Classifier Partition Curve with Bypass and Imperfection

Corrected and actual partition to underflow at a size from d50c, sharpness m and water bypass, with actual d50, d25, d75, imperfection and stages in series.

Method: Wills and Finch; Wills' Mineral Processing Technology; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Corrected cut size	125.00	µm
Sharpness of separation	1.7000	
Bypass (fraction of feed water to underflow)	32.000	%
Particle size of interest	150.00	µm
Identical classifiers in series (each re-treating the overflow)	1.0000	

Calculated results

Parameter	Value	Unit
Corrected partition to underflow	61.132	%
Actual partition to underflow	73.570	%
Actual cut size (S = 50 %)	77.493	µm
Size with 25 % corrected partition	74.517	µm
Size with 75 % corrected partition	187.93	µm
Imperfection	0.45364	
Recovery of size d to the combined underflow of N in series	73.570	%

Notes for this case

• The corrected curve is the Plitt/Whiten form fitted by d50c and m; the actual curve adds the fines carried to the underflow with the water (bypass, Kelsall). m above 3 is rare in cyclones. Imperfection here uses the corrected curve.

Formula and method

$$C(d) = 1 - \exp\left[-0.693\left(\frac{d}{d_{50c}}\right)^{m}\right], \quad S = R_f + (1 - R_f)C, \quad I = \frac{d_{75} - d_{25}}{2d_{50}}, \quad R_N = 1 - (1 - S)^N$$

Variables

d_{50c}	Corrected cut size	m
m	Sharpness of separation	-
R_f	Bypass (fraction of feed water to underflow)	-
d	Particle size of interest	m
N	Identical classifiers in series (each re-treating the overflow)	-
$C(d)$	Corrected partition to underflow	-
$S(d)$	Actual partition to underflow	-
d_{50}	Actual cut size (S = 50 %)	m
d_{25}	Size with 25 % corrected partition	m
d_{75}	Size with 75 % corrected partition	m
I	Imperfection	-
$R_N(d)$	Recovery of size d to the combined underflow of N in series	-

Method and standards

Partition curve with bypass.

Assumptions and limits

- Plitt/Whiten curve shape; bypass equal to water split.

References

- Wills and Finch
- Wills' Mineral Processing Technology
- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 9
- eqs. 9.16-9.19 (Plitt, 1976; Kelsall, 1953)
- eq. 9.28 (Svarovsky and Thew, 1984) and Example 9.2

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/mining-minerals/classification-partition-curve

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