Condensate Recovery and Flash Steam — Report

Calculation summary | PlantCalcKit v1.0

DOCUMENT

Plant / project	**Example Plant**
Equipment tag / system	**CR-01**
Calculation / document no.	**CALC-39E**
Revision	**0**
Prepared by	**Your name**
Checked by	**—**
Date	**07-Nov-2026**

Flash steam use: Low-pressure header · Vertical vessel · Condensate saturated at the pressure · Velocity basis: lower of the two · Steam properties IAPWS-IF97; isenthalpic let-down; heat counted above makeup water; boiler efficiency 85.0 %

Calculation basis

Status: **✓ Inputs OK · ℹ️ 9 default value(s) in use: fixed steam velocity limit, capacity factor K, liquid hold-up time, liquid proportion target, disengagement height, flash steam line velocity, proposed returned liquid temperature, boiler efficiency, operating hours per year**

KEY INPUTS

Input	Unit	Value used
Condensate generated (total available)	t/h	20.0
Condensate pressure before the let-down	bar g	10.00
Flash vessel pressure	bar g	3.00
Low-pressure header pressure	bar g	2.00
Steam demand of the low-pressure header	t/h	5.0
Liquid hold-up time	min	2.0
Current condensate return (% of generated)	%	55.0
Current returned condensate temperature	°C	70.0
Proposed condensate return (% of generated)	%	90.0
Proposed returned liquid temperature	°C	143.7
Makeup water temperature	°C	25.0
Boiler efficiency (fuel to steam)	%	85.0
Fuel price (per unit of fuel heat input)	per MMBTU	8.00
Makeup water cost (incl. treatment, effluent)	per t	2.50
Chemical conditioning cost per t of feedwater	per t	0.35
Operating hours per year	h/yr	8,000
Project capital cost	USD	450,000
Added operating cost per year	USD/yr	20,000

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RESULTS — FLASH STEAM AND CONDENSATE

Result	Unit	Value
Saturation temperature in the flash vessel	°C	143.7
Flash steam fraction of the condensate	%	8.26
Flash steam flow	t/h	1.49
Residual liquid condensate flow	t/h	16.51
Flash steam vented	t/h	0.00

RESULTS — FLASH VESSEL AND VENT CONDENSER SIZING BASIS

Result	Unit	Value
Flash steam volume flow	m³/h	685.4
Allowable steam velocity used	m/s	2.20
Minimum vessel diameter (larger of the two)	mm	633
Suggested vessel diameter (next 50 mm up)	mm	650
Liquid hold-up volume	m³	0.596
Vessel straight length (tangent to tangent)	m	2.80
Flash steam line diameter (design velocity)	mm	98

CURRENT AND PROPOSED CASE

Item	Unit	Current	Proposed	Difference
Heat recovered above the makeup water	kW	575	3,383	2,808
Fuel energy saved per year	MWh/yr	5,412	31,840	26,428
Value of makeup water avoided	USD/yr	220,000	360,000	140,000
Value of chemicals avoided	USD/yr	30,800	50,400	19,600
Value of fuel saved	USD/yr	147,724	869,136	721,412
Total value of the recovered condensate	USD/yr	398,524	1,279,536	881,012

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PROJECT ECONOMICS

Result	Unit	Value
Added operating cost	USD/yr	20,000
Net annual saving	USD/yr	861,012
Project capital cost	USD	450,000
Simple payback	years	0.52
Simple return on capital	%	191.3
Value of the vented flash steam per year	USD/yr	0

FINDINGS AND RECOMMENDATIONS

◆ **Opportunity**

Simple payback of 6 months: the project pays back quickly. Check that the returned condensate is clean enough for the boiler.

