



Pengaruh Udara Pemanas dalam Proses Filtrasi Sentrifugasi (*Centrifuge Dryer*) Terhadap Perpindahan Massa Cairan

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INTISARI

Kombinasi pemisah mekanis dan termal dalam teknologi pengeringan modern telah banyak digunakan di industri seperti proses filtrasi sentrifugasi dengan pemanasan (*Centrifuge Dryer*) di industri gula. Metode ini dapat membantu proses pemisahan mencapai kondisi optimal dan efisiensi proses. Saat ini pemodelan matematis perpindahan massa cairan dan parameter-parameter untuk perancangan alat *Centrifuge Dryer* belum banyak tersedia. Untuk itu perlu dilakukan studi mengenai kombinasi kedua metode tersebut. Penelitian ini dilakukan dengan cara mengalirkan udara panas ke dalam tabung filtrasi sentrifugasi dan menghitung kadar air dalam padatan *cake* secara berkala. Model perpindahan massa cairan dirumuskan untuk memprediksi profil kandungan cairan dalam *cake*, profil pertumbuhan *cake* dan nilai parameter koefisien perpindahan massa. Variabel yang dipelajari yaitu konsentrasi umpan slurry (0,65-0,45 gr kapur/gr slurry), suhu udara panas (50°C-90°C) dan kecepatan udara panas (1,283 dan 4,147 m/s). Hasil penelitian menunjukkan bahwa udara panas memberi pengaruh signifikan saat fase drainase. Semakin tinggi suhu dan kecepatan udara panas maka semakin kecil kandungan cairan dalam *cake*. Dari perhitungan model diperoleh nilai koefisien perpindahan massa berkisar dari 0,019 hingga 0,1452 kmol/(m²s) dan nilai permeabilitas *cake* berada pada rentang 8,48 x 10⁻¹⁴ hingga 1,36 x 10⁻¹³ m⁴/(Ns).

Kata kunci : kombinasi, filtrasi sentrifugasi, udara panas, perpindahan massa, koefisien perpindahan massa, permeabilitas *cake*.

ABSTRACT

The combination of mechanical and thermal separation in modern drying technology has been widely used in industrial such as filtration centrifuge combined with heating (Centrifuge Dryer) in sugar industry. This method can help the process of separating achieves optimum conditions. Currently mathematic modeling of liquid mass and the parameters for the design Centrifuge Dryer equipment are not available. Therefore it is necessary to conduct a study of both methods. This research was conducted by flowing heating air into the filtration centrifuge tube and measure the water content in the solid cake is periodically. The development of liquid mass transfer models is formulated to predict the fluid content profile in the cake, cake growth profile and value of the mass transfer coefficient parameter. The variables studied were feed slurry concentration (0.65 to 0.45 g lime/g slurry), heating air temperature (50°C-90°C) and heating air flow rate (1.283 and 4.147 m/s). The results showed that the heating air had significant effect at the drainage phase. The higher the temperature and dryer air flow rate, the smaller the fluid content in the cake. The results of model simulations show that the developed model can illustrate the combination of filtration centrifuge with heating. From the model calculation of mass transfer coefficient values obtained ranged from 0.019 to 0.1452 kmol/(m²s) and the cake permeability values were in the range of 8,48 x 10⁻¹⁴ hingga 1,36 x 10⁻¹³ m⁴/(Ns).

Keywords: combination, centrifugation filtration, heating air, liquid content, mass transfer coefficient, cake permeability.