



BTS

BIOTECHNOLOGY
SOLUTIONS



OLMARK
Associates

“QUALITY CORROSIVE BACTERIA TESTING MATERIALS FOR THE OIL & GAS INDUSTRY: SHIPPED AT THE SPEED OF YESTERDAY!”



OLMARK.IN | E MAIL : olmarkassociates@gmail.com

Olmark Associates
1-Old Industrial Area
hittorgarh, Rajasthan
INDIA | 312001



BIOTECHNOLOGY SOLUTIONS

Setting the standard for quality bacterial growth media.

Got Corrosion? BTS manufactures quality bacterial growth media and biological testing materials for the oil and gas industry. We provide unparalleled service and quality corrosive bacterial testing materials, manufactured and delivered in a time frame that meets the needs of the fast paced oil and gas industry. Our state of the art manufacturing facility can customize orders to your requirements: getting you the bacterial growth media you need, when you need it.

FAST SHIPPING!

Don't wait 6 weeks for delivery! Most orders ship in 1-3 business days. Call us at (281)-531-5319 for your rush order: many orders are shipped on the same day they are placed!



All of our media products are produced in accordance with N.A.C.E. (National Association of Corrosion Engineers) standard TM0194-2014 for oil and gas system bacterial monitoring. All of our anaerobic media, such as our media for the detection of sulfate reducing bacteria (SRB), are made under strict anaerobic conditions utilizing anaerobic chambers.



QUALITY IS OUR #1 PRIORITY.

All critical quality control parameters such as oxygen exposure, total dissolved solids (TDS) concentration, and pH are closely monitored in our bacterial growth media. Every single case of media can be traced back to the exact date of production, the batch of raw materials used, and the technicians who were involved in the production. All quality control documents are available for each case of media.

CORROSIVE BACTERIA TESTING PRODUCTS:

API-RP38 (API) - Detection of Sulfate Reducing Bacteria (SRB):

What is API?

- API Media was the recommended formula by the American Petroleum Institute in the API-RP38 standard for monitoring SRB in oil and gas systems.
- API is a strictly anaerobic media and is manufactured at BTS inside custom built anaerobic chambers.
- The original API formulation calls for the use of a nail as a source of iron.



False Positive:

If a water source inoculated into API has a significant concentration of dissolved sulfide, this can cause iron sulfide to form and create a false positive.

NEGATIVE:

Clear formula & an iron nail.

POSITIVE:

Iron sulfide precipitate.



HOW IT WORKS

- API contains nutrients such as proteins, organic acids, and sulfate specially formulated to facilitate the growth of oil and gas field SRB.
- The redox potential of properly made API, typically less than -300mV, will allow for the reduction of the sulfate to sulfide by SRB.
- The biogenic sulfide created by SRB then reacts with dissolved iron species, as well as the iron in the nail. This reaction precipitates a black iron sulfide solid. Black precipitation in the vial is a positive indication for SRB.

Modified Postgate's B Media (MPB) - Detection of Sulfate Reducing Bacteria (SRB):

What is MPB?

- This highly sensitive SRB growth medium is currently the NACE TM0194 standard for the cultivation of SRB in oil and gas systems.
- Modified Postgate's B (MPB) Media was formulated by SRB research pioneer John Postgate in 1975.
- MPB is a strictly anaerobic media and is manufactured at BTS inside custom built anaerobic chambers.



False Positive:

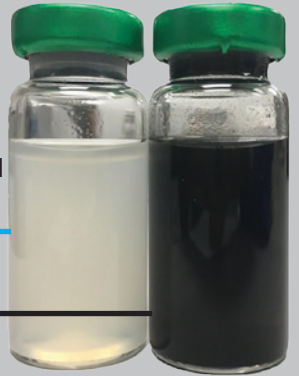
If a water source inoculated into MPB has a significant concentration of dissolved sulfide, this can cause iron sulfide to form and create a false positive.

NEGATIVE:

Opaque off-white coloration.

POSITIVE:

Iron sulfide precipitate.



HOW IT WORKS

- MPB contains nutrients such as proteins, organic acids, and sulfate specially formulated to facilitate the growth of oil and gas field SRB.
- The redox potential of properly made MPB, typically less than -300mV, will allow for the reduction of the sulfate to sulfide by SRB.
- The biogenic sulfide created by SRB then reacts with dissolved iron species in the MPB solution. This reaction precipitates a black iron sulfide precipitate. Black precipitation in the vial indicates a positive for SRB.

