TABLE 16.3 Comparison between Biological Trickling-filter and Activated-sludge Waste-water Treatment Processes

Item	Filter	Sludge tank
Capital costs	High	Low
Operating costs	Low	High
Space requirements	High	Low
Aeration control	Partial except in enclosed forced-draft types	Good
Temperature control	Difficult	Possible; heat losses small
Sensitivity to variations in applied feed concentrations	Fairly insensitive but slow to recover if upset	More sensitive, but recovery is rapid
Clarity of final effluent	Good	Not as good
Fraction of soluble organics removed	70%–90%	85%–95%
Typical θ_H		
Low rate	6 to 48 h	4 to 6 h
High rate	0.75 to 4 h	
Fly and odor nuisance	High	Low

where η is the effectiveness factor, L is the thickness of the biofilm (cm), r_m is the maximum rate of removal of substrate (mg S/l · s), and S_0 is the substrate concentration in the bulk liquid (mg/cm^3). Typical values for r_m are 0.2 to 0.5 mg S/l · s. Substituting eq. 16.42 into eq. 16.41 yields

$$-F\frac{dS_0}{dz} = \eta\frac{r_m S_0}{K_s + S_0} LaA \tag{16.43}$$

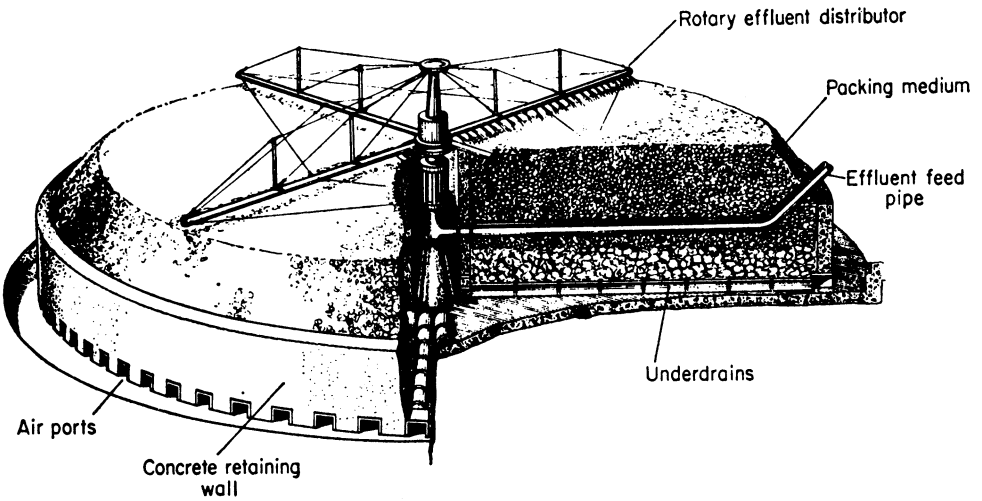

Figure 16.8. Typical trickling biological filter. (With permission, from J. W. Abson and K. H. Todhunter, in N. Blakebrough, ed., *Biochemical and Biological Engineering Science,* Vol. 1, Academic Press, New York, 1967, p. 326.)