MECHANICAL STEAM TRAP

Comparison

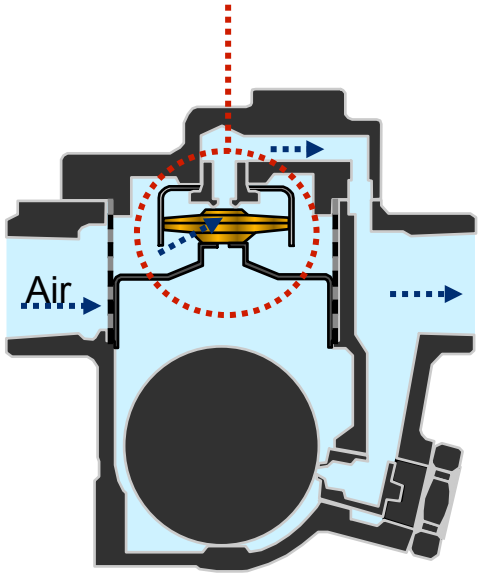
TLV Free Float Steam Trap Vs. Others Type Of Steam Trap

Comparison

Air Venting Capabilities

TLV Free Float

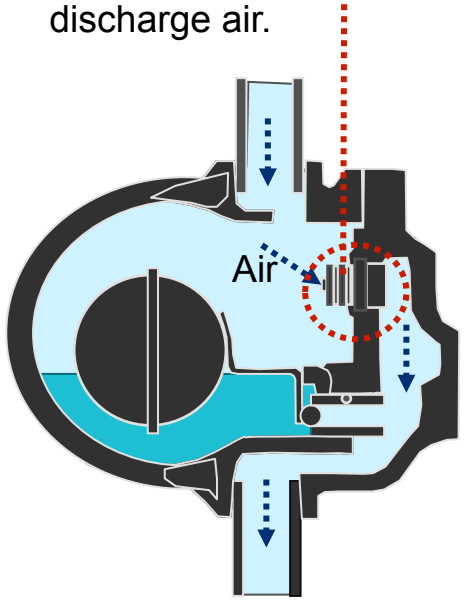
Automatic x-element air venting



Quick Air Venting
For Rapid Start-up

Lever Float

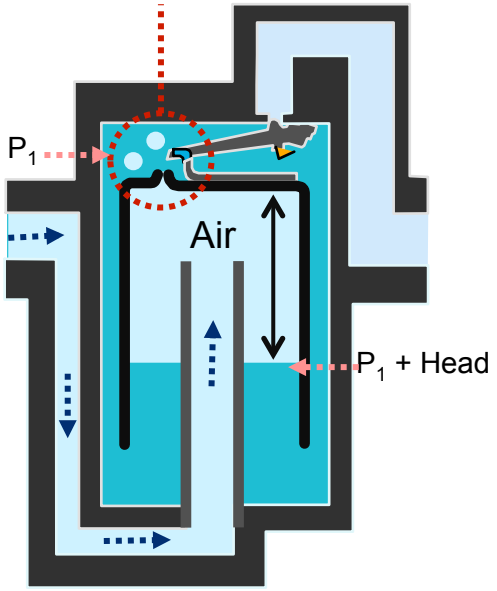
Air vent valve open to discharge air.



Quick Air Venting
For Rapid Start-up

Inverted Bucket

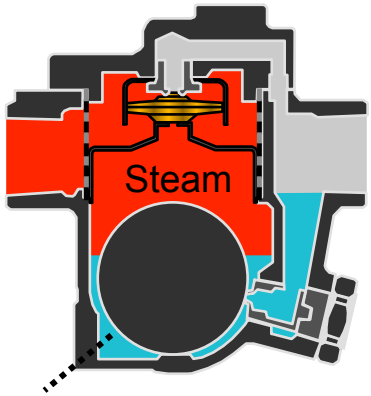
Air leaks through vent hole slowly.



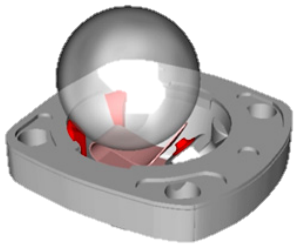
Prone to Air Binding
Slow Start-up

Comparison
Tight Steam Seal

TLV Free Float



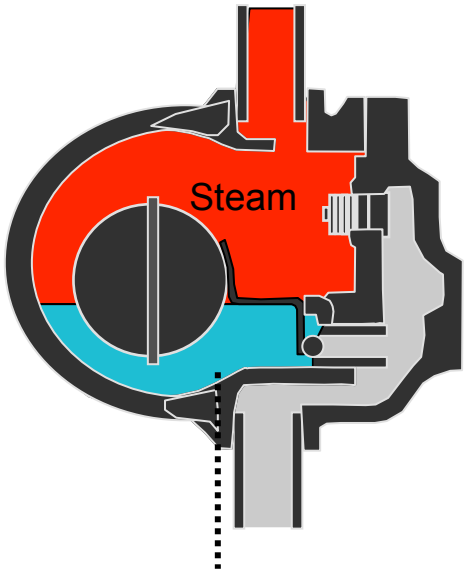
Water Sealed Operation



Three Point Seating

Tight Seal For
Minimum Steam Loss

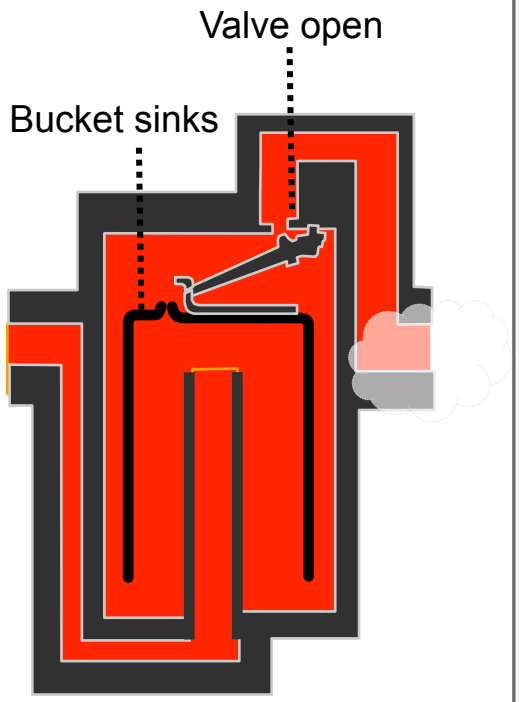
Lever Float



Water Sealed Operation

Tight Seal

Inverted Bucket

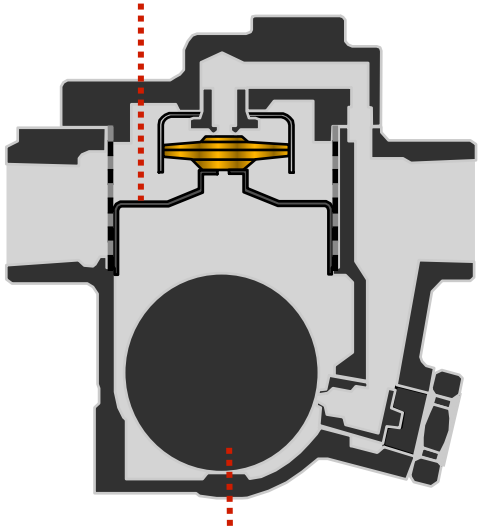


Live Steam Leak
Under Low-Load Conditions

Comparison
Durability

TLV Free Float

Float cover protects free float.

