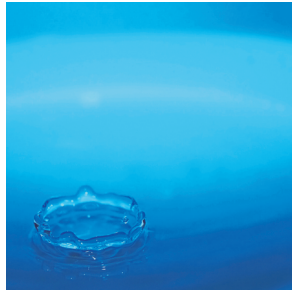


Flash Separators



Celebrating
12 years of service
to the
Indian Process
Industry



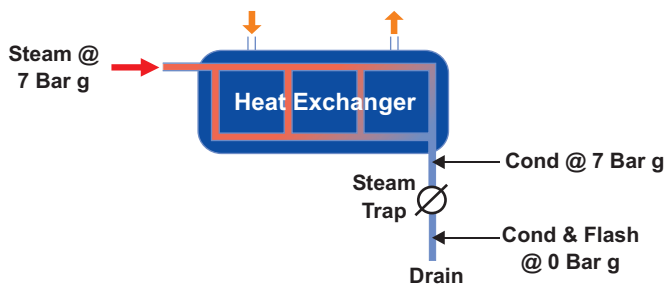
We sell Savings

WHAT IS FLASH STEAM?

In most steam installations, it is common to see a plume of steam rising above the boiler house or a condensate tank. This "flash steam" is just like live steam and contains as much heat as live steam at the same pressure.

When pressure is reduced, water boils at a lower temperature. As steam is discharged from the steam space of equipment, its pressure reduces from that of the steam supply (or, steam space) to that of the outlet.

Flash steam is generated at the point at which pressure drops. For e.g. At trap outlets. The pipe downstream of the trap will contain a mixture of condensate and flash steam (at the lower pressure) .



For example, if the heat exchanger shown here is supplied with steam at 7 bar g, and this is discharged via the trap to the atmosphere, the pressure after the trap is close to 0 bar g (atmospheric pressure).

The boiling point (and therefore, temperature) drops sharply.

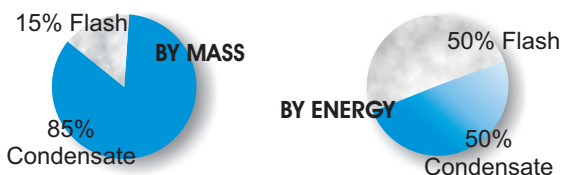
This means that the sensible heat of the condensate is suddenly reduced from 171.3 kcal/kg to 100 kcal/kg. So, where does the surplus sensible heat of $171.3 - 100 = 71.3$ kcal/kg go?

It is converted into latent heat, and "flashes" into vapour, or steam.

Pressure kg/cm2 (absolute)	Temp. Deg C	Enthalpy of water kcal/kg	Enthalpy of steam kcal/kg	Latent heat of vapourisation kcal/kg
P	T	hf	hg	hfg=hg-hf
1	99.1	100	638.5	539.4
2	119.6	119.9	655.8	525.9
4	142.9	143.6	653.4	509.8
6	158.1	159.3	657.8	498.5
8	169.6	171.3	660.8	489.5
10	179.0	181.2	663.0	481.8
11	183.2	185.6	663.9	478.3

DOES IT MATTER ?

A condensate pipe contains only 15% flash steam as compared to 85% of condensate by mass. The flash steam may therefore, seem trivial. However, the heat energy present in steam at 1kg/cm^2 is more than **6 times** that of water !!



SAVING ENERGY FROM FLASH

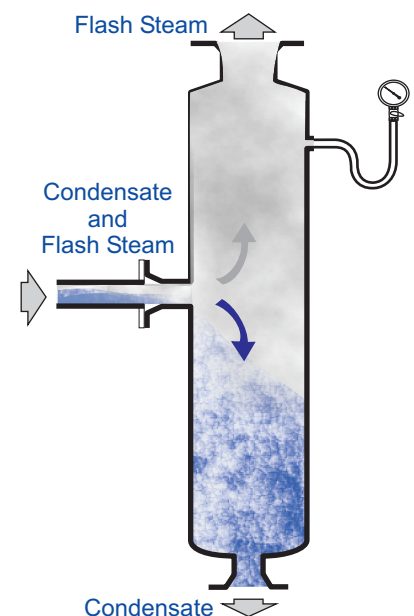
As seen here, any condensate pipe carries approximately 99% (by volume) of flash steam, and 1% of condensate. This bi-phase condition occurs immediate downstream of the trap or discharge orifice.



