Your Steam Trap Specialists

American Plant Maintenance

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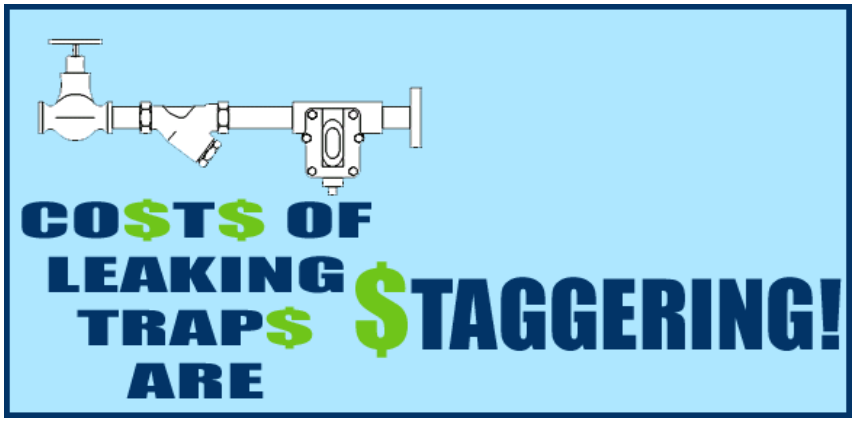
BE PROACTIVE

If you have blowing, leaking or plugged steam traps, you are not only losing energy. You are losing thousand of dollars



The only thing that costs you more than repairing your steam traps is ignoring them!

What is a Steam Trap?

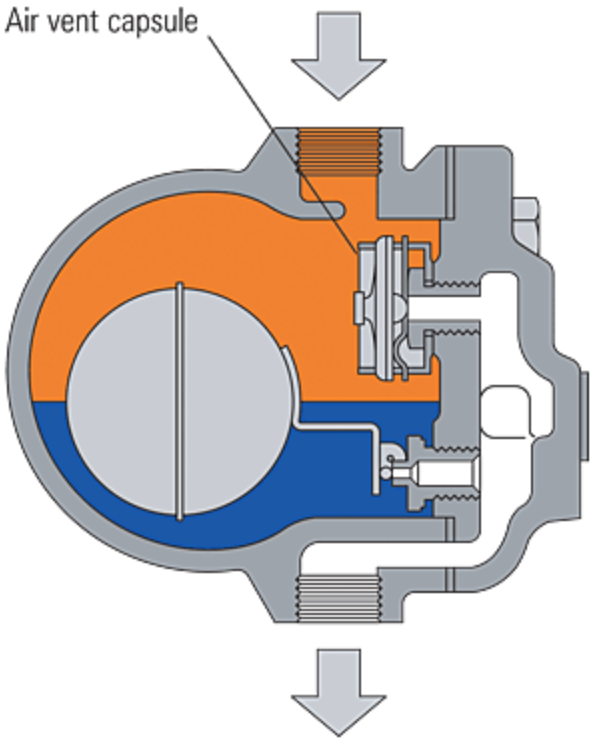
Webster's Definition

Steam Trap: A device that automatically obstructs the passage of steam (as from a pipe) but permits the escape of condensate or entrained air

Float & Thermostatic Traps

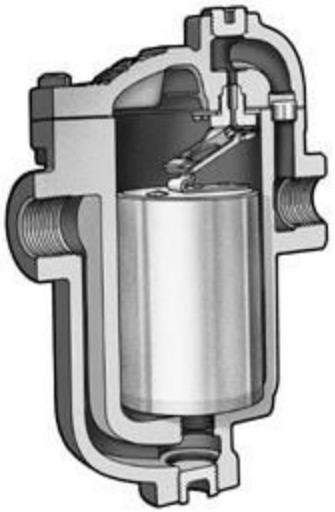
- **Float and Thermostatic Traps**

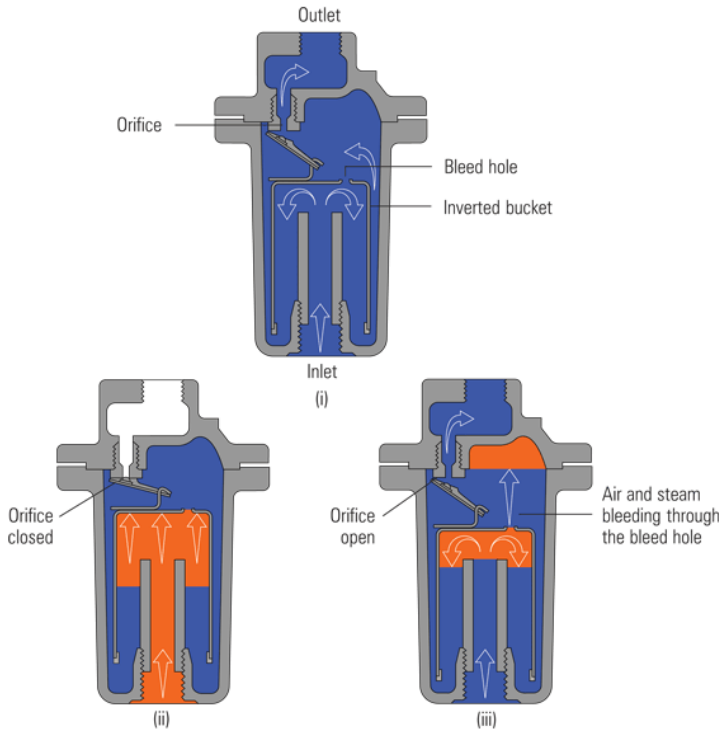
This type of trap should cycle regularly at intervals depending on condensate load and size of float. Under acceptable operation the Steamtector gives zero readings followed by a reading of discharge. Under failed conditions the Steamtector gives a continuous high reading.



