



EFFICIENT MICROBES

SOUTH AFRICA

OVERVIEW OF EM APPLICATIONS & PRODUCTS

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Efficient Microbes Technology: Potential Applications

This document gives an overview of the potentials of EM technology in various sectors, as well as an overview of existing Efficient Microbes products.

EM is one of the only technologies (if not the only technology) worldwide that contains live, stable consortia of aerobic, facultative anerobic and synthetic nitrogen-fixing microorgnasims which are self-supporting and able to influence any system into which they are introduced in a regenerative direction.

The microbes in EM *do not* alter the natural ecology in environments they are applied, but rather motivate the existing beneficial and neutral microbes in a regenerative direction, allowing them to dominate the environment, increase the uptake of nutrition, process toxins and eliminate pathogenic microbes.

The microbes in EM are non-GMO and not chemically synthesized.

On the following pages is a breakdown of the applicable sectors in which EM products can be used. More detailed information on each of the EM products themselves is contained later in this document.



A. PLANT AND SOIL HEALTH:

APPLICABLE PRODUCTS:

➤ **EM PRO-SOIL (Reg. #: B4336, Act 36 of 1947)**

Product Benefits: Increased plant and crop growth, increased soil health, & increased disease resistance. Reduced plant mortalities & reduced input costs.

APPLICATIONS:

- Crop farming
 - Forestry
 - Greenhouses and hydroponics
 - Gardening and horticulture
 - Golf courses, parks and sports grounds
 - Composting (reduced turning and composting time & increased calorific value of compost)
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B. LIVESTOCK PRODUCTION & ANIMAL HEALTH:

APPLICABLE PRODUCTS:

➤ **EM PRO-LIVESTOCK (Reg. #: V21210, Act 36 of 1947)**

Product Benefits: Increased animal health & immunity, and reduction of diseases. Increased animal growth, weight gain and production. Improved Feed Conversion. Reduction in antibiotics and inputs.

➤ **SUPER EM**

Product Benefits: Reduction of noxious gases and pathogens in breeding areas and housing areas. Improved processing of animal waste and effluent from abbatoirs.

APPLICATIONS:

- Livestock health and production
 - Poultry production (broilers and layers)
 - Equine health and remediation of breeding/housing areas
 - Pet Health, including avian health
 - Livestock waste remediation
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C. WATER REMEDIATION & AQUACULTURE:

APPLICABLE PRODUCTS:

➤ **EM PRO-AQUA 1: WATER REMEDIATION**

Product Benefits: Reduction or elimination of toxins and excess nutrients in large or small water bodies. Reduction of algae blooms and invasive water plants. Increased water clarity.

➤ **EM PRO-AQUA 2: AQUACULTURE**

Product Benefits: Increased fish health, growth and production. Reduction of toxins and pathogens in breeding areas.

APPLICATIONS:

- Garden ponds, housing estates and golf courses
 - Municipal ponds and lakes
 - Aquaculture operations
 - Koi ponds
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D. WASTE REMEDIATION & ODOUR CONTROL:

APPLICABLE PRODUCTS:

➤ **SUPER EM**

Product Benefits: Reduction of odours, pathogens and toxins in solid and liquid waste remediation.

APPLICATIONS:

- Pit Latrines: Reduction of odours and pathogens, and increased breakdown of organic waste.
 - Ground remediation: breakdown of toxins or pollutants in soils.
 - Septic tanks: improved breakdown of organic waste
 - Increased breakdown of organic waste in waste dumps.
 - Industrial effluent treatment
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E. DOMESTIC APPLICATIONS:

APPLICABLE PRODUCTS:

- **Super EM**
- **EM Pro-Soil**
- **EM Pro-Aqua**
- **EM Health Products**

- Product Benefits: Various – see applications below.

APPLICATIONS:

- Home sanitizer for probiotic inoculation of surfaces and non-chemical elimination of pathogens.
- Odour control: drains, rubbish bins, cat litter boxes etc.
- Gardening: grass, plant and tree health
- Pond cleaner
- Pet health
- Application to fruits and vegetables to increase shelf-life and reduce pathogens or chemical residues.
- Human Health Products

On the following pages you will find more detailed descriptions of the EM products outlined in the various sectors above.

The products described are under the Efficient Microbes brand, but products for any sector can be contract-manufactured for clients under their own brand.