WORKING PRINCIPLE

The Steamline Flash Separator is designed with efficiency and economics in mind. It effectively separates this bi-phase fluid into flash steam & condensate as seen in the diagram. The vessel diameter is sized so as to reduce the velocity of the fluid in the pipe. The heavier condensate falls to the bottom of the flash separator and is drained by a suitable steam trap. The height of the vessel is chosen such that flash steam rises without entraining water droplets, resulting in drier steam.

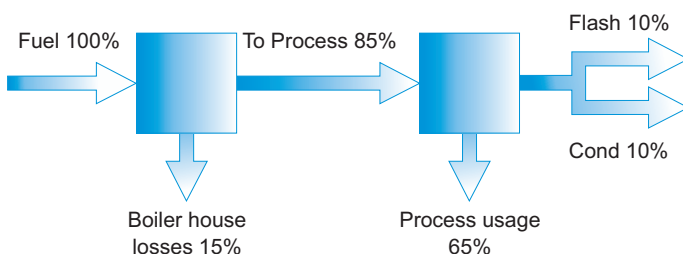
This flash steam can be recovered from condensate. It can then be used for low pressure steam applications, for removing dissolved oxygen in deaerator tanks and heating boiler feedwater. Even blowdown or contaminated condensate can be flashed and put to good use. Remember, flash is as good as live steam hence, flash recovery is the best form of energy conservation.



IN OTHER WORDS,
HALF THE ENERGY IN CONDENSATE CAN BE
LOST
IF FLASH STEAM IS VENTED !

TYPICAL STEAM SYSTEM ENERGY BALANCE

Even if condensate is returned, but flash is vented, the energy lost is still almost 10%.



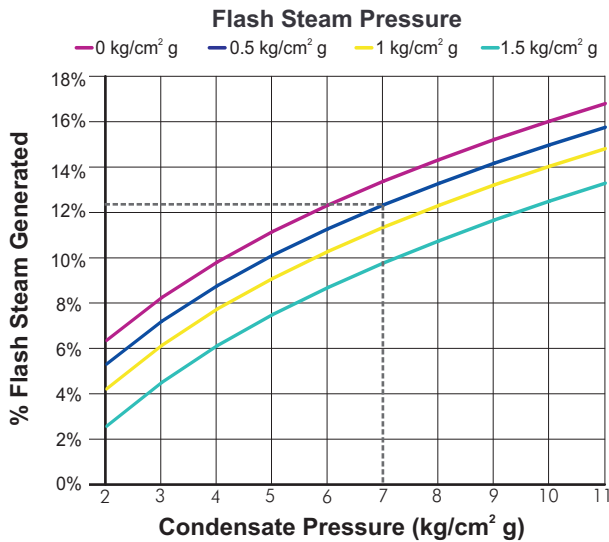
WHAT BENEFIT CAN I EXPECT ?

Flash steam is just as good as live steam therefore, the cost of flash steam is exactly the same as live steam. To estimate flash quantities quickly, we use the formula below to develop a set of graphs. (Note: Normally we flash at 0.5 or 1kg/cm²g)

$$\% \text{ Flash Steam Generated} = \frac{(h_{f1} - h_{f2}) \times 100\%}{h_{fg2}}$$

Where,

- h_{f1} = Enthalpy of water at higher press in kcal/kg
- h_{f2} = Enthalpy of water at the flashing press in kcal/kg
- h_{fg2} = Latent heat of vaporisation at the flash steam pressure in kcal/kg



Calculating Flash Steam separated

For example, if a heat exchanger is supplied with 500 kg/hr of steam @ 7 kg/cm²g, this steam condenses to the same quantity of condensate after giving off heat to process. This condensate at 7 kg/cm²g is discharged to a flash separator at 0.5 kg/cm²g. Let us see how much flash steam can be separated.

