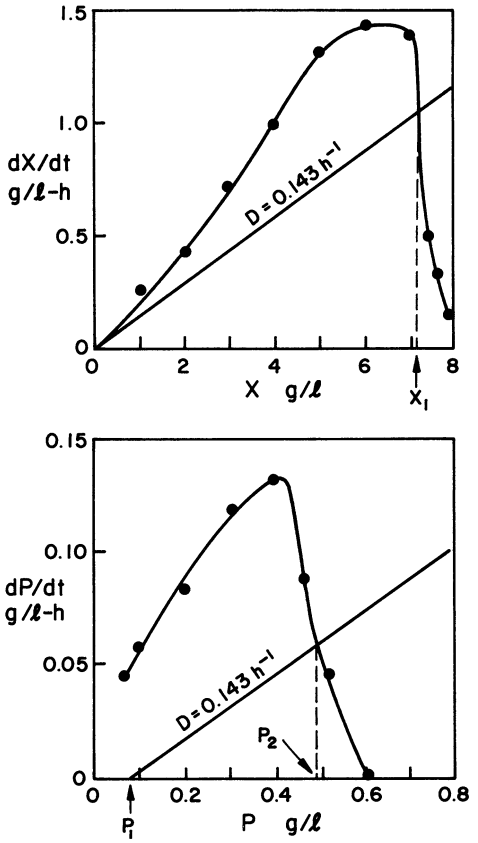

Figure 9.7. Solution to Example 9.2 using alternative graphical approach.

where S_0 is the initial substrate concentration, $Y^M_{X/S}$ is the yield coefficient, and X_0 is the initial biomass concentration. When biomass concentration reaches its maximum value (X_m), the substrate concentration is very low, $S << S_0$, and also $X_0 << X$. That is, $X_m \approx Y^M_{X/S} S_0$. Suppose that at $X_m \cong Y^M_{X/S} S_0$, a nutrient feed is started at a flow rate F, with the substrate concentration S_0. The total amount of biomass in the vessel is $X' = VX$, where V is the culture volume at time t. The rate of increase in culture volume is

$$\frac{dV}{dt} = F \tag{9.28}$$

Integration of eq. 9.28 yields

$$V = V_0 + Ft \tag{9.29}$$

where V_0 is the initial culture volume (l).

The biomass concentration in the vessel at any time t is

$$X = X'/V \tag{9.30}$$