Stock Refining: Specific Energy and Specific Edge Load

Gross and net specific refining energy (kWh/t, HP-day/ton) and specific edge load from refiner and no-load power, throughput, speed and edge length.

Method: Smook; Handbook for Pulp & Paper Technologists; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Refiner motor power	900.00	kW
No-load power	300.00	kW
Pulp production (oven-dry)	500.00	t/d
Rotor speed	1,000.0	rpm
Cutting edge length per revolution	60.000	km

Calculated results

Parameter	Value	Unit
Gross specific energy	43.200	kWh/t
Net specific energy	28.800	kWh/t
Net energy, HP-day per short ton (HPD/ton)	1.4599	
Specific edge load (J/m)	0.60000	

Notes for this case

- SEL is in J/m (= W·s/m): low SEL (≈1 J/m) fibrillates, high SEL cuts fibres.

Formula and method

$$E_g = \frac{P}{\dot{m}_{OD}}, \quad E_n = \frac{P - P_0}{\dot{m}_{OD}}, \quad SEL = \frac{P - P_0}{N L_s}$$

Variables

P	Refiner motor power	W
P_0	No-load power	W
$\dot{m}_{OD}$	Pulp production (oven-dry)	kg/s
N	Rotor speed	1/s
L_s	Cutting edge length per revolution	m
E_g	Gross specific energy	J/kg
E_n	Net specific energy	J/kg
E_{HPD}	Net energy, HP-day per short ton (HPD/ton)	HPD/ton
SEL	Specific edge load (J/m)	J/m

Method and standards

Specific energy and edge load definitions.

Assumptions and limits

- Throughput as OD fibre.
- SEL is in J/m (W·s/m) and E_HPD in HP-day per short ton; both are shown as plain numbers in every unit system.

References

- Smook
- Handbook for Pulp & Paper Technologists

- 3rd ed. (Angus Wilde, 2002)
- ch. 13.2 (refining; specific energy in kWh/t or HP-day/ton) and ch. 5 (groundwood specific energy)
- Specific edge load: net power / (speed × cutting edge length)

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/chemical/pulp-paper/refining-specific-energy

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.