Phenol Red Dextrose (PRD) - Detection of Acid Producing Bacteria (APB) and General Heterotrophic Bacteria (GHB):

What is PRD?

- PRD is a nutrient broth that is the NACE TM0194 Standard for the detection of Acid Producing Bacteria (APB).
- PRD is historically an aerobic media to facilitate the cultivation of aerobic and facultative organisms.
- BTS also manufactures Anaerobic PRD (AnPRD) in vials, flats, and cases.



False Positive:

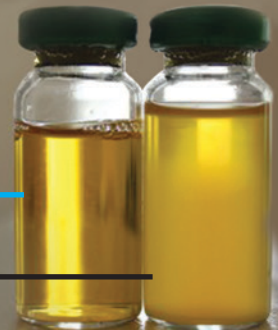
If the pH of a liquid inoculated into the media is low, such as waters containing acidic biocides or chemicals, the vial may immediately turn yellow. This is considered a false positive. Typically, false positive PRD will be yellow without any visible turbidity.

NEGATIVE:

Clear: no turbidity.

POSITIVE:

Turbid from biomass.



HOW IT WORKS

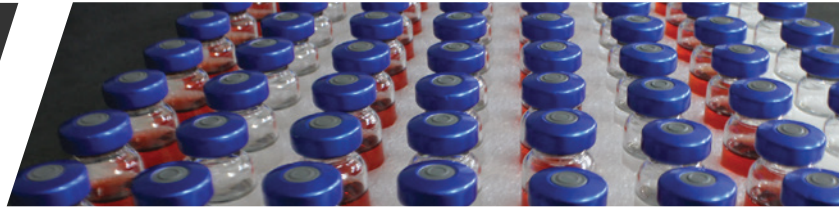
- PRD contains nutrients such as proteins and sugars as well as a colorimetric acid indicator.
- When APB bacteria metabolize the nutrients in the solution, they will create organic acids. These organic acids will lower the pH of the solution and the acid indicator will go from red to yellow/orange.
- Some bacteria can grow in this solution and not produce acid. These bacteria will cause the vial to become turbid or cloudy as biomass forms, however the vials will not turn yellow. These bacteria are known as General Heterotrophic Bacteria (GHB).



ADDITIONAL PRODUCTS & SERVICES:

#1: Mixed Cases of Media.

Get mixed media cases, customized to your exact requirements, in alternating rows of Acid Producing Bacteria (APB) and Sulfate Reducing Bacteria (SRB) media for rapid testing. Our media comes with convenient open top caps, which can be easily wiped with a sterile alcohol prep pad for fast and clean use.



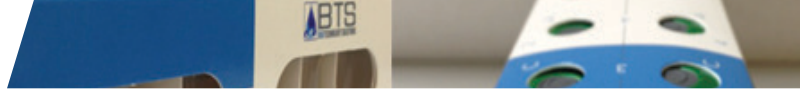
#2: IRB, IOB, MRM, NRB, GHB, SOB, SBN, & TGB.

In addition to bacterial growth media for the detection of Sulfate Reducing Bacteria (SRB) and Acid Producing Bacteria (APB), Biotechnology Solutions also offers bacterial growth media for the detection of Iron Reducing Bacteria (IRB), Iron Oxidizing Bacteria (IOB), Maximum Recovery Media (MRM), Nitrate Reducing Bacteria (NRB), General Heterotrophic Bacteria (GHB), and Sulfur Oxidizing Bacteria (SOB). We can also supply you with Standard Nutrient Broth (SBN) and Thioglycolate Broth (TGB).



#3: Field Cases.

A box of 12 vials for easier handling while in the field.



#4: Sessile Kits.

A kit that has sufficient supplies to process a sessile sample while on location. Each kit contains instructions, a field case with SRB/APB media, PBS vial, syringes, sterile swab and alcohol pads.



#5: Alcohol Pads, Syringes, & Needles.

We stock alcohol pads, syringes, & needles. Get all your corrosion testing accessories from BTS.



#6: New! ATP and Molecular Testing.

BTS now offers 2 additional types of services for corrosive bacterial detection and enumeration: ATP testing and molecular level analysis. Both can be combined with BTS' bacterial growth media to increase test speed and yield further information.

1. ATP: 2nd gen ATP testing provides quick results and quantification of total microbiological population. ATP is best suited to applications where specific bacterial identification is unnecessary and the customer requires rapid information.
2. Molecular Analysis: Complete metagenomic analysis for MIC employs the latest technologies in quantitative polymerase chain reaction (qPCR) for total microorganism quantitation and 16s rRNA gene-based next generation sequencing (NGS) for identifying species and relative populations.