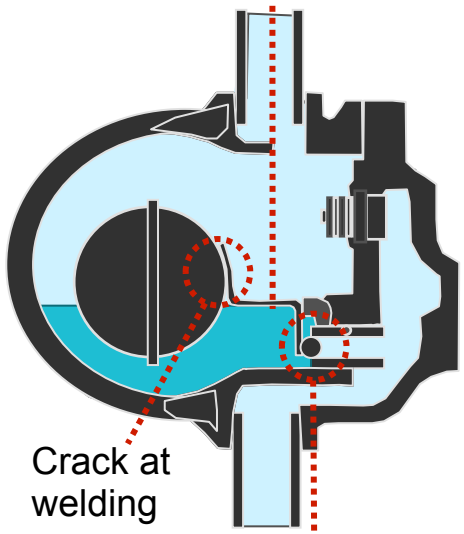


Only 1 moving part.
No concentrated wear.

No Concentrated Wear
Excellent Durability

Lever Float

Lever weak against water hammer.



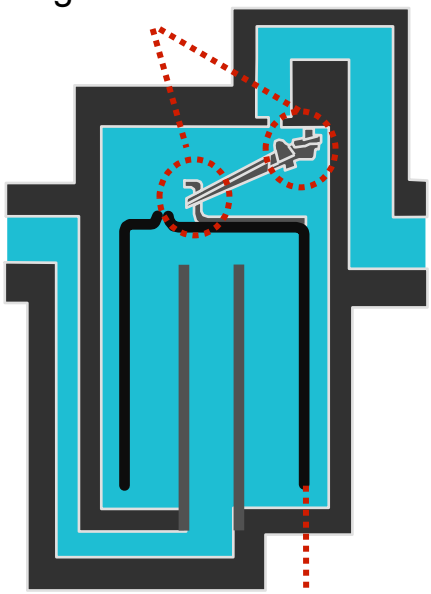
Crack at welding of hinges

Concentrated wear

Failure-Prone
Poor Durability

Inverted Bucket

Linkage Failure



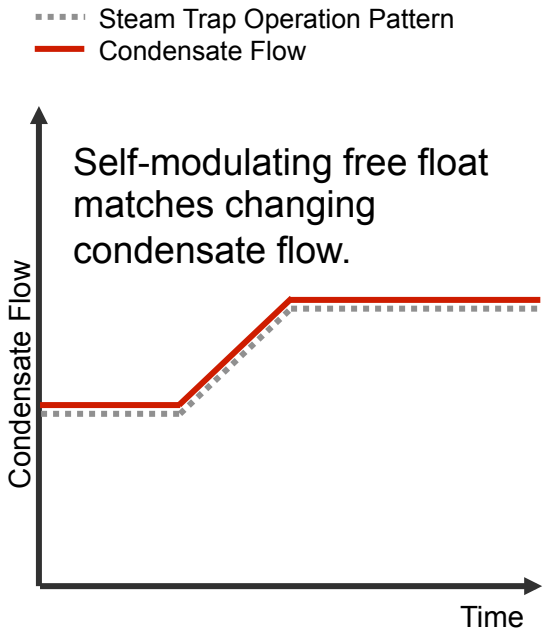
Bucket vulnerable to waterhammer

Linkage Failures
Poor Durability

Comparison

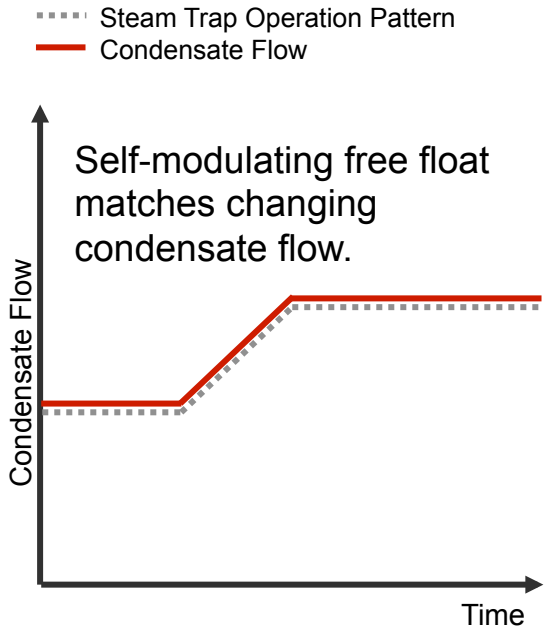
Condensate Discharge Pattern

TLV Free Float



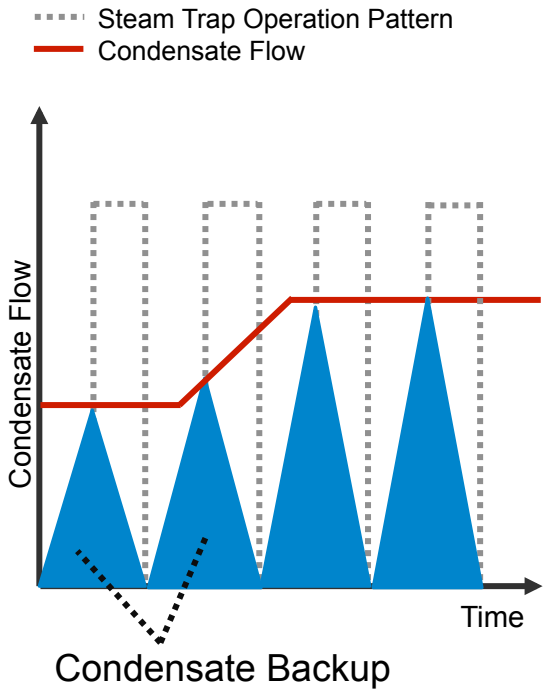
Continuous and Instantaneous Discharge

