Steam Trap Sizing and Steam Loss — Report

DOCUMENT

Plant / project	**Example Plant**
Equipment tag / system	**TRAP-01**
Calculation / document no.	**CALC-STEAM-TRAP-001**
Revision	**0**
Prepared by	**Your name**
Checked by	**—**
Date	**07-Nov-2026**

Calculation basis

Trap type: Thermodynamic · Load: Steam line drip leg · Steam loss: Orifice discharge (isentropic) · Cost: Fuel cost (boiler efficiency) · Steam properties IAPWS-IF97; compressible orifice flow with k = 1.135; Napier rule W = A P / 70; discharge coefficient 0.60

Status: **✓ Inputs OK · ℹ️ 10 default value(s) in use: insulation efficiency, bare-pipe outside heat-transfer coefficient, warm-up time of the drained line, safety factor on the load, discharge coefficient, operating hours per year, feedwater temperature, boiler efficiency, share of the steam loss recovered by repair, steam loss of a leaking trap**

KEY INPUTS

Input	Unit	Value used
Steam pressure upstream of the trap (inlet)	bar g	10.00
Back pressure downstream of the trap	bar g	2.00
Ambient temperature (drip leg heat loss)	°C	15.0
Length of steam line drained by the trap	m	50.0
Pipe outside diameter	mm	168.3
Pipe wall thickness	mm	7.11
Insulation efficiency	%	80.0
Bare-pipe outside heat-transfer coefficient	W/m²·K	12.0
Warm-up time of the drained line	min	30
Safety factor on the load	×	2.0
Trap seat orifice diameter	mm	4.80
Open area of the failed trap	%	100
Discharge coefficient	-	0.60
Operating hours per year	h/yr	8,000
Feedwater temperature	°C	105.0
Boiler efficiency (fuel to steam)	%	85.0
Fuel price per unit of energy	per GJ	6.00
Cost to repair or replace one trap	per trap	250

RESULTS — TRAP SIZING AND STEAM LOSS

Result	Unit	Value
Saturation temperature at the inlet pressure	°C	184.1
Differential pressure (inlet − back pressure)	bar	8.00
Running load (heat loss of the drained line)	kg/h	19.3
Warm-up load (heating the pipe metal)	kg/h	117.2
Process load (heat duty ÷ latent heat)	kg/h	1,080.4
Design condensate load (before the safety factor)	kg/h	117.2
Safety factor used	×	2.0
Required trap capacity at the differential pressure	kg/h	234.3
Capacity class	—	B
Indicative body pressure class	—	PN 16
Back pressure as % of inlet gauge pressure	%	20.0
Flash steam fraction at the trap discharge	%	10.1
Flash steam flow at the design load	kg/h	11.9
Steam loss through the failed-open trap	kg/h	61.9
Steam loss by the other method (cross-check)	kg/h	62.7
Loss as a multiple of the design condensate load	×	0.5
Steam lost per year	t/yr	495
Fuel energy lost per year	MWh/yr	379
Annual cost of the steam loss	per yr	8,185

RESULTS — TRAP SURVEY

Result	Unit	Value
Traps surveyed	traps	20
Failure rate (leaking, failed open and failed closed)	%	25.0
Steam loss of the surveyed traps	kg/h	124.7
Steam lost per year	t/yr	998
Fuel energy lost per year	MWh/yr	764
Annual cost of the steam loss	per yr	16,495
Traps to repair or replace	traps	5
Cost of the repair programme	total	1,250
Annual saving after repair	per yr	16,495