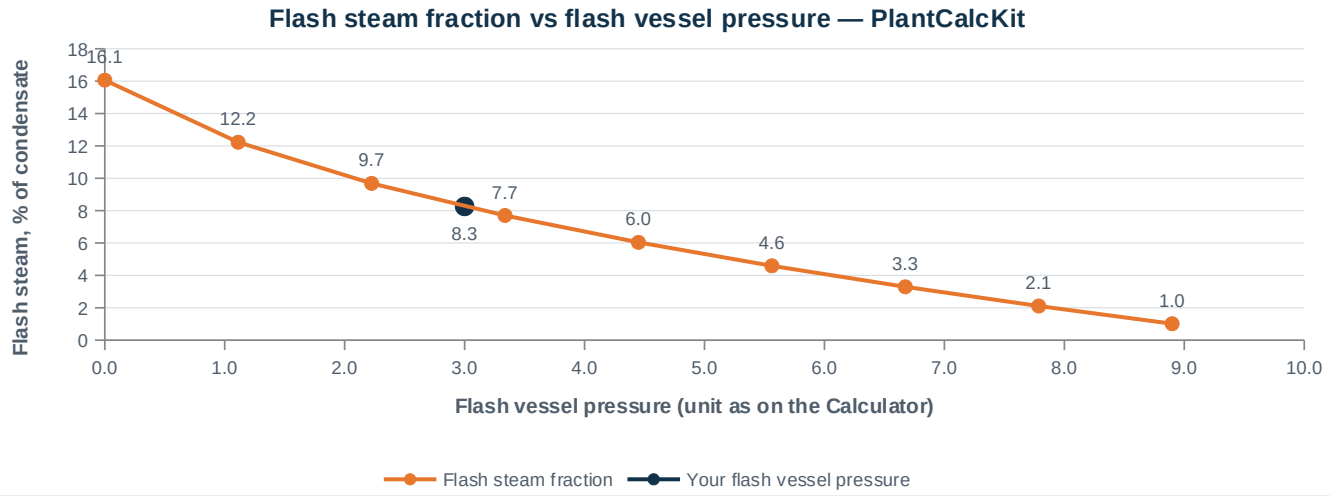
ℹ️ **Note**

The residual condensate leaves the vessel at 144 °C: the return pumps need a positive suction head above the vapour pressure, and the receiving tank must be rated for the flash.

ℹ️ **Note**

The savings assume the returned condensate is clean: monitor its conductivity, hardness and oil or iron content and divert it to drain when contaminated.

CHARTS



Observations — flash fraction

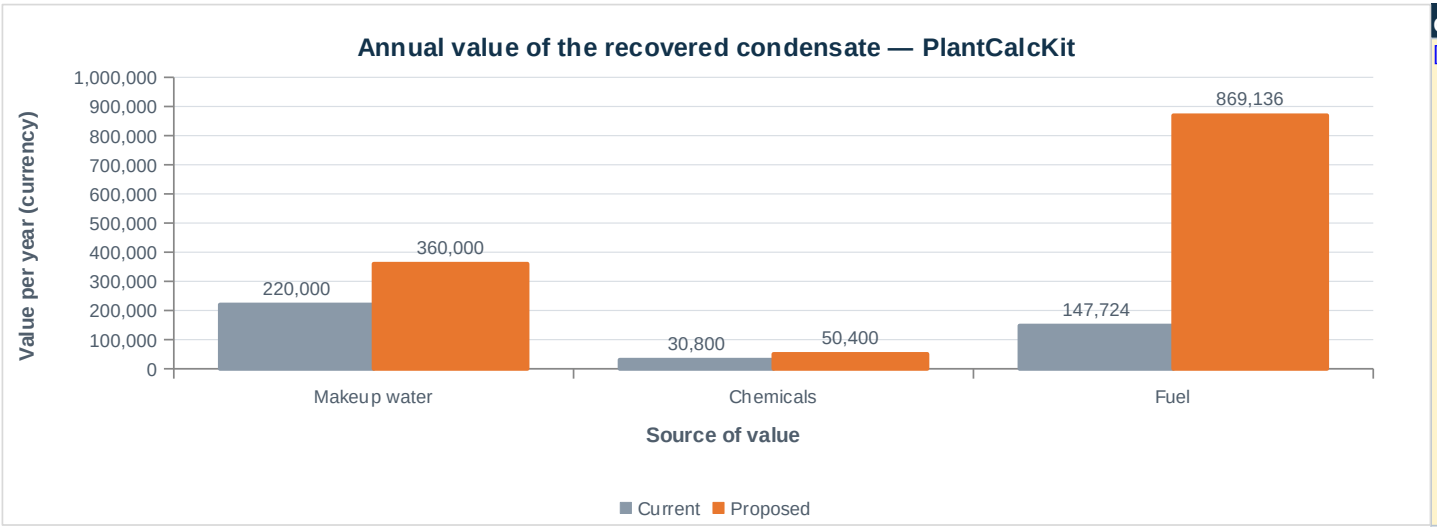
[Write your observations here]



Observations — payback

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Condensate Recovery and Flash Steam — Report



Observations — value by source

[Write your observations here]

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