In the graph above, travel vertically up from the condensate pressure at 7 to the 0.5 flash line. At that point go horizontally across to the Y-axis to see the % flash separated.

Quantity of flash steam = 12.5% of 500 kg/hr = 62.5 kg/hr

$$\text{Fuel savings/hr} = \frac{\text{Qty of flash} \times \text{heat content} \times \text{Cost of fuel}}{\text{GCV of fuel} \times \text{boiler efficiency} \times \text{Sp. gravity}}$$

Assuming boiler is oil fired, furnace oil cost Rs. 30 per litre, and that the heat exchanger runs for 8000 hrs/year.

$$\begin{aligned} \text{Fuel savings} &= \frac{62.5 \times 532 \times 30}{10200 \times 0.84 \times 0.88} = \text{Rs } 132.29 \text{ /hr} \\ &= \text{Rs. } 132.29 \text{ p/hr} \times 8000 \text{ hrs} = \text{Rs. } 10,58,320 \text{ /yr} \end{aligned}$$

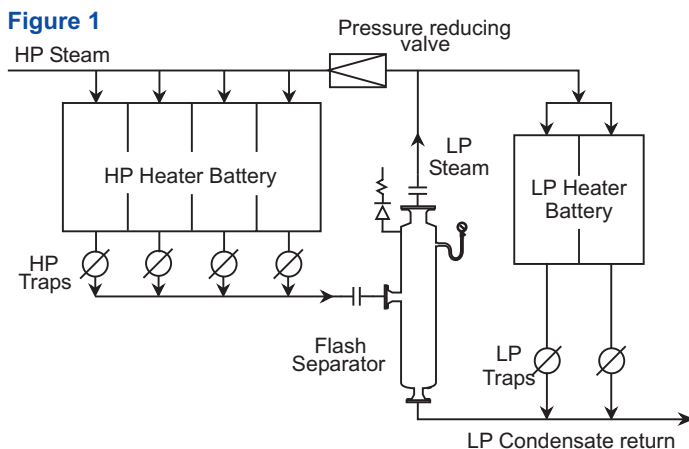
$$\begin{aligned} \text{Water savings} &= \text{Qty of flash} \times \text{water cost/litre} \times \text{hrs/yr} \\ &= 62.5 \text{ kg/hr} \times 0.1 \text{ paise/litre} \times 8000 \text{ hrs/yr} \\ &= \text{Rs. } 50,000 \text{ /yr} \end{aligned}$$

The total savings are Rs. 11,08,320 /yr. A Flash Separator costs a fraction of this amount.

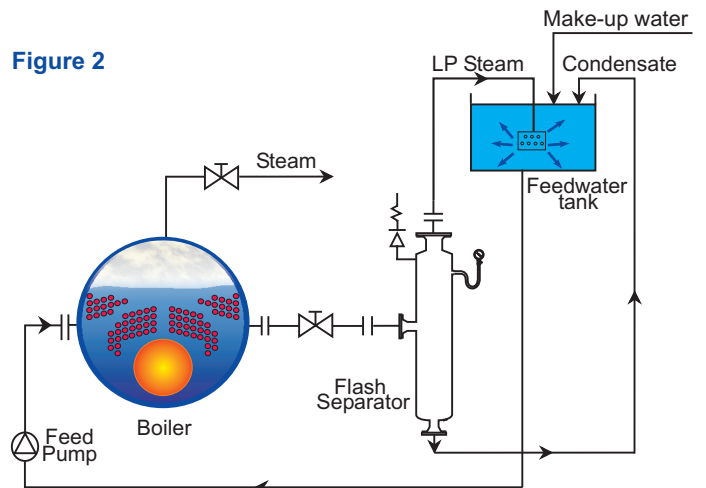
HOW CAN FLASH STEAM BE USED ?