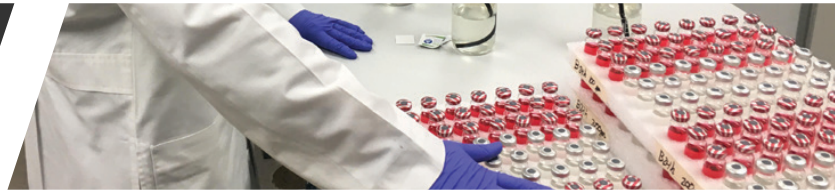
Understanding the quantity and identity of the specific microorganisms found in a water system can help mitigate the effects of MIC through proper biocide treatment program development.



ADDITIONAL PRODUCTS & SERVICES:

#7: **New!** Biocide Efficacy Tests A.K.A. Kill Tests.

BTS can provide your company with biocide testing services. Third party testing, no horse in the race, test what is best for your application or bacteria.



#8: **New!** Uniphos® Gas Detector Tubes & Pumps:

Get Precision piston style air sampling pumps, H₂S, CO, O gas detector tubes, and water vapor detector tubes from Uniphos®. Send in your used pump, in any condition, and get a free replacement pump!



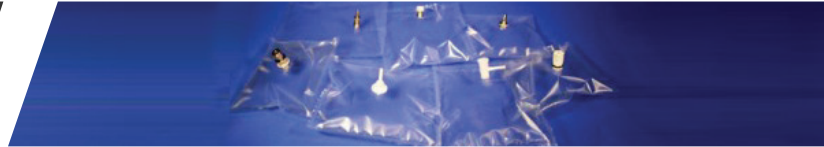
#9: **New!** CHEMetrics Dissolved Oxygen Tests:

CHEMets® dissolved oxygen tests, Dissolved CO₂ tests and Sulfide test kits and refills from CHEMetrics.



#10: **New!** Gas Sampling Bags:

Get Tedlar® gas sample bags, ALTEF gas sampling bags, & multi-layer foil gas sampling bags from BTS.



#11: **New!** Customized Kits:

Everything you need for the field in a tough new field case! Create the perfect combination of BTS media, syringes, alcohol pads, sampling containers, gas detector tubes, pumps, sampling tools, HACH products, CHEMetric products, refractometers, ATP reagents all in high quality Pelican® cases. Any combination you need, BTS will supply at a competitive price.



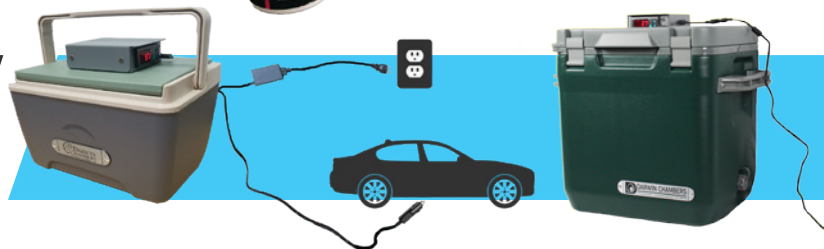
#12: **New!** Hach® Products:

Let BTS supply you with pH testing strips, chloride strips, sulfate/sulfide strips, & nitrate/nitride testing strips from Hach®.



#13: **New!** Incubators:

BTS now offers 2 incubators from Darwin Chambers that have been specifically selected by BTS' technical staff for optimal field use.





CUSTOM MEDIA SOLUTIONS & FIELD MONITORING STANDARDIZATION:

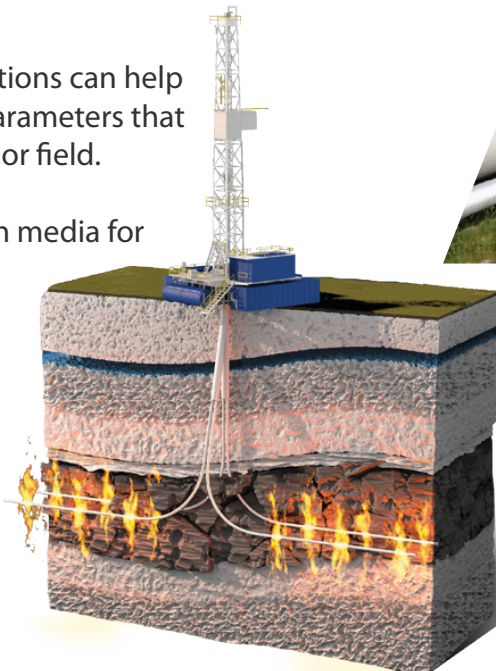
Standardize the culture media in your field with a custom system specific formula to get accurate and consistent results.

