AIR & HYDRONIC SPECIALTIES
"STRENGTH IN SERVICE"

Strength in Service

steam trap ASSESSMENT

efficiency starts ***here.***

Air & Hydronic Specialties is proud to be your sustainability service provider.
Thank you for choosing us to survey your steam system.

This is a sample report.

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EXECUTIVE SUMMARY

A total of 299 steam traps were noted during the steam trap survey. As a result of the field investigation and computed analysis, **19%** of the traps surveyed were found to be **defective and passing steam**. The steam loss is calculated to be **3,666.45 tons** per year, at an annual **cost of $43,997**. In addition to the traps that were passing steam, 1,430.16 tons of annual steam loss via steam leaks was identified during the survey. Altogether the total annual steam savings including leaks is **$65,722.**

FINANCIAL SUMMARY		
Annual steam trap energy savings		$43,997
Annual steam leak energy savings		$17,162
Additional GEM trap efficiency savings		$4,562
Total Savings		**$65,722**
Project 1 - Fix Leaks	*1,430.16 tons*	*TBD*
Project 2 - Replace Failed Traps	*3,666.45 tons*	$72,861
Total Investment		**$72,861**
Simple Payback		**90.20%**
ROI (years)		**1.11**
Annual MMBTU reduction		13,166
Fuel coefficient		117
CO2 (lbs./year) Reduction		**1,540,449**

Of the 299 traps surveyed, 200 were in service while 77 were not running at the time of the survey due to possible idling at the processes. 22 traps were removed from the previous survey. There are also 17 traps identified that require additional investigation. The following table is a summary of the in-service traps condition.

In-Service Trap Population		
Condition	**# of Traps**	**Percentage**
Good	127	64%
Partially Open	25	13%
Failed Open	28	14%
Failed Closed	3	2%
Pending Investigation	17	9%
Totals	**200**	**100%**

ASSESSMENT OVERVIEW

Steam Trap Survey Process

A combination of visual inspection, ultrasonic detection, and thermal measurement techniques are employed to accurately assess the steam trap's condition. The infrared thermal imaging will verify the presence of high temperature steam upstream of the trap and lower temperature condensate downstream of a properly functioning trap. It is important to remember that these measurements only give a snap shot of the system at the time of the measurement. Temperatures significantly below steam temperature upstream of the trap indicate the trap is either fully or partially blocked and not draining condensate effectively.

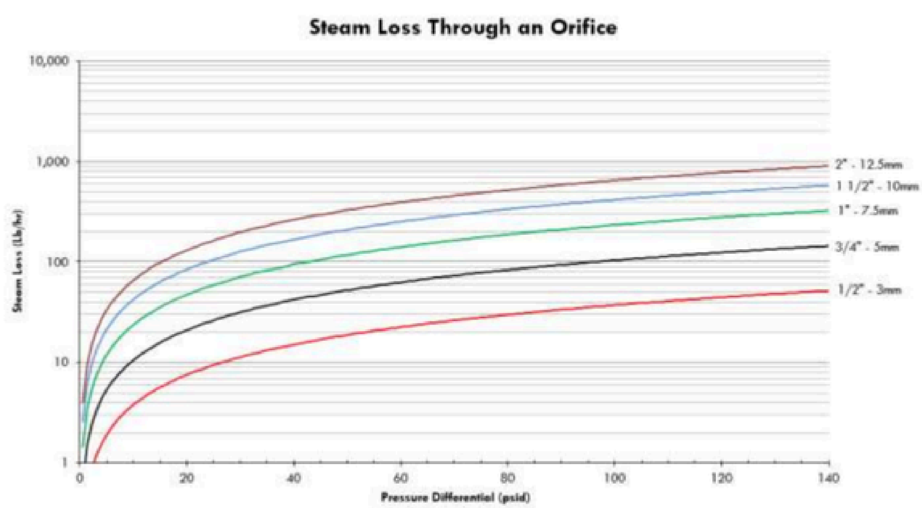
Steam Loss through Failed Traps

The amount of steam lost through a failed open mechanical trap depends on the size of the orifice and the differential pressure across the trap. The graph below illustrates the steam loss expected across mechanical steam traps. This data is provided by mechanical steam trap manufacturers. This chart, in combination with Napier's equation for steam loss through an orifice is used to calculate steam loss.

