

I INTRODUCTION

1.1 General Background

Production of tapioca starch is one of the most important agro-industries in Thailand. Most of tapioca starch mills are located in Chonburi, Rayong and Nakornrachsima provinces. Altogether there are about 50 first grade and 200 second grade tapioca starch mills in a country.

Tapioca starch industry can be classified as one of the most polluting industries considering the volume of wastewaters and the amount of pollutants generated per unit weight of product. Processing one ton of tapioca roots yields approximately 200 kgs of starch and one ton of starch releases about 30-50 m³ of wastewaters containing 4000 - 6000 mg/l of BOD₅. Based on these figures a medium sized mill producing 60 tons of starch per day would discharge 2,400 m³/day of wastewaters. The total BOD₅ load would be 12,000 kg/day which is equivalent to the amount of wastes generated by 180,000 persons. It has been estimated that this particular industry contributes over 97 % of the total pollution load generated in the areas of Chonburi and Rayong. Hence, the industry is entirely responsible for serious pollution problems found in streams, rivers, and coastal waters in the area.

Treatment of tapioca starch wastes using a conventional process has been found to be uneconomically feasible to almost all factories because of their low financial and technical capability. The wastewaters are acidic, turbid, deficient in essential bacterial nutrients, and high in organic content. A conventional process of treatment such as activated sludge process will require pH adjustment and nutrient supplement, thus significantly increasing the already high cost of treatment. Anaerobic and facultative ponds in series were found to be an ideal method of treatment, but a very large area would be required. Apparently a low-cost technology of waste treatment is sorely needed in tackling water pollution problems caused by this industry.

1.2 Purposes of Research

After reviewing technical and economic feasibility of various processes of waste treatment the anaerobic filter process was considered to be the most ideal process for tapioca starch wastes considering characteristics of the wastewater, tropical environment, and high efficiency and simplicity of the process. Consequently, this research was initiated with the following purposes;

- 1) to collect and collate information on performance of anaerobic filters in treating industrial wastes,
- 2) to conduct a treatability study of tapioca starch wastes employing a laboratory-scale anaerobic filter,
- 3) to investigate effects of such factors as pH, nutrient, organic loading, etc., on the efficiency of the process,
- 4) to establish optimum design criteria for full-scale application and,
- 5) to evaluate technical and economic feasibility of the process.

1.3 Scope of Investigation

In this research an extensive literature review was conducted on the subjects of tapioca starch waste treatment, and theoretical and practical aspects of anaerobic waste treatment with particular emphasis on the anaerobic filter process. A pilot anaerobic filter was constructed and used in continuous treatment of tapioca starch wastes for a period of 62 days starting from February 17, 1975 to April 19, 1975. The pilot study was devoted to detailed investigation of the effects of pH, nutrient, alkalinity, organic loading, and filter height on the process performance under normal ranges of ambient temperatures and waste strength. The results obtained were analysed to work out optimum design parameters for full-scale application, and to arrive at concrete conclusion on applicability of the process. Recommendations on full-scale application of the process were finally presented.