Utilising flash steam can improve boiler efficiency substantially, and decrease the steam consumption from the boiler. In continuous blowdown systems where blowdown rates are higher due to the poor feed water quality, heat from the blowdown water can be recovered in the form of flash steam.

- ✓ Nearly 50% of energy available in the hot pressurized water (either blowdown or condensate) can be recovered in the form of flash steam.
- ✓ Low pressure steam can be useful in LP steam processes. This is well illustrated in Fig 1 below.



- ✓ Low pressure flash steam is often used in the deaerator to reduce dissolved oxygen content and save fuel by increasing feedwater temperature.
- ✓ Specific steam consumption is reduced by using flash
- ✓ It can even be condensed so at least the water can be saved.
- ✓ Even if no use at all can be found for low pressure flash steam it can always be used to heat feedwater thus reducing fuel consumption. See Fig 2 below.



A common thumb rule states that every 6°C rise in feedwater temperature results in a 1% fuel saving.

(Source: PCRA handbook for energy conservation)

SIZING AND SELECTING THE CORRECT SEPARATOR

The FS is sized depending on the following factors :

- Condensate inlet flow to the flash vessel
- Pressure of the flash steam inside the flash vessel.
- Qty of flash steam (calculated)

Our heat exchanger example has an inlet condensate flow of 500 kg/hr. The quantity of flash steam as seen from the %Flash steam graph is =12.5% of 500 kg/hr = 62.5 kg/hr

From the selection table below, we can see that FS150 is the separator suited for our needs.

Condensate kg/hr	Flash Steam,kg/hr				
	50	100	200	500	1000
10000	FS350	FS350	FS350	FS350	FS350
5000	FS300	FS300	FS350	FS350	FS350
2500	FS250	FS250	FS300	FS300	
2000	FS250	FS250	FS250	FS300	
1500	FS200	FS250	FS250	FS300	
1000	FS200	FS200	FS250		
500	FS150	FS150			
250	FS150				

Selection Table

ORDERING INFORMATION

- | | | |
|--------------------------------|---------------------------------|---|
| <input type="checkbox"/> FS150 | <input type="checkbox"/> I=IBR | <input type="checkbox"/> S= Std. Flanges (ASA150) |
| <input type="checkbox"/> FS200 | <input type="checkbox"/> N=NIBR | <input type="checkbox"/> X= Non-std. Flanges |
| <input type="checkbox"/> FS250 | | |
| <input type="checkbox"/> FS350 | | |

FEATURES OF STEAMLINE FLASH SEPARATORS

- ▶ Low separation velocity ensures dryness
- ▶ Supplied complete with all required accessories
- ▶ Designed in accordance with IBR code
- ▶ IBR certified versions available
- ▶ Superior build quality and parts
- ▶ Optional customized level based discharge for larger flow-rates

STANDARD SUPPLIES

- ✓ Pressure gauge with syphon and cock
- ✓ Safety valve
- ✓ Strainer and steam trap
- ✓ Mounting kit
- ✓ Lifting eye (FS 250 and above)

MECHANICAL SPECIFICATIONS

Operating Parameters

Design Pressure	10 kg/cm ² g
Pressure Class	#150 (Higher on request)
Design Temperature	200°C
Flange Standard	ASA150