Lever Float



Continuous and Instantaneous Discharge

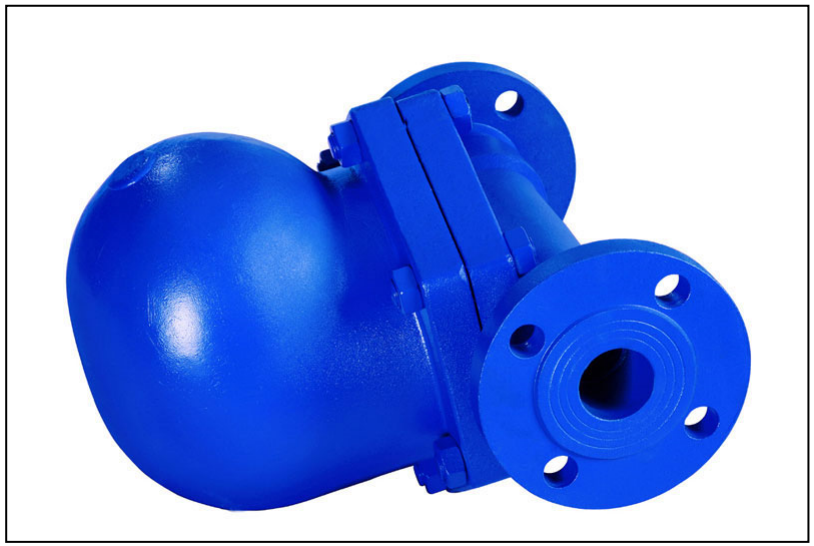
Inverted Bucket

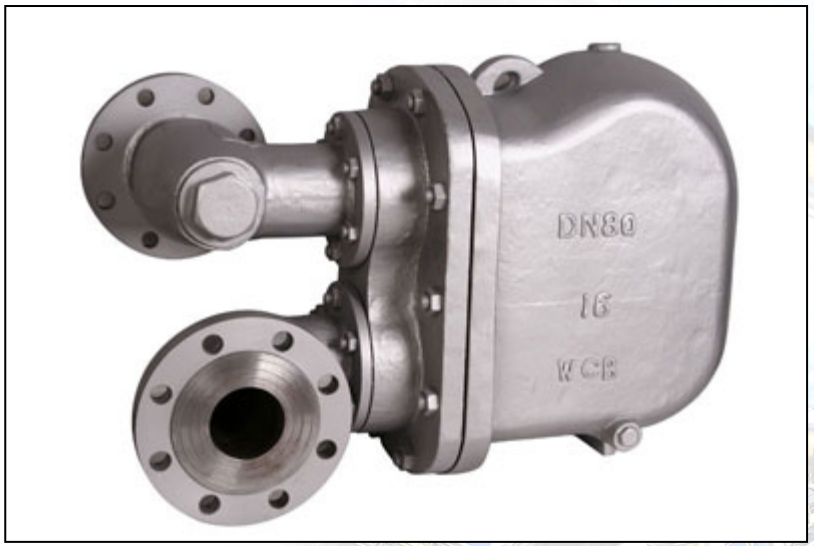


Intermittent Discharge

Lever Float Steam Trap

Construction

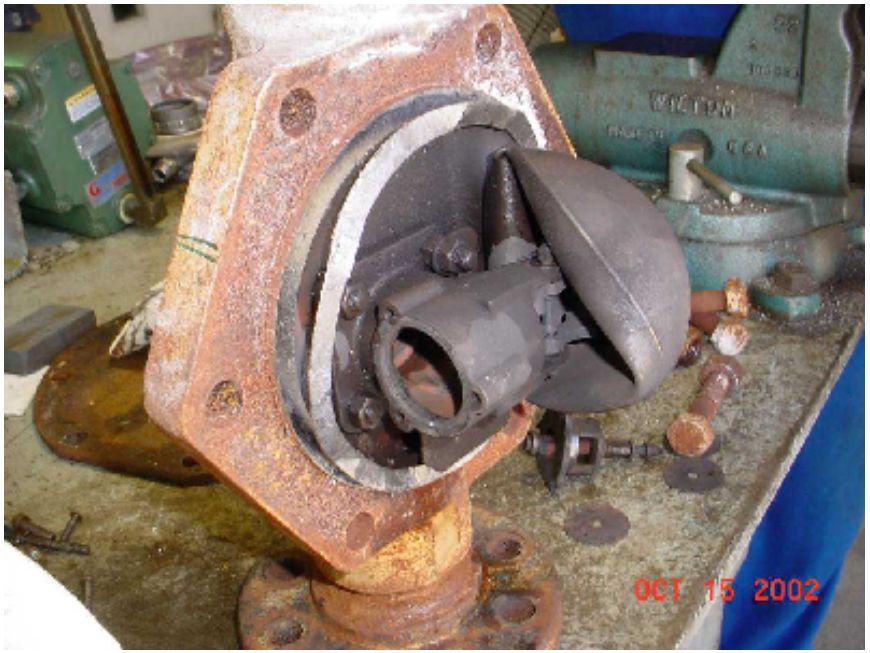




Lever Float Steam Trap

Potential Weakness

Failure of Lever Float Steam Trap



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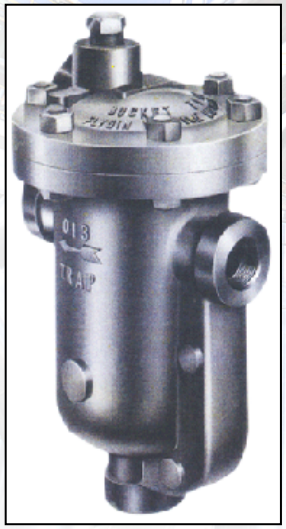
Inverted Bucket Steam Trap

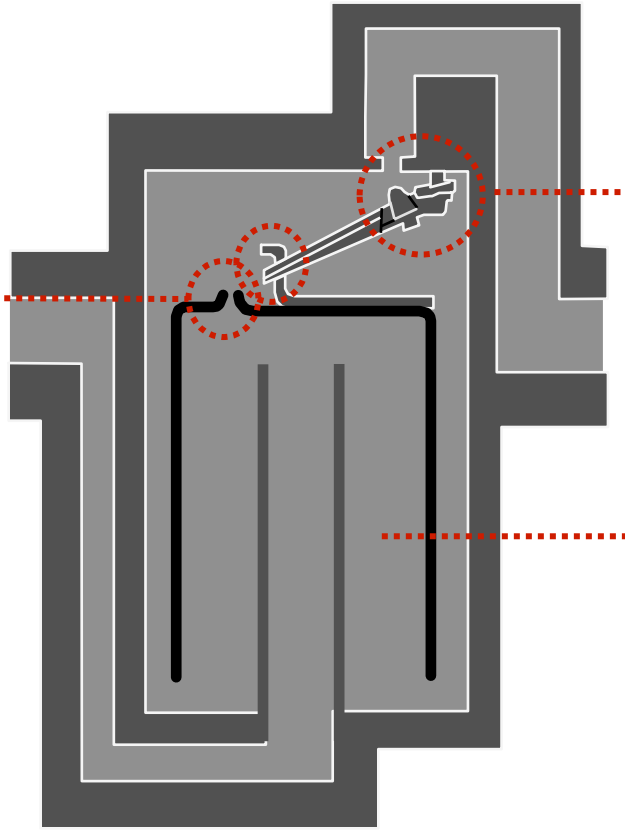
Construction



Inverted Bucket Steam Trap

Potential Weakness

Where Are The Potential Weakness?



