
Environmental Solutions

ENSOL 1000

ELIMINATE WASTE ODOUR

GREATLY REDUCE WASTE SOLIDS

VASTLY IMPROVE SPRAYED PASTURE HEALTH

EFFLUENT BEFORE TREATMENT
(ANAEROBIC DIGESTION)

Turn your liability into an asset!

EFFLUENT AFTER TREATMENT
(AEROBIC DIGESTION)

Ensol 1000 - A patented 21st century waste treatment that enables naturally occurring bacteria to digest waste aerobically. This results in very fast waste breakdown with little or no odours being produced. Also, the application of the aerobically digested liquid waste onto the paddocks results in increased grass or plant growth and nutrient content.

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UNTREATED EFFLUENT PONDS:

Dairy effluent ponds are becoming a bigger and bigger issue with environmental regulators and the public as the effects on the environment and human health are recognised.

IN ANAEROBIC WASTE PONDS SOLID WASTE BREAKDOWN IS SLOW AND NASTY ODOURS ARE PRODUCED POTENTIALLY LEADING TO UNWANTED COMPLAINTS FROM NEIGHBOURS

POND PROBLEMS INCLUDE:

- **Bad odour emanating from the pond**
- **Slow solid waste breakdown**
- **Thick crust buildup on pond surface**
- **Sludge at the bottom making it hard to pump out**
- **Production of greenhouse gasses such as methane and H2S.**

EFFLUENT PONDS TREATED WITH ENSOL 1000:

Because of ENSOL 1000s' unique formula, effluent treated with it is turned aerobic. This allows the effluent to be digested aerobically so it does not produce any odour.

Observed Benefits to the pond when treating with Ensol 1000

- **The pond is turned aerobic**
- **Pond produces virtually no odour**
- **Production of gasses such as methane and H_2S are greatly reduced**
- **Faster and more complete breakdown of solids occurs**
- **Huge reduction in sludge allowing more pump out**

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SPRAYING PADDOCKS WITH UNTREATED EFFLUENT:

It is common practice for farmers to spray effluent onto their paddocks. It helps to return nutrients to the soil and it is a method to dispose of the effluent buildup.

UNFORTUNATELY SPRAYING YOUR PADDOCKS WITH UNTREATED WASTE CAN BE VERY DETRIMENTAL TO THE SOIL HEALTH AND SUBSEQUENTLY THE GRASS HEALTH AND NUTRITIONAL VALUE

WHY IS THIS? Because the effluent is mostly digested anaerobically. This process is usually accompanied by bad odour, the production of many toxic greenhouse gasses, such as methane and H_2S and a buildup of volatile fatty acids and other unwanted residues. When this waste is applied to the soil it creates anaerobic conditions in the top layer. This negatively affects the microbiology in the soil leading to a host of problems.

PROBLEMS INCLUDE:

- Soil structure collapses and compaction occurs
- Reduced plant nutrient uptake meaning a reduced nutritional value
- Increase in weed growth as they tend to thrive in anaerobic conditions
- Enlarged grass thatch layer.

SPRAYING PADDOCKS WITH ENSOL TREATED EFFLUENT:

Effluent treated with ENSOL 1000 allows it to be digested aerobically so it does not produce any odour and does not contain nasty residues like those created with anaerobic digestion. The nutrients in ENSOL 1000 treated aerobically digested effluent are more plant available and when sprayed onto paddocks it has amazing positive effects on the soil and therefore the plants.

Observed Benefits of using Ensol 1000 treated effluent

- **Stock will feed on effluent sprayed grass in as little as 3 to 4 days post spray.**
- **Soil health is greatly improved resulting in soil de-compaction.**
- **Increased soil water retention and therefore increased drought resistance.**
- **Treated effluent sprayed grass tends to grow faster.**
- **Grass has a much improved nutrient content.**
- **Improved grass nutrient content means improved stock health.**
- **The anaerobic thatch layer, harboring nasty diseases such as face exzema, is greatly reduced.**

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AEROBIC vs ANAEROBIC WASTE DIGESTION

The following discusses the big differences between anaerobic and aerobic waste digestion. Most effluent ponds have waste that is being digested anaerobically.