There are several variations of Napier's equation. The specific equation below is used more commonly when calculating steam loss.

$$M = 24.24 \times P \times D^2$$

Where:
M = flow rate, lbs./hr.
P = Absolute pressure
D = Diameter of orifice



	Pressure Range (psig)					
	2-15	15-30	30-60	60-90	90-120	120-150
Average Pressure (psig)	8.5	22.5	45	75	105	135
Trap Size (Orifice size)	Steam Loss (Lbs./hr.)					
1/2" (0.118")	7.83	12.55	20.15	30.27	40.40	50.53
3/4" (0.197")	21.82	34.99	56.16	84.38	112.60	140.82
1" (0.295")	48.93	78.46	125.93	189.21	252.50	315.78
1 1/2" (0.394")	87.28	139.97	224.63	337.52	450.41	563.29
2" (0.492")	136.11	218.25	350.27	526.30	702.33	878.36

Source: U.S. Department of Energy Estimates

The diameter of the orifice is derived from the chart on the previous page. For example, a 1/2" mechanical trap steam loss is based on an orifice diameter of 0.118". At 50 psig the steam loss is 20.15 lbs./hr. The temperature downstream of the trap is used to determine the pressure it is passing steam at and the loss is calculated at each trap based on the previous table.

The traps are assigned to two distinct production hours, which more accurately represent their annual operation. These hours are divided as follows:

Operating Hours of All Traps		
Period	Hours	Percentage
Period 1	8,000	27.09%
Period 2	4,500	72.91%

The total steam loss takes into account the hours of operation for each trap. The hours of operation are based on the specific application. All drip legs are assigned to Period 1, as they will always be required to run. All other processes, including heat exchangers, unit heaters, and air handling units are assigned to Period 2 as they are only needed periodically.

The total steam loss through all the failing traps is **3,666.45 tons per year**. Using a steam cost of $12* per ton, the annual cost of steam lost through failed traps is **$43,997.**

**Steam cost average taking into account energy cost, boiler efficiency, water make-up/treatment costs, maintenance costs and heat losses associated with steam production.*

INTRODUCTION TO STEAM

Steam is the most commonly used medium to distribute heat around an industrial plant, due to its high energy content and the ease with which its temperature can be regulated. Steam condenses to water as it loses its useful energy.

Purpose of Steam Traps

A steam trap is an automatic valve that allows condensate, air and other non-condensable gases to be discharged from the steam system while holding the steam in the system. Several different types of steam trap technologies exist to accomplish this extremely critical and necessary task. For any steam system to operate properly traps are used to remove condensate, air and other non condensable gases such as carbon dioxide from the steam system. Each one of these categories is explained below.

Condensate:

When steam releases its heat energy in a heat exchanger making hot water, from a radiator heating a room, from a steam pipe transferring steam or from any process application, the steam reverts back to water. This water, technically referred to as condensate, must be separated from the steam and removed from the system or the system would back up with water. The removal of condensate from steam is considered the primary function of the steam trap.

Air:

Air exists in all steam pipes prior to system start-up when the system is cold. This air must be bled out of the piping system so that the steam can enter and eventually reach the designated process applications. If the air is not removed, the steam will effectively be blocked from entering the steam pipes by the residual air. In addition to blocking the steam, air acts as an insulator to heat transfer. Even after the system is filled with steam, small amounts of air can re-enter the system through various paths such as boiler water make-up systems and vacuum breakers.

Non-Condensable Gases:

Gases other than air such as carbon dioxide exist inside steam systems. These non-condensable gases must also be separated from the steam and removed from the system for all processes to operate properly. In addition to inhibiting steam flow and proper heat transfer, carbon dioxide can be very corrosive to components in the system.

Steam Trap Applications

Steam trap applications are divided into three very distinct categories. Each category is described in detail below.

Drip Applications:

Drip applications are by far the most common application for steam traps. This application refers to removing the condensate that forms in steam lines when steam loses its heat energy due to radiation losses. Traps used in these applications are referred to as drip traps. Generally speaking, traps used for these applications require relatively small condensate capacities and do not normally need to discharge large amounts of air. (Air removal is the primary function of air vents and process traps located throughout the system) The most common trap choices for drip applications are thermodynamic for line pressures over 30 psig, and float and thermostatic for line pressures up to 30 psig. Inverted bucket traps are also commonly used for drip trap applications due to their ability to handle large amounts of dirt and scale often found in this type of application.

Process Applications:

Process trap applications refer to removing condensate and air directly from a specific heat transfer process such as a heat exchanger that could be making hot water or a radiator heating a room. Traps used in these applications are referred to as process traps. Generally speaking, traps used for process applications require larger condensate handling capability and also need to be able to discharge large amounts of air. The most common trap choices for process applications are float and thermostatic traps. Both are known for their excellent condensate and air handling capabilities.