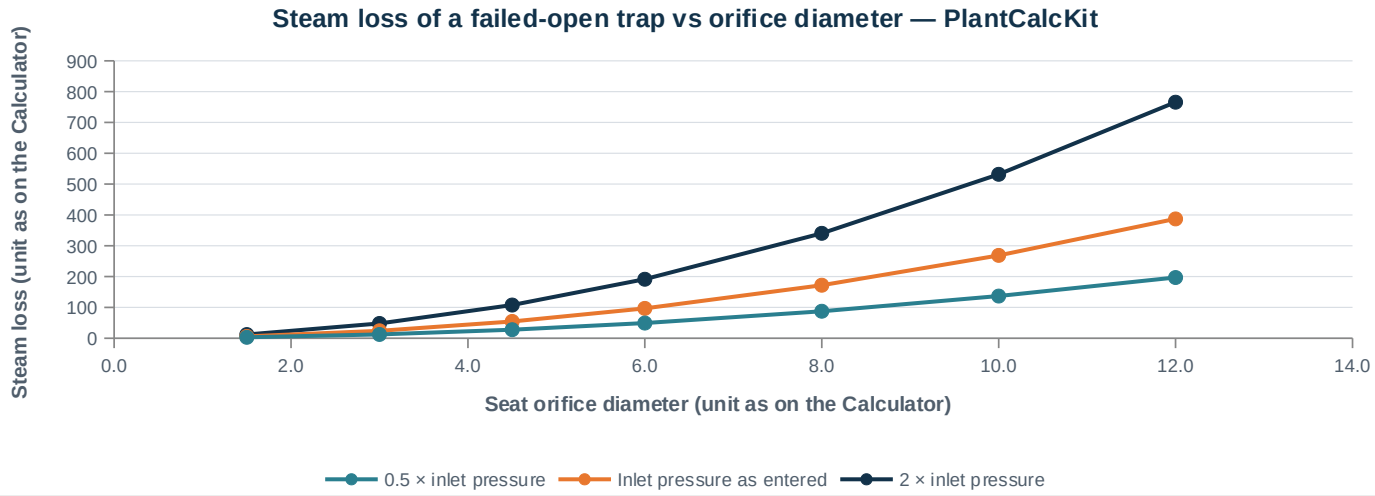
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Simple payback of the repair programme	months	0.9

FINDINGS AND RECOMMENDATIONS

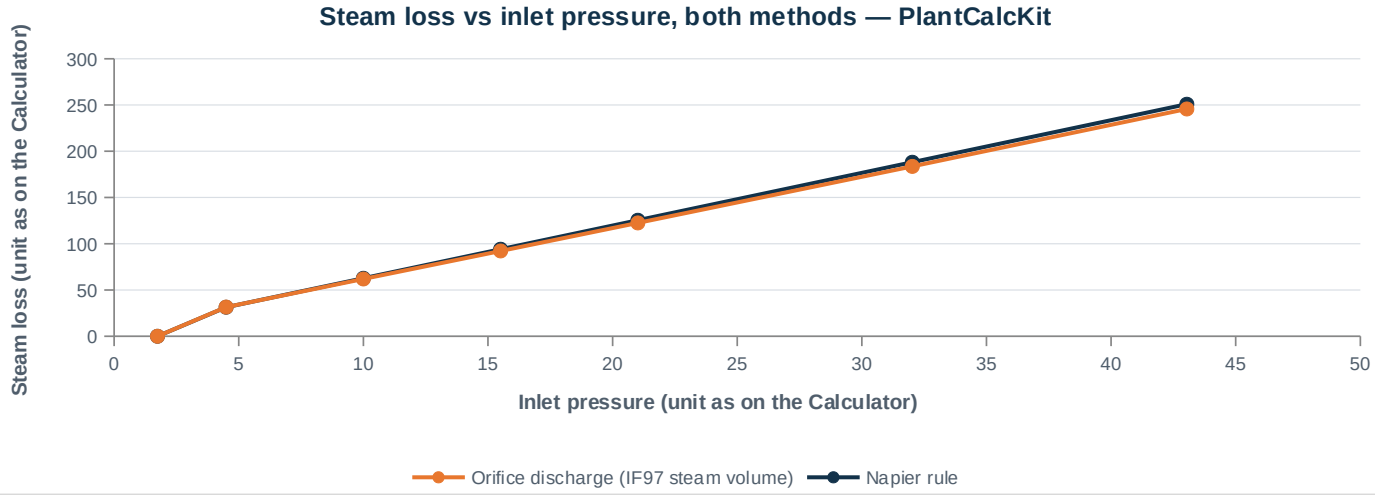
⛔ **Act now**	Survey: 2 trap(s) failed open and 2 leak. Together they lose 125 kg/h of steam (998 t/yr), worth 16,495 USD per year. Repair the largest losses first (chart on the Report).
⚠️ **Correct soon**	Survey failure rate is 25.0 %, above the 5 % target of a managed programme: schedule regular testing so failures are found before they cost steam.
⚠️ **Correct soon**	Survey: 1 trap(s) failed closed. Condensate backs up: poor heat transfer, water hammer and corrosion risk. Repair them even though they lose no steam.
◆ **Opportunity**	The repair programme costs 1,250 USD and saves 16,495 per year: simple payback 0.9 months.
◆ **Opportunity**	Flash steam is 10.1 % of the condensate (12 kg/h at the design load). Recovering it in a flash vessel saves fuel and avoids steam plumes at the return.
ℹ️ **Note**	The warm-up load (117 kg/h) is more than three times the running load (19.3 kg/h). A start-up drain or a longer warm-up time keeps the permanent trap smaller.