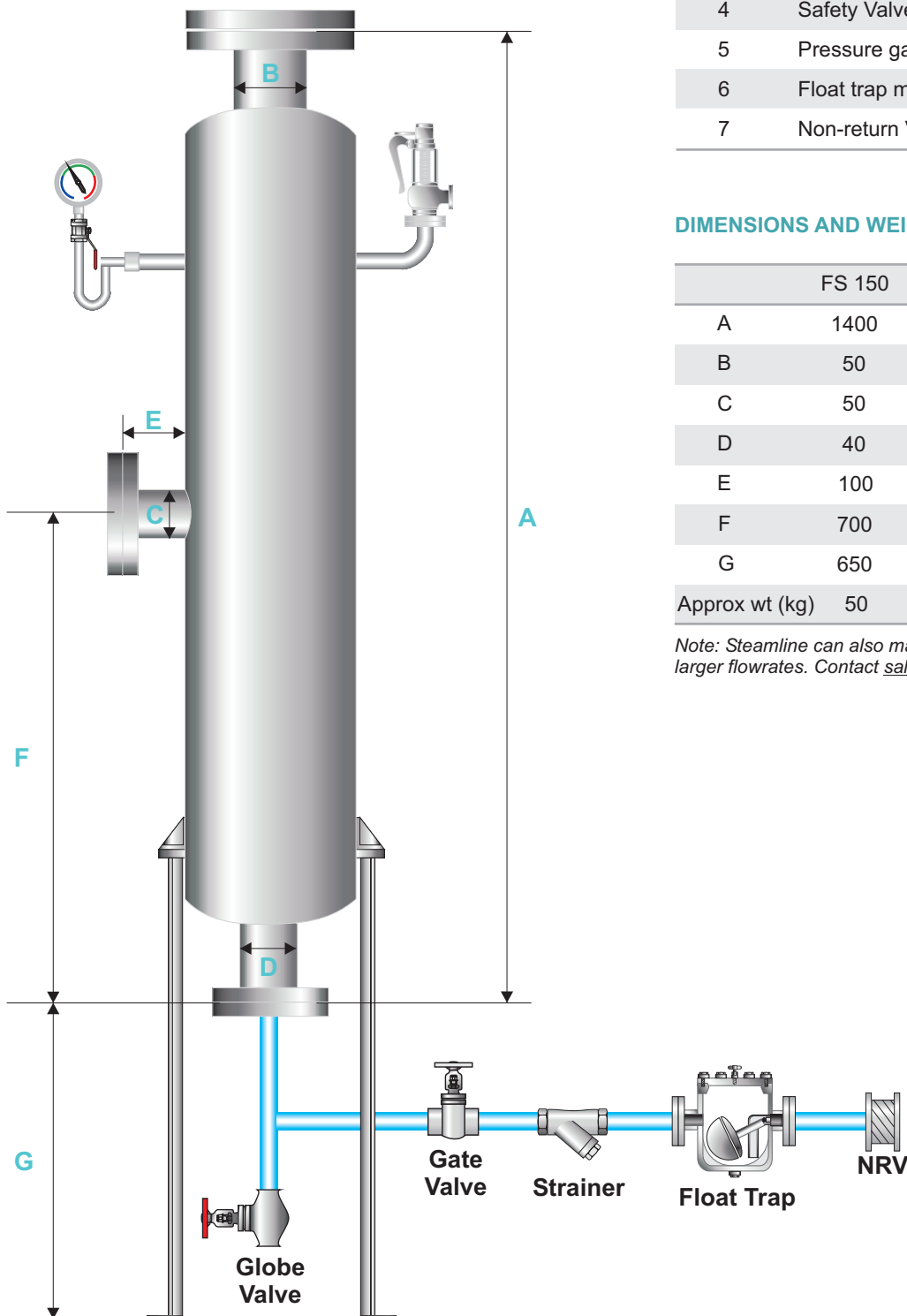
Materials

S.No.	Part	Material
1	Shell & Nozzles	CS to ASTM A 106 Gr. B
2	Dished ends	CS to ASTM A 234 Gr. WPB
3	Flanges	CS to ASTM A 105
4	Safety Valve	CS to ASTM A 216 Gr. WCB
5	Pressure gauge	SS 304
6	Float trap module	CS
7	Non-return Valve	Wafer Type SS 316

DIMENSIONS AND WEIGHTS

	FS 150	FS 200	FS 250	FS 300	FS 350
A	1400	1600	1600	1600	1800
B	50	80	100	100	150
C	50	80	100	100	150
D	40	40	50	50	50
E	100	100	100	100	100
F	700	800	800	800	900
G	650	650	700	700	700
Approx wt (kg)	50	75	110	150	190

Note: Steamline can also make custom-designed Flash Separators for larger flowrates. Contact sales@steamline.com for more information.