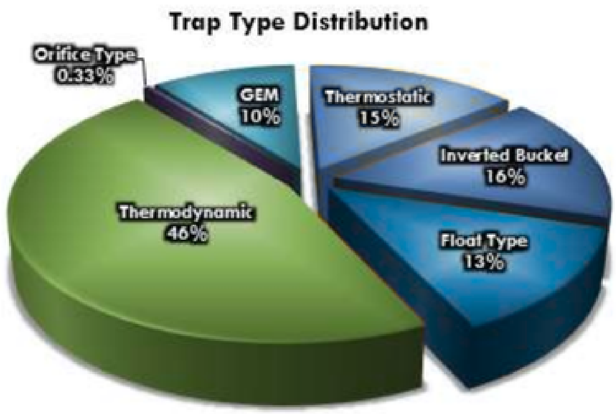
In contrast, thermodynamic traps and inverted bucket traps, which have poor air handling ability, would normally make a poor choice for process applications.

Tracing Applications:

Steam tracing refers to using steam to indirectly elevate the temperature of a product using jacketed pipes or tubing filled with steam. A typical application would be wrapping a high viscosity oil pipeline with steam tubing. The steam inside the tubing heats the oil to lower its viscosity, allowing it to flow easier through the pipeline. Similar to any steam applications, a steam trap must be used on the end of the steam tubing to discharge unwanted condensate. Steam traps used in these applications are referred to as tracer traps. The most common trap choice for tracing applications is the thermostatic type.

STEAM TRAP TYPES

The chart and table below illustrate the different types of steam traps found at Sample Company and what percentage of the overall trap population they make up. A description of how different steam traps work, including those noted at Sample Company, can be found throughout this section.



Trap Type Statistics		
Type	**# of Traps**	**Percentage**
Inverted Bucket	47	15.72%
Float Type	39	13.04%
Thermodynamic	138	46.15%
Orifice Type	1	0.33%
GEM	30	10.03%
Thermostatic	44	14.72%
Totals	**299**	**100%**

Mechanical: Mechanical stream traps discharge condensate at steam temperature. This makes them the first choice for process applciations where the rate of heat transfer is high for a given heat transfer area, such as heat exchanger applications.

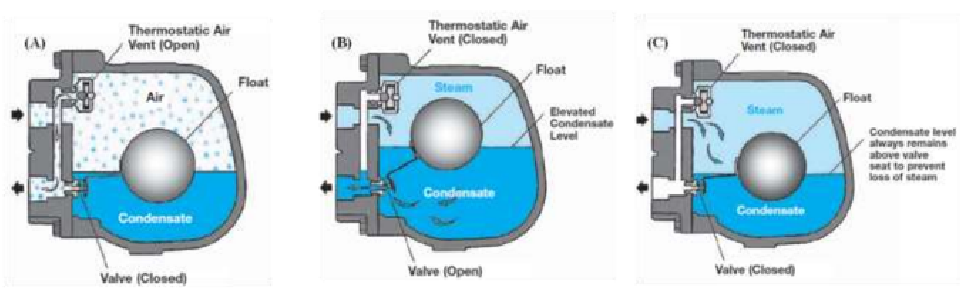
Mechanical traps have a float mechanism that rises and falls in relation to condensate level and this usually has a mechanical linkage attached that opens and closes the valve. Mechanical traps operate in direct relationship to condensate levels present in the body of the steam trap. Inverted bucket and float traps are examples of mechanical traps.

Float Traps

A) When cold air enters the trap during start-up, the thermostatic air vent is open, allowing the discharge of large quantities of air from the system.

B) When condensate enters the trap, the float lifts, opening the valve, and discharges the condensate.

C) When steam is present, and no condensate is entering the trap, the valve and the thermostatic air vent remain closed, trapping steam in the system.



Potential Failure Mode

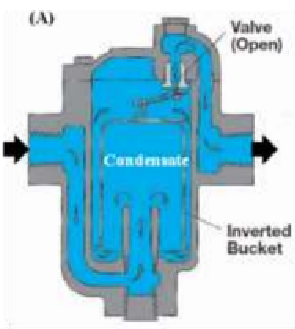
Float traps can be damaged by freezing. Also, if a trap is subjected to a higher differential pressure than intended, it will close and not pass condensate.

