ASSET AND THE ENVIRONMENT

TO IMPROVE HUMAN HEALTH,

HVAC SYSTEMS WITH MULTI-ENZYMES

BIO-FILM DE-CONTAMINATION ON













As a responsible **BIO**, **GREEN** and **ENVIRONMENTAL** player **AIRESTEC** wish to inform that minimum printed materials will be distributed.

For those that wishes to have a soft copy, please send us an email - info@airestec.com

Airestec aims to improve occupant health and well-being, environmental performance, economic returns of buildings using established and innovative practices, standards and technologies



{BIO & GREEN SOLUTIONS TO THE GLOBAL MARKET} Complete Scientific and Total Systematic De-Contamination with Airestec Multi-Enzyme pH 7.0 (Neutral) and Treatment solution on HVAC systems (filters, coils, blowers, air ducts, diffusers), walls, ceilings and surfaces to significantly improve human health, improved IAQ, protect equipment (prevent asset damage), energy & system efficiency by preventing growth of Bio-Film (jelly), Bacteria, Fungal and Mould, constant improved airflow, heat exchange, corrosion protection (12 to 60 months warranty), reducing the causes of "Sick Building Syndrome" and/or "Building Related Illness" and protecting the environment with economic returns, established innovative practices, standards, technologies and affordability.





Bacteria, Fungal & Mould, Spores Circulates Hundreds Of Times A Day Throughout The System Where We Breath

We Care For Your Health, Asset & The Environment

- Established in Australia with 20 years experience in Multi-Enzyme Properties and contributing to protecting Australia and Countries Internationally from infection
- □ Aim to Enhance Human Health, Equipments & Environment To Global Problems
- **Established in Malaysia 2002**
- Continuous R & D To Green & Bio Products
- Product & Intellectual Property (IP) Owner
- In-House Scientist And R & D Laboratory
- □ Specifically for Air-Conditioning / HVAC systems, Ducts & Cooling Towers
- Independent Evaluation By Prominent Bodies
- Ensure That Clients Benefit From Advance & Novel Technologies
- □ Producing & Improving New Technologies To Exceed Customer Satisfaction
- Complying To Int'l Standards Product Manufacturing AS/NZS ISO 9001-2000









Prevent Asset Damage Prolong Equipment Life



Manufactured under quality system certified complying with AS/NZS ISO 9001:2000 by accredited certification body



Bio-Film (jelly), Bacteria, Fungal & Mould

are found in all aqueous substrates, environment such as cooling coils, heat exchangers, distribution pipes, cooling tower in-fills, walls and equipments.

BIO-FILM CAUSES THESE PROBLEMS

Sick Building Syndrome / Building Related Illnesses

 Devastation To Human Health
 Heat Transfer Reduction / Airflow Reduction
 System Fouling / Equipment Failure
 Shortens Equipment Life / Increased Wear & Tear

 Downtime For System Cleaning / Decreased Productivity

 Expensive Replacement Parts
 Loss In Efficiency / Loss In Comfort
 Food, Beverage & Product Contamination

 Scaling / Corrosion



Airestec Specialised Multiple-Enzymes

Airestec Bioactive Multi-Enzymes is <u>pH 7.0 (Neutral)</u> and 100% Biodegradable. Non Corrosive and Non Destructive to coils,

and Non Destructive to coils, components, rubber, plastics, and prolong equipment life.

Safe for occupants & present no threat to nature, water table, eco/aqua systems, wastewater treatment plants & actually helps the environment.





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Penetrates, breakdown and release bio-film (jelly) bonds, <u>bacteria, fungal, mould</u> <u>& algae</u> from any aqueous substrates and allows it to be flushed out, thereby helps to increase, extend the heat transfer, airflow at its best and bringing the system back as near as new. Guaranteed to clear blocked coils even at 12 inches thick (10 rows). Prolong bio-film formation will significantly improve IAQ.

Pitting corrosion is a localised form of corrosion by which cavities or "holes" are produced in the material. Pitting is considered to be more dangerous than uniform corrosion damage because it is more difficult to detect, predict and design against.

Microbial Induce Corrosion (MIC) on surfaces cost the nation billions of dollars yearly in equipment damage, product contamination, energy losses. Once anchored to a surface, bio-films (jelly) carries out a variety of detrimental effects.

Suitable for ISO 14000 companies



Airestec Multi-Enzyme Removing Bio-Film Attachments

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Bacterial bio-films (jelly), causes oxidization, pitting, corrosion, fouling, reduction of airflow, decreased productivity due to equipment failure, downtime for system cleaning and expensive parts replacement, as heat exchange efficiency is progressively diminished and not forgetting bacteria, fungal and mould contamination within the bio-film (jelly) which can cause devastation to human life, exposed food, beverages and products. Bio-Film (jelly) produces within 4 days and found on solid substrates submerged in or exposed to aqueous solution. It can grow on all kinds of surfaces, distribution pipes and regardless of the material it is made from. Dust particles provide a source of nutrients to many different fungi. Bacterial bio-films cause infection to human health, fouling, product contamination, equipment failure, decreased productivity due to downtime for system cleaning and expensive replacement parts. Acid, Alkaline, Biocides cannot break down Bio-Film bonds.