CHARTS



Observations — steam loss vs orifice size

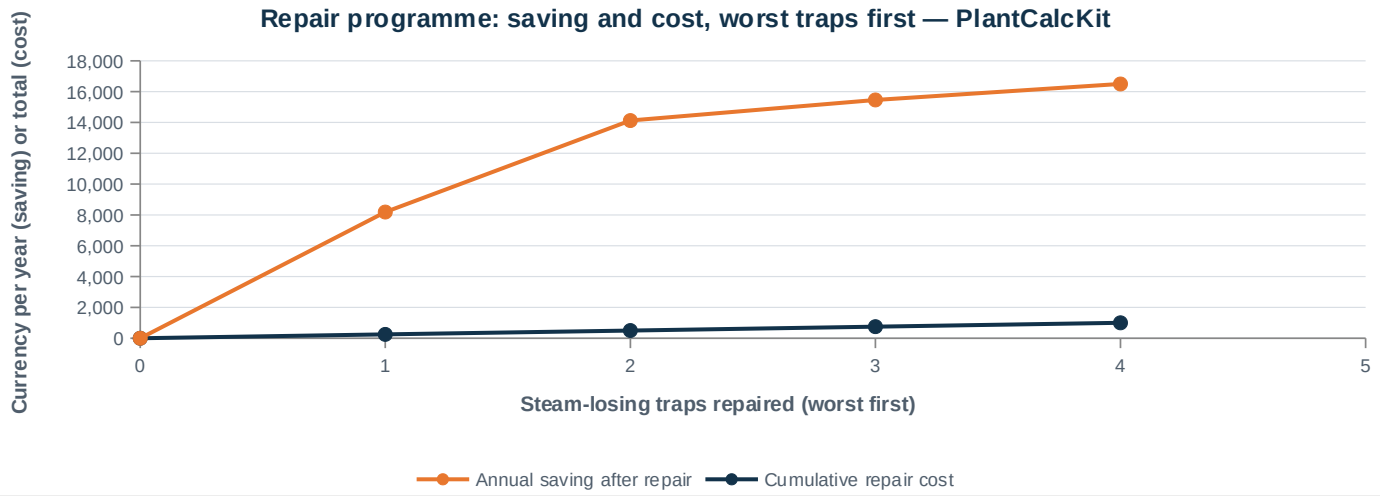
[Write your observations here]



Observations — method comparison

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CHARTS (continued)



Observations — repair programme

[Write your observations here]

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