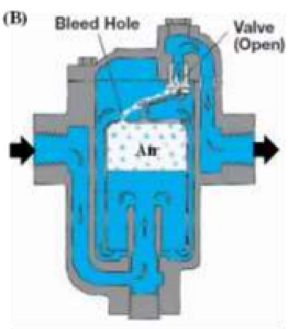
Inverted Bucket

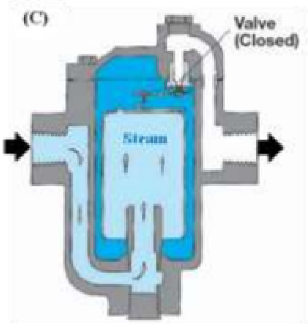
A) With condensate completely filling the trap, the bucket is in the down position with the valve open, allowing condensate to be discharged.

B) Small amounts of air will pass thru the bleed hole on top of the bucket and be discharged. (Note: large amounts of air will lift the bucket and close off the trap temporarily air locking the system)

C) When steam enters the trap, the inverted bucket will fill with steam and float, closing off the valve, preventing steam from escaping.







Potential Failure Mode

Bucket traps must maintain a water prime to function properly. If the prime is lost, the bucket will remain in the down position with the valve open, and live steam will be discharged from the system.

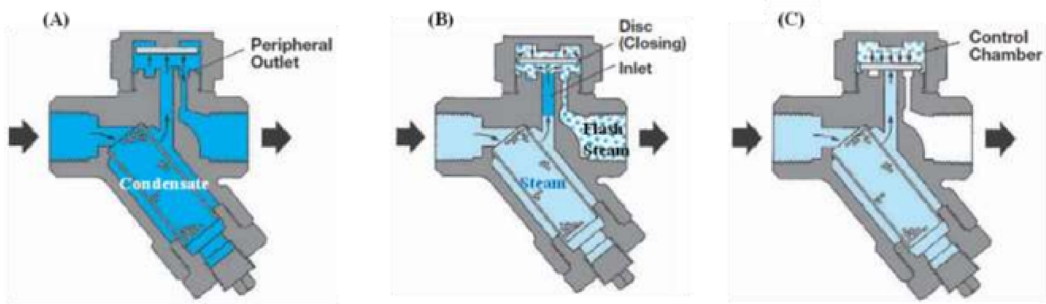
Thermodynamic: Thermodynamic steam traps are compact, simple, lightweight and not affected by waterhammer or vibration. Thermodynamic traps discharge condensate close to steam saturation termperature. These traps would be considered ideal for steam mains drainage and critical tracing.

As the inlet pressure to a trap increases, the disc lifts off the seat and allows the unwanted condensate to escape through the peripheral outlet surrounding the inlet.

A) When condensate is present, trap is in the full open position discharging condensate.

B) When steam enters the trap, the disc begins to close with the formation of flash steam above the disc.

C) Trap will remain closed, trapping steam in the system until the flash steam above the disc condenses, due to ambient heat loss.



Potential Failure Mode

A possible failure mode for thermodynamic traps is the disc not seating properly due to dirt or scale on the flat seating surface, causing the loss of steam.

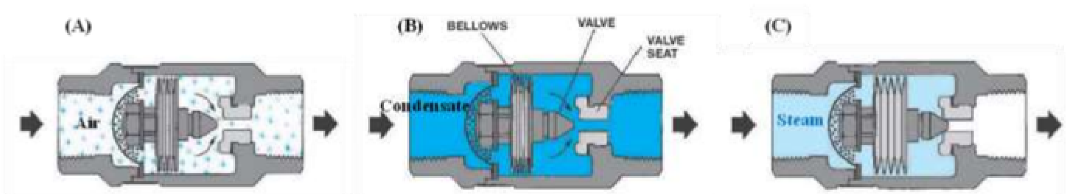
Thermostatic: Thermostatic steam traps do not open until the condensate temperature has dropped below steam saturation temperature. These traps are widely used in applications where it is acceptable to utilize some of the sensible heat in the condensate and reduce flash steam losses, such as non-critical tracing.

The bellows type thermostatic trap uses a fluid-filled thermal element (bellows) that operates under the principle of thermal expansions and contraction. The fluid vaporizes and expands as the temperature increases, causing the bellows to close the valve. As the temperature decreases, the fluid condenses and contracts, causing the bellows to open the valve.

A) When air, which is cooler than steam, is present, the bellows are retracted and the seat is open, allowing large quantities of air to be discharged.

B) When condensate, which is cooler than steam, is present, the bellows are retracted and the seat is open, allowing condensate to be discharged.

