POTTER
The Symbol of Protection

BAC-PAK
BACTERIUM TEST KIT

Bac-Pak Microbiology Influenced Corrosion Water Testing Kit
Model #BAC-PAK

Test kit includes:
- 1 ea. "Bac-Pak" foil pack with three microbiological test vials labeled APB, SRB, and IRB.
- Vial holder
- 120cc bottle for obtaining sample

Stock number: 1119172

Note: Water sample can be obtained through the inspectors test valve or main drain. Precautions should be taken to prevent an unwanted water flow alarm.

The BAC-PAK is a test kit designed to allow field testing of wet pipe sprinkler systems and/or water supplies for MIC causing bacterium. The kit allows field testing for; Iron related bacterium (iron-pipe oxidizing and reducing bacterium); Sulfate Reducing Bacterium (causes pit corrosion) and Acid Producing Bacterium (causes pit corrosion). The testing takes just a few minutes. The results will appear over a period of up to 9 days to allow for bacteria culture growth.

A more thorough test performed by a chemist and including a laboratory analysis is available. The Potter water test model PWTK, stock #1119178.

For dry pipe systems use the Potter 5 Year Deposit Test Kit. Stock # 1119174. This test is also performed by a chemist and includes a laboratory analysis.

Procedure

Water Test:

1. Run water source to be tested for approximately 15 seconds.
2. Remove cap on 120cc bottle and fill bottle. Replace cap.
3. Shut off water.
   Note: If the water is extremely black or dirty it can be filtered through a coffee filter before pouring into the test vials. This will allow the color changes to be noticed.
4. Fill in all pertinent information on the test vial holder.
5. Remove cap on vial for APB test.
6. Fill vial to line on side of vial with water from sample bottle.
7. Cap vial and invert for approximately 2 seconds, then turn upright and place in the cutout holder with the corresponding cap color.
8. Repeat steps 4-6 with SRB & IRB vials.
9. Place test vials in in a location which does not have direct sunlight or extreme temperature changes.
10. Observe and note color changes of vials over a period of up to 9 days.

Day by Day Result chart

Day	APB	SRB	IRB	Comments
1-2	Color Change to Yellow ~Population: 800,000 *cfu/ml.	Color Change to Black ~Population >700,000 *cfu/ml.	Color Change to Reddish Brown or Orange ~Population ~140,000 *cfu/ml.	Severe MIC corrosion possibility is very high if any bottle changes color.
3-5	Color Change to Yellow ~Population: 9,000 *cfu/ml.	Color Change to Black ~Population 18,000 *cfu/ml.	Color Change to Reddish Brown or Orange ~Population 9,000 *cfu/ml.	MIC corrosion possibility is high if any bottle changes color.
6-9	Color Change to Yellow ~Population 150 *cfu/ml.	Color Change to Black ~Population 1,200 *cfu/ml.	Color Change to Reddish Brown or Orange ~Population 500 *cfu/ml.	MIC corrosion possibility is moderate. SRB infection moderate to high.

Result Diagnosis

If any vial indicates a presence of MIC within the first 5 days, the possibility of MIC corrosion is high to severe and the system should be treated with Potter Pipe-Shield.

If only 1 vial indicates the presence of MIC after 5 days, the possibility is moderate to high. Immediate treatment with Potter Pipe-Shield may not be necessary. The building owner or their representative has options:

An Iron Test, Potter stock #1119176 can be performed to determine the level of dissolved iron in the system.

A Water Test, Potter stock #1119178 can be performed to provide a more comprehensive test of the water.

Another Bac-Pak test can be performed at a later date (within 12 months), to determine if the condition has worsened.

The system can be treated with Pipe-Shield.

Note: If any of the bacterium show up in a sample, this indicates the bacterium population at the point where the sample was taken in the system. The nutrient level or oxygen concentration may not be conducive to growth at that particular point. However, the conditions may be right for extreme growth in another part of the system.

The presence of MIC in a fire sprinkler system should always be a cause for concern. Potter suggests treating systems containing MIC causing bacterium with Potter Pipe-Shield.

