

### THE PROBLEM

Microbiological activity is recognized as a significant contributor to the corrosion problems faced by many industries. Present test procedures for the influence of micro-organisms have been tedious, inefficient and inaccurate in spite of the great importance of microbially influenced corrosion (MIC). The Caproco Hydrogenase Test provides a sensitive, rapid and practical method for detecting a wide range of corrosion-influencing bacteria.

### MICROBIAL CORROSION

It has been established that one of the most important mechanisms of MIC is the depolarization of the cathode by hydrogen-utilizing bacteria such as the sulfate-reducing bacteria (SRB). This type of bacteria uses an enzyme, hydrogenase, to extract the energy of the corrosion process for their metabolic activities.

This results in localized corrosion in the form of pits and for some bacteria, the production of H<sub>2</sub>S and iron sulfide deposits.

Present test procedures have concentrated on identifying the presence of certain marker organisms such as SRB in water and deposit samples. It has recently become apparent that determining the influence of bacteria in corrosion cells should be based on a measure of the *activity* of the organisms rather than their absolute numbers.

### HYDROGENASE TESTING

A procedure has been developed at the University of Calgary that allows the corrosion engineer to test for the presence of organisms producing hydrogenase enzyme. The test may be performed on water or deposit samples and may be carried out in the field or in a laboratory. No expensive equipment or sophisticated analytical techniques are required.

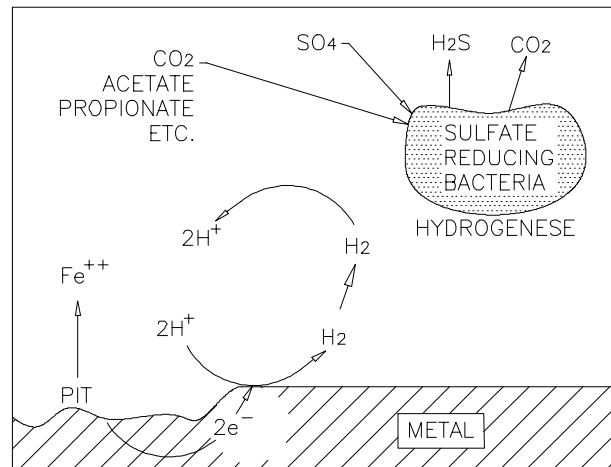
The test is a reliable indicator of the activity of corrosion-causing organisms. It has been performed on a wide range of samples and has shown over 95% correlation with a range of culture methods. It will have particular application in the analysis of samples from biofilm probes; the biofilm probe stud can be introduced directly into the reaction vial for enzyme extraction. The presence of hydrogenase enzyme on a metal surface has been found to be a reliable indicator of potential microbial corrosion.

### ADVANTAGES

1. Rapid - Test results can be obtained in as little as twenty minutes
2. Simple - No special training is required to perform the test
3. Sensitive - As few as 250 cells can be detected where active hydrogen uptake is occurring
4. Non-Specific - A wide range of corrosion-causing bacteria can be detected

### PROCEDURE

Samples of water are filtered to concentrate cells. Samples of corrosion product or sludge can be used without pre-treatment. The sample is placed in a vial containing the enzyme-extracting solution.



After 15 minutes' contact, the solution is filtered and placed in a clean vial in an anaerobic chamber. A gas generator is activated and the oxygen in the chamber removed by reaction with the hydrogen generated. The enzyme then oxidizes the excess hydrogen and simultaneously reduces an indicator dye in the solution. The activity of hydrogenase is established by the development of a blue color in less than four hours. The intensity of the color is proportional to the rate of hydrogen uptake by the hydrogenase enzyme.

The development of the Caproco MIC Analyzer Instrument now allows the user to have a quantitative indication of bacterial activity.

