allowing for some variation in instantaneous wastestream flows and acidity. This surge capacity is required because the dynamic response of the solids feeding and slaking system would be too slow for direct automatic pH control. The 9 by 9 by 10-foot deep neutralization basin was chosen to provide ten minutes retention to a peak flow of three times the average. The use of an automatically adjustable slurry feeder is recommended for feeding the lime slurry to the neutralization basin. The abrasive and plugging characteristics of lime slurry make throttling by conventional control valves difficult and troublesome.

The limestone pits for neutralizing hydrochloric acid have been scaled from pits in similar service at Institute, West Virginia. Influent hydrochloric acid and dilution water should be sparged evenly over the bottom of the pit with the neutralized effluent overflowing near the top. Gases emitted from the pit should be collected by a blower and discharged at a height of at least 12 feet. Polyester-Fiberglas pipe, or equivalent, should be used for streams containing HCl including the blower suction and discharge piping. Two pits have been shown to allow one to be out of service for cleaning while operating the other. If the available limestone is of sufficient quality to allow infrequent cleaning and if cleaning can be scheduled during normal down time, one pit may be adequate.

The 22-acre, 15-foot deep evaporation pond represents the minimum size suitable for both evaporating the 180 gallons per minute of wastewater and providing ultimate disposal of dissolved and suspended solids. To avoid danger of polluting subsurface water supplies in the Bhopal area, this pond should be lined with clay suitable for rendering the pond bottom and dikes impervious to water. The 22-acre surface area is based on a total evaporation rate of 10.4 gallons per minute per acre of which 2.4 is required to balance rainfall and 8.0 is required to evaporate wastewater influent. The evaporation rate was estimated by the use of data from portions of the United States felt to be possibly similar to the climatic conditions at Bhopal. The true value should be checked on-site, using actual weather data for the Bhopal area. The 15-foot depth was selected to provide one to two years of solids disposal capacity based on a requirement of 143 to 286 acre-feet per year. This preliminary geometry for the evaporation pond should be optimized with consideration to terrain and soil conditions. However, the chosen design must conform to the restraints of adequate surface area for evaporation plus adequate volume for solids disposal. It should be further recognized that if the proposed pond geometry is selected, new ponds will have to be constructed at one to two-year intervals throughout the life of the project.

Potential Problems

One potential problem for which no provision has been made in the proposed design is the possibility of floating oils decreasing the estimated rate of evaporation from the pond. In addition to the free oils such as toluene contained in the aqueous wastes, some of the organic salts that are dissolved in the acid wastes may be liberated by neutralization. This problem should be studied in further detail. It may be necessary to include either a skimming or steam distillation step between the neutralization basin and evaporation pond. A skimming operation at this point would be complicated by the high level of suspended and settleable solids.

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Attach.