TMP Refiner Heat Recovery: Clean Steam from Refiner Power

Steam released by thermomechanical pulp refiners from their motor power and the share recoverable as clean steam in a reboiler, with the steam per tonne of pulp.

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

Input parameters

Unit system: SI

Parameter	Value	Unit
Refiner motor power	20.000	MW
Pulp production (oven-dry)	500.00	t/d
Share of power appearing as steam	90.000	%
Share recovered as clean steam (reboiler)	70.000	%
Latent heat of the steam	2,100.0	kJ/kg

Calculated results

Parameter	Value	Unit
Specific refining energy	960.00	kWh/t
Refiner steam generated	30.857	t/h
Clean steam recovered	21.600	t/h
Recovered steam per OD tonne	1.0368	kg/kg

Formula and method

$$\dot{m}_s = \frac{P\phi}{h_{fg}}, \quad \dot{m}_r = \eta_r \dot{m}_s$$

Variables

P	Refiner motor power	W
$\dot{m}_{OD}$	Pulp production (oven-dry)	kg/s
ϕ	Share of power appearing as steam	-
η_r	Share recovered as clean steam (reboiler)	-
h_{fg}	Latent heat of the steam	J/kg
E	Specific refining energy	J/kg
$\dot{m}_s$	Refiner steam generated	kg/s
$\dot{m}_r$	Clean steam recovered	kg/s
$\dot{m}_r/\dot{m}_{OD}$	Recovered steam per OD tonne	kg/kg

Method and standards

Energy balance on the refiners.

Assumptions and limits

- Refiner heat leaves as saturated steam: only the latent heat is counted. Superheat in the refiner steam and the sensible heat of the dilution water are not included.

References

- Smook
- Handbook for Pulp & Paper Technologists
- 3rd ed. (Angus Wilde, 2002)
- ch. 5.6 (TMP: most of the refining energy appears as steam, recovered in reboilers)

Report details

Report reference	FCC-MN0H-50MC (the same inputs always give the same reference)
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Calculator	TMP Refiner Heat Recovery: Clean Steam from Refiner Power
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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/tmp-heat-recovery

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.