EM Pro-Livestock is a 100% natural microbial formula containing a unique blend of naturally occurring beneficial bacteria. It is administered to livestock either as a feed and water additive, or in a concentrated dose for direct ingestion for acute health issues. EM Pro-Livestock is produced through a natural fermentation process, utilizing natural and organic ingredients. The microbes in EM Pro-Livestock are not genetically modified.

EM Pro-Livestock works to properly balance the animal's system through a mechanism known as competitive exclusion, improving the underlying microbial ecology within the animal to one that is balanced and healthy. It assists the animal to build immunity, reduce the ability of pathogenic bacteria to flourish and create natural vitamins and antibiotics.

Most importantly, however, EM Pro-Livestock improves the ability of animals to break down and utilise the nutrition in their feed. This leads to better utilisation of inputs, better weight gain and better Feed Conversion.

BENEFITS:

- Greatly improved digestion and utilisation of feed inputs
- Improved Feed Conversion Ratio
- Increased disease resistance and combatting of pathogens
- Decreased mortality
- Decreased need for antibiotics and medicinal inputs

INGREDIENTS: Natural Sugar Cane Molasses, Kelp, Natural Organic Sea Salt, Purified and Structured Water, Proprietary Blend of EM Cultures (list below).

MICROBIAL SPECIES: Bifidobacterium animalis ssp lactis, Bi bifidum, Bi longum, Lactobacillus acidophilus, L. bulgaricus, L. casei, L. delbrueckii, L. fermentum, L. plantarum, L. diacetylactis, L. lactis, Saccharomyces cerevisiae, Streptococcus thermophilus.



EM Pro-Soil is a 100% natural microbial soil enhancer containing multiple classes of naturally occurring beneficial microorganisms.

Leagues ahead of most probiotic formulae (which are most often just combinations of pure cultures), EM Pro-Soil is comprised of a wide range of live aerobic, facultative anaerobic and nitrogen-fixing synthetic microorganisms. These microbial species are brewed together at body temperature to form robust consortia which have the ability to influence, in a regenerative direction, any ecology or system into which they are introduced.

EM Pro-Soil has enhanced levels of phototrophic bacteria also known as purple non-sulfur bacteria (PNSB). These microbes have powerful detoxifying, anti-oxidative and anti-entropic properties and are active in re-establishing a wide range of beneficial microbes in polluted or unbalanced environments, such as poor soil conditions.

EM Pro-Soil can also help reduce composting turning costs by 70-80% and prevent anaerobic, odor-causing decay. It facilitates healthy decomposition and increased production of stable organic matter particles (humus).

BENEFITS:

- Increased nutrient uptake by plants, grasses and crops, leading to a healthier, faster growing and more disease resistant organism.
- Lower input costs and/or increased efficacy from *existing* inputs.
- Effective in the rehabilitation of dead soils, and, through correct continued use, can reduce the need to let fields lie fallow.
- Natural balancing of N, P and K levels in the soil.

INGREDIENTS: Purified and Structured Water, Natural Sugar Cane Molasses, Mineral Powder, Sea Salt, 100% Natural Juice Concentrates, Proprietary Blend of EM Cultures (list below).

MICROBIAL SPECIES: *Bacillus subtilis*, *Bifidobacterium animalis*, *Bi. bifidum*, *Bi. longum*, *Lactobacillus acidophilus*, *L. buchneri*, *L. bulgaricus*, *L. casei*, *L. delbrueckii*, *L. fermentum*, *L. plantarum*, *Lactococcus diacetyllactis*, *Lactococcus lactis*, *Rhodopseudomonas palustris*, *R. sphaeroides*, *Saccharomyces cerevisiae*, and *Streptococcus thermophilus*.



Efficient Microbes Pet Products (EM Pro-Canine, EM Pro-Feline, EM Pro-Avian and EM Pro-Equine) are 100% natural liquid probiotics utilising “effective microorganisms”, a technology developed in the early 1980’s in Japan. EM pet products are formulated from 100% natural ingredients and live cultures fermented at body temperature.

Pets today are subject to the same chemicals, antibiotics and environmental hazards as humans. The air that they breathe is polluted and there are a host of chemicals and antibiotics that they ingest through their foods. This creates stress on the system that can lead to all manner of health issues such as digestion problems, diarrhoea, skin problems, food intolerances & chronic diseases.