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Description of Bacterium Tested

APB (Acid Producing Bacterium)
Acid Producing Bacterium corrosion is a major player in the MIC (Microbiologically Influenced Corrosion) process. APB are capable of producing organic and inorganic acids which degrade the metallic sections of a fire sprinkler system, as well as produce nutrients for SRB. They live in a symbiotic relationship with SRB; but are capable of living on their own. Telltale signs of APB corrosion include, but are not limited to, pit corrosion and under deposit corrosion.

The APB have been recognized as a possible major cause of corrosion, mainly because their fermentative activities will cause the pH, particularly in the biofilms, to drop into the acid range. Under these conditions, an acid-driven form of corrosion could occur, where the metals begin to dissolve and lose integrity. This form of acid-corrosion can be viewed as an initiating, or alternate, event to SRB-initiated electrolytic corrosion. In the last two decades, industry has become more aware of the risks posed by the APB and have come to generally view the creation of acidic pH levels in the environment under reductive conditions to be predominantly driven by the APB. This heightens the corrosion risk to the fire sprinkler system within the affected zone. The APB BART changes from purple to yellow as it contains a pH indicator which changes colors when the bacterium provide an acidic solution within the vial.

SRB (Sulfate Reducing Bacterium)
Sulfate Reducing Bacteria are responsible for extreme damage to piping and support equipment in the fire sprinkler industry. They are probably the most destructive part of the MIC group. Sulfate-reducing bacteria are a group of anaerobic bacteria (i.e. don't need oxygen) that generate hydrogen sulfide (H2S). H2S can cause a number of significant problems in fire sprinkler water. These problems range from "rotten egg" odors to the blackening of equipment, iron sulfide formation (black solids), slime formations, and extensive corrosion. SRB microorganisms are difficult to detect because they are anaerobic (without air) and tend to grow deep down within biofilms and tubercles as part of a microbial community. SRB are very adaptive and may need the exact pressure, temperature, and velocity conditions of the system in question to thrive. When those conditions do not exist, the SRB form protective "spores" and may lie dormant for thousands of years until the right conditions exist for them to thrive again. SRB may not be present in the free-flowing water over the site of the fouling. It may take years to see the results from this pitting-type corrosion. Or the process may be swift, pitting in a confined area through the thickness of the iron structure. SRB are so adaptive they have even been known to reduce nitrates to ammonia when sulfur is not present. Corrosion deposit analysis should be performed if “black water” or “rotten egg smell” is present within the fire sprinkler system, in addition to the Bac-Pak test, as SRB are sometimes not evident in water samples. Potter is able to perform corrosion deposit analysis. Please contact your local Potter distributor for more information and/or order Potter’s five year deposit test kit (stock# 1119174).

If SRB activity is present in the BART, sulfate is reduced to H2S, which reacts with the diffusing ferrous iron of the fire sprinkler system to form black iron sulfide. This iron sulfide is the main source of what is called “Black Water” (iron sulfide). This sulfide commonly forms either in the base (as black precipitates) and/or around the ball (as an irregular black ring) of the BART. General appearance of water will be various shades of black.

IRB (Iron Related Bacterium)
The iron-related bacteria (IRB) are bacteria that are iron-utilizing. They are an important part of the MIC-causing group, because they are able to build tubercles and have many redox (reduction--oxidation) reactions that support SRB and other MIC bacteria. They are also responsible, in many cases, for the destructive corrosive process of iron and steel and may appear as general “rust” coating of the fire sprinkler system. The form of iron utilization can range from simply a passive bioaccumulation in the slime growths (biofilm) through to active use in metabolism. This test uses the bacteria's ability to use ferric and ferrous iron in many ways to create various reactions, most of which are colored and result in an orange or brown color within the vial. It is now understood that some of the IRB may be able to derive respiratory or energy functions out of the reduction (ferrous) to oxidation (ferric) manipulations that occur through the activity of the IRB. The IRB have a symbiotic relationship with other bacteria species and can contribute to very complex life cycles within a colony of bacteria. Their relationship with SRB is very well founded.

Disposal:
1. Remove caps from Bac-Pak vials and place vial in microwave.
2. Microwave for 30 seconds.
3. Replace cap and dispose of in regular trash facilities.

Shelf Life:
Two years from opening of foil pouch.

Certification:
APB, SRB and IRB test vials have been tested against the appropriate A.T.C.C. (American Type Culture Collection) strains for each specific group of bacterium.