OSF – Redução da granulometria de sólidos

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Conteúdo

Questão 1

A material is crushed in a Blake jaw crusher and the average size of particle reduced from 50 mm to 10 mm with the consumption of energy at the rate of 13.0 kW/kg s. What will be the consumption of energy needed to crush the same material of average size 75 mm to an average size of 25 mm:

Q1 a. Assuming Rittinger's law applies?

Resposta (1)

Energy comsumption

$$E(75,25)/\mathrm{kW/kg\,s} = \overset{\text{Rittinger's Law}}{=} K_R\, f_c \left((25)^{-1} - (75)^{-1}\right) \cong 5.128\,\mathrm{E}^{-3} \left((25)^{-1} - (75)^{-1}\right) \cong 1.368\,\mathrm{E}^{-4}; \tag{1}$$

$$E(30,10)/\mathrm{kW/kg\,s} = 13.0 = \overset{\text{Rittinger's Law}}{=} K_R\, f_c \left((10)^{-1} - (30)^{-1}\right) \implies K_3\, f_c \cong 5.128\,\mathrm{E}^{-3}$$

Q1 b. Assuming Kick's law applies?

Resposta (2)

Calculating energy comsumption

$$E(75,25)/\mathrm{kW/kg\,s} = \overset{\text{Kick's law}}{=} K_k\, f_c \ln\frac{L_1}{L_2} \cong 8.077 \ln\frac{75}{25} \cong 8.874; \tag{2}$$

$$E(50,10)/\mathrm{kW/kg\,s} = 13.0 = \overset{\text{Kick's law}}{=} K_k\, f_c \ln\frac{L_1}{L_2} = K_k\, f_c \ln\frac{50}{10} \implies K_k\, f_c = \frac{13}{\ln(50/10)} \cong 8.077$$

Which of these results would be regarded as being more reliable and why?

Resposta

A reductiong of $(75 \to 25)$mm can be considered coarse for which Kick's law is more accurate

Q1 c.

A crusher was used to crush a material whose compressive strength was $22.5\,\mathrm{MN/m^2}$. The size of the feed was *minus* $50\,\mathrm{mm}$, plus $40\,\mathrm{mm}$, and the power required was $13.0\,\mathrm{kW/kg/s}$. The screen analysis of the product was as follows:

Minimum size/mm		Quantity Product/%
Through	6.000	100
On	4.000	26
On	2.000	18
On	0.750	23
On	0.500	8
On	0.250	17
On	0.125	3
Through	0.000	5

What would be the power required to crush $1\,\mathrm{kg/s}$ of a material of compressive strength $45\,\mathrm{MN/m^2}$ from a feed *minus* $45\,\mathrm{mm}$

Resposta

Calculating energy required

> Reduction from *minus* $45.000\,\mathrm{mm}$ can be considered

Questão 4

Se se regularem uns rolos de moagem de 1 m de diâmetro de tal modo que as superfícies de moagem fiquem à distância de 12.5 mm e o ângulo de presa for 31°

Q4 a.

qual é o tamanho máximo de partículas que se deveria introduzir nos rolos?

Resposta

$$\cos\alpha = \cos(31/2) = \frac{r_1 + b}{r_1 + r_2} = \frac{(1.0/2) + (12.5/2)}{(1.0/2) + r_2} \implies$$

$$\implies r_2 = \frac{0.5 + 6.25}{\cos(31/2)} - 0.5 = \frac{0.5 + 6.25}{\cos(31/2)} - 0.5 \cong 6.505\,\mathrm{m}$$

Q4 b.

Se a capacidade real da máquina é 12% da teórica, calcular o ritmo de produção em $\mathrm{kg\,s^{-1}}$, quando a funcionar a 2.0 Hz, se a superfície de trabalho dos rolos tiver 0.4 m de comprimento e se a alimentação pesar 2500 $\mathrm{kg/m^3}$.

Resposta

$$\dot{m} = z\,A\,\mu\,\rho$$