Every oil and gas system is different and has its own unique chemistry. Whether you are trying to monitor the bacteria in a waterflood, frac operation, production facility, or pipeline, understanding the chemistry and biochemistry of the water is key to being successful, constant, and accurate. The specific system chemistry can have a major impact on the type of culture media that will be best suited to maximize your recovery and provide accurate quantification of the bacteria you are trying to monitor. This goes far beyond simply matching the total dissolved solids (TDS) of the fluids.

Experts in bacterial culturing at Biotechnology Solutions can help you identify the key nutrients and environmental parameters that will influence the growth of bacteria in your system or field.

Let Biotechnology Solutions create a custom growth media for your company by mimicking as closely as possible, your system's water chemistry and bacterial nutrient sources. This will allow you to standardize your monitoring programs across facilities, fields, pipelines, or even entire formations.

Standardization with optimized formulas not only ensures you have the most accurate results, but it also allows you to have the long term consistency in your monitoring programs across your field, systems or even service providers.



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olmarkassociates@gmail.com | +91 979 939 7506

WANT TO LOWER YOUR COSTS?

Save Money with Bundled Pricing!

Save \$



- **BTS Media.**

Save \$



- **Gas Detector Tubes.**

Save \$

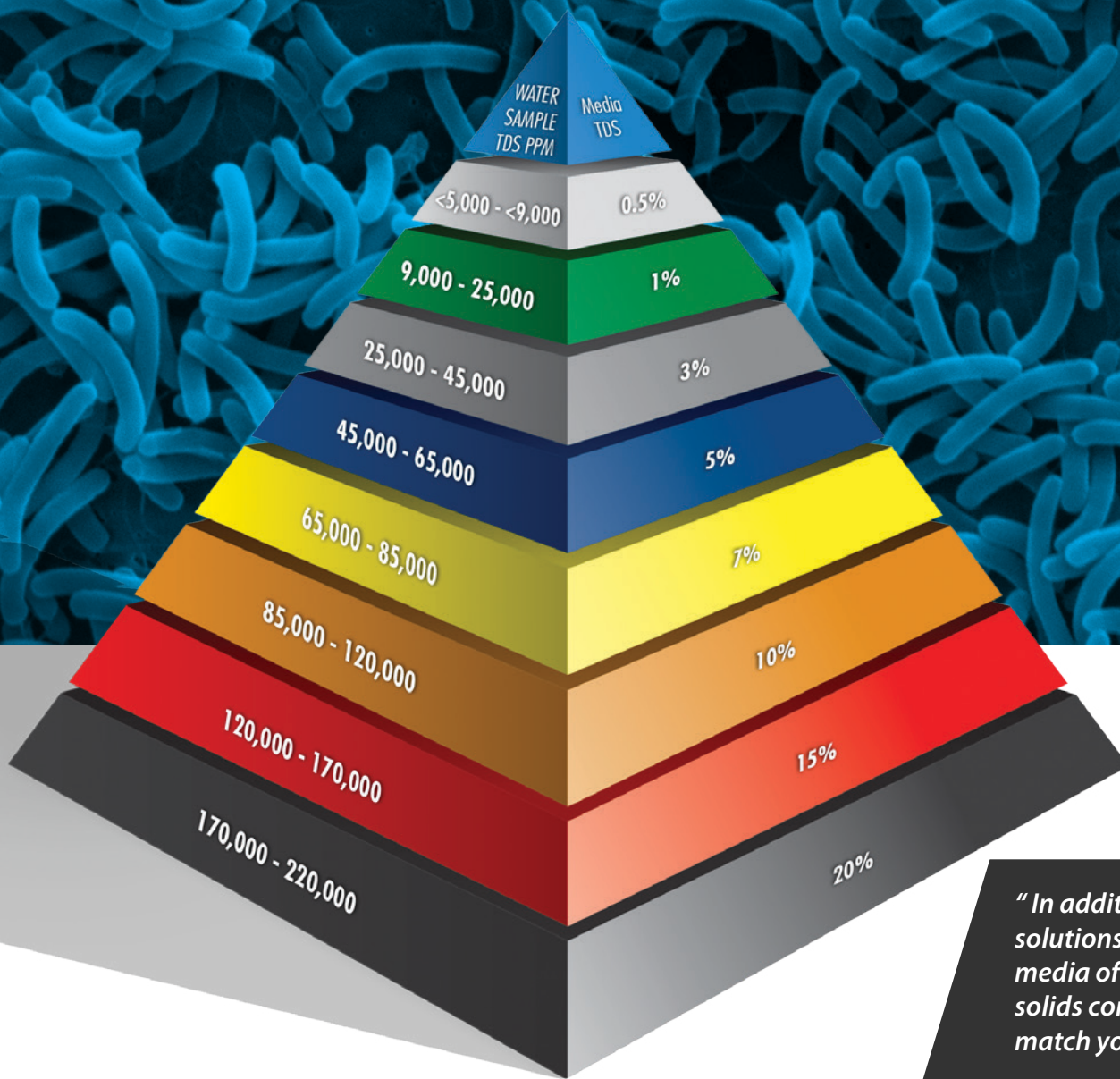


- **Dissolved Oxygen Tests.**

Contact BTS & get bundled pricing by buying these products in bulk combinations. *Start saving money today!*

TOTAL DISSOLVED SOLIDS (TDS):

Cap Color Reference Guide:



"In addition to our standard solutions, we will customize media of any total dissolved solids concentration (TDS) to match your water source".

RESULTS INTERPRETATION TABLE:

"equal to or greater than" (≥) the highest dilution used in the testing.

NUMBER OF POSITIVE VIALS	ACTUAL DILUTION OF SAMPLE	GROWTH (+) INDICATES BACTERIA PER ML	REPORTED BACTERIA PER ML