Flash Separator

Partial Reference List

Sr.	Client & Location	Qty	Sr.	Client & Location	Qty
1	Weikfield Agro, Pune	1	31	Godfrey Phillips, Mumbai	1
2	Cadbury India, Pune	1	32	Orchid Chemicals, A'bad	1
3	Cadbury India, Pune	1	33	Precision Controls, Pune	1
4	Wimco, Mumbai	1	34	Orchid Chemicals, A'bad	1
5	Hindustan Polyamides, Pune	1	35	Precision Controls, Pune	1
6	Coca-cola, Wada	1	36	Alok Industries, Vapi	5
7	Fresenius Kabi, Pune	1	37	Cargill Foods India Ltd, Kurkumbh	1
8	Dynamix Dairy, Pune	5	38	Multi Organics, Chandrapur	1
9	Coca-cola, Wada	3	39	Precision Controls, Pune	2
10	Coca-cola, Wada	3	40	Alok Industries, Vapi	1
11	Shriram Trading, Kolhapur	1	41	Precision Controls, Pune	2
12	Nestler Limited, Mumbai	2	42	Suvarna Fibrotech, Pune	1
13	Fresenius Kabi, Pune	2	43	Serum Institute, Pune	3
14	Privi Aromatic, Mahad	1	44	Serum Institute, Pune	1
15	ACSI, Pune	1	45	Serum Institute, Pune	3
16	Global Oils and Fats Ltd, Gujrat	5	46	Alok Industries, Vapi	5
17	Thermax Chemicals, Khopoli	3	47	ATC Tires, Tirunelveli	4
18	Thermax Microlabs, Chinchwad	4	48	Precision Controls, Pune	1
19	Aggarwal Rice Mill, Moga	1	49	Zytext Biotech Pvt. Ltd., Mumbai	1
20	Godfrey Phillips, Mumbai	1	50	Bodal Chemicals Ltd-VII, Gujarat	1
21	Godfrey Phillips, Mumbai	1	51	Sudarshan Chemicals, Roha	3
22	Baxter India, Waluj	3	52	Meghmani Organics, Ahmedabad	1
23	ACSI, Pirangut	1	53	Meghmani Organics, Ahmedabad	1
24	Cee Dee Vaccum, Pune	1	54	Cipla Limited, Patalganga	1
25	Privi Organics, Mahad	1	55	Alok Industries, Vapi	2
26	Pratima Enterprises, Pune	1	56	Mayur Dye Chem, Baroda	1
27	ACSI, Uttaranchal	1	57	Precision Controls, Pune	1
28	ACSI, Pirangut	1	58	Sudarshan Chemicals, Mahad	1
29	Shalina Laboratories P. Ltd., Mumbai	2	59	Precision Controls, Pune	1
30	Praj Industries Ltd., Pune	1	60	Sudarshan Chemicals, Mahad	2

In the interest of continuous product development, Steamline reserves the right to upgrade or modify any specifications without prior notice. For the latest revision, please refer to our website www.steamline.com or contact your local Steamline Sales Engineer.

Steamline, 1999-2011. All rights reserved.



Head Office and Works:
S. No. 32/3/14, Kondhwa Budruk, Pune, Maharashtra, India 411 048.
Phone: + 91 20 2693 2213 Fax: + 91 20 2693 2214
Email: sales@steamline.com Web: www.steamline.com

12 YEARS