Valve seat failure/
Linkage failure

Tiny air vent hole

- slow air venting through the small vent will cause air binding and longer start-up time

Live steam leak under low load or no-loads conditions

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Comparison
Summary

Characteristics	TLV Free Float	Lever Float	Inverted Bucket
Air Venting Capabilities	Excellent Automatic x-element / bimetals air venting	Good Air vent valve for discharge of air	Poor Small vent hole discharges air slowly.
Durability & Reliability	Excellent Only 1 moving part and no concentrated wear. Float cover offers protection against waterhammer.	Poor Failure-prone and weak against water hammer.	Poor Linkage failures and weak against water hammer.
Tight Steam Seal Under Low-Load Conditions	Excellent Water-sealed operation and Three-points seating	Good Water-sealed operation	Poor Live steam leak under low-load conditions.
Suitability For Superheated Steam	Suitable Tight steam seal	Suitable Tight steam seal	Not Suitable Live steam leak under low-load conditions.
Condensate Discharge Pattern	Continuous and Instantaneous	Continuous and Instantaneous	Intermittent

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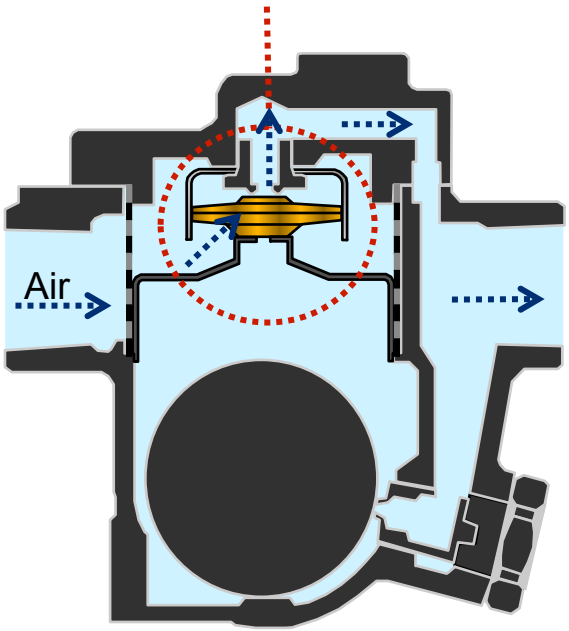
Comparison
Air Venting Capabilities

TLV Free Float

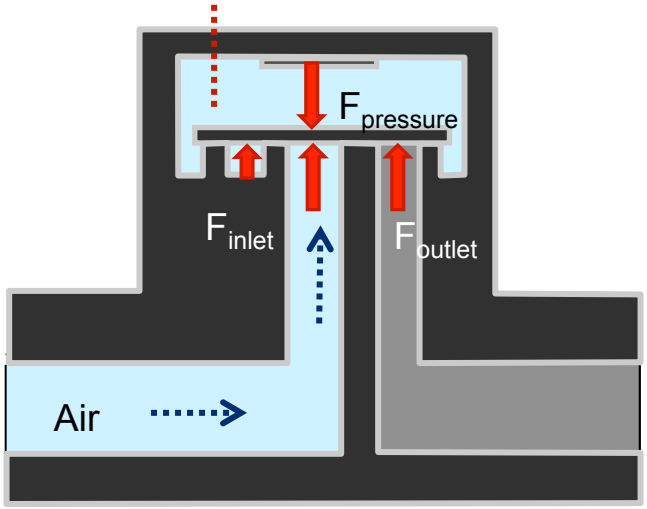
Automatic x-element air venting



Excellent Air Venting, Fast Start-up

Thermodynamic (Disc) Trap

Air : incondensable.
Therefore, no condensation will take place.



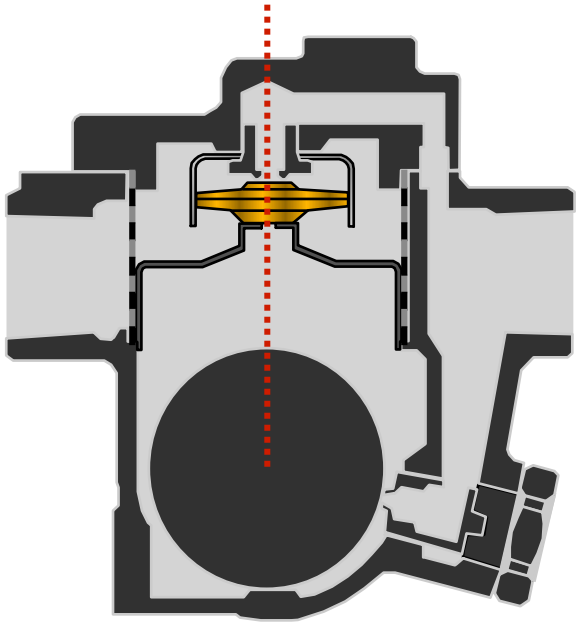
Disc remain close as $F_{pressure} > F_{inlet} + F_{outlet}$

Air Binding Leads to Slow Start-up.

Comparison
Durability (Cont'd)

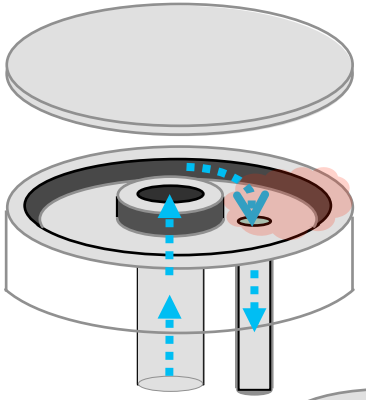
TLV Free Float

Only 1 moving part. No concentrated wear.



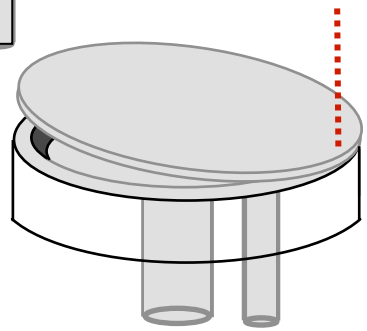
No Concentrated Wear
Long Service Life

Thermodynamic (Disc) Trap



Uneven pressure drop

Uneven contact may cause concentrated wear.

