Models for erosion prediction in gas–particle flows

Experimental prediction of erosion intensity function :

$$\boxed{E = E(\alpha_1, V_{P1}, k, f, T, \ldots)}$$

for the combination of particle and wall material.

1. Erosion model by Grant & Tabakoff / Elfeki (1975, 1987)

$$
\begin{aligned}
E &= k_1 f(\beta_1) V_1^2 \cos^2 \beta_1 \left[1 - R_T^2\right] + f(V_{1N}) \\
f(\beta_1) &= \left[1 + k_2 (k_{12} \sin(\beta_1 \frac{90}{\beta_0})\right]^2 \\
R_T &= 1 - k_4 V_1 \sin \beta_1 \\
f(V_{1N}) &= k_3 (V_1 \sin \beta_1)^4
\end{aligned}
$$

where β_0 is the impingement angle with the highest erosion intensity.

For quartz particles, $d_P = 10 \ldots 165 \mu m$, and stainless steel 410 the following material parameters are used :

$$
\begin{aligned}
k_1 &= 6.07 \cdot 10^{-6} \\
k_2 &= \begin{cases} 1.0 & \text{für} \quad \beta_1 \leq 2\beta_0 \\ 0.0 & \text{für} \quad \beta_1 > 2\beta_0 \end{cases} \\
k_{12} &= 0.293328 \\
k_3 &= 5.56 \cdot 10^{-13} \\
k_4 &= 0.0017 \\
\beta_0 &= 30^\circ
\end{aligned}
$$

Investigation of Particle Separation in Symmetrical Double Cyclone Separators

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