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**MADISON CHEMICAL
INDUSTRIES INC.**

InfoTech Bulletin #23

**“MicroSpear”
Anti-Microbial Technology
For Water and
Wastewater Applications**

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Madison Chemical Industries Inc.

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Introduction

Madison's permanent anti-microbial additive, MicroSpear¹ is used today in a wide variety of coating products. For general information regarding this technology, please refer to InfoTech Bulletin Number 08. The Bulletin you are now reading is specifically designed for people interested in two areas involving immersion service. One is reducing microbially-induced corrosion (MIC) in applications such as wastewater pipelines and treatment plants. The other is maintaining potable water purity in water transmission pipelines and holding tanks.

The Corrosion Challenge

In wastewater pipelines and treatment facilities, the life expectancy is determined by corrosion more than any other single factor. In a complex series of reactions, the microbes present in wastewater create a highly acidic environment that quickly attacks exposed iron, steel and concrete.

The Purity Challenge

In the processing, storage and distribution of potable water, purity is increasingly important to regulatory bodies and the consuming public. Historically, protective coatings have not contributed to water purity and in some cases actually harbour bacteria such as e-coli, which are considered significant health risks.

The Madison Solution

A common solution to both of these challenges was made available by Madison in 1999, following 3 years of intensive research into dozens of potential options. Madison research scientists developed the ability to render virtually any coating permanently anti-microbial through the addition of MicroSpear. During the manufacturing process, we are able to lock this compound into the polymer backbone of various coating products, thus enabling it to retain its effectiveness throughout the life of the coating system. In Madison literature, this technology was originally referred to as our "AM additive"; today, it is referred to under the trade name MicroSpear.

Microbiologically Induced Corrosion

How can the AM Technology prevent MIC? Madison has available a published technical report for those so inclined, but in layman's terms, the MIC process is as follows. Sewage contains sulphur-bearing compounds. Certain bacteria eat these compounds and excrete H₂S (hydrogen sulphide), a mild acid. Other bacteria thrive in this environment, ingest the H₂S, oxidize it and secrete H₂SO₄ (sulphuric acid). This powerful acid attacks the substrate aggressively, leading to premature failure of steel, concrete, ductile iron and even plastic structures. Even when the structure has been coated, the pH can get so low that the acid attacks the coating itself. The result is widespread, hard-to-predict failure.

¹ Madison and MicroSpear are trade marks of Madison Chemical Industries Inc. All rights reserved

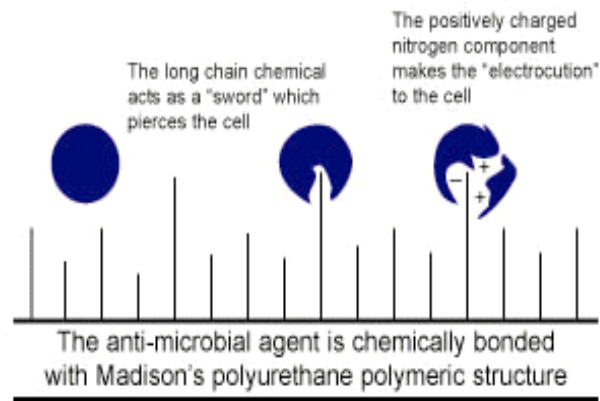
How Does MicroSpear Work?

By combining an inherently superior coating with our Anti-Microbial system, we not only create a physical barrier but MicroSpear alters the environment at the coating surface and makes it less acidic by reducing the level of bacteria that give rise to the low pH in the first place. In potable water applications, MicroSpear ensures that the coating surface does not harbour bacteria that might threaten water quality. Here's how and why the system works.

1. It Spears The Microbe

To you and me, MicroSpear in its pure form looks like baby powder and is just as harmless. In fact it is E.P.A.² approved. But, viewed microscopically, the individual particles are bristling with barbs or "spears"; hence, the name MicroSpear. To a single-celled organism, each particle looks like an 800-pound porcupine. On contact with a coating containing

MicroSpear, the cell wall is either pierced, causing it to perish immediately, or is damaged so that the microbe perishes when it tries to divide and reproduce. Because this is a physical phenomenon rather than a chemical one, the efficacy of MicroSpear™ is not depleted in any way, nor is the microbe able to mutate or adapt, as they can with chemically-based anti-microbials such as triclosan -- see Reuters News Agency bulletin Thursday, Oct 20, 2005.



2. MicroSpear "Additive" The Microbe

MicroSpear contains positively charged nitrogen ions. This constitutes an electrical charge that is infinitesimal to you and me, but to a microbe, it's deadly because the electrical charge disrupts the microbe's electrochemistry. The result of the porcupine effect and the "electrocution" effect is like a "one-two punch".

3. MicroSpear is Integral To The Coating

Part of the elegance of Madison's AM technology is that MicroSpear is more than just an additive. Our research team found a way of polymerizing it right into the chemical backbone of the polyurethane resin. Thus, MicroSpear is an integral part of the coating itself; non-leaching and non-diminishing. It isn't just trapped in the coating film, it's part of it, throughout the entire coating thickness.

4. MicroSpear is Completely Permanent

It follows from the above that Madison's AM technology is totally permanent. It simply cannot be extracted from the coating because it is part of the polymer. The microscopic barbs continue to work year after year, just like an ancient warrior would use his spear again and again. The electrical charge is also permanent, just like the Van der Waals

² Unites States Environmental Protection Agency

effect well known to electrical engineers. MicroSpear cannot be flushed out, abraded out or worn out. It cannot evaporate, migrate or dissolve. It is not ingested or consumed by the microbes. It remains present for the life of the coating.

5. MicroSpear Keeps On Working, Even If The Coating Is Damaged

Even if the coating is gouged or chipped, MicroSpear continues to protect the substrate. Small damaged areas actually form a protective scab of corrosion by-product that continues to shield the surface below. In any event, corrosion is minimal because the pH is relatively neutral.

6. The Microbes Can't Adapt

Unlike the phenomenon of bacteria becoming resistant to antibiotics, we have a strictly physical process here. Because of the "one-two" mechanism, we are not creating the conditions that allow micro-organisms to adapt or develop resistance.

7. It Is Proven And Approved

Third party tests are available proving the effectiveness and the permanence of MicroSpear. It is also E.P.A.-approved.

Disclaimer

The E.P.A. prohibits claims as to the efficacy of anti-microbial coatings on the purity of water and other potables coming into contact with said coatings. Madison makes no such claims, express or implied.

Commonly Asked Questions

Q. How much does it cost?

A. A growing number of Madison coatings contain MicroSpear as a standard ingredient; in such cases, the Technical Data Sheet will say so. On most other products, it can be manufactured into the coating on a special order basis; this adds about 10% to the cost of the coating into which it is being incorporated.

Q. To which products can it be added?

A. Just about any Madison Chemical coating.

Q. What literature is available?

A. A technical paper and a detailed PowerPoint presentation. To qualified parties, a copy of our third party test results can be made available.

Q. How can I find out more?

A. Contact your local Madison dealer or staff representative. If you don't know who they are, call head office at (905) 878-8863 and ask to speak to our Sales Support Group.