SECTION 6

DISINFECTION: CHLORINATION

INTRODUCTION

Until recently, chlorination was considered virtually an unmixed blessing as a cheap, effective method to destroy bacteria and viruses. It is now recognized, however, that chlorination of wastewater may create chlorinated compounds harmful to the environment and to human health. The extent of this potential hazard has not yet been determined; new and existing wastewater treatment plants continue to utilize chlorine for disinfection. The primary purpose of municipal wastewater chlorination is the destruction of pathogenic microorganisms. This is reflected in the literature reviewed, shown in Table 44.

WATER QUALITY PARAMETERS

Zaloum and Murphy (711) concluded that chlorination of treated wastewater effluents does not reduce BOD, COD, and total organic carbon. Susag (1346), however, found BOD reductions by chlorination of up to 2 mg/ℓ per mg/ℓ of chlorine added. These values are somewhat misleading, in that BOD reduction was due both to oxidation of the organic material and to the formation of chlorinated organics resistant to bacterial action.

When chlorine is added to a wastewater containing ammonia nitrogen, ammonia reacts with the hypochlorous acid formed to produce chloramines. Further addition of chlorine converts the chloramines to nitrogen gas. The reaction is influenced by pH, temperature, contact time, and initial chlorine-to-ammonia ratio. If sufficient chlorine is added, 95 to 99 percent of the ammonia will be converted to nitrogen gas with no significant formation of nitrous oxide. The quantity of chlorine required was found to be 10 parts by weight of chlorine to 1 part of ammonia nitrogen when treating raw sewage. This ratio decreased to 9:1 for secondary effluents, and 8:1 for lime-clarified and filtered secondary effluent (627).

ELEMENTAL CONTAMINANTS

Little information is available on the minimal removal by chlorination of elemental contaminants. Andelman (16) studied