Thermic Fluid Heater Sizing from a List of Users

Thermic fluid heater rating and circulation flow from up to five users' loads, diversity, piping loss and margin, with the supply–return temperature drop.

Method: Heat balance definitions (Q = ṁc_pΔT)

Input parameters

Unit system: SI

Parameter	Value	Unit
User 1 load	600.00	kW
User 2 load	400.00	kW
User 3 load	250.00	kW
User 4 load	0	kW
User 5 load	0	kW
Diversity factor	90.000	%
Piping and tank heat loss share	5.0000	%
Design margin	15.000	%
Fluid specific heat at mean temperature	2.5000	kJ/(kg·K)
Supply–return temperature difference	25.000	K

Calculated results

Parameter	Value	Unit
Connected load	1,250.0	kW
Demand with diversity and losses	1,181.2	kW
Heater rating	1,358.4	kW
Circulation flow	78.246	t/h
Heater rating (lakh kcal/h)	11.680	

Notes for this case

- Size the pump on the heater rating; users with their own control valves need the full flow only when all are open. 1 lakh kcal/h = 116.3 kW.

Formula and method

$$Q_d = k_d \sum Q_i\,(1+f_l), \quad Q_h = Q_d(1+m), \quad \dot{m} = \frac{Q_h}{c_p \Delta T}$$

Variables

Q_1	User 1 load	W
Q_2	User 2 load	W
Q_3	User 3 load	W
Q_4	User 4 load	W
Q_5	User 5 load	W
k_d	Diversity factor	-
f_l	Piping and tank heat loss share	-
m	Design margin	-
c_p	Fluid specific heat at mean temperature	J/(kg·K)

ΔT	Supply–return temperature difference	K
ΣQ	Connected load	W
Q_d	Demand with diversity and losses	W
Q_h	Heater rating	W
$\dot{m}$	Circulation flow	kg/s

Method and standards

Load summation.

Assumptions and limits

- Steady loads.
- Piping and tank loss is taken as a share of the diversified load. A heat loss is closer to fixed for a given system and temperature, so with a low diversity factor the loss is understated; enter a larger share then.

References

- Heat balance definitions (Q = ṁc_pΔT)

Report details

Report reference	FCC-HR2W-8DZK (the same inputs always give the same reference)
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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/boilers-power-plant/thermic-fluid-heaters/thermic-fluid-heater-load-list

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.