



STEAM SOLUTIONS LLP

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CIN NO : AAJ-2931

STEAM TRAP PERFORMANCE COMPARISON TEST REPORT

Day:07/Nov/2019– 09/Nov/2019 Location : Renukoot

Test execution place :

- 1.Voltas VAM Chiller.
2. Thermax VAM Chiller.

Test Team : Mr.Aditya Jain (Steam Solutions LLP), and Mr. Seemansh Grover (Engineer –Steam Solutions LLP)

Test Witness : Mr.Rakesh Singh , Mr. Navin Chaubey and Mr. Rishabh Aditya.

Test Procedure :

ISO7841 (Steam Leakage Amount Measurement Method)

- * Pour water into a bucket and use it as an aquarium to receive drain flash steam.
- * Initial water temperature / weight at the start of the test is measured in advance.
- * Submerge the exit piping of the steam trap into the prepared bucket and catch the discharged drain.
- * After a certain period of time has elapsed, remove the outlet pipe and re measure the water temperature and water volume in the bucket.



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LOCATION 1: VOLTAS CHILLER

TestParameters:

PrimarySteamPressure:3.6 kg/cm²

Downstream Pressure : 0 kg/cm²

[CorrespondingSteamTemperature=149 C],

SensibleHeatof Steam :150kcal/kg

Latent HeatofSteam:506 kcal/kg

Weighing Time : 15 min

Note :

1. No trap was installed previously at the tested location.
2. Outlet pipe of trap was welded directly and arrangement could not be made for submerging downstream pipe. If, any flanged connection was present, arrangement was possible.
3. System parameters were restored with new trap and chiller was set to perform steady.

[First time]

	No Existing Trap	STJ Trap (25A, Nozzle #10)
Initial weight	--	--
Initial water temperature	--	--
Final weight	122 kg	84.5 kg
Water temperature after draining	--	--
Drain weight kg/h	488 kg/h	338 kg/h
Savings of Drain Weight %	30.73 %	
Loss of Steam kg/h	150 kg/h	



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LOCATION 2 :Thermax VAM Chiller

TestParameters:

PrimarySteamPressure:6-7.5kg/cm²

DownstreamPressure:0kg/cm²

[CorrespondingSteamTemperature=169.7 C],

SensibleHeatofSteam:172.0kcal/kg

LatentHeatofSteam:489.6 kcal/kg

Weighing Time : 5 min

Note :

1. Discharge pressure from existing trap outlet was very high.
2. For measuring flow from existing trap, only 4 turns of the outlet valve were open.
3. After STJ trap is installed, discharge pressure was reduced significantly and outlet valve could be opened complete for measurement purpose.
4. For measuring flow from STJ trap, outlet valve was open complete.

[First Time]

	SPIRAXTDTrap (50 A,) Discharge open only 4 turns	STJTrap (25A, Nozzle #10) Discharge open complete
Initialweight	40kg	40kg
Initialwatertemperature	12.5 C	13.2C
Finalweight	47.1kg	51.18kg
Watertemperatureafterdraining	64.1C	49.0C
Drainweight	7.10kg	11.18kg
InitialHeatQuantity(H1)	500 kcal	528kcal
FinalHeatQuantity(H2)	3019.1 kcal	2507.82kcal
HeatQuantityIncrease,(H2-H1)	30228 kcal/h	23760kcal/h
LossofHeat,kcal/h	6468 kcal/h	
EnergySavings%	21.4 %	
LossofSteamkg/h	13.2 kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)



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[Second Time]

	SPIRAX TD Trap (50 A) Discharge open only 4 turns	STJ Trap (25 A, Nozzle #10) Discharge open complete
Initial weight	40.2kg	40.3 kg
Initial water temperature	13.2 C	13.5 C
Final weight	47.6 kg	51.43 kg
Water temperature after draining	62.7C	48.3 C
Drain weight	7.6kg	11.13 kg
Initial Heat Quantity(H1)	530.64 kcal	544.05 kcal
Final Heat Quantity(H2)	2984.52 kcal	2484.07 kcal
Heat Quantity Increase,(H2-H1)	29446.54 kcal/h	23280.23 kcal/h
Loss of Heat,kcal/h	6165.8 kcal/h	
Energy Savings%	20.9 %	
Loss of Steam kg/h	12.6 kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)

[Third Time]