Inverted Bucket Traps

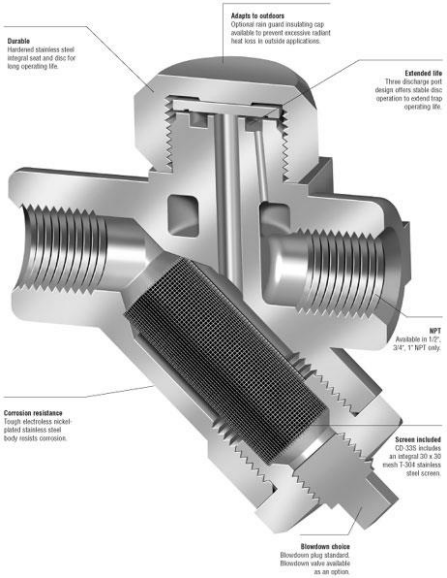
This type of trap is intermittent in operation and should cycle regularly at intervals depending on condensate load and size of bucket. Under acceptable operation the Steamtector gives very low readings followed by a reading of discharge. Under failed conditions the Steamtector gives a continuous high reading.

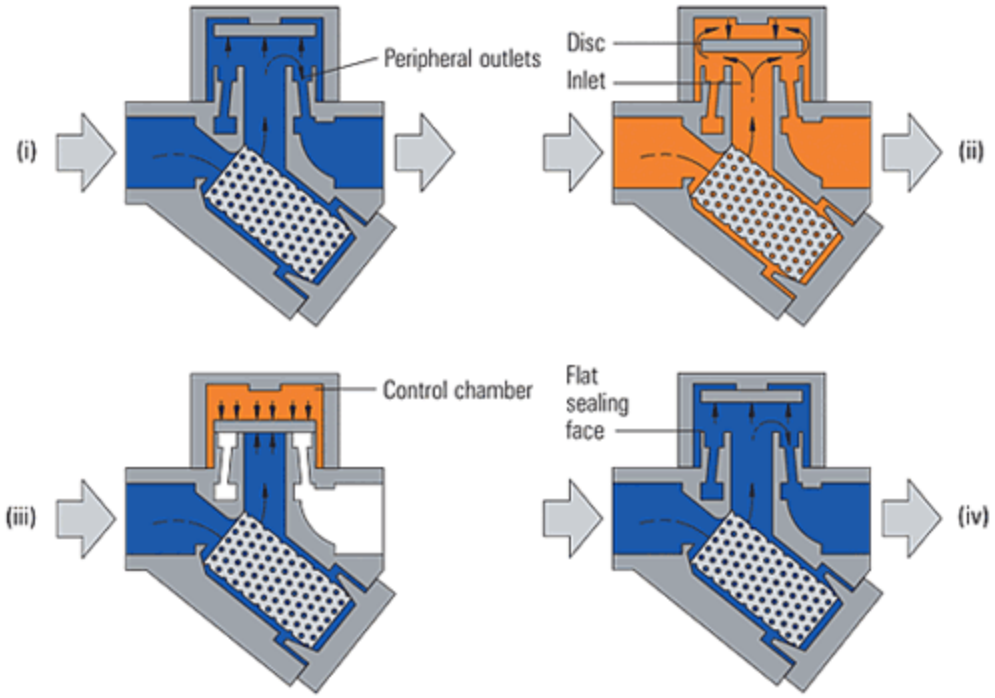




Disc Traps (Thermodynamic)

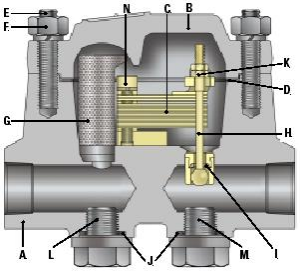
This trap has in intermittent operation, the cycle time usually being 10-20 seconds, but may be as long as 5 minutes. The trap discharges condensate followed by a short blast of live steam before the disc reseals. When this trap fails it may not be seating correctly, sounding like a motorcycle, or if it is blowing by it will have a continuously high reading

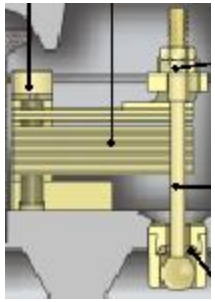


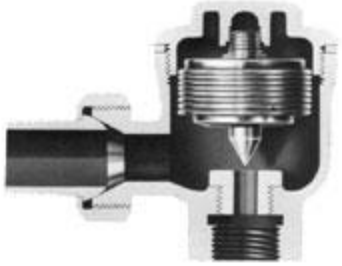


Bimetallic, Bellows and Capsule Traps

(Bellows & Capsule are also known as Thermostatic)
These types modulate with the condensate load, continuously discharging except at low loads when they can become cyclic. Under acceptable operation the Steamtector gives low readings of flow. Under failed conditions the Steamtector gives a continuous and high reading.