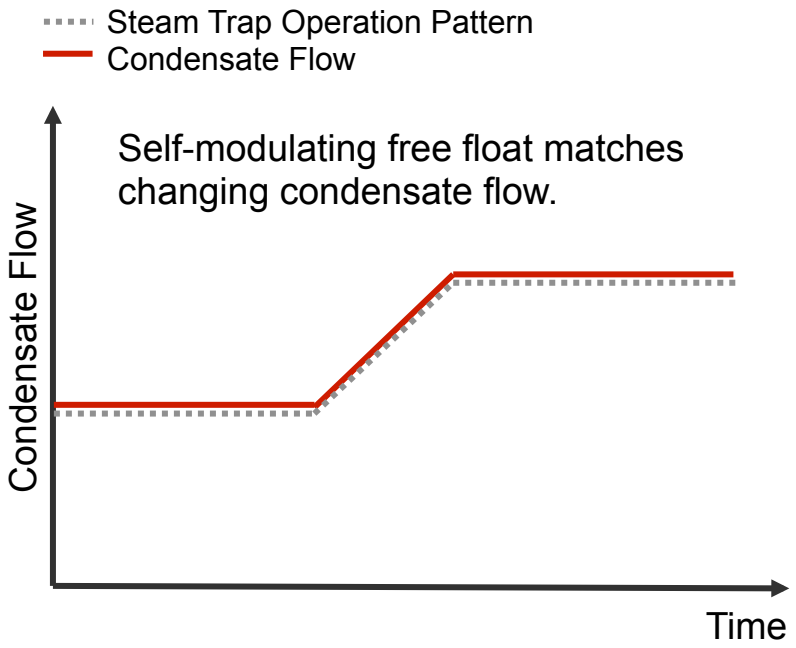


Concentrated Wear on Disc
Short Service Life

Comparison

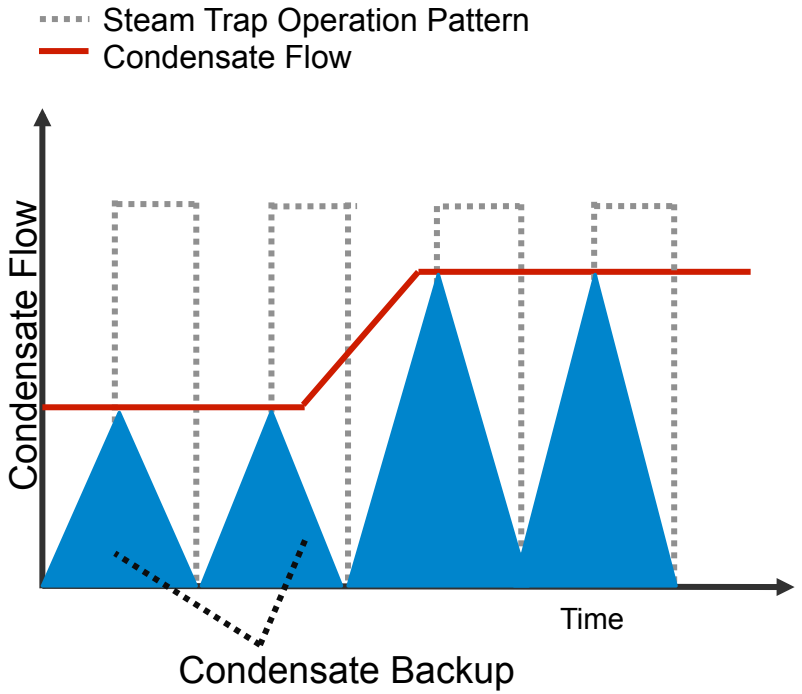
Condensate Discharge Pattern

TLV Free Float



Continuous and Instantaneous Discharge

Thermodynamic (Disc) Trap

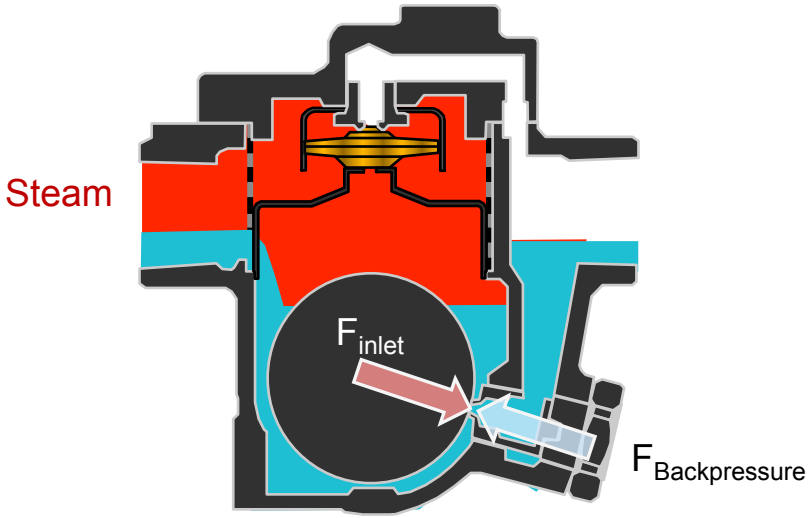


Intermittent Discharge

Comparison
Backpressure Tolerance

TLV Free Float

Force by trap inlet pressure is of opposing direction to backpressure

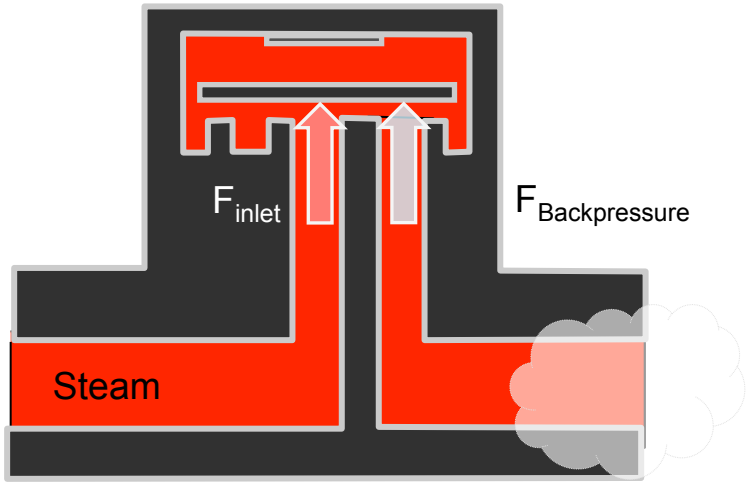


Opening Force = $F_{Backpressure}$

Excellent Backpressure Tolerance
(i.e. High Allowable Backpressure)

Thermodynamic (Disc) Trap

Force by trap inlet pressure is in the same direction to backpressure



Opening Force = $F_{Inlet} + F_{Backpressure}$

Poor Backpressure Tolerance
(i.e. Low Allowable Backpressure)

Comparison
Inherent Steam Loss

Model	Inherent Steam Loss Rates (Normal Condition)
Disc	1.0 kg/hr
Free Float	0.1kg/hr

Steam Trap Type	 Typical Disc Type	 Bucket Type with Universal 2-Bolt Connection	 TLV FS21 Free Float Type with Universal 2-Bolt Connection	 TLV SS1N Free Float Type
Inherent Steam Consumption* (kg/hr)	0.80 – 1.85	0.90 – 1.00	0.51	0.05

Note: Data presented here is the result of accurate measurements with TLV's ISO 7841 approved steam trap operating test rig.