There are numerous factors that will contribute to localised corrosion on metal surfaces. The production of ammonia by the reduction of nitrates or nitrites may lead to severe localised loss on copper based metals. Inorganic acid, such as sulphuric acid produced by Thiobacillus sp., can also have detrimental effects. Some of the problems caused include severe bacterial slimes and fouling, sulphuric acid, under deposit corrosion and health hazards. They adhere to heat transfer surfaces and reduce heat transfer, indoor air quality of the ship/submarine is significantly compromised.

Airestec Bioactive Micro-Organism Multi-Enzyme Coil De-contaminator (BMED) <u>Ph 7.0 Neutral</u> formulation assures that bio-films (jelly), bacteria, fungal, mould and blockages are released within the middle of the coils. **Contamination circulates through the system several hundred times a day.**

Satellite Dish



Before De-Contamination & Treatment

After De-Contamination & Treatment

<u>Acid / Alkaline / Surfactants (soap)</u>, cannot *penetrate, break-down* and *release* these bio-film (jelly & algae) bonds. It can destroy and dull the top coat paint thereby causing potential corrosion and other effects.

Bio-films on surfaces cost the nation billions of dollars yearly in equipment damage, product contamination, energy losses. Once anchored to a surface, bio-film microorganisms carry out a variety of detrimental effects.

Airestec Micro-Organism Multi-Enzyme De-Contamination/Cleaner (pH 7.0 Neutral) does the job with flying colours and maintain the clarity of the substrates.



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	Substance	Thermal Conductivity (Wm-1 K-1)	
CaCO ₃	Calcium Carbonate	2.60	
$Ca_3(PO_4)_2$	Calcium Phosphate	2.60	
CaSO ₄	Calcium Sulphate	2.30	
Fe_2O_3	Iron Oxide	2.90	
Analcite	Mineral Deposit	1.30	
Bio-film	Jelly/Slime	0.60	
(Source: Aquadyn Industries & Buckman Laboratories U.S.A.)			

Bacterial bio-films cause infection to human health, fouling, product contamination, equipment failure, decreased productivity due to downtime for system cleaning and expensive replacement parts. Microbial bio-films on surfaces cost the nation billions of dollars yearly in equipment damage, product contamination and energy losses.

Microbiological corrosion is a kind of corrosion caused by microbes (bacteria). The bacteria do not directly eat the metal, but their waste products are corrosive. They also can cause pitting. Bacterial slimes also encourage scale formation at metal surfaces. Some of the problems caused include severe bacterial slimes and fouling, sulphuric acid, under deposit corrosion and health hazards. Bio-films forms an insulation and reduce heat exchange, hereby energy efficiency and airflow will be compromise.

Airestec Coil Treatment is applied as a microscopic coating. The polymer has no affect on the thermal conductivity of the coils themselves, as it has a thermal resistance of less than 0.01 Wm-1 K-1 and should not be considered as a source of efficiency loss.

For example 0.8 mm of bio-film can reduce thermal conductivity by as much as 10%. Bio-film build-up of 6mm which is regularly seen in even well maintained plant rooms can reduce efficiency by as much as 70%.



Bio-Film Attachments & Formations



Due to this the indoor air quality of the building is significantly compromised and can cause detrimental infection to occupants health from *Sick Building Syndrome and Building Related Illness*, which can cause lost in productivity (higher absenteeism and medical expenses), fatigue, respiratory complaints, headaches, eye irritation, asthma and difficulty concentrating.

Bacterial bio-films (jelly), causes loss in heat exchange, reduction in airflow, more energy usage, oxidization, pitting, corrosion, equipment failure, downtime for system cleaning and expensive parts replacement, and not forgetting bacteria, fungal and mould contamination within the bio-film (jelly) which can cause devastation to human life, exposed food & beverage, products and equipment. Bio-Film (jelly), Bacteria, Fungal and Mould starts formation within 4 days on cooling coils.



Bio-Film Detachment - Airestec Multi-Enzyme



Airestec Bioactive Multi-Enzyme Cleaner (pH 7.0 Neutral) penetrates, breakdown and release bio-film (jelly) bonds, <u>bacteria, fungal, mould & algae</u> from any aqueous substrates and allows it to be flushed out easily without removing any of the aluminum substrates, thereby helps to increase, extend the heat transfer, airflow at its best and bringing the system back as near as new. Guaranteed to clear blocked coils even at 12 inches thick (10 rows).

Use of Acid or Alkaline will remove the aluminum substrate on the surface of the coil but unable to remove the biofilms in the middle of the coil. Each acid or alkaline wash the fins will get thinner, brittle and system does not work to design. Therefore, increase in energy usage, causes corrosion, more wear & tear.



Damage Through the Use of Acid/Alkaline & Salt Environment

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Most cleaning agents increases corrosion of the metal, leaving the surface pitted. This prevents water from easily shedding off the fins. The water droplets attract microbial growth, feed it and carry it into the air stream. Then the water droplets are deposited downstream into the ducts or directly into the room, supporting secondary growth and higher humidity. In addition, most cleaning agents will emit vapours that may be harmful to health.

