Screen Passage Probability and Vibration g-Force

Gaudin's probability that a particle passes a square aperture, the open area, the chance of passing in n presentations, and the vibration g-force of the screen.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Aperture size (square)	10.000	mm
Wire diameter	2.5000	mm
Particle size	7.0000	mm
Number of presentations to the deck	20.000	
Vibration amplitude (half the stroke)	3.0000	mm
Vibration frequency	15.000	Hz

Calculated results

Parameter	Value	Unit
Open area fraction	64.000	%
Probability of passage in one presentation	5.7600	%
Probability of passing within n presentations	69.471	%
Expected presentations to pass	17.361	
Stroke (peak to peak)	6.0000	mm
Vibration g-force	2.7164	

Notes for this case

• Spherical particles and a single layer on the deck. Near-mesh particles (d/x above 0.75) need many presentations and tend to peg the apertures. Vibrating screens usually run at 3–7 g.

Formula and method

$$p = \left(\frac{x-d}{x+w}\right)^2 = f_o\left(1-\frac{d}{x}\right)^2, \quad f_o = \frac{x^2}{(x+w)^2}, \quad \Gamma = \frac{a(2\pi\nu)^2}{9.81}$$

Variables

x	Aperture size (square)	m
w	Wire diameter	m
d	Particle size	m
n	Number of presentations to the deck	-
a	Vibration amplitude (half the stroke)	m
ν	Vibration frequency	1/s
f_o	Open area fraction	-
p	Probability of passage in one presentation	-
$1-(1-p)^n$	Probability of passing within n presentations	-
$1/p$	Expected presentations to pass	-
$2a$	Stroke (peak to peak)	m
Γ	Vibration g-force	-

Method and standards

Gaudin's probability of passage.

Assumptions and limits

- Spheres, square apertures.

References

- Wills and Finch
- Wills' Mineral Processing Technology
- 8th ed. (Butterworth-Heinemann, 2016)
- ch. 8
- eqs. 8.11-8.15 (Gaudin, 1939) and Table 8.1 (Taggart, 1945)

Report details

Report reference	FCC-Y1XA-XMBN (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

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/screen-passage-probability-g-force

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.