

# **CHAPTER III**

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Man has always endeavoured to find solutions for his day-to-day problems by using new chemicals and artificial methods. The solutions to these problems have always been intrinsic in nature, however, man's lack of understanding of nature's complex processes has prevented him easy access to effective, safe products and processes.

Chemical world is being shifted to a biological world with the progress of biotechnology in adopting a methodology for solving various problems of processing industry. This technology essentially involves the creation and application of available knowledge base. There are millions of species of bacteria on earth, some are harmful and some are beneficial. Though infections come from bacteria, in fact most of the bacteria are beneficial to maintain the ecology of the earth. Some species of bacteria are more potent and powerful than others. The process of decomposition or biodegradation of organic matters depends on bacterial action.

Biodegradation is the Earth's natural process of converting organic matter into environmentally safe by-products including water, carbon dioxide and methane gas. This process is accomplished through naturally occurring micro-organisms such as bacteria and fungi. Although these micro-organisms are naturally carrying, certain environmental factors may not be conducive to proper growth of these microbes consequently for the reduction of organic compounds. For instance, nutrient levels, presence of chemicals and atmospheric conditions (viz. variations in temperature, oxygen, and pH levels) can adversely affect growth of these micro-organisms. Nowadays, a number of chemicals are manufactured by feeding a

precursor to a bacterial population, eliminating the need for multi-step chemical syntheses

Excessive organic loading of wastewater may cause oxygen depletion in a water system and lack of oxygen or "oxygen debt" can drive fish away from parts of the water system. Prolonged exposure to low dissolved oxygen levels also increases the susceptibility of aquatic organisms to other environmental stresses and can kill some of the biota - animal and plant life - in a water system. Lack of oxygen will also result in the breakdown of sulphur compounds and cause the water to have an unpleasant odour, affecting its aesthetic value and preventing recreational use. Nutrients such as phosphorous and nitrogen cause eutrophication - the excessive growth of algae and water plants - in a water system. The effects of a heavy loading of suspended solids include milkiness, silting up and shallowing of watercourses. So it should be encouraged to treat the effluent properly before discharging it into wetland. The tanning industries, which generates huge quantities of effluent and solid wastes daily, is responsible for the pollution of environment to a great extent. The following equation gives an idea about the pollution capability of tanning process: *Hide Skin 1kg*    *Water 35l*    *Chemicals 0.5kg* → *Leather 0.3kg*    *Effluent 35l*    *Solid waste 1.2kg*. There are over 3000 tanneries located in 14 states of Indian Territory and the quantum of wastes from tanneries in India is approximately 1 million ton of solids and 60 million cubic meter of effluent per year.

Uncontrolled growth of tanneries have generated huge quantity of liquid and solid wastes. Unscientific method and practices of disposal of wastes have attracted the attention of public and the tanneries are required to take all appropriate control systems for abatement of pollution to meet the standards prescribed by the Pollution Control Boards.

Bioclean cultures are specifically used to resolve problems in wastewater systems receiving high-strength effluents for many industry. They have been selectively adapted through a scientific process that develops the bacteria and allows them to degrade tough and toxic compounds that would normally overwhelm naturally occurring bacteria. The Bioclean culture Series is designed to make good systems operate better and significantly improve conditions in problematic effluent treatment plants. These microbes increase the efficiency of the plants without the need for increasing plant capacity, thereby saving electricity costs.

### **III.1. Benefits of Bioclean cultures :**

- Digests difficult compounds that are toxic to naturally occurring bacteria or existing generic bacteria
- Provides rapid breakdown of difficult-to-degrade substances viz. surfactants, fats, oils, sulphides, mercaptans, phenols, cresylates, hydrocarbons, aromatic compounds etc
- Cultures grow either in presence or in absence of oxygen.
- Bio-culture is the only bio-product that can perform efficiently in effluents having high Total Dissolved Solids (TDS)
- No modification of the current process is required.
- Low treatment cost. Increases efficiency of the treatment plant and saves energy costs.
- Typically costs a fraction of a paisa to treat a litre of effluent.
- Odour control because of complete biodegradation of organic compounds.

- Generates minimum sludge as most of the waste is converted to carbon dioxide and water
- Non-corrosive, non-pathogenic and also usable in small quantities, making it safe and easy to handle and store

It is therefore, necessary to pay attention for the treatment of effluent with effective microbes to improve the ETP of Leather Industries.

### **III.2. The present work has been taken with a view to :**

1. Study the physico-chemical properties of the tannery effluent
2. Study the efficiency of different bacteria in secondary treatment process.
3. Identify the more efficient bacteria in secondary treatment process.
4. Study the percentage organic load decreasing ability of the efficient bacteria singly and in combination