In wastewater treatment plants, construction materials in the gas space above the surface of wastewater are susceptible to microbiologically-influenced corrosion (MIC). Aerobic bacteria, belonging to the species *Thiobacillus*, are typically responsible for the corrosion. General conditions required for the bacteria to flourish include the presence of sufficient moisture, oxygen, and hydrogen sulphide in the gas space.

Simply put, the bacteria use hydrogen sulphide as an energy source and produce sulphuric acid as a metabolic by-product. Only a few parts per million of hydrogen sulphide in a gas space are needed for serious corrosion to occur. These ingredients are typically present in wastewater sewers and beneath covers in preliminary, primary, and solids treatment facilities. The sulphuric acid that is produced by the bacteria corrodes the structure material.

Regular visual observation of the condition of each surface that is exposed will provide a record by which the amount of corrosion can be tracked.

The easiest way to detect and monitor the presence of this microbiologically produced sulphuric acid, even before its effects are visible, is to measure the pH of the condensate on the surface of the structure. This can be inexpensively performed using colorimetric methods.

Continued
measurable concentrations of hydrogen sulphide. An excellent practical reference on this corrosion problem in wastewater facilities is the American Society of Civil Engineers’ *Manuals and Reports on Engineering Practice No. 69, Sulphide in Wastewater Collection and Treatment Systems*, 1989.


Marcel Piens
Coatings Research Institute Limelette, Belgium:

Microbiologically-influenced corrosion (MIC) is a phenomenon closely related to the formation of biofilms on a metal surface. However, MIC does not include new corrosion processes other than those related to electrochemical corrosion. The micro-flora (micro-plant species that produce a slime film, or biofilm) may cause corrosion problems. They may do this

- by depolarisation of the cathode (consumption of hydrogen [\(H_2\)]),
- by degradation of corrosion inhibitors (\(NO_2^- \rightarrow NO_3^-\)),
- by production of corrosive products such as acids, and
- by formation of galvanic concentration cells because of the biofilm.

The following observations may help in recognising the presence of MIC.

- Extensive formation of tubercles, nodules, or stalks
- Presence of black liquid under these tubercles
- Presence of sulphur granules within the cells of bacteria found in the deposits
- Unexplained drops in pH
- \(H_2S\) evolution upon addition of acid to deposits
- Pitting corrosion
- Presence of biofilm

Continued
Upcoming Problem Solving Forum Topics for 2002
- Metallizing concrete to protect rebar
- Preparing galvanizing for paint
- Coating low alloy steels with zinc coatings
- Antifouling for warm tropical waters
- Surface preparation of flame cut edges for thermal spray
- Criteria for repairing concrete
- Linings for pressure vessels
- Surface preparation of weld joints
- Interpreting visible contamination in a pre-job meeting
- UHP pumps
- Coating steel in coastal areas
- Testing for soluble salts in different atmospheres

“Problem Solving Forum” provides the readers of JPCL-PCE with a number of answers to difficult technical questions. Answers are provided by experts in the particular field being discussed.

The discussion about the question will not necessarily stop at the time the answers are published, however; for at the end of the “Forum,” readers’ comments regarding the answers provided to previous questions will be published under the heading, “Reader Response.” In this way, JPCL-PCE will promote a long-term exchange of ideas and opinions regarding problems faced by the users of protective and marine coatings.

For additional information or to send responses, contact Brian Goldie, PCE, Westmead House, 123 Westmead Road, Sutton, Surrey SM1 4JH, England—tel: +44-20-8288-0077; fax: +44-20-8288-0078; e-mail: brianpce@aol.com or Karen Kapsanis, JPCL, 2100 Wharton Street, Suite 310, Pittsburgh, PA 15203—tel: 412-431-8300; 800-837-8303; fax: 412-431-5428; e-mail: kkapsanis@protectivecoatings.com.