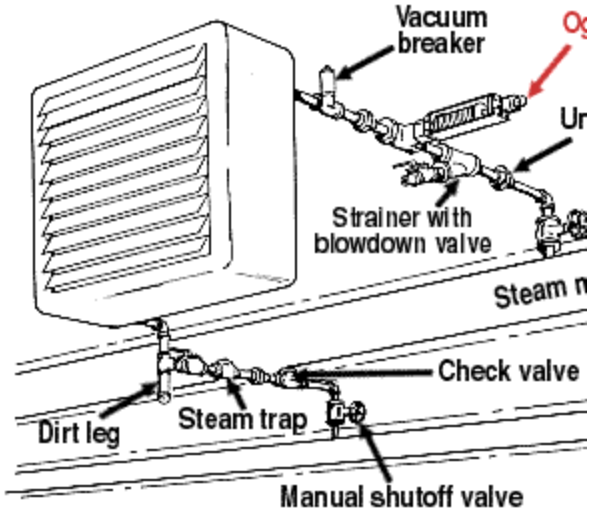






Where To Find Steam Traps?

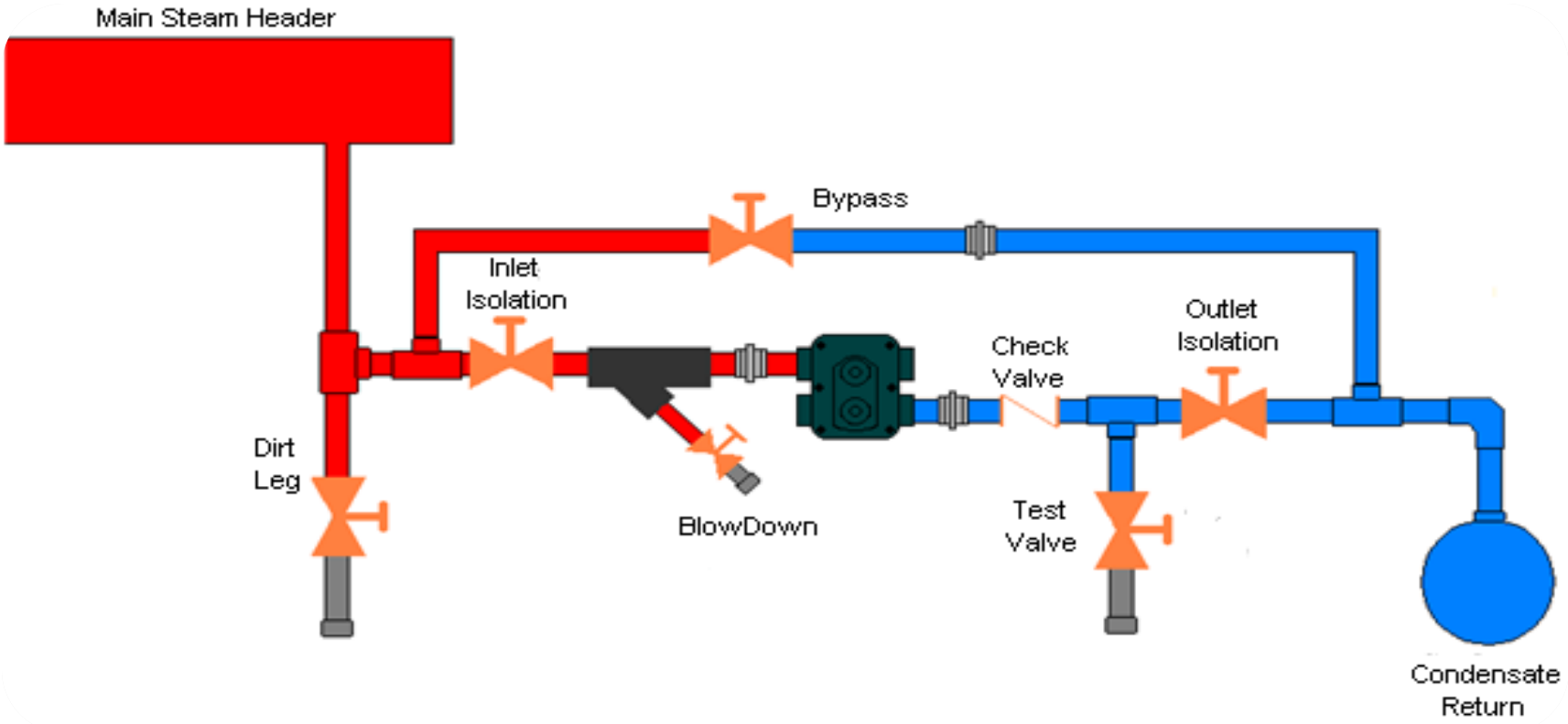
Unit Heaters



Heat Exchangers

Humidifiers

IDEAL TRAP STATION



TRUE COST OF GENERATING STEAM

- **Direct Costs**
- **Indirect Costs**

DIRECT COSTS

- Cost of Water
- Cost of chemicals *(deionizer-resin treatment to handle iron plus softener)*
- Cost of fuel (coal-gas-oil). *There is #2 & #6 oil; #6 has more BTU's but requires steam to keep it thin enough to burn.*
- Electrical costs to run blower, damper, etc.

INDIRECT COSTS

- Depreciation of all equipment involved with steam system.
- Cost of real estate -- buildings and grounds.
- Maintenance -- cost of maintaining steam system.
- Operators -- cost of operators and benefits.
- Major repair & replacement of equipment and parts.
- Auxiliary equipment -- piping, traps, valves, etc.
- Cost of inspection -- insurance companies.
- Insurance -- workman's comp, liability, etc.

Blowing & Leaking Steam Traps

Pressurize Condensate Return

Causes of Traps To Fail Open

- Severely worn internals
- Large pieces of scale interfering with internal operation
- Physical damage due to mechanical linkages, bellows, etc.

What You Can Do:

- Clean trap
- Replace defective parts
- Replace trap

Note: make sure to verify application requirments to insure that the ***right*** trap is used.

