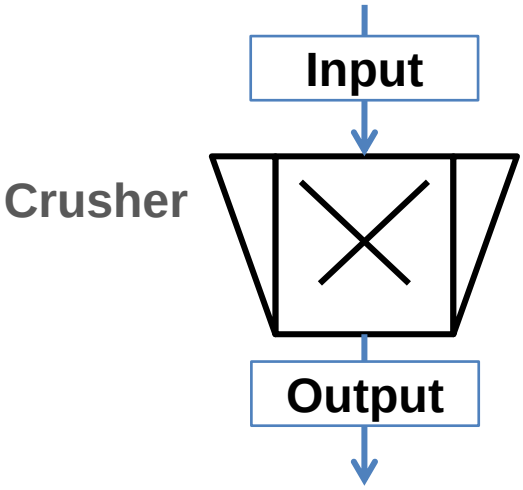
Crusher Cone

General description



This model is used to perform milling of the input stream.

$$w_{out,i} = \sum_{k=0}^{i} w_{in,k} S_k B_{ki} + (1 - S_i) w_{in,i}$$

- $w_{out,i}$ is the mass fraction of particles with size i in output distribution
- $w_{in,i}$ is the mass fraction of particles with size i in inlet distribution
- S_k is the mass fraction of particles with size k, which will be crushed
- B_{ki} is the mass fraction of particles with size i, which get size after breakage less or equal to k

The King selection function is used to describe S_k:

$$S_k = \begin{cases} 0, x_k \leq x_{min} \\ 1 - \left(\frac{x_{max} - x_i}{x_{max} - x_{min}} \right)^n, x_{min} < x_k < x_{max} \\ 1, x_k \geq x_{max} \end{cases}$$

$$x_{min} = CSS \cdot \alpha_1$$

$$x_{max} = CSS \cdot \alpha_2$$

- x_k is the mean particle diameter in size-class k
- CSS is the close size setting of a cone crusher
- α_1, α_2, n are the parameters of the King selection function

To calculate B_{ki}, the Vogel breakage function is used:

$$B_{ki} = \begin{cases} 0.5\left(\frac{x_i}{x_k}\right)^q \left(1 + tanh\left(\frac{x_k - x'}{x'}\right)\right) \\ 0, i < k \end{cases}$$

- x' is the minimum fragment size which can be achieved by crushing
- q is the parameter of the Vogel breakage function

Unit parameters:

Name	Symbol	Description	Units	Valid values
CSS	CSS	Close size setting of a cone crusher. Parameter of the King selection function	[m]	CSS > 0
alpha1	α_1	Parameter of the King selection function	[-]	0.5 ≤ alpha1 ≤ 0.95
alpha2	α_2	Parameter of the King selection function	[-]	1.7 ≤ alpha2 ≤ 3.5
n	n	Parameter of the King selection function	[-]	1 ≤ n ≤ 3
d’	x'	Minimum fragment size, achieved by crushing. Parameter of the Vogel breakage function	[m]	d’ > 0
q	q	Parameter of the Vogel breakage function	[-]	

Requirements

- Solid phase
- Particle size distribution

Application example

- *Example Flowsheets/Units/Crusher Cone.dlfw*
- *Example Flowsheets/Processes/Agglomeration Process.dlfw*

References

R. P. King, Modeling and simulation of mineral processing systems, Butterworth & Heinemann, Oxford (2001).

L. Vogel, W. Peukert, Modelling of Grinding in an Air Classifier Mill Based on a Fundamental Material Function, KONA 21 (2003) 109-120.