	SPIRAX TD Trap (50 A) Discharge open only 4 turns	STJ Trap (25 A, Nozzle #10) Discharge open complete
Initial weight	40.1kg	40 kg
Initial water temperature	13.1 C	14 C
Final weight	47.6 kg	51.0 kg
Water temperature after draining	63.8C	48.4 C
Drain weight	7.5 kg	11.0 kg
Initial Heat Quantity(H1)	525.3 kcal	560.0 kcal
Final Heat Quantity(H2)	3036.9 kcal	2468.4 kcal
Heat Quantity Increase,(H2-H1)	30139.2 kcal/h	22900.8 kcal/h
Loss of Heat,kcal/h	7238.4 kcal/h	
Energy Savings%	24.0 %	
Loss of Steam kg/h	14.77 kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)



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OBSERVATIONS:

- Spirax 50 NB Trap was operating at high discharge pressure. After replacing Spirax trap with STJ Trap, discharge pressure is significantly reduced.
- Flash steam clouds visible at flash tank were also reduced significantly after installing STJ Trap.
- Spirax 50 NB trap is replaced by 25NB STJ Trap with all parameters working well under limits.
- STJ trap is working steady and continuous at lower discharge pressure and lower condensate values too.
- Savings will be much higher since valve was not open full for Spirax Trap.

RECOMMENDATION:

Placement of steam trap is intermediate in VAM chiller . Some amount of live steam is allowed to pass intentionally to heat LiBr (second generator) and reach required concentration. Therefore, an additional STJ trap is also required at the exit of second LiBr generator as well to harness flash steam recovery from second generator as well.

STEAM SAVINGS :

- Average Steam savings per hour for VAM Chiller : 13.26 kg/hr. *

*Basis : Spirax valve 4 turns open to STJ valve full open



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ESTIMATED FUEL SAVINGS AND ROI :

Location : VAM Chiller : Average of 3 readings : 13.26 kg/hr

Cost of Steam Production : Rs 1.04 per kg

Avg savings per day :(Average steam loss /hour x cost of steam production) x 24

= $(13.26 \times 1.04) \times 24$ = Rs. 331 per day.

Steam Savings per year: 331×360 = Rs 1,19,160

STJ 25A Trap Cost – Rs 84,000

ROI = Cost of STJ Trap ÷ Monthly steam savings: $84,000 \div 9930 = 8.5$ months

STJ Trap warranty : 10 years

Total Savings over Warranty Period: Rs. 11,91,600

Life of STJ Trap : 20 to 30 years

Total Savings over Life of Trap @ 20 years: Rs. 23,83,200

Total Savings over Life of Trap @ 30 years: Rs. 35,74,800



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PERFORMANCE COMPARISON :

PARAMETERS	SPIRAX SARCO 50 NB	STJ TRAP 25 NB
MOC	Cast Iron	SS 304 Overall
Trap size	50 NB	25 NB
Operation	Intermittent and Non steady discharge	Continuous and Steady discharge
Moving parts	Yes	No
Trap life	4 - 5 years	20 + years
Flash steam recovery	No provision ,very large flash steam clouds at flash tank	Yes, minimized flash steam at flash tank
Operational losses with time	High operational losses due to wear and tear of moving part	Nil operational losses
Initial cost	Rs. 46,000	Rs 84,000
Savings from Trap	--	Rs 1,19,160 (assuming losses remain constant with time for spirax trap)

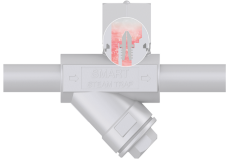
The worth of STJ steam trap is not the initial value of investment, but the performance of trap makes the value worth. The primary objective of steam trap is to ring about steam savings. The performance of any of the mechanical trap will fall over the period because of wear and tear of moving parts. Our traps will continue to perform consistently over the period bringing you savings.

With this, it is estimated that a considerable amount of fuel reduction is expected by reviewing the trap of each area in your factory. As for STJ Traps, since there are no moving parts, MOC (Material of Construction) is SS304 overall and additional feature of in line maintenance, it assures reliable performance and longer life compared to any other traps.

Based on the results of this test, we are looking forward to your consideration for introducing STJ Traps, for energy conservation and environmental measures, including reduction in fuel costs. We appreciate your consideration.

14/11/2019, THURSDAY

FOR STEAM SOLUTIONS LLP
 SEEMANSH GROVER



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STEAM TRAP PERFORMANCE COMPARISON TEST REPORT

Day:03/July/2019 ;

Location : Renukoot ;

Test execution place :

1. Digestion 1 Steam Header.
2. Digestion 3 Steam Header.

Test Team : Mr. Kishor Jain (Steam Solutions LLP), and Mr. Seemansh Grover (Engineer –Steam Solutions LLP) ;

Test Witness : Mr. Nagendra Singh and Mr. Siddharth Tiwari.

