



Con^{MIC}Shield[®] Prevents Corrosion Before it Begins



New Concrete Pipe And Manholes

Concrete pipe is used more often than any other type of product in city sewer systems. **Con^{MIC}Shield** keeps it from corroding for just a fraction of the cost of plastic liners or coatings. There is no special fabricating, welding or testing required at the plant or in the field with **Con^{MIC}Shield** since it is precisely metered into the mix at the plant.



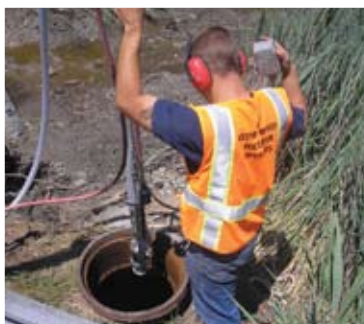
Shotcrete

Pipelines and tunnels that have already suffered from corrosion can be rehabilitated in place. **Con^{MIC}Shield** is easily added to the mix water for both dry and wet shotcrete hand-spraying. **Con^{MIC}Shield** is also incorporated into special mixes for centrifugally lining corroded pipe interiors for structural reinforcement and protection in one application. See Centrifugally Cast Concrete Pipe (CCCP) at www.permaform.net.



Poured-in-Place Structures

Con^{MIC}Shield is an excellent choice for both new and rebuilt wet wells, lift stations, WWTP head works, clarifiers and similar concrete structures subjected to highly concentrated sulfide conditions. Metered into the mix at the ready-mix plant, **Con^{MIC}Shield** is delivered as an integral part of the concrete when it is delivered to the job site. No spark testing, welding or adhesion tests are needed.



Rehabilitation

Con^{MIC}Shield has performed successfully since its introduction in 1996 for the rehabilitation of heavily corroded manholes. **Con^{MIC}Shield** inhibits bacterial growth while calcium aluminate cements can only slow the corrosion process. **Con^{MIC}Shield** is far less expensive than coatings and **Con^{MIC}Shield** will not delaminate, pinhole, peel or wash off. Structural reinforcement and corrosion protection is complete in one application.



biotech armor for concrete

CAUTION: Con^{MIC}Shield[®] is an EPA registered microbiostatic agent proven effective for long term use in the prevention of MIC in city sewer systems. It is not intended for the protection against direct acid or acid vapor contact. If such conditions exist, further protection is required.

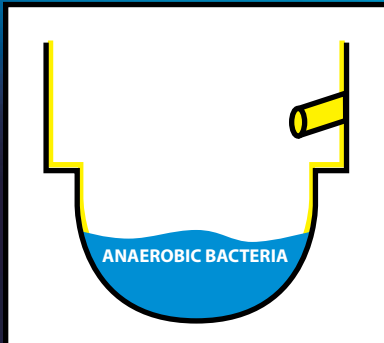
What is MIC Corrosion?

Hydrogen sulfide gas converted to sulfuric acid by bacteria.

Microbiologically Induced Corrosion

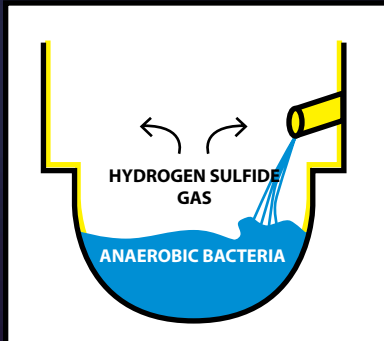
STEP 1

Anaerobic (non-air breathing) bacteria form in raw sewerage and produce hydrogen sulfide gas (H_2S). Factors contributing to rapid bacterial growth are temperature, retention time, high BOD levels and turbulence. As inflow and infiltration are decreased, hydrogen sulfide gas is dramatically increased - flows are not diluted and gases are trapped inside generating more acid in less time.



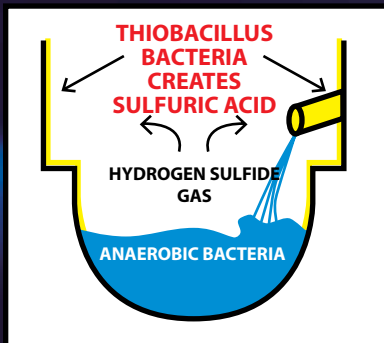
STEP 2

Turbulence from force mains, drop manholes, steep grade changes and pumping stations allow hydrogen sulfide gas (H_2S) to release into the atmosphere in pipes and manholes.



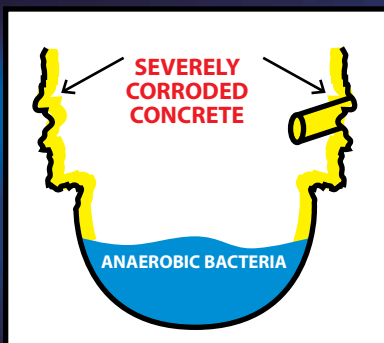
STEP 3

Hydrogen Sulfide gas (H_2S) is converted into sulfuric acid (H_2SO_4) by the aerobic (air breathing) Thiobacillus bacteria that grow on the concrete surfaces above the waste water flows.



STEP 4

Sulfuric acid (H_2SO_4) produced by the aerobic (Thiobacillus) bacteria quickly corrodes the concrete, resulting in severe structural damage to the pipe and manholes.



The Science Behind **Con^{MIC}Shield**[®]

EPA registered microbiostatic agent

Durable - Economical - Effective

Con^{MIC}Shield[®]

Is a proven technology for the economical and effective long term prevention of bacterial corrosion of concrete in highly corrosive (MIC) sanitary sewer environments.