Plugged Steam Traps

Can Have Destructive Consequences

Causes of Plugged Steam Traps

- Plugged strainers
- Over pressure of system beyond rating
- Steam locking or air binding
- Damaged internals

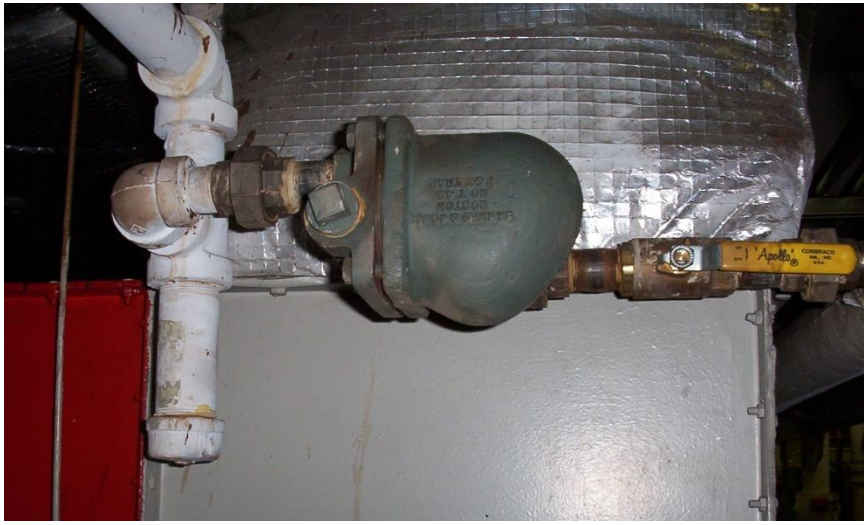
What You Can Do:

- Clean strainer
- Replace damaged internals or entire trap
- Verify application requirements

Note: make sure to verify application requirments to insure that the ***right*** trap is used.