Bacterial bio-films (jelly) and harsh chemicals, such as Acid or Alkaline, causes oxidisation, etching, pitting, pin-holes, brittleness, corrosion, fouling, reduction of airflow/heat exchange, decreased productivity due to equipment failure, downtime for system cleaning, tripping, wear/tear and expensive parts replacement.

Dramatic loss of efficiency associated with grossly bio-fouled surfaces as heat exchange efficiency is progressively diminished and not forgetting bacteria, fungal and mould contamination which can cause devastation to human life, exposed food, beverage and finished products. Disruption of system can cause \$\$\$\$\$

Airestec De-Contamination/Cleaning prevents the bio-film (jelly) bonds from formation for longer periods thereby, extending the <u>fouling rates and</u> <u>temperatures</u>. Prolong bio-film formation will significantly improve IAQ, prevent bacteria, fungal and mould growth, increase and maintain heat transfer and airflow at its best.





Legionella Bacteria {Legionnaires Disease}



Cooling towers use evaporation of water to reject heat from the system. The function of the cooling tower is to cool the warm water from the chiller condenser. Following the central air conditioning system cycle, the heat from the rooms in a building is transferred to chilled water, which is then transferred into the refrigerant, and finally to the cooling water.

Bio-films foul cooling tower distribution decks, in-fills and basins. Portions of these may break loose and transport to other parts of the system, causing blockage and accelerated bacterial and fungal growth. Once bacteria colonize surfaces and produce bio-films (jelly), numerous problems arise including reduced heat transfer/extraction efficiency, trap particulate, disrupt water distribution, distort air flows and causes fouling, corrosion, scaling, contribute to potentially health hazards within the system and heavier work load on the chillers.

Bio-Films (jelly or slime) forms within 4 days in any aqueous environment and provides harbourage to Legionella Bacteria (Legionnaires Disease). Bio-Film is a community of micro-organisms which adheres to a surface, forms a jelly / slimy like substances in contact with water. Biocides, Chlorine, Acid, Alkaline cannot break down bio-film (jelly / slime) which protects the organisms (bacteria, fungal, mould, algae).

The Legionella bacteria (Legionnaires Disease) multiply within the protective structure of the bio-film. The bio-film continues to grow until the structure becomes somewhat unstable, with fragments breaking off and thrown into the environment, producing significantly high counts of micro-organisms. Water temperature between 30 and 55 degrees are desirable for Legionnaire Bacteria growth. It is beyond any doubt that high level of Legionella bacteria are found in cooling towers. This means that a dangerously high level of <u>legionnaires' disease</u> may be released at any time.



Legionella Bio-film Release (Legionnaires Disease)



Bio-Films (jelly) are resistant to acid, alkaline, biocides and anti-microbial agents. Disinfectant are effective for killing single cells only, but not clumps as it only kills those on the surfaces. Bio-Films (jelly or slime) forms an insulating coating on heat transfer coils and causes a reduction in heat exchange, microbial corrosion, trap particulate, increase problem of fouling, disrupt water distribution, distort air flows, causes corrosion within the system and provides harbourage to Legionnaires Disease.

Bio-films are usually found on solid substrates submerged in or exposed to some aqueous solution. Bio-films consist of many species of bacteria and are implicated in a significant amount of human bacterial infections. Bio-films also causes higher TDS, blockages and system failure.

Once anchored to a surface, bio-film micro-organisms carry out a variety of detrimental effects, depending on the surrounding environmental conditions. Bio-film (jelly / slime) forms when bacteria adhere to surfaces in aqueous environments and begin to excrete a slimy, glue-like substance that can anchor them to all kinds of material - such as metals, plastics, most substrates and soil particles. Bio-film are food source for bacteria, fungal and mould.

Research & Development Challenges

Legionella was first identified as the causative agent in a lethal outbreak of bacterial pneumonia at an American Legion convention in Philadelphia in 1976 (hence, the designation "Legionnaire's Disease"). A high percentage of the attendees died from this pneumonia. Legionella has since been implicated by The Centers for Disease Control (CDC) in some 150,000 deaths per year in the USA and many more throughout the industrialized world.

1) Lack of Funding or Seeking Grants

2) Expensive & Extensive Trials Needed

3) Returns from the R&D

You will be surprise that we have only One (1) challenge

And that is.....

Dedicated and Passionate Research Scientist on Enzymes without worrying about

GRANTS and FUNDING

Why and how.....

- 1) It does not cost much on Lab R&D
- 2) Our service sector can be utilise for trial purpose and get paid
- 3) Lab and Field Trial
- 4) Scientist is able to see performance
- 5) Immediate re-formulation, if necessary

Looking Forward To

1) Collaboration Partners

2) Energy Efficiency & Carbon Audits

Questions & Answers

Airestec has acquired the Bio Nexus Status, which is under the purview of Ministry of Science, Technology and Innovation (MOSTI) and is owned by the Ministry of Finance Incorporated.

THANK YOU