Con^{MIC}Shield[®]

Is used in new concrete pipe and manholes by precasters; in wet wells, clarifiers and similar cast-in-place structures by ready-mix producers and in repair mortars by certified contractors.

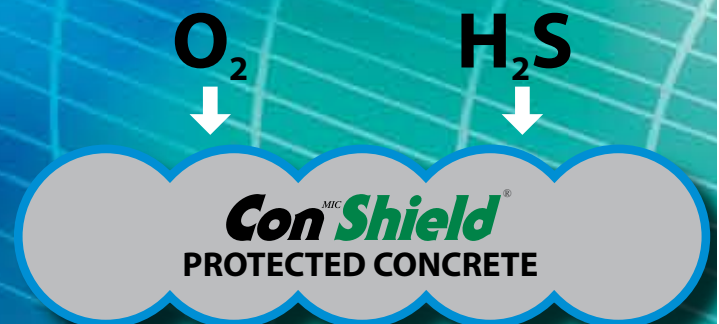
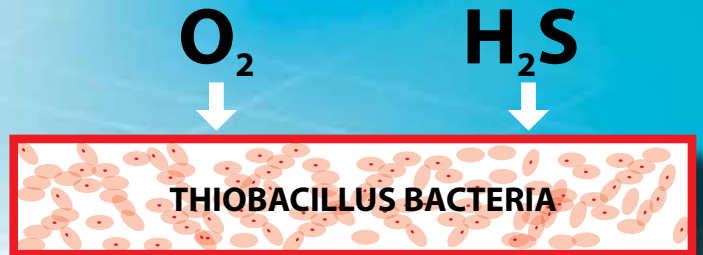
Con^{MIC}Shield[®]

Is a liquid additive precisely dosed during the mixing phase to perform consistently, safely and effectively in each specific mix design by certified precasters, ready mix producers and shotcrete contractors. Other design properties are unaffected by adding **Con^{MIC}Shield**[®].

Unlike coatings and plastic liners, **Con^{MIC}Shield**[®] cannot chip, peel, delaminate, pinhole or wash off since it molecularly bonds throughout the entire thickness.

Since the bacteria is inhibited by an electro-physical mechanism, the treated concrete is protected from microbiologically induced corrosion, and will last as long as the life of concrete.

BACTERIA + SULFIDE GAS = SULFURIC ACID



Con^{MIC}Shield is Proven Scientifically

Bacterial Activity is Source of Corrosion



Specimen Preparation



Inoculated with bacteria



5 hours after incubation



**24 hours after incubation
99.9% reduction of bacteria**

Even today, more than 70 years after the 1945 discovery of Microbial Induced Corrosion (MIC) by C.D. Parker, concrete corrosion in sanitary sewers is still commonly referred to as a sulfide (H_2S) gas problem.

The primary problem for concrete in the sewer environment is *Thiobacillus thiooxidans* (concretivorous) - Latin for "concrete-eating".

National Association of Corrosion Engineers (NACE) lists *Thiobacillus* as the most common sulfur-oxidizing bacteria.

Thiobacillus is the most common sulfur-oxidizing bacteria. *Thiobacillus* bacteria oxidize sulfur and sulfide gas to produce sulfuric acid which quickly dissolves concrete. Corrosion is caused by the sulfuric acid.

NACE TPC Publication 3, September, 1990 Pages 22 and 23.

Double Blind Clinical Testing Program

Con^{MIC}Shield treated concrete has been vigorously tested at independent labs since 1997. These ongoing tests continue to validate the long term effectiveness of the product.

"The testing protocol which closely follows ASTM D-4783 requires unidentified treated and non-treated specimens to be inoculated with live bacteria and incubated at 25 degrees Celcius. With each repeated test, within just 24 hours there was a 99.9% reduction of bacteria."

Dr. Clarence Baugh, Custom Biological Laboratories.

Con^{MIC}Shield is not a new product. It has been successfully used in North America for rehabilitation of severely deteriorated manholes, lift stations, pipe and for new concrete pipe and manholes since its introduction in 1996. There is simply no easier or less expensive way to provide a 100 year design life against MIC.

References, case studies, specifications and test reports are available upon request.

Benefits of Specifying **Con^{MIC}Shield[®]**

DURABLE

Con^{MIC}Shield[®] inhibits the colonization and growth of acid-producing bacteria on concrete in sanitary sewers. Once **Con^{MIC}Shield[®]** is incorporated into the mix, protection is throughout the entire thickness of the concrete matrix, and the fortified structure will last for the life of the concrete.

INTERNAL PROTECTION

Since **Con^{MIC}Shield[®]** is fully incorporated into the concrete mix and is molecularly bonded to its ingredients, it imparts EXTENDED protection against gram positive and gram negative bacteria, fungi, algae and yeasts. **Con^{MIC}Shield[®]** is not a surface treatment; it is throughout the entire thickness of the pipe, manhole or structural lining.

COST EFFECTIVE

Con^{MIC}Shield[®] does not require spark testing, seam welding or adhesion tests. **Con^{MIC}Shield[®]** costs less to install than coatings or linings since it is precision metered into the mix. Expensive field applications, testing and repairs are eliminated.

PROVEN PERFORMANCE

Since its first commercial use in concrete in 1996, **Con^{MIC}Shield[®]** has provided long-term MIC corrosion protection to more than one-million square feet of concrete throughout the World.

QUALITY CONTROL

Con^{MIC}Shield[®] is provided through certified users who demonstrate their accurate and consistent procedures for mixing, processing and record verification. Each design mix is certified by **Con^{MIC}Shield[®]** Technologies Inc.

Con^{MIC}Shield[®] is available through certified precast concrete pipe and manhole producers, ready-mix suppliers, and rehabilitation specialists throughout the World.



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