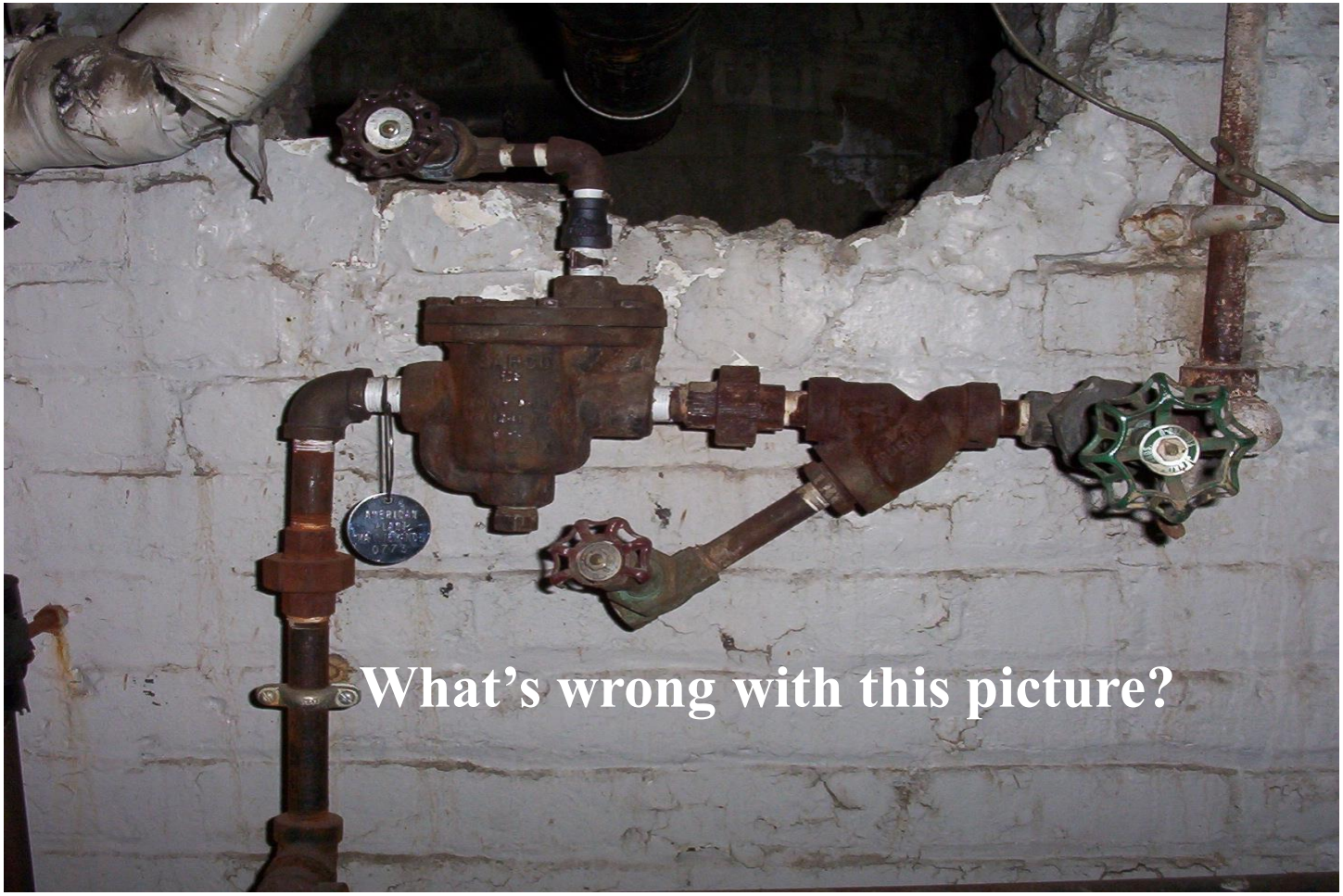
Steam Trap Issues

Cracked Body

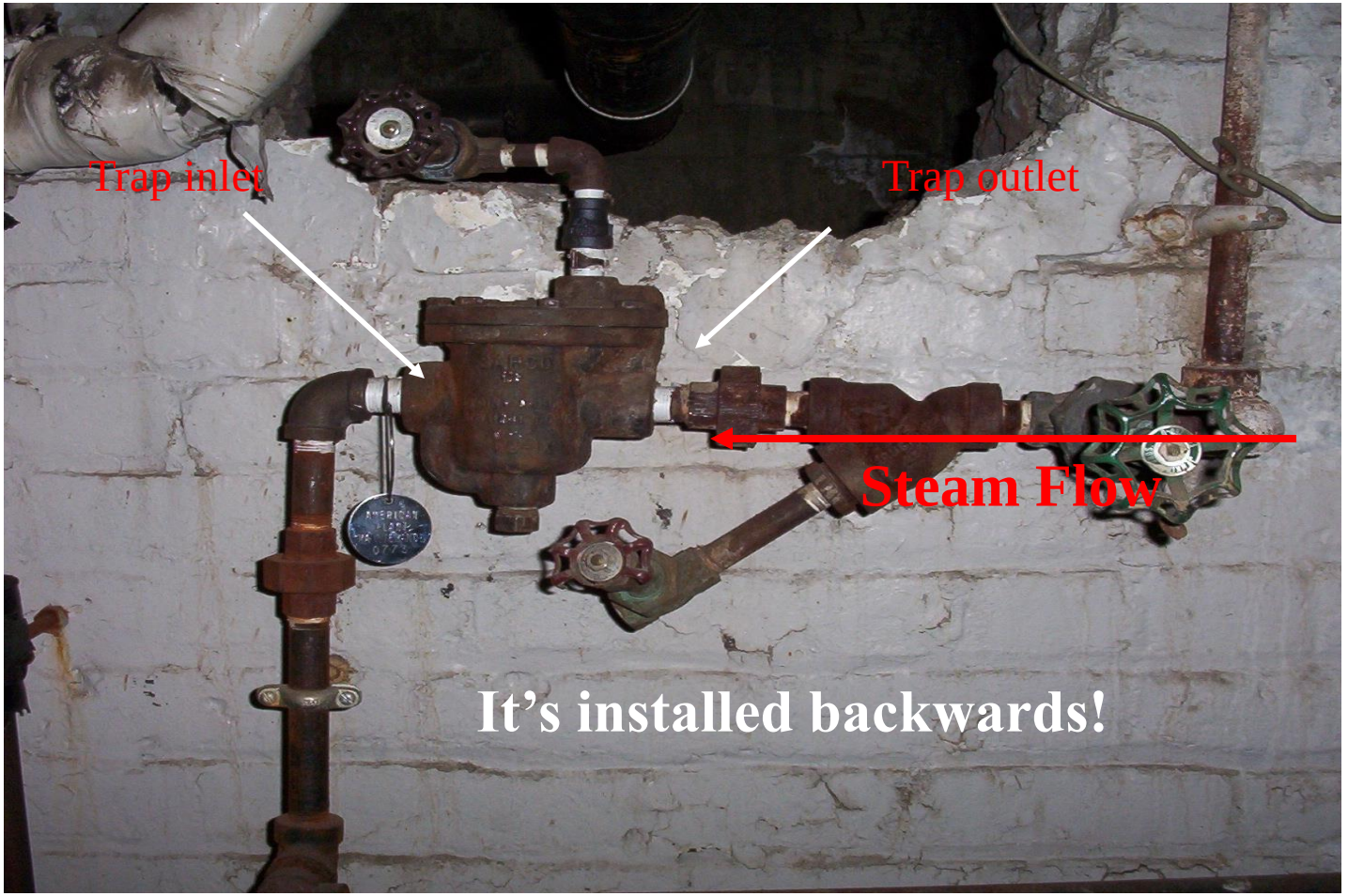


F&T Trap on a drip leg application – Body Upside down.