It has been scientifically proven that the beneficial bacteria in any organism’s body is responsible for over 80% of the immune function, assimilation of nutrition, creation of natural antibiotics, creation of the body’s own vitamins and preventing the build-up of pathogenic (disease-causing) bacteria.

BENEFITS:

- Improved digestion and digestive tract function
- Improved resistance to pathogenic bacteria and environmental toxins
- Increased natural energy
- Effective in dealing with skin problems and eczemas.

INGREDIENTS: Purified and Structured Water, Natural Sugar Cane Molasses, Mineral Powder, Sea Salt, 100% Natural Juice Concentrates, Proprietary Blend of EM Cultures (list below).

MICROBIAL SPECIES: Bifidobacterium animalis ssp lactis, Bi bifidum, Bi longum, Lactobacillus acidophilus, L. bulgaricus, L. casei, L. delbrueckii, L. fermentum, L. plantarum, L. diacetyllactis, L. lactis, Saccharomyces cerevisiae, Streptococcus thermophilus.



EM Pro-Aqua is a 100% natural microbial formula that consumes excess nutrients in water bodies, prevents the build-up of algae and invasive water-plants, breaks down solid waste and reduces BOD, COD and Suspended Solid levels in waste water.

EM Pro-Aqua also greatly enhances water quality and clarity, and is highly beneficial to natural fish life, and thus it is effective in aquaculture operations.

ALGAE & INVASIVE WATER-PLANTS:

EM Pro-Aqua is particularly effective in preventing the build up of algae or invasive water-plant species in ponds and lakes of all sizes. The microbes in EM consume excess nutrients found in these environments, and also thrive in the same environments which are so conducive to the growth of algae. EM is also highly beneficial to the natural plant and fish life found in these environments.

CONTAMINATED/WASTE WATER:

Waste water typically has a high level of pathogens, suspended solids (SS), protein, mineral salt and chemical compounds. This makes the treatment of waste water extremely difficult without the use of chemicals. High contents of organic matter can lead to the formation of malodours as well as the degradation of sulphur, phosphate, and nitrogen. EM Pro-Aqua biologically consumes odour-causing toxins and breaks down waste.

AQUACULTURE: EM Pro-Aqua is also used in aquaculture as a means to improve water conditions, and enhance the growth and health of fish. Through use of EM it is possible to decrease the frequency of water exchange and reduce aeration costs, whilst simultaneously reducing mortalities and increasing production.

INGREDIENTS: Natural Sugar Cane Molasses, Mineral Powder, Sea Salt, Natural Juice Concentrates, Natural Mineral Additives, Wheat Bran, Purified and Structured Water, Proprietary Blend of EM Cultures (list below).

MICROBIAL SPECIES: *Bacillus subtilis*, *Bifidobacterium animalis*, *Bi. bifidum*, *Bi. longum*, *Lactobacillus acidophilus*, *L. buchneri*, *L. bulgaricus*, *L. casei*, *L. delbrueckii*, *L. fermentum*, *L. plantarum*, *Lactococcus diacetylactis*, *Lactococcus lactis*, *Rhodopseudomonas palustris*, *R. sphaeroides*, *Saccharomyces cerevisiae*, and *Streptococcus thermophilus*.



Super EM is a concentrated, all-natural, biological product, which eliminates odours and breaks down solid waste.

Super EM utilises the immense power of nature to biologically consume odour-causing toxins and break down waste. By combining three distinct classes of probiotic bacteria, as opposed to the commonly used single-strain bacterial products, EM (Efficient Microbes) technology forms a powerful probiotic consortium, which can be applied to, and effectively work in, any environment to which it is introduced.

EM is not only effective at breakdown of waste solids and harmful chemicals, but also eliminates disease causing bacteria – preventing harmful bacteria from establishing a population in any environment to which EM is applied. It is non-toxic, not chemically synthesized and non-genetically modified.

BENEFITS:

- Eliminates toxic gases and disease-causing bacteria in livestock holding pens and poultry coops, thereby increasing animal health and reducing the need for antibiotics and venting.
- Reduces odours and pathogens in pit toilets, septic tanks and waste water
- Breaks down organic waste in pit toilets, septic tanks, drains and sewers
- Drastically reduces fly and mosquito populations in areas where there are odours, such as pit-toilets, wastewater and rubbish sites.

