Chapter I

INTRODUCTION

During the past one or two years, intensive interest in the problem of impurities contaminants in water supplies has been shown. Many types of compounds are coming under scruting at the present time, and removal of these may prove necessary in the future. These compounds originate from industrial and municipal discharges, agricultural runoff and other nonpoint sources, decaying vegetation, and reaction of water treatment chemicals such as chlorine, with agueous organic matter. Technological advances have created various treatment processes for removing impurities in water, such as adsorption, distillation, crystallization and solvent extraction. Adsorption system with activated carbon, as a unit process, is of major significance where highest product purity is required. It affords a most effective means of removing last trace contaminants and of using in the chemical industries for a wide range of solute solvent separations. There are certain applications where adsorption, although effective, proves too costly because of the volume of impurities to be removed Conversely, adsorption with activated carbon usually becomes economical where standard methods become too costly. A common practice is combining the concepts of adsorption with distillation, crystallization or solvent extraction to even better the end product and further reduce processing costs. Definition of conditions for most effective and efficient use of adsorption on activated carbon in the waste water treatment application is complicate by the heterogeneity of the solvent system, by the variability in concentration and composition of the waste components, by the variability and relative lack of control of systemic variables such as pH. These and similar characteristics of waste waters must dictate the method and specific conditions of operation. However, certain qualitative operating criteria can be set forth on the basis of knowledge of the general behavior of adsorption systems. By way of example, the desirability of utilizing as small an adsorbent particle size as operational conditions permit is well recognized. With particulate matter in the solution being treated, fine adsorbent particle sizes can lead to serious problems of clogging and servere head loss in columnar operation with packed beds.

One method for taking advantage of fine adsorbent particle size and get avoiding head-loss and air binding problems normally associated with packed-bed operation with fine media is to employ a fluidized-solid contacting technique or moving bed system. Moving bed system is often more economical and efficient. In the moving bed columnar, the flow of liquid is up through the carbon bed, which the carbon advances periodically down through the column. The column used are usually in cone shape for complete and rapid discharge of carbon, the adsorbent. Generally a cone between 45-60 degree is adequate for good discharge.

Activated carbon has long been a substance of great importance in removal of small concentrations of dissolved substances from liquids. Its applications range from domestic water supply and numerous process industries through use as a pharmaceutical and "cleaning up" of organic laboratory preparation. Recent studies indicate the economic feasibility of purifying industrial and municipal waste waters by adsorption especially on activated carbon. Both single-solute and multi-solute adsorption from dilute liquid solution have been studied. This thesis concerns both, especially the latter case at which little attention has been given.