Steam Trap Issues



Steam Trap Issues



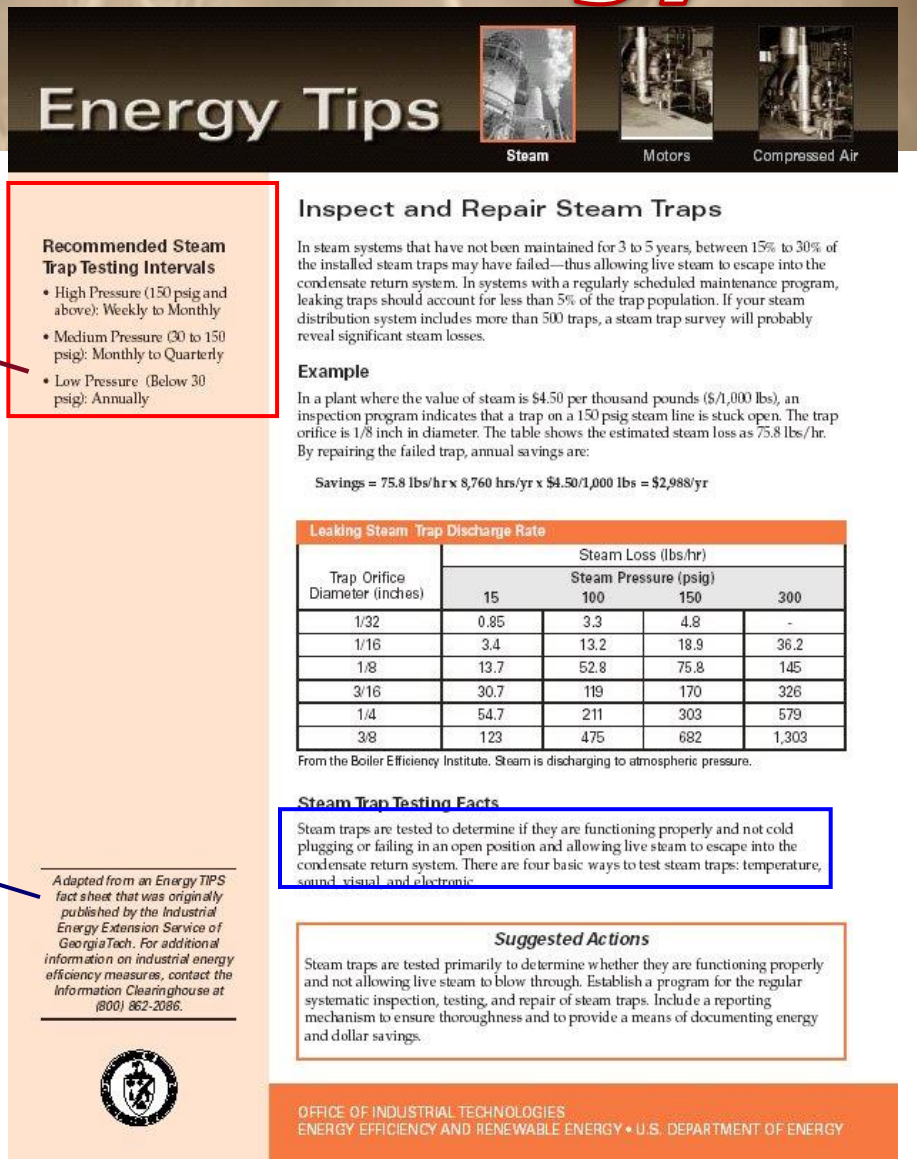
US Department of Energy

Recommended Steam Trap Testing Intervals

- **High Pressure (150 psig and above): Weekly to Monthly**
- **Medium Pressure (30 to 150) psig: Monthly to Quarterly**
- **Low Pressure (Below 30 psig Annually**

Steam Trap Testing Facts

Steam traps are tested to determine if they are functioning properly and not cold plugging or failing in an open position and allowing live steam to escape into the condensate return system. There are four basic ways to test system traps: Temperature, sound, visual and electronic.



Energy Tips

Steam | Motors | Compressed Air

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Adapted from an Energy TIPS fact sheet that was originally published by the Industrial Energy Extension Service of GeorgiaTech. For additional information on industrial energy efficiency measures, contact the Information Clearinghouse at (800) 862-2086.

Inspect and Repair Steam Traps

In steam systems that have not been maintained for 3 to 5 years, between 15% to 30% of the installed steam traps may have failed—thus allowing live steam to escape into the condensate return system. In systems with a regularly scheduled maintenance program, leaking traps should account for less than 5% of the trap population. If your steam distribution system includes more than 500 traps, a steam trap survey will probably reveal significant steam losses.

Example

In a plant where the value of steam is $4.50 per thousand pounds ($/1,000 lbs), an inspection program indicates that a trap on a 150 psig steam line is stuck open. The trap orifice is 1/8 inch in diameter. The table shows the estimated steam loss as 75.8 lbs/hr. By repairing the failed trap, annual savings are:

Savings = 75.8 lbs/hr x 8,760 hrs/yr x $4.50/1,000 lbs = $2,988/yr

Leaking Steam Trap Discharge Rate

Trap Orifice Diameter (inches)	Steam Loss (lbs/hr) Steam Pressure (psig) 15	100	150	300
1/32	0.85	3.3	4.8	-
1/16	3.4	13.2	18.9	36.2
1/8	13.7	52.8	75.8	145
3/16	30.7	119	170	326
1/4	54.7	211	303	579
3/8	123	475	682	1,303

From the Boiler Efficiency Institute. Steam is discharging to atmospheric pressure.

Steam Trap Testing Facts

Steam traps are tested to determine if they are functioning properly and not cold plugging or failing in an open position and allowing live steam to escape into the condensate return system. There are four basic ways to test steam traps: temperature, sound, visual, and electronic.

Suggested Actions

Steam traps are tested primarily to determine whether they are functioning properly and not allowing live steam to blow through. Establish a program for the regular systematic inspection, testing, and repair of steam traps. Include a reporting mechanism to ensure thoroughness and to provide a means of documenting energy and dollar savings.

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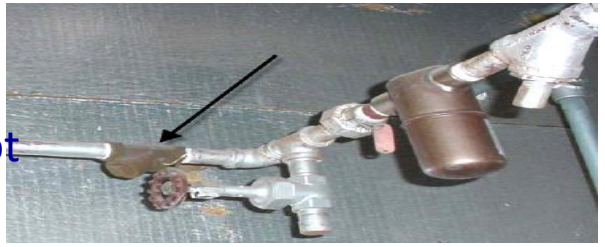
ENERGY EFFICIENCY AND RENEWABLE ENERGY • U.S. DEPARTMENT OF ENERGY

Not Just Testing Steam Traps - Analyzing the Entire Trap System

Issues Discovered During Surveys

It is clear from the picture that this trap has been here a long time. What is not so obvious is that this trap is installed incorrectly.