Comparison

Summary

Characteristics	TLV Free Float	Thermodynamic
Air Venting Capabilities	Excellent Automatic x-element /bimetals air venting	Poor Prone to air binding.
Durability & Reliability	Excellent Only 1 moving part and no concentrated wear. Float cover offers protection against waterhammer.	Poor Concentrated wear on disc from frequent opening and closing.
Tight Steam Seal Under Low-Load Conditions	Excellent Water-sealed operation and Three-points seating	Poor Live steam leak during low-load conditions.
Suitability For Superheated Steam	Suitable Tight steam sealing.	Not Suitable Poor steam sealing.
Condensate Discharge Pattern	Continuous and Instantaneous	Intermittent
Backpressure Tolerance	High Backpressure Tolerance Unaffected by high backpressure.	Poor Backpressure Tolerance Easily leak steam when discharge against high backpressure.

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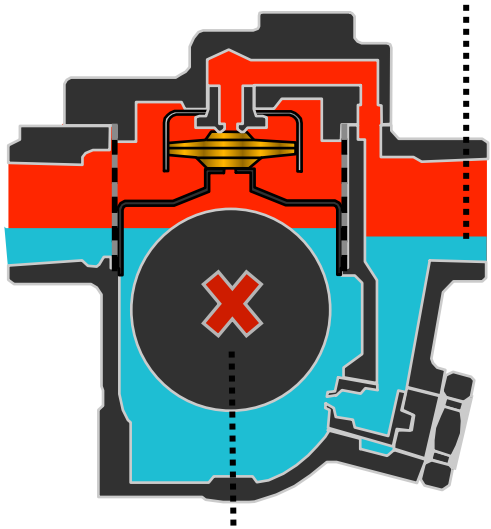
Comparison
Failure Mode

TLV Free Float

Condensate continues to discharge.

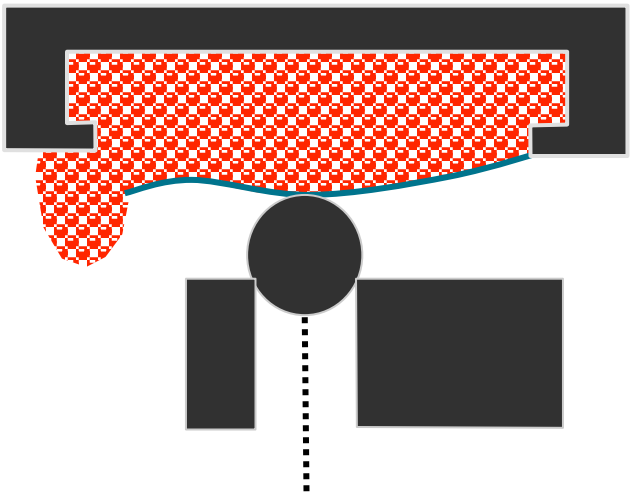


Free Float damaged.

Fail Open Design
(No Condensate Backup When Fails)

Thermostatic Trap (Capsule)

Diaphragm damaged & thermoliquid escape.

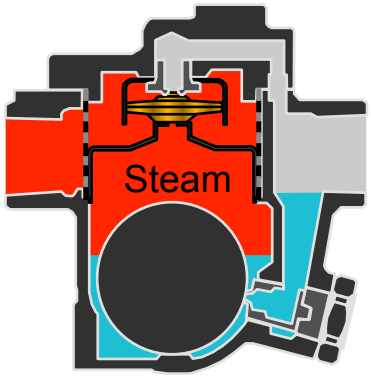


Close and block the valve, causing condensate backup.

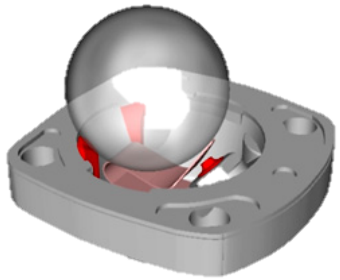
Fail Close Design

Comparison
Tight Steam Seal

TLV Free Float



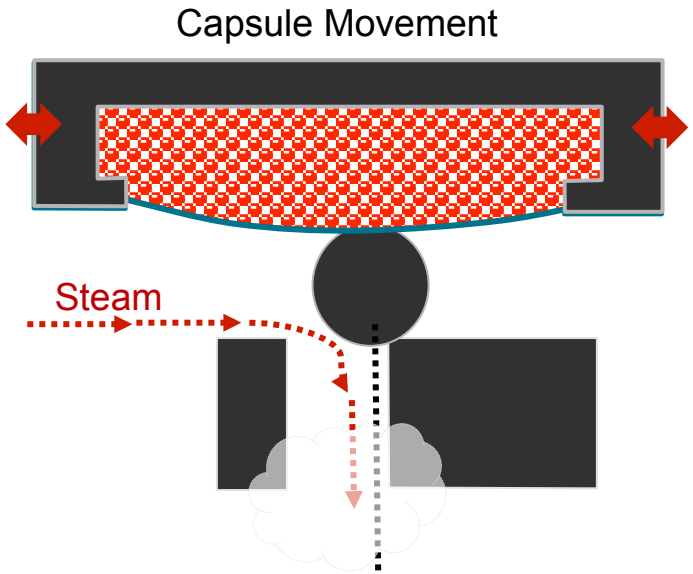
Water Sealed Operation



Three Point Seating

Tight Steam Seal, Minimal Steam Loss

Thermostatic Trap (Capsule)



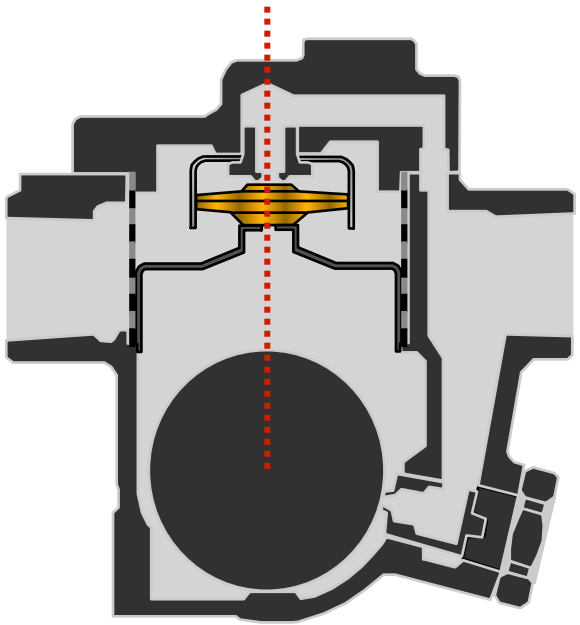
Valve may not rest in proper position, result in steam leak.