1	1:10	1 to 9	10
2	1:100	10 to 99	100
3	1:1,000	100 to 999	1,000
4	1:10,000	1,000 to 9,999	10,000
5	1:100,000	10,000 to 99,999	100,000
6	1:1,000,000	100,000 to 999,999	1,000,000



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SULFATE REDUCING BACTERIA (SRB) CULTURING:

GOOD:

BTS Media:

MPB media, when made correctly, will have a milky white opaque precipitate or suspension.



BAD:

Other Media Companies:

MPB media made without anaerobic chambers will have a brown/rusty appearance due to the oxidized iron.



IS YOUR SRB MEDIA WORKING?

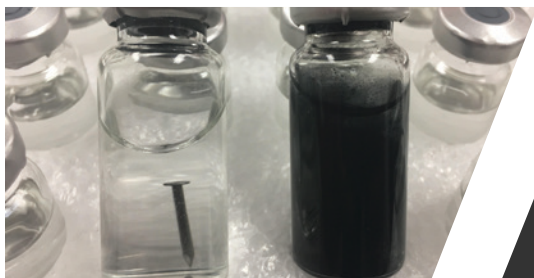
False negative results are the greatest problem for culturing based monitoring, particularly for SRB detection. If the SRB media is not made correctly, especially if not made under strict anaerobic conditions, the redox potential and the oxygen levels in the media will not be optimal for facilitating the growth of SRB.

Most media manufacturing companies cut corners and do not make their anaerobic media correctly. As a result, you may not be accurately detecting the SRB present in your system and experiencing false negative results. Don't let SRB go undetected by utilizing low quality media.



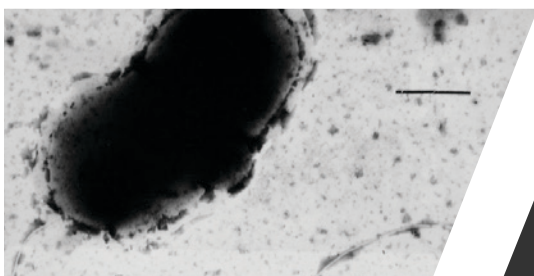
Souring:

Biogenic souring refers to the production of sulfide by Sulfate Reducing Bacteria (SRB): SRB chemically reduce the compound sulfate, a common water component, to sulfide and hydrogen sulfide: extremely hazardous and corrosive compounds.



FeS Formation:

Iron sulfide is biogenically formed when sulfide produced by SRB reacts with iron. The result of this reaction is a black precipitate that can plug perforations, filter systems, and facilitate corrosion mechanisms.



MIC Microbiologically Influenced Corrosion:

SRB are especially adept in the facilitation of microbial influenced corrosion (MIC). Their metabolism and metabolism byproducts are thought to accelerate cathodic depolarization as well as producing extremely corrosive hydrogen sulfide.



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