Test Procedure : ISO7841 (Steam Leakage Amount Measurement Method)

- * Pour water into a bucket and use it as an aquarium to receive drain flash steam.
- * Initial water temperature / weight at the start of the test is measured in advance.
- * Submerge the exit piping of the steam trap into the prepared bucket and catch the discharged drain.
- * After a certain period of time has elapsed, remove the outlet pipe and re measure the water temperature and water ; volume in the bucket.

Test Parameters :

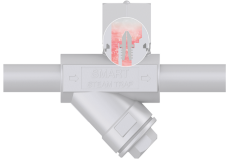
Primary Steam Pressure : 42bar

Downstream Pressure : 0 bar

[Corresponding Steam Temperature = 254C],

Sensible Heat of Steam : 264.85kcal/kg

Latent Heat of Steam : 403.87kcal/kg



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LOCATION 1 : MAIN STEAM HEADER

Weighing Time : 5 min

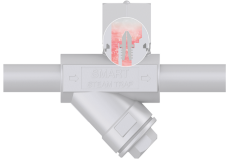
[First time]

	SPIRAX TD Trap (15A)	STJ Trap (15A, Nozzle #0)
Initial weight	4.00 kg	4.00 kg
Initial water temperature	27.2 C	27.9 C
Final weight	5.88kg	5.48kg
Water temperature after draining	75 C	48.8C
Drain weight	1.88 kg	1.48 kg
Initial Heat Quantity (H1)	108.8 kcal	111.6kcal
Final Heat Quantity (H2)	441.0 kcal	267.42kcal
Heat Quantity Increase,(H2 - H1)	3986.4kcal/h	1869.9kcal/h
Loss of Heat, kcal/h	2116.5 kcal/h	
Savings of Drain Weight%	21.30%	
Energy Savings %	53.1%	
Loss of Steam kg/h	5.24kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)

[Second time]

	SPIRAX TD Trap (15A)	STJ Trap (15A, Nozzle#0)
Initial weight	4.00kg	4.00kg
Initial water temperature	27.2C	26.5C
Final weight	5.70kg	5.46 kg
Water temperature after draining	71.6 C	47.7 C
Drain weight	1.70kg	1.46 kg
Initial Heat Quantity (H1)	108.8 kcal	106kcal
Final Heat Quantity (H2)	408.12kcal	260.44 kcal
Heat Quantity Increase,(H2-H1)	3591.8kcal/h	1864.8kcal/h
Loss of Heat,kcal/h	1727kcal/h	



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	SPIRAX TD Trap (15A)	STJ Trap (15A, Nozzle#0)
Savings of Drain Weight%	14.10 %	
Energy Savings%	48.10 %	
Loss of Steam kg/h	4.28 kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)

[Third time]

	SPIRAX TD Trap (15A)	STJ Trap (15A, Nozzle#0)
Initial weight	4.00kg	4.00kg
Initial water temperature	27.9 C	25.2C
Final weight	5.79 kg	5.44kg
Water temperature after draining	73.6C	48.4C
Drain weight	1.79 kg	1.44kg
Initial Heat Quantity(H1)	111.6kcal	100.8 kcal
Final Heat Quantity(H2)	427.9kcal	263.3 kcal
Heat Quantity Increase,(H2-H1)	3795.6kcal/h	1950kcal/h
Loss of Heat,kcal/h	1845.6kcal/h	
Savings of Drain Weight%	19.60%	
Energy Savings%	48.60%	
Loss of Steam kg/h	4.57kg/h	

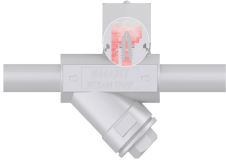
(The drain weight is the mixture weight of saturated liquid and saturated steam.)

LOCATION 2 : DIGESTION 3 STEAM HEADER LINE

Weighing Time : 3 min (* 3 min 47 sec for first time)

[First Time]

	SPIRAX TD Trap (20 A)	STJ Trap (20 A, Nozzle#E3)
Initial weight	4.00kg	4.00kg
Initial water temperature	29.2 C	24.9C



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	SPIRAX TD Trap (20 A)	STJ Trap (20 A, Nozzle#E3)
Final weight	5.15 kg	4.95kg
Water temperature after draining	99.0C	59.8C
Drain weight	1.15kg	0.95 kg
Initial Heat Quantity (H1)	116.8kcal	96.4kcal
Final Heat Quantity (H2)	509.85kcal	296.0kcal
Heat Quantity Increase,(H2-H1)	6233.8kcal/h	3165.8kcal/h
Loss of Heat,kcal/h	3068 kcal/h	
Savings of Drain Weight%	17.39 %	
Energy Savings%	49.22 %	
Loss of Steam kg/h	7.60kg/h	

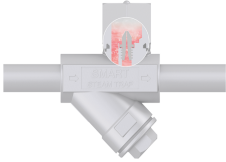
(The drain weight is the mixture weight of saturated liquid and saturated steam.)