INGREDIENTS: Natural Sugar Cane Molasses, Mineral Powder, Sea Salt, Natural Juice Concentrates, Natural Mineral Additives, Wheat Bran, Purified and Structured Water, Proprietary Blend of EM Cultures (list below).

MICROBIAL SPECIES: *Bacillus subtilis*, *Bifidobacterium animalis*, *Bi. bifidum*, *Bi. longum*, *Lactobacillus acidophilus*, *L. buchneri*, *L. bulgaricus*, *L. casei*, *L. delbrueckii*, *L. fermentum*, *L. plantarum*, *Lactococcus diacetylactis*, *Lactococcus lactis*, *Rhodopseudomonas palustris*, *R. sphaeroides*, *Saccharomyces cerevisiae*, and *Streptococcus thermophilus*.



The human body, like all living systems, contains tens of trillions of microbes. It has been estimated that there are 10 times more microbes in the human body than there are human cells. These bacteria represent a great diversity, with estimates of more than 400 different species of bacteria within a human being.

Prior to the industrial revolution humans would get all the natural bacteria that they need from the vegetables and meats that they ate. Today, chemical farming, over-cropping and the use of pesticides have depleted the bacteria from the soils to such an extent that, in many operations, only inorganic fertilizers can now keep crops growing. In livestock farming, the use of antibiotics further destroys microbes that would have eventually made it into our own bodies. Without these vital bacteria, the body cannot function optimally, disease resistance is lowered and one cannot correctly assimilate the nutrition from food.

EM (effective microorganisms) health products are unique combinations of beneficial microorganisms that operate in a revolutionary relationship with each other and in so doing enable the human body to function to its full potential on a physical level.

BENEFITS:

- Aids in digestion and imbalances of the bowel.
- Addresses the cause of Irritable Bowel Syndrome (IBS), heartburn, acid reflux and other stomach ailments.
- Increases the ability of the body to process food and utilise nutrition.
- Increases resistance to disease, particular bacterial infections.

INGREDIENTS: 100% Natural Fruit juices, Kelp, Chamomile, Rose Hips, Olive Leaf, St Johns Wort, Elderberry, Siberian Ginseng, Astragalus Molasses, Purified and structured water, Proprietary Blend of EM Cultures (list below).

MICROBIAL SPECIES: Bifidobacterium animalis ssp lactis, Bi bifidum, Bi longum, Lactobacillus acidophilus, L. bulgaricus, L. casei, L. delbrueckii, L. fermentum, L. plantarum, L. diacetylactis, L. lactis, Saccharomyces cerevisiae, Streptococcus thermophilus.

HISTORY OF EM

Throughout the 1970s and 80s Dr. Higa pioneered the research that led to the development and commercialization of EM technology. This natural biotechnology has since been successfully commercialized throughout world markets in human health, agriculture, livestock and industrial waste treatment. Thousands of research and efficacy studies have been conducted and documented in projects, conferences and books around the world.

Originally, EM was developed for use in agriculture (crop farming) as an alternative to agricultural chemicals such as pesticides and fertilizers. EM however is not a conventional fertilizer and unlike the purpose of fertilizers, the purpose of EM is to increase the number of beneficial microorganisms in the soil. This improves the soil's microbial health and promotes a healthy environment for plants. It can also be used as a processing tool to manufacture organic fertilizers.

From crop farming, its application flowed naturally into livestock. EM is actively used in livestock operations, including hog, cattle/dairy, and poultry. From livestock, the positive effects on the livestock waste and effluent into lagoons and rivers led to the use of EM for environmental purposes: from land/soil remediation to water purification. EM environmental applications throughout the world have included cleaning polluted waterways, lakes and lagoons, in septic systems, municipal wastewater treatment plants, and landfills/dump sites. As EM became used extensively in livestock, research began into its use as a functional food supplement for human health. It was discovered that EM exhibits very beneficial effects as an antioxidant and probiotic on the digestive system.

ABOUT EFFICIENT MICROBES

Efficient Microbes is a privately registered company dedicated to the use of natural microbial-based products and services for human health, agriculture, livestock and environmental sustainability.

Efficient Microbes has its head office in Durban, South Africa and a network of independent distributors based throughout Southern Africa. Efficient Microbes is committed to the consumer and to the environment, and offers the most effective and environmentally friendly solutions to a large number of problems that are normally solved with medicines or harsh chemicals.

For more information go to www.efficientmicrobes.co.za