ANAEROBIC WASTE DIGESTION:

Water and effluent flow into effluent ponds on a daily basis. These ponds are mostly anaerobic ponds and waste is digested anaerobically (no oxygen). The anaerobic digestion process is slow and anaerobic lagoons favour methane producing and sulphur reducing bacteria that cause carbon, sulphur and nitrogen from the cow waste to be partially released into the atmosphere in the form of methane gas, (CH4), Carbon Dioxide, (CO2), Hydrogen Sulphide, (H2S) and Ammonia (NH4). Anaerobic lagoons can also release odorous compounds such as Volatile Fatty Acids (VFAs), Phenols and Volatile Amines as well as Volatile Sulphur containing compounds.

These compounds/odours can cause odour complaints from the neighbours and, when sprayed onto paddocks, can negatively affect the pasture by interfering with the microbiology in the soil, reducing grass nutrient content and creating an unhealthy layer of thatch. Many diseases like face eczema live in this layer of dead grass.

AEROBIC WASTE DIGESTION:

A pond that has conditions suitable for aerobic waste digestion is far more active than an anaerobic one. Waste digested in an aerobic pond will be digested many times faster than in an anaerobic pond with little or no odour produced during the process.

The table below shows the effect of oxygen in the effluent pond.

Dissolved Oxygen	Biochemical reactions	Biological processes
Very low	H2 & CO2 to CH4	Anaerobic
Low	SO4 to H2S, HS-	Anaerobic
Intermediate	Faculative	Anaerobic/ Aerobic
Medium high	NH2 to NO2	Aerobic
High (>1mg/L)	NH4+ to NO3-,NO2-	Aerobic

Effective aerobic treatment inhibits anaerobic bacteria reducing or eliminating related emissions. The reduced nutrient loss from the pond can then be returned to the pasture.
The bottom line of the table shows the reduction of ammonia (NH4) by nitrification to Nitrate (NO3) and Nitrite (N02). (Weeds like ammonia).

However, the amount of Oxygen required for nitrifying aerobic conditions is generally much greater than most mechanical aerators can provide, (5-8 ppm of dissolved oxygen). Mechanically aerated ponds can often still show high concentrations of anaerobic, purple-sulphur bacteria.

Modern fertilizers can make cows urine very high in nitrates which means the effluent contains lots of nitrogen requiring lots of oxygen to oxidise the NH4. This is harder to deal with in the effluent ponds as is clearly shown in the table.

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THE SOLUTION IS ENSOL 1000:

Previous efforts to create oxidative conditions through mechanical aeration have proven to be too costly and energy intensive for the majority of farmers.

ENSOL 1000 provides a cost-effective solution to reducing odours and solids by stimulating naturally occurring aerobic and facultative bacteria already present in animal effluent. In the presence of nitrate oxygen, these bacteria will grow exponentially and enhance aerobic processes.

