# Mill Roller Surface Speed and Escribed Volume

Peripheral speed of a mill roller from its diameter and speed, and the escribed volume per hour through a work opening of a given length.

**Method:** v = π D n; escribed volume = v L g (Hugot, Handbook of Cane Sugar Engineering, milling); Hugot; ...

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Roller mean diameter | 1.0700 | m |
| Roller speed | 5.0000 | rpm |
| Roller length | 2.1300 | m |
| Work opening | 12.000 | mm |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Roller surface speed | 16.808 | m/min |
| Escribed volume | 25.776 | m³/h |
| Hugot maximal peripheral speed 33D/(D + 0.73) | 19.617 | m/min |
| Hugot maximal roller speed | 5.8357 | rpm |
| Hugot economic peripheral speed 30D/(D + 0.73) | 17.833 | m/min |

### Notes for this case

- Fibre throughput divided by the escribed volume is the fibre loading (kg/m³) used to set mill openings.
- Hugot's speed limits (D in m, speeds in m/min) hold for D from 0.6 to 1.5 m.

## Formula and method

$$v = \pi D n, \quad \dot{V} = v L g$$

$$V_M = \frac{33D}{D+0.73}, \quad n_M = \frac{V_M}{\pi D} = \frac{10.5}{D+0.73}, \quad V_E = \frac{30D}{D+0.73} \ [\mathrm{m/min};\ D\ \mathrm{m}]$$

### Variables

| | | |
|---|---|---|
| $D$ | Roller mean diameter | m |
| $n$ | Roller speed | 1/s |
| $L$ | Roller length | m |
| $g$ | Work opening | m |
| $v$ | Roller surface speed | m/s |
| $\dot{V}$ | Escribed volume | m³/s |
| $V_M$ | Hugot maximal peripheral speed 33D/(D + 0.73) | m/s |
| $n_M$ | Hugot maximal roller speed | 1/s |
| $V_E$ | Hugot economic peripheral speed 30D/(D + 0.73) | m/s |

### Method and standards

Kinematics.

### Assumptions and limits

- Rigid rollers.
- Hugot's maximal and economic speeds are shown only for diameters of 0.6–1.5 m, and a note compares the surface speed with the maximal speed.

### References

- v = π D n; escribed volume = v L g (Hugot, Handbook of Cane Sugar Engineering, milling)
- Hugot
- Handbook of Cane Sugar Engineering
- 3rd ed. (1986)
- ch. 11
- eqns 11.5–11.9 (maximal and economic speeds)
- pp. 178–185

## Report details

| | |
|---|---|
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| Release checks | 2 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/sugar-ethanol/milling/mill-roller-surface-speed

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.