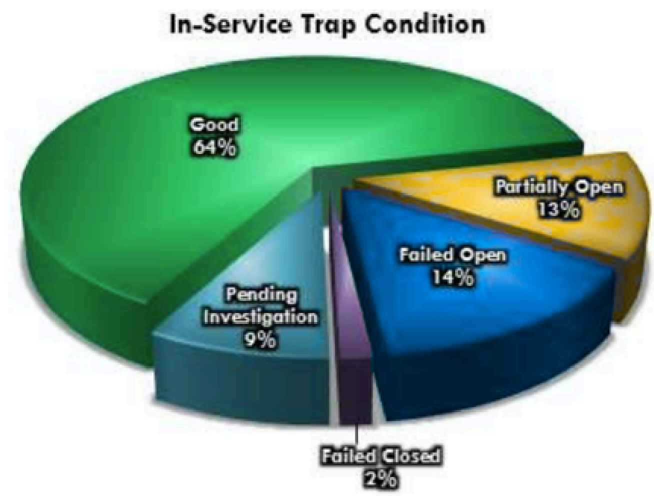
C) When steam reaches the trap, the bellows expand which closes off the seat and prevents steam from escaping.



Potential Failure Mode
Thermostatic bellows can be damaged by freezing and water hammer.

STATE OF CURRENT TRAPS

The pie chart and table below show the condition of the steam traps at the time of the survey. The condition of the traps can only be assessed if the process is on and calling for steam.



In-Service Trap Condition		
Condition	**# of Traps**	**Percentage**
Good	127	64%
Partially Open	25	13%
Failed Open	28	14%
Failed Closed	3	2%
Pending Investigation	17	9%
Totals	**200**	**100%**

Below is an explanation of each trap condition:

Failed open traps pass a large quantity of live steam either because of mechanism jamming or internal parts are worn away.

Failed partially open traps pass a smaller but significant quantity of live steam due to valve seating faces becoming worn.

Failed closed traps are traps that are found to be cold. This could be caused by the trap mechanism becoming jammed closed, due to blockage in the pipe work, or the trap being isolated.

Pending investigation is designated for traps that require additional examination to determine the true condition of the trap, or traps. Most often this is due to malfunctioning traps in the surrounding area or located on the same condensate line leading to back-pressure and increased temperatures across the condensate line. Due to the elevated temperatures the thermal reading is inaccurate thus making it difficult to identify the state of the trap in question.

Operating correctly (Good) are traps noted to be working as intended by the manufacturer of the mechanical steam traps.

The table below illustrates the failing traps by type at Sample Company:

Trap Type	# of Traps	Percentage
Inverted Bucket	16	28.57%
Float Type	9	16.07%
Thermodynamic	26	46.43%
Thermostatic	5	8.93%
Totals	**56**	**100%**

Why Do Steam Traps Fail?

Anything mechanical will eventually malfunction; steam traps are no exception to the rule. Mechanical trap failure rate is high because these mechanical parts are put under the conditions of moisture, heat and pressurization. Proper maintenance improves longevity and helps reduce maintenance cost.

There are four general conditions, which adversely affect traps:

1. Age – mechanical parts are not able to overcome time when dealing with high heat, pressurization and moisture.

2. Rust, scale and particulate – by far the leading cause of failures resulting in either a leaking or plugged trap.

3. Pressure surges (due to sudden steam valve openings, improper piping, or trap misapplications) – resulting in water-hammer and subsequent damage to the internal steam trap components.

4. Over-sizing inverted bucket traps can lose their prime; thermodynamic traps can experience rapid cycling.

STEAM LINE LEAKS

Steam and condensate leaks can cost industry millions of dollars in wasted energy, while creating safety hazards, increasing emissions and lowering plant reliability. Steam leaks result in the loss of both latent and sensible energy. While plant personnel would be well advised to pay attention to all utility losses, greater attention should be paid to the costs and problems associated with losses related to steam.

What Are the Major Causes of Steam Leaks?

1. Threaded Pipe Connections
The number one cause of steam and condensate leaks is the use of threaded pipe connections in a steam and condensate system. Pipe threads are prone to fail with the expansion and contraction of the steam and condensate during system startup, operation, and shutdown. Using different types of materials on the threaded connection to prevent leakage has limited success.
Solution: Use other connection methods in the steam and condensate system, such as welded connections or tube-type connections.

2. Packing on Standard Type Valves
Without a proactive maintenance program, standard packing on steam isolation valves will fail and leak steam during operation.
Solution: Use other types of valves that have corrected the sealing problems encountered in steam and condensate. Commonly used valves include ball valves and butterfly valves (in some applications).