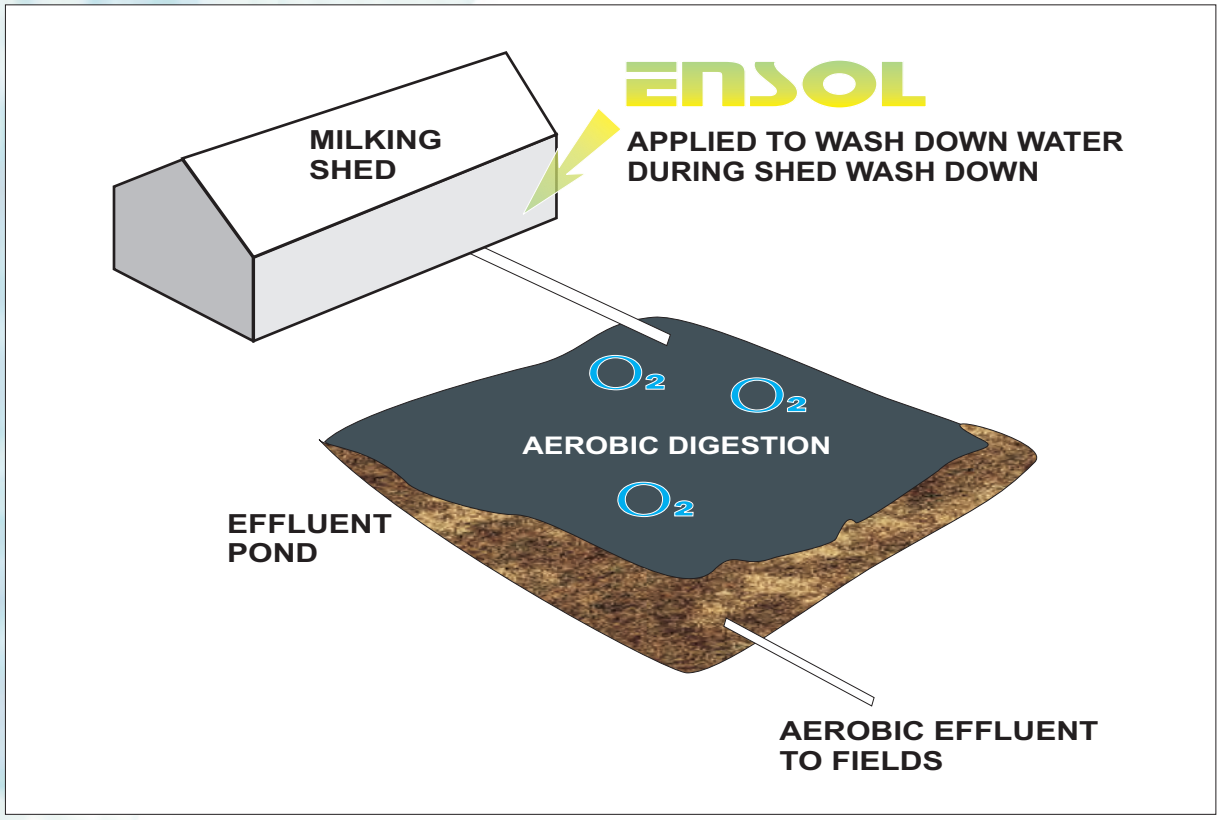

FIG 1: Ensol 1000 is applied to the wash down water. The pond will then turn aerobic.

The results are a massive reduction in sludge and crust on the pond making it easier to pump. The pond produces virtually no odour, even while spraying or stirring. Resultant non-odourous waste liquid is an excellent fertilizer as the nutrients are more plant available and absorbed by grass more efficiently. (This can help to reduce nutrient runoff). The waste has a positive effect on the soil micro-biology, enhancing grass growth and nutrient content and reducing the thatch layer. Stock consume aerobically digested effluent sprayed grass much sooner than grass sprayed with anaerobically digested effluent (As little as three days). Results show stock grazing on aerobically digested effluent sprayed grass are healthier.

All this without costly energy inputs or capital expenditures from mechanical aeration. There are no moving parts to break or excessive energy costs to worry about. We don't add any foreign bacteria or enzymes but work with what nature already provides.

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HOW ENSOL WORKS:

This patented 100% biodegradable product contains large quantities of chemically bound oxygen and can provide oxygen in almost unlimited quantities.

A large colony of nitrifying bacteria will stabilise ammonium Nitrogen. This oxidizes ammonium to nitrates, nitrites and bacterial (organic) immobilised nitrogen. Ensol 1000 supplied at the correct dosage will provide 350 - 400 ppm of oxygen to the nitrifying bacteria allowing them to thrive.

Crusts forming on the top of effluent ponds indicate that the surface active substances and biologically active organisms that affect the oxygen transfer rate and aeration efficiency are not keeping up. A decrease in the rate of bacterial breakdown of liquid manure and oxygen transfer is observed. This increase in slurry fibre and total solids content affects the efficiency of most mechanical aerators. To aid aeration most manufacturers recommend separating the solids.

Ensol 1000 can supply more than enough oxygen to a waste pond to enable the bacteria to digest the solids.

Until now it has been expensive to continuously aerate a pond with air pumps, or add possibly dangerous, expensive chemicals to achieve the necessary aerobic state.

WHY ENSOL 1000 WORKS SO WELL:

Adding ENSOL 1000 to an effluent pond is an easy, safe and cost effective way to turn it hyper-aerobic.
ENSOL 1000 is a liquid so as much oxygen can be added to the pond as required.
ENSOL migrates throughout the effluent turning the entire pond aerobic. The Oxygen in ENSOL is preferred by bacteria to D.O, (dissolved oxygen) to the extent that they rapidly become hyper aerobic and become more active than with D.O. alone. With ENSOL far more oxygen can be added than by any other chemical or mechanical means.

