

Bioreactor: Role in Petrochemical Industry

By

Genesis Technologies

Crude oil normally contains high molecular weight hydrocarbons. Hydrocarbon as fermentation as carbon substrate sources present immense possibilities for future industrial fermentation.

Hydrocarbons are completely reduced to organic compounds containing carbon and hydrogen, but no oxygen atoms in their molecule. Both coal tar and petroleum derivatives are included in this class of substrates. Hydrocarbon may be saturated or unsaturated. Also their molecules may be cyclic, straight, branched chain or mixtures of the two types of structures within the same molecule. This point should be considered in screening programs to obtain hydrocarbon-oxidizing bacteria. Non hydrocarbon oxidizing microorganisms grow reductively in the hydrocarbon oxidizing products and in mixed cultures. Only a few representatives of microbial production may actually attack the hydrocarbon itself.

Microbial attack on a hydrocarbon in the process introduces an O₂ atom into the molecule and produces a compound, which by definition is no longer, a hydrocarbon. This is an important consideration, because the unique characteristics of hydrocarbon oxidizing microorganisms appear to be associated mainly with their ability to bring about the initial attack on the molecule. The hydrocarbon can be attacked if the right organism is allowed with enough incubation time. Thus, microorganism can degrade even a highly toxic hydrocarbon such as toluene.

Hydrocarbon microbiology is of immense interest since hydrocarbon can be used as fermentation substrates. The ability of the microorganisms to utilize hydrocarbons for growth is also finding some use in geologic prospecting for new oil deposits. This is because hydrocarbon gases emanate from these oil deposits and diffuse upward through the overlying soil. The presence of large numbers of hydrocarbon oxidizing microorganisms in the soil is therefore taken as an indication of a possible oil reserve.

It has also been noted that microbiologically induced corrosion in the oil field instruments are common phenomena where corrosion can be due to attack of slime forming bacteria, sulfur bacteria, yeast and molds. By far, most problems arise due to the sulfate reducing bacteria (SRB) of genus *Desulfovibrio* and to a much lesser extent are of the genus *Clostridium* inorganic sulfates as energy sources with the evolution of hydrogen sulfide (H₂S) during the process. Corrosion causing bacteria can be cultivated in bioreactor with possible control options to study biochemical properties of the organisms. The anti corrosion strain can be developed for field trial to check corrosion rate.