3. Carbonic Acid
The carbonic acid found in most systems will attack the components of a steam and condensate system. The carbonic acid deterioration will be noticeable at the thinnest part of the pipe, which is the threaded connection.
Solution: Use other connections methods in the steam and condensate system, such as welded that will resist the carbonic acid or CO2 corrosion. In the condensate system, use stainless steel to provide maintenance-free operation.

4. Water Hammer
The water hammer in the steam and condensate system can produce pipe connection failures that result in system leaks. As a safety concern this could result in pipes bursting over time.
Solution: Water hammer should not occur in the steam and condensate system and can be eradicated with best practice line drainage and steam system insulation.

Leaks were identified during the survey. These leaks were noted and photographed in an effort to ease the plant's effort to get back to them and fix them. These leaks totaled:

Steam Loss (tons/yr.)	Energy Loss (MMBTU/yr.)	Annual Steam Loss Cost	CO_2 reductions (tons/yr.)
1,430.16	3,438.10	$17,162	402,258

There were eight leaks documented, which includes the location and description of what was leaking. This list is detailed below. The total steam leak cost savings are **$17,162** annually. The steam loss is estimated using Napier's equation, similar to what is used to estimate loss through failing steam traps. Leaks are estimated as a conservative hole size and based on the pressure setting of that particular pipe. This provides a good indication of what fixing the leaks can save the plant.

It should be noted that no cost estimate to fix the leaks was provided. Due to the complexity of fixing a steam leak and the varying prices by area it is too difficult to estimate a price for the fixes. However, AHS has partners that specialize in fixing steam leaks even if they require steam lines to remain pressurized. In the event that Sample Company requires assistance for these fixes it can be arranged and the project can be managed.

Pic #	Department	Location	Pressure	Conn Size	Component	Waste lbs./hr.	Annual Cost	Description
230	Teslin	Across from offices 20' up	140	1/2"	Piping	14.65	$769.89	Trap leak on trap 39
285	Building 39	3rd floor, West wall	140	3/4"	Valve	58.59	$3,079.55	Above trap 249 (nt)
326	Chloroformate Rack	Near trap 10, Chloroformate rack chlorine vaporizer	139	1 1/2"	Valve	77.15	$4,055.00	Ball valve leaking steam
331	Chloroformate Rack	Near trap 12, west of Building 238 Hose drop. Steam drop on beam	125.6	3/4"	Valve	53.14	$2,792.89	Gate valve leaking steam
341	Chloroformate Tank farm	West of t-156,	141	1"	Valve	58.97	$3,099.46	Gate valve leaking
343	Chloroformate Tank farm	North of tank 10	90.9	3/4"	Piping	10.00	$525.53	Fitting on hose
346	Pipe Rack	Main steam line West of water treatment, column SM28, im 2	137.1	3/4"	Valve	17.21	$904.76	Ball valve leaking
334	Destructor Rack	Destructor rack 3rd level by SYL them tank	140	3/4"	Valve	58.59	$3,079.55	Gate valve leaking

CARBON EMISSIONS

Due to increased public awareness and widespread implementation of the ISO14000 Environmental Management standard, being seen to be actively reducing your business effect on the environment is an important sales advantage. A key element of this will be reducing carbon emissions. The table below provides the amount of carbon dioxide emissions based on different fuel uses. Sample Company currently uses natural gas to power the boilers. With the estimated total reductions of 13,166 MMBTU per year, the plant will assist in reducing its total carbon footprint by **1,540,449 lbs. per year.**

Carbon Dioxide Emissions Coefficients by Fuel

Carbon Dioxide (CO2) Factors:	Pounds CO_2 Per Million BTU	Kilograms CO_2 Per Million BTU
Propane	139.0	63.1
Butane	143.2	65.0
Butane/Propane Mix	141.1	64.0
Home Heating and Diesel Fuel	161.3	73.2
Kerosene	159.4	72.3
Coal (All types)	210.2	95.3
Natural Gas	117.0	53.1
Gasoline	157.2	71.3
Residual Heating Fuel (Businesses only)	173.7	78.8

Source: U.S. Energy Information Administration estimates.