OBSERVED BENEFITS OF USING ENSOL 1000:

Results from trials show that by using ENSOL 1000 there is a massive reduction in sludge and crust on the pond making it easier to pump. The pond produces little or no odour, even while spraying or stirring. Resultant non-odourous waste liquid is an excellent fertilizer as the nutrients are more plant available and absorbed by grass more efficiently. (This reduces nutrient runoff). The waste has a positive effect on the soil micro-biology, enhancing grass growth and nutrient content and reducing the thatch layer. Stock consume aerobically digested effluent sprayed grass much sooner than grass sprayed with anaerobically digested effluent (As little as four days). Stock grazing on aerobically digested effluent sprayed grass are healthier. Healthy soil allows heavy rain to soak through but at the same time, it retains moisture for longer in dry conditions because it has space for the water molecules.

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ENSOL INGREDIENTS:

ENSOL's proprietary blend of ingredients stimulates the naturally occurring bacteria that digest waste and oxygenates the environment in order to keep feeding those microorganisms.

Nitrate blend

The product contains a specially formulated blend of calcium nitrate, potassium nitrate and ammonium nitrate. Each of these compounds forms a nitrate ion, which provides an oxidant source for aerobic bacteria. When oxygen levels are very low, which is typical in wastewater, normally aerobic bacteria and facultative bacteria can get their oxidant from nitrate. This is not necessarily the addition of oxygen. Instead, the oxidation process requires that for the sulfide ion to be "oxidized", an ion must be present to "accept" the electron lost by the sulfide ion. Therefore the nitrate ions serve as an electron acceptor in the oxidation pathway of aerobic and facultative bacteria in an anaerobic environment.

Calcium

The calcium ion, when added to typically high sulfide wastewater, will precipitate out calcium sulfate which lowers the concentration of the sulfate ion and deprives anaerobic bacteria of their oxidant source. Combined with the addition of the nutrient source for oxidation of facultative and aerobic bacteria, this compound plays an important role in ensuring that the aerobic bacteria out-compete the anaerobic bacteria. Calcium is also a source of nutrition for cell development in bacteria.

Ammonium

The ammonium ion is an important building block for cell nutrition and growth. It contributes to the rapid growth of the microbial population and can also function as an electron donor in the respiratory path of aerobic bacteria.

Potassium

Potassium is a key building block for cell nutrition and growth. The potassium ion is an integral part of the unique formulation that provides for the overall health of the aerobic bacteria.

Carbon source

Microorganisms such as bacteria require a carbon source for protein synthesis. ENSOL 1000's proprietary formula provides a source of dissolved nutrients for the facultative and aerobic bacteria that use nitrate as their respiratory oxidant. This effectively stimulates the rapid growth of the desired aerobic bacteria.

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APPLICATION:

There are two application stages.

1 - INITIAL DOSE

The whole effluent pond needs to be treated with an initial dose of ENSOL 1000. This first amount depends on the volume of the pond and will be enough to turn the effluent pond aerobic.

Approx 100 parts per million
Eg: If the pond is 100m^3 (100,000L) it will need an initial dose of 10L of ENSOL 1000.

To apply simply pour ENSOL 1000 into the pond around edges.

Note: The initial dose rate is an average amount and might need to be adjusted depending on the results.

2 - CONTINUOUS DOSING

Incoming effluent needs to be treated by dosing daily. This will keep the pond aerobic.

Dairy:

Approx 5ml of ENSOL 1000 per cow per day.
Eg: If you milk a herd of 500 cows you will need to use 2.5L of ENSOL 1000 per day.
To apply simply add to milking shed wash down water.

Piggery:

Approx 1L of ENSOL 1000 per 500 pig equivalents per day.

To apply simply add to pig pen wash down water.

Note: The continuous dosing rate is an average amount and can be adjusted up or down to obtain the best results.

AVAILABLE QUANTITIES:

ENSOL 1000 is supplied in:

5L BOTTLES

20L CANS

1200L TOTE

ENSOL 1000

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TESTS AND TRIALS

ENSOL 1000 is currently being used for many different New Zealand, Australian and United States agricultural applications with outstanding results. Tests and trials can be found on the website.

PLEASE SEE OUR WEBSITE FOR MORE INFO

WWW.BIOMAGIC.CO.NZ

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