It is common to find steam system components installed incorrectly. A mechanical check valve that requires gravity to operate properly is installed upside down. The check valve will not operate correctly in this orientation.



This valve is stuck partly open steam blowing live steam to atmosphere. Valves fail due to wear, corrosion & dirt/contaminates stuck in the valve seat

GATHERED DATA Table 1: Information by Trap Tag

Table 1 - All Steam Trap Survey Information Sorted by Trap Tag Number
Result Key: OK=Okay B=Blowing L=LeakingP=Plugged NIS=Not In Service LBD=Leak By Design
NA=Not Accessible RIP=Retired In Place Trap Type Key: IB=Inverted Bucket VIB=Vertical Inverted Bucket
FT=Float & Thermostatic BM=Bimetallic TD=Thermodynamic 90RT=Radiator Trap

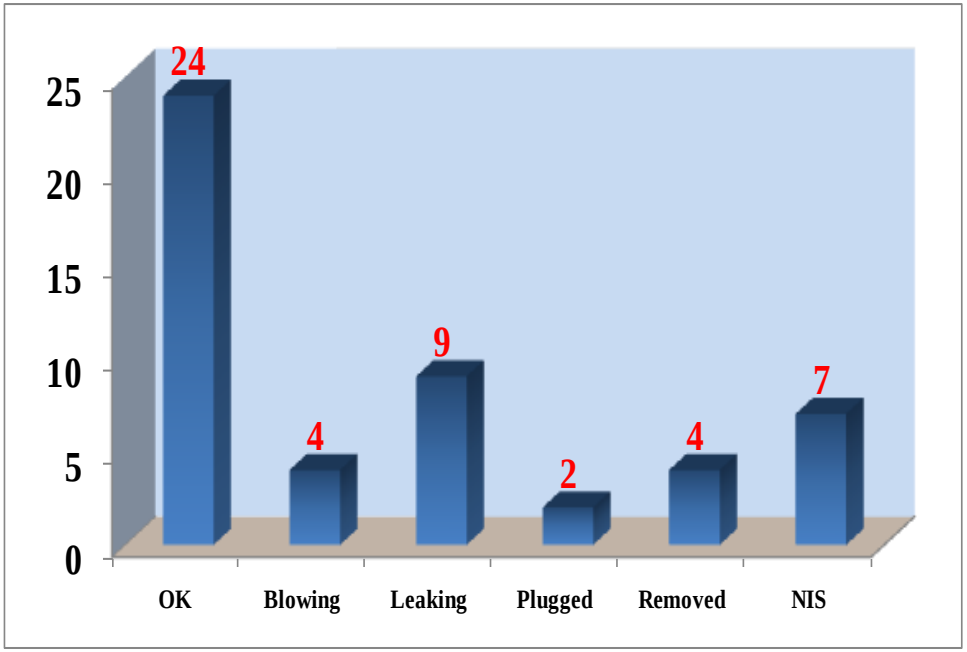
Tag	Appl.	Bldg / Floor / Room	Trap Location, Elevation	Mfr.	Model	Type of Trap	Pipe Size	Press (PSI)	Temp In	Temp Out	Result	Comments
134	Drip Leg	1st / CIP Rm	At Rinse Recovery Tank, 0-5’	Armstrong	811	IB	3/4"	100	301	221	L	Inlet Isolation, Strainer, Blow Down, Check Valve, Test Valve, Outlet Isolation. Replace Rotted 3/4" Nipple.
136	HEX	1st / CIP Rm	Right Of Rinse Recovery Tank, 0-5’	Spirax Sarco	FT-15	FT	2”	5	224	192	OK	Inlet Isolation, Strainer, Blow Down, Check Valve, Test Valve, Outlet Isolation.
137	Drip Leg	1st / CIP Rm	Above Backflow Preventer, 5-10’	Spirax Sarco	UTD52	TD	3/4"	100	288	197	OK	Inlet Isolation, Strainer, Check Valve, Outlet Isolation. Replace 3/4" Check.

Calculation 1:
Cost of Loss of Live Steam

The calculation below is based on a completely blown trap with no additional restrictions to the orifice. Some styles of traps have a valve stem that penetrates the orifice & take up a portion of the area. This lowers the estimated losses based on the restricted portion. A 1/4" orifice with a 1/8" valve stem would have an area reduction of 0.0123 sq inches & would lower the above estimated losses from $3,922 to approximately $2,941.

Steam Loss Data						# bad traps:		
Avg Size of Leak (dia):	0.250	in.		Hours/Day:	24	Steam Cost:	1	
Steam Pressure:	10	psi		Days/Yr:	365	0	15	$/1000 lb
Steam Loss Calculations								
Amount Lost:	29.85	lb/hr	X	24	hrs/day	=	716.292	lb/day
Daily Cost:	716.292	lb/day	X	$15.00	Steam cost	=	$10.74	Cost/day
Total Est. Loss Per Year:	$10.74	Cost /day	X	365	days/yr	=	$3,921.70	Loss/yr
Annual Loss:	$3,921.70	Loss/year	X	1	trap	# bad traps:	$3,921.70	Annual loss

Figure 1:
Survey Statistics Results



Fifty (50) traps on site;
Thirty nine (39) were tested;
Seven (7) were not in service;
Four (4) were removed.

The quantity of blowing, leaking & Plugged traps accounts for about 30% of all the traps & about 38% of the traps tested. The results collec during the survey are shown graphically.