REFERENCES

1. Thermal Energy
36 Bentley Ave
Ottawa, ON, K2E6T8
Tel: 613.723.6776

2. Harrell, Greg, Ph.D., PE. 2001. Steam System Survey Guide
Oak Ridge National Laboratory, Managed by UT-Battelle for the Department of Energy

3. Watson McDaniel. Steam Trap Applications.
428 Jones Blvd
Limerick airport Business Center
Pottstown, PA 19464
Tel: 610.495.5131

4. U.S. Energy Information Administration. 2013. Carbon dioxide Emissions Coefficients.
Retrieved November, 2014
(http://www.eia.gov/environment/emissions/co2_vol_mass.cfm)

5. U.S. Department of Energy. 2005. Steam Pressure Reduction: Opportunities and Issues.
Retrieved November, 2014
(http://www.energy.gov/sites/prod/files/2014/05/f15/steam_pressure_reduction.pdf)

SAMPLE TRAP LIST

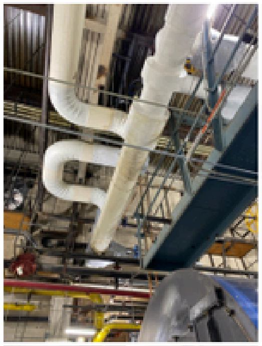
Watson McDaniel
Precision Manufactured Steam Products

Trap	Location	Location Detail	Manufacturer	Model	Connection Size	Connection Type	Universal	Open Ended	Orifice Size	Application	Pressure (PSIA)	Condition	Hours of Operation	Steam Cost per 1,000 pounds	Steam Loss per year	Cost per year	Notes
82	Boiler Room	Drip leg	Armstrong	880	0.5	NPT	na	na	0.125	Drip	54.7	Cold	8700	$10.00			
83	Boiler Room	Drip leg	Sarco	FT-14	0.5	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	Incorrect installation
84	Boiler Room	Drip leg	Watts	WFT	1.5	NPT	na	na	0.25	Drip	54.7	FO	8700	$10.00	432,584	$4,325.84	
85	Boiler Room	Water Heater	Sarco	FT-75	1.5	NPT	na	na	0.25	Process	54.7	OK	8700	$10.00			
86	Boiler Room	Water Heater	Sarco	FT-75	1.5	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
87	Boiler Room	Water Heater	Sarco	FT-75	1.5	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
88	Boiler Room	Water Heater	Sarco	FT-75	1.5	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
89	Boiler Room	Heat Exchanger	Sarco	FT-75	1	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
90	Boiler Room	Heat Exchanger	Armstrong	211	2	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
91	Chiller Room	Heat Exchanger	Sarco	FT-75	2	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
92	Chiller Room	Heat Exchanger	Sarco	FT-75	2	NPT	na	na	0.25	Process	54.7	OK	8700	$10.00			
93	Chiller Room	Heat Exchanger	None installed	na	na	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	No trap installed.
94	Chiller Room	Heat Exchanger	Sarco	FT-75	2	NPT	na	na	0.25	Process	54.7	Ok	8700	$10.00			
95	Chiller Room	Heat Exchanger	Sarco	FT-75	2	NPT	na	na	0.25	Process	54.7	OK	8700	$10.00			
96	Chiller Room	Drip leg	Sarco	TD-52	1/2	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			Poor drip leg design
97	Chiller Room	Drip leg	Mepco	FT	1	NPT	na	na	0.125	Drip	54.7	Ok	8700	$10.00			
98	Chiller Room	Heat Exchanger	Sarco	FT-75	1	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
99	Chiller Room	Drip leg	Sarco	B1H	1/2	NPT	na	na	0.125	Drip	54.7	Ok	8700	$10.00			
100	Chiller Room	Heat Exchanger	Watson McDaniel	WFT	2	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
101	Chiller Room	Heat Exchanger	None installed	na	2	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
102	Chiller Room	Heat Exchanger	Watson McDaniel	WFT	2	NPT	na	na	0.25	Process	54.7	Ok	8700	$10.00			
103	Chiller Room	Drip leg	Sarco	FTI-75	1/2	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
104	Chiller Room	Heat Exchanger	None installed	na	2	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
105	Chiller Room	Heat Exchanger	None installed	na	2	NPT	na	na	0.25	Process	54.7	FO	8700	$10.00	432,584	$4,325.84	
106	Chiller Room	Drip leg	Sarco	FTI-75	1/2	NPT	na	na	0.125	Drip	54.7	Ok	8700	$10.00			
