RINGKASAN

Analisis dan penentuan konstanta-konstanta biokinetika dari sampel air limbah industri telah dilakukan untuk sistem aerator Bacth dan Kontinu. Perubahan konsentrasi substrat,[S], dan konsentrasi biomass,[X], pada waktu tertentu masing-masing diikuti melalui penentuan COD (Chemical Oxigen Demand) dan SS (Suspended Solid). Percobaan dilakukan pada suhu 28 ^{o}C tanpa kondisi mikrobiologis yang khusus.

Untuk sistem Kontinu diperoleh harga-harga K_o, K_m, K_d dan y untuk sampel air limbah X berturut-turut 0,77891 jam^{-1} ; 183,714 mg L^{-1} ; 0,08762 jam^{-1} dan 0,86936 dengan persamaan kinetika peruraian substrat (bahan organik terlarut) dan pembentukan sel/biomass terhadap waktu sebagai berikut :

$$[S] = \frac{183,714\ (1 + 0,08762.t)}{t(0,77891 - 0,08762) - 1}\ \text{mg L}^{-1}$$

$$[X] = \frac{0,86936\ ([S] - [S]_o)}{(1 + 0,08762.t)}\ \text{mg L}^{-1}$$

Sedangkan untuk sistem Bacth berturut-turut 0,01715 jam^{-1} ; 593,385 mg L^{-1} ; 0 (asumsi) dan 0,79629 dengan persamaan kinetika berikut :

$$[S] = [S]_o\ .\ \exp -(0,01715.\overline{[X]}.t/10,1765)\ \text{mg L}$$

$$[X] = [X]_o\ .\ \exp\ (0,01715.t)\ \text{mg L}^{-1}$$

Tampak bahwa pengolahan dengan sistem aerator Kontinu lebih menguntungkan daripada sistem Bacth, karena komposisi dalam reaktor lebih terkendali dan konsentrasi substrat pada waktu tertentu,[S], tidak tergantung dari konsentrasi substrat awal,[S]o. Demikian pula asumsi/pendekatan kinetika yang digunakan untuk sistem Kontinu lebih tepat karena faktor kematian/respirasi endogen dari mikroorganisme dilibatkan dalam pembentukan persamaan kinetikanya.

SUMMARY

By using samples taken from an industrial wastewater treatment plant, analysis and determination of biokinetic constants were done for Bacth and Continuous aerator system. Both COD (Chemical Oxigen Demand) and SS (Suspended Solid) values were determined in following the changes in the substrate concentration,[S], and biomass concentration,[X], respectively. The experiment was carried out at 28 °C without any specific microbiologis condition.

For Continuous system, the obtained value of each K_o, K_m, K_d and y is 0.77891 h^{-1} ; 183,714 mg L^{-1} ; 0.08762 h^{-1} and 0.86936, respectively. The resulting kinetic equations of substrate (soluble organic substances) removal and biomass production are

$$[S] = \frac{183,714\ (1 + 0,08762.t)}{t(0,77891 - 0,08762) - 1}\ \text{mg}\ L^{-1}$$

$$[X] = \frac{0,86936\ ([S] - [S]_o)}{(1 + 0,08762.t)}\ \text{mg}\ L^{-1}$$

For Bacth system, the values of each K_o, K_m, K_d and y is 0.01715 h^{-1} ; 593.385 mg L^{-1} ; 0 (with assumtion) and 0.79629, respectively. The resulting kinetic equations are

$$[S] = [S]_o\ .\ \exp -(0,01715.\overline{[X]}.t/10,1765)\ \text{mg}\ L$$

$$[X] = [X]_o\ .\ \exp\ (0,01715.t)\ \text{mg}\ L^{-1}$$

Aeration process with continuous system is better than the bacth system, since the composition of such a reactor system is easier controlled, and the remaining (efluent) substrate concentration,[S], is independent of the initial (influent) substrate concentration,$[S]_o$. In addition, the kinetic assumtions and approaches adopted for continuous system were more valid, since the endogenous respiration factor was also considered in the formation of the kinetic equations.