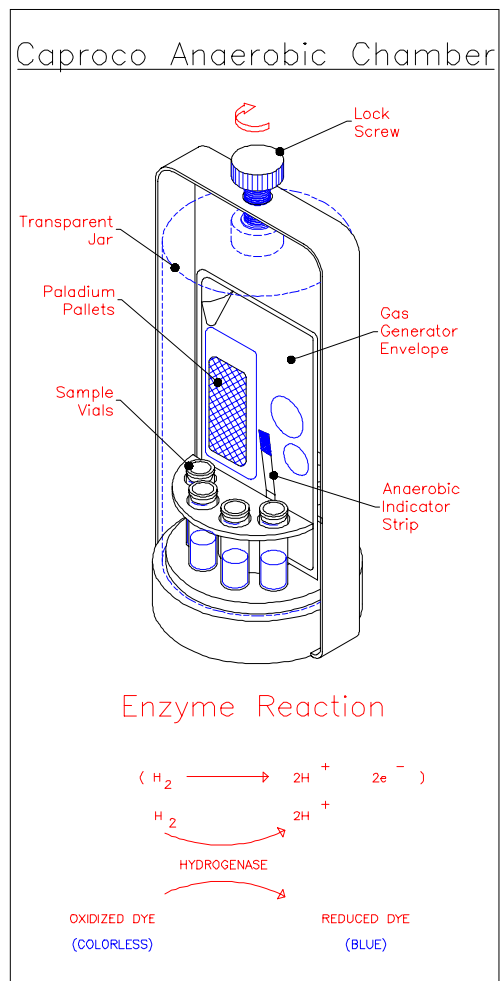
**SOME OF THE ORGANISMS DETECTED BY THE CAPROCO HYDROGENASE TEST:**

- Desulfovibrio Desulfuricans (DSM 642)
- Desulfovibrio Vulgaris (DSM 8303)
- Desulfovibrio Thermophilus (DSM- 1276)
- Desulfovibrio Baculatis (DSM 1741)
- Desulfomonas Pigra (DSM 749)
- Desulfotomaculum Ruminis (DSM- 2174)
- Alteromonas Putriciens (ATC 8071)
- Clostridium Pasteurianum (W5)

**ORDERING INFORMATION**

Part Number	Types of Samples			Test Chamber #87100 Included
	Planktonic (Water)	Sessile (Deposits)	Sludge	
87200	YES	YES	YES	YES
87201	YES	YES	YES	NO
87202	YES	YES	YES	YES
87203	YES	YES	YES	NO
87300	YES	NO	NO	NO
87400	NO	YES	YES	NO
87500	NO	NO	YES	NO

**Each Kit Contains Sufficient Consumables To Perform 10 Tests In 5 Gas Atmospheres**



**TEST KITS**

PART NUMBER	DESCRIPTION
87200	Hydrogenase All-Purpose Starter Test Kit (10 pk.)
87201	Hydrogenase All-Purpose Test Kit w/o Chamber (10 pk.)
87202	Hydrogenase All-Purpose Starter Test Kit c/w Carrying Case (10 pk.)
87203	Hydrogenase All-Purpose Test Kit c/w Carrying Case (10 pk.)
87300	Hydrogenase Test Kit for Planktonic (Water) Sampling (10 pk.)
87400	Hydrogenase Test Kit for Sessile (Deposit) or Sludge Sampling (10 pk.)
87500	Hydrogenase Test Kit for Sludge Sampling (10 pk.)
87602	Hydrogenase Basic Test Kit (20 pk.) Chemical Vials and Filters only
87610	Hydrogenase Basic Test Kit (100 pk.) Chemical Vials and Filters only
87100	Anaerobic Test Chamber Assembly - will test up to 8 samples simultaneously

**MISCELLANEOUS SUPPLIES (MULTI-PAKS)**

PART NUMBER	DESCRIPTION
87810	Re-Usable Filter Holder for Planktonic Samples (ea.)
87811	Filter Membrane for Planktonic Testing (50 pk.)
87820	Syringe 3 c.c. c/w Needle (50 pk.)
87821	Syringe 10 c.c. (50 pk.)
87830	Gas Generator Envelope c/w Catalyst and Indicator (10 pk.)
87840	Scapel Blades Incl. 1 Holder (50 pk.)
87880	Rubber Gloves (100 pk.)
87881	Cotton Swabs (100 pk.)
12903	Replacement Biofilm Studs for Caproco Biofilm Probe (Set of 5)
10620	Replacement Corrosion / Biofilm Coupons 3" x 3/4" x 1/8" (ea.)