107	Chiller Room	Drip leg	Sarco	FTI-75	1/2	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
108	Chiller Room	Drip leg	Sarco	FTI-75	1/2	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
109	Chiller Room	Drip leg	Sarco	FTI-75	1/2	NPT	na	na	0.125	Drip	54.7	Ok	8700	$10.00			
110	Chiller Room	Drip leg	Armstrong	FT	3/4	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			
111	Chiller Room	Drip leg	Sarco	FTI-75	1/2	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			
112	Chiller Room	Drip leg	Armstrong	880	1/2	NPT	na	na	0.125	Drip	54.7	Cold	8700	$10.00			
113	AH 16-18	Air Coil	Bestobell	FT	1	NPT	na	na	0.125	Process	54.7	OK	8700	$10.00			
114	AH 16-18	Air Coil	Illinois / Watts	FT	1.5	NPT	na	na	0.25	Process	54.7	OK	8700	$10.00			
115	AH 16-18	Drip leg	Armstrong	880	1/2	NPT	na	na	0.125	Drip	54.7	Cold	8700	$10.00			
116	AH 16-18	Air Coil	Illinois / Watts	FT	2	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
117	AH 16-18	Drip leg	Armstrong	880	3/4	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			
118	ENG 37	Heat Exchanger	Armstrong	FT	2	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
119	ENG 37	Heat Exchanger	Sarco	FT-75	2	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
120	AH 12	Drip leg	Illinois / Watts	FT	3/4	NPT	na	na	0.125	Drip	54.7	Cold	8700	$10.00			
121	AH 12	Air Coil	Sarco	FT-75	1 1/4	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
122	1417	Drip leg	Sarco	FT-14	3/4	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
123	1417	Air Coil	Illinois / Watts	FT	1	NPT	na	na	0.125	Process	54.7	Cold	8700	$10.00			
124	1417	Air Coil	Sarco	FT-75	2	NPT	na	na	0.25	Process	54.7	OK	8700	$10.00			
125	1417	Air Coil	Illinois / Watts	FT	1 1/2	NPT	na	na	0.125	Process	54.7	OK	8700	$10.00			
126	1417	Drip leg	Sarco	B1H	3/4	NPT	na	na	0.125	Drip	54.7	Cold	8700	$10.00			
127	1417	Air Coil	Illinois / Watts	FT	1 1/2	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
128	Elec Room 7	Drip leg	Sarco	B1H	3/4	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			
129	AH 13	Air Coil	Watson McDaniel	IB	1 1/4	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
130	AH 13	Air Coil	Watson McDaniel	IB	1 1/4	NPT	na	na	0.25	Process	54.7	Cold	8700	$10.00			
131	Eye	Drip leg	Sarco	FT-14	3/4	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
132	AH 133	Drip leg	Sarco	FT-14	1	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			
133	AH 133	Drip leg	Sarco	FT-75	3/4	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
134	AH 133	Drip leg	Hoffman	FT	3/4	NPT	na	na	0.125	Drip	54.7	OK	8700	$10.00			
135	AH 11	Air Coil	Watson McDaniel	IB	1	NPT	na	na	0.125	Process	54.7	Cold	8700	$10.00			
136	AH 11	Drip leg	Illinois / Watts	FT	3/4	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
137	Eye	Drip leg	Sarco	FT-14	3/4	NPT	na	na	0.125	Drip	54.7	FO	8700	$10.00	108,146	$1,081.46	
138	AH 24-28	Drip leg	Illinois / Watts	FT	3/4	NPT	na	na	0.125	Drip	54.7	Cold	8700	$10.00			

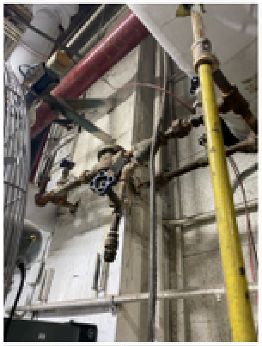
SAMPLE VISUAL REPORT

Company: Air & Hydronic Specialties
Contact: Robert Warnell
Phone: 7025736196
Email: Rob.warnell@airhydronicspecialties.com

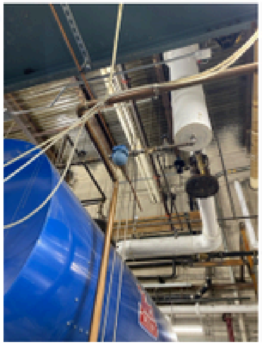
Title:
Created:
No. Items:

(1)


Boiler Room Header For Main Steam
Created: Tue, 4/30/2024
No Drip Traps At All On Main Header

(2)


Tag 82
Created: Tue, 4/30/2024
Steam trap on Main Steam line, drip trap, cold.

(3)


Boiler Room Trap #83
Created: Tue, 4/30/2024
Installed incorrectly, failed open.

Prepared by Rob Warnell

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