Poor Sealing Leads to Steam Loss

Comparison
Durability

TLV Free Float

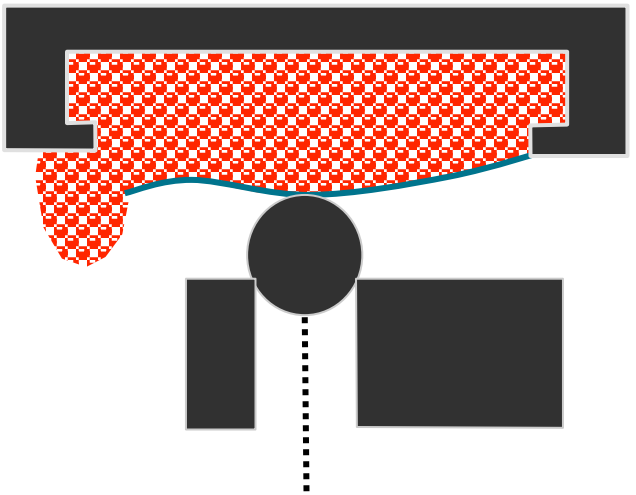
Only 1 moving part. No concentrated wear.



No Concentrated Wear.
Excellent Durability

Thermostatic Trap (Capsule)

Superheated Steam may cause rupture or deformation of diaphragm.



Close and block the valve, causing condensate backup.

Diaphragm Weak Against Superheat.
Poor Durability.

Comparison
Summary

Characteristics	TLV Free Float	Thermostatic (Capsule)
Air Venting Capabilities	Excellent. Automatic x-element/bimetal air venting.	Excellent. Valve is opened at initial to discharge air.
Durability & Reliability	Excellent Only 1 moving part and no concentrated wear. Float cover offers protection against waterhammer.	Poor Diaphragm is easily damaged by superheated steam.
Tight Steam Seal Under Low-Load Conditions	Excellent. Water sealed operation and Three-points seating	Poor Valve may not rest in proper position due to capsule movement, leads to steam leak.
Failure Mode	Fail Open No condensate backup even when trap fails.	Fail Close Condensate backup and cause possible damage to equipment.
Condensate Discharge Pattern	Continuous and Instantaneous	Intermittent

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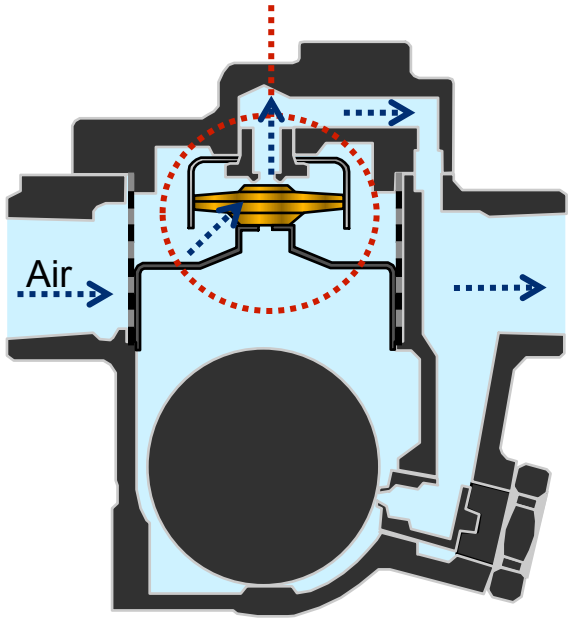
Comparison
Air Venting Capabilities