A conservative method is used to calculate the total estimated steam loss. The calculation is based on an industry method of calculating steam losses & is accepted by the U.S. Department of Energy. Dominant factors in the formula are the steam pressure, orifice size & mode of failure. Utilizing an estimated steam cost of $15.00/1,000 lbs of steam, calculated annual losses in excess of $38,800 are being suffered. This is based on the steam traps that were tested & found to be blowing, leaking & plugged.

RETURN ON INVESTMENT

Figure 2: ROI for replacing all steam traps found to be blowing, leaking, and plugged.

Return on investment	Each	15X
Labor (avg.)	$266.67	$4,000
Trap costs (avg.)	$548.47	$8,227
Total Parts & Labor	$815.13	$12,227
Cost per day for failed trap (avg.)	$7.09	$106.41
Return on investment (Days):		115

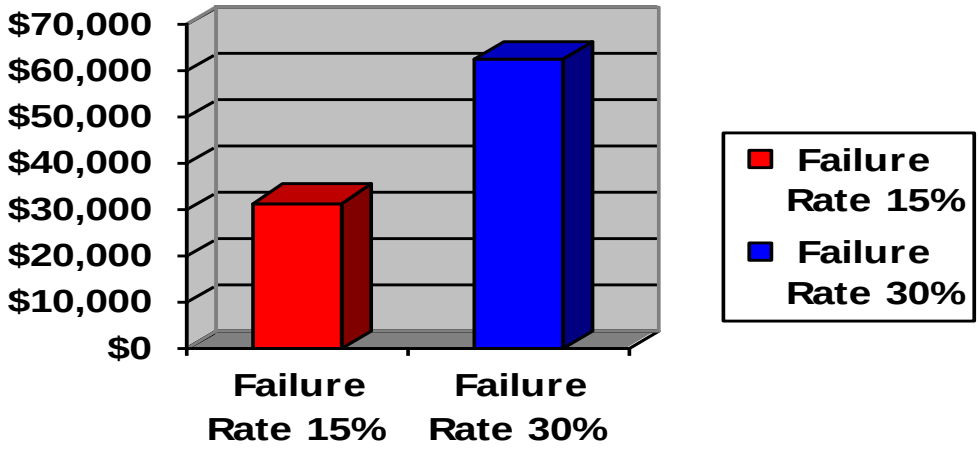
The return on investment analysis is based on repairing the blowing, leaking & plugged steam traps. The steam trap estimate includes costs to repair or replace the failed steam traps & the labor to complete the installation.

The average cost & labor per trap is $815.13. The total estimate for repairing the traps (including labor) is: $12,227.

The return on investment is 115 days. This estimate uses $106.41 as a daily cost of loss of live steam.

PRELIMINARY ECONOMICS SHEET

The Department of Energy states when steam traps are not maintained for 3-5 years expect a 15%-30% failure rate. For this analysis we will use 100 traps at $15.00/1000lb/hr.



PSI	Result	Mfr	Model	Type	Pipe Size"	Orifice	Annual Steam Loss
10	Blowing	Radiator Trap	122	90 RT	1/2"	0.250	$3,005.00
D.O.E. 15% Failure							x 15 Traps
ESTIMATED TOTAL ANNUAL EXPENSE OF STEAM LOSS:							$26,297
D.O.E. 30% Failure							x 30 Traps
ESTIMATED TOTAL ANNUAL EXPENSE OF STEAM LOSS:							$52,594

Cost Of Steam Leaks at 10 PSI For One Trap

Orifice Size (in)	Monthly Cost of Steam Loss	Annual Cost of Steam Loss
1/8	$62.61	$751.34
1/4	$250.45	$3,005.34

Expenses for the above steam losses are based on an estimated steam cost of $15.00/1000 lb/hr. Higher pressures will have higher steam losses (not linear). These estimates are for a single steam trap. Multiply the above losses by the number of steam traps that are suspected of blowing for a total estimate of losses

Cost Of Steam Leaks at 100 PSI For One Trap

Orifice Size (in)	Monthly Cost of Steam Loss	Annual Cost of Steam Loss
1/8	$290.75	$3,489.00
1/4	$1,163.00	$13,955.98

Expenses for the above steam losses are based on an estimated steam cost of $15.00/1000 lb/hr. Higher pressures will have higher steam losses (not linear). The above estimates are for a single steam trap. Multiply the above losses by the number of steam traps that are suspected of blowing for a total estimate of losses

COSTS FOR VARIOUS SIZED STEAM LEAKS FOR ONE TRAP

ORIFICE SIZE	5 PSI	10 PSI	15 PSI	30 PSI	50 PSI	70 PSI	100 PSI
1/32”	$37.45	$49.96	$56.46	$84.98	$123.00	$161.03	$218.06
1/8”	$599.24	$751.34	$903.43	$1,359.70	$1968.07	$2,576.44	$3,489.00
1/4”	$2,396.97	$3,005.34	$3,613.71	$5,438.82	$7,872.29	$10,305.77	$13,955.98
5/16”	$3,745.27	$4,695.85	$5,646.42	$8,498.15	$12,300.46	$16,102.76	$21,806.22
3/8”	$5,393.19	$6,762.02	$8,130.85	$12,237.34	$17,712.66	$23,187.98	$31,400.96
7/16”	$7,340.73	$9,203.86	$11,066.99	$16,656.38	$24,108.90	$31,561.42	$42,740.19
1/2”	$10,353.28	$12,021.37	$14,454.84	$21,755.27	$31,489.17	$41,223.07	$55,823.93

QUESTIONS & ANSWERS

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