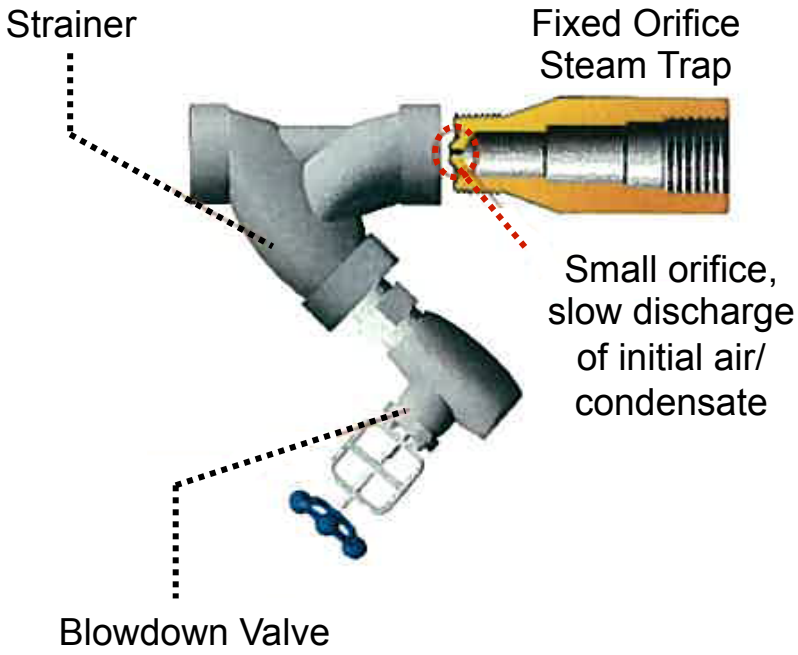
TLV Free Float

Automatic x-element air venting



Excellent Air Venting, Faster Start-up

Fixed Orifice Steam Trap

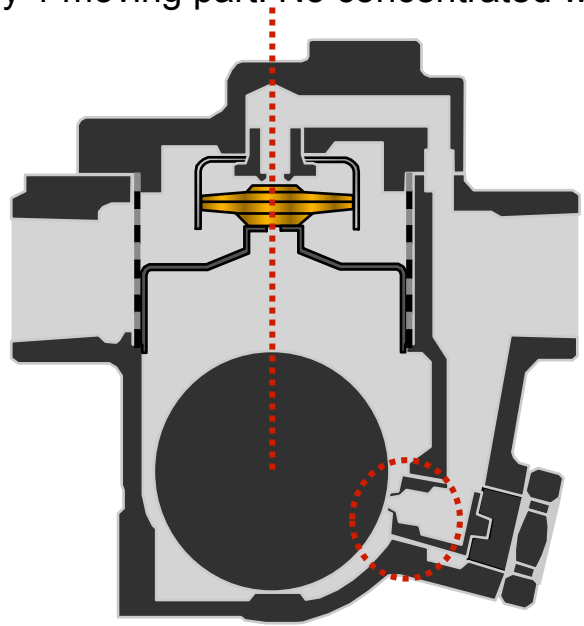


Poor Air Venting, Longer Start-up

Comparison
Durability & Reliability

TLV Free Float

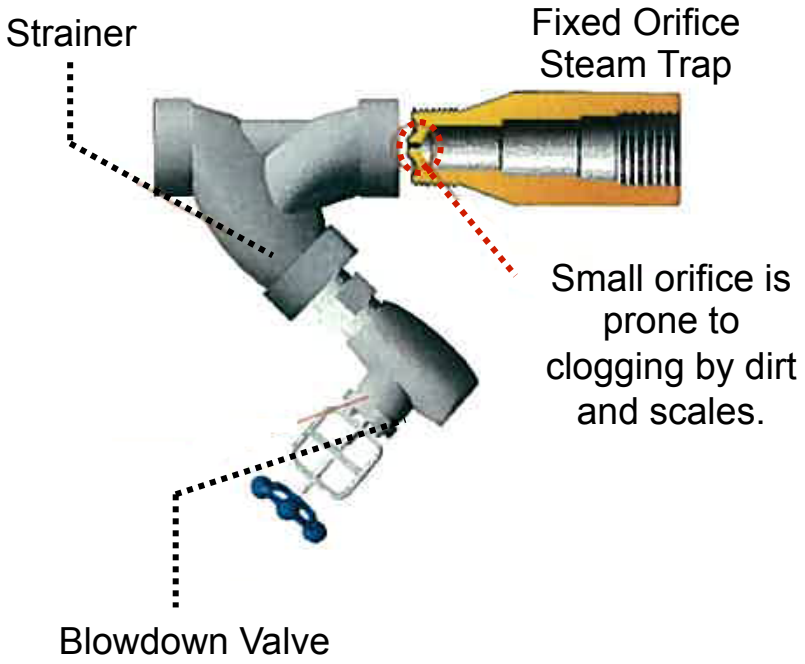
Only 1 moving part. No concentrated wear.



Orifice is larger than that of Fixed Orifice Steam Trap

Long Service Life

Fixed Orifice Steam Trap



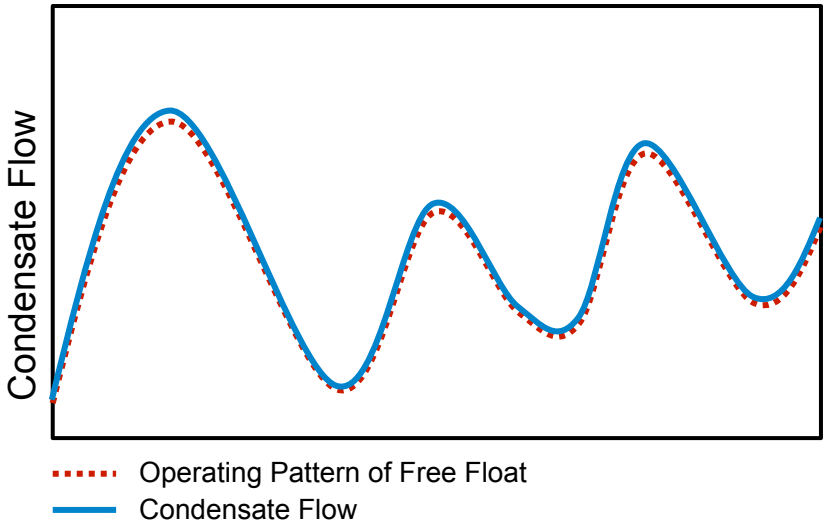
Susceptible to Clogging
High Maintenance/Replacement Frequency

Comparison

Condensate Discharge Pattern

TLV Free Float

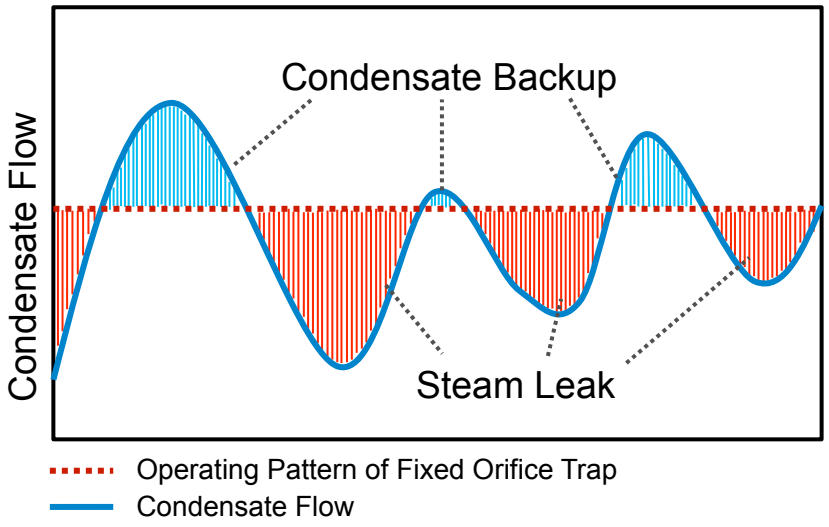
The rising/sinking of free float adjusts the orifice opening according to the condensate load .



Free Float Modulates With Varying Condensate Loads

Fixed Orifice Steam Trap

As the orifice size is fixed, fluctuation in load will cause either steam leak or condensate backup.

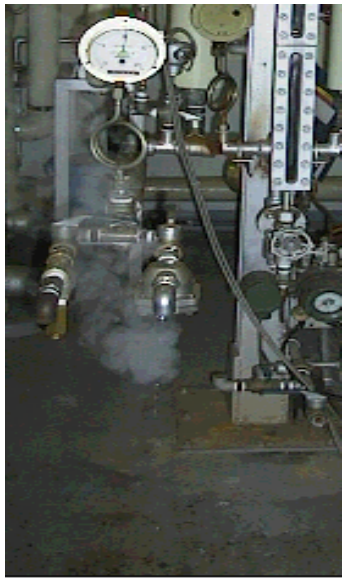


Fixed Orifice Trap Is Not Capable of Handle Varying Loads

Comparison

Condensate Discharge Pattern

TLV Free Float



Free Float Steam Trap
(Model: SS1N)

Flow Capacity: 180 kg/h
Steam Pressure: 10 barG
Condensate Rate: 5 kg/h

Only condensate is discharging with a small amount of flash steam.

Fixed Orifice Steam Trap

Fixed Orifice Steam Trap

Flow Capacity: 174 kg/h
Steam Pressure: 10 barG
Condensate Rate: 5 kg/h

Live Steam Leak as the condensate rate is much smaller than the flow capacity

Comparison
Summary

Characteristics	TLV Free Float	Fixed Orifice
Air Venting Capabilities	Excellent. Automatic x-element/bimetal air venting	Poor. Slow air discharge through small orifice
Durability & Reliability	Excellent. No concentrated wear and less prone to blockages	Poor. Highly susceptible to blockages due to small orifice
Condensate Discharge Pattern	Continuous and Instantaneous.	Continuous.
Capabilities to Handle Varying Loads	Excellent. Self-modulating free float matches condensate flow.	Poor. Fluctuation in load will either cause steam leak or condensate backup.
Ease of Maintenance	Easy Maintenance. No removal from piping required. Inline access to internals allowed.	Difficult Maintenance. Disassembly from piping required. Frequent maintenance of strainer and blowdown valve

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