[Second Time]

	SPIRAX TD Trap (20A)	STJ Trap (20A, Nozzle#E3)
Initial weight	4.00kg	4.00kg
Initial water temperature	32.40C	25.2 C
Final weight	4.98 kg	4.84 kg
Water temperature after draining	89.4C	60.5C
Drain weight	0.98 kg	0.84kg
Initial Heat Quantity (H1)	129.6kcal	100.8 kcal
Final Heat Quantity (H2)	445.2 kcal	292.8 kcal
Heat Quantity Increase,(H2-H1)	6312kcal/h	3840.4kcal/h
Loss of Heat,kcal/h	2471.6kcal/h	
Savings of Drain Weight%	14.29 %	
Energy Savings %	39.16%	
Loss of Steam kg/h	6.12 kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)

[ThirdTime]



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	SPIRAX TD Trap (20A)	STJ Trap (20A, Nozzle#E3)
Initial weight	4.00kg	4.00kg
Initial water temperature	27.7C	25.2C
Final weight	5.00 kg	4.85 kg
Water temperature after draining	91.8C	58.6 C
Drain weight	1.00kg	0.85 kg
Initial Heat Quantity (H1)	110.8kcal	100.8kcal
Final Heat Quantity (H2)	459kcal	284.2 kcal
Heat Quantity Increase,(H2-H1)	6964kcal/h	3668.2kcal/h
Loss of Heat,kcal/h	3295.8 kcal/h	
Savings of Drain Weight %	15%	
Energy Savings %	47.33%	
Loss of Steam kg/h	8.1 kg/h	

(The drain weight is the mixture weight of saturated liquid and saturated steam.)

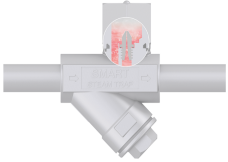
OBSERVATIONS:

- During test run ,performance of the TD trap is inconsistent. On the other hand ,STJ Trap operates in consistent manner.
- In TD Trap, the interval of condensate discharge increases or decreases while in STJ Trap ,condensate discharge is continuous and discharged as soon as it is generated.
- Energy loss through trap is found higher for TD Trap in every case.
- The Energy lost through TD trap is bound to increase with the life of trap. Performance of mechanical traps deteriorate with time due to wear and tear of moving parts leading to more steam losses.

STEAM SAVINGS :

- Average Steam savings per hour for Digestion 1 : 4.70 kg/hr
- Average Steam savings per hour for Digestion 3 : 7.27 kg/hr.

The worth of STJ steam trap is not the initial value of investment, but the performance of trap makes the value worth. The primary objective of steam trap is to ring about steam savings. The performance of any of the



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mechanical trap will fall over the period because of wear and tear of moving parts. Our traps will continue to perform consistently over the period bringing you savings.

With this, it is estimated that a considerable amount of fuel reduction is expected by reviewing the trap of each area in your factory. As for STJ Traps, since there are no moving parts, MOC (Material of Construction) is SS304 overall and additional feature of in line maintenance, it assures reliable performance and longer life compared to any other traps.

Based on the results of this test, we are looking forward to your consideration for introducing STJ Traps, for energy conservation and environmental measures, including reduction in fuel costs. We appreciate your consideration.

ESTIMATED FUEL SAVINGS AND ROI :

***Location1 : DIGESTION 1 : Average of 3 readings : 4.70kg/hr**

Cost of Steam Prodction:Rs1.04 per kg

Avg savings per day :(Average steam loss/hour x cost of steam production) x 24= (4.70x1.04)x24 = 117.31 per day.

Steam Savings per year : 117.31 × 360 = Rs 42,231

STJ15A Trap Cost - Rs 74,000

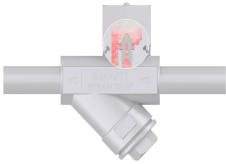
ROI = Cost of STJ Trap ÷ Monthly steam Savings : 74,000 ÷ 3519.3 = 21 months

STJ Trap warranty : 10 years

Total Savings over Warranty Period : Rs. 4,22,313

Life of STJ Trap : 20 to 30 years

Total Savings over Life of Trap @ 20years : Rs. 8,44,626



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Total Savings over Life of Trap @ 30 years : Rs.12,66,939

*** Location 2 : DIGESTION 3: Average of 3 readings : 7.27 kg/ hr**

Cost of Steam Production : Rs 1.04 per kg

Avg savings per day :(Average steam loss per hour x cost of steam production) x 24 = (7.27x1.04) x 24 = Rs181.46 per day

Steam Savings per year : Rs 181.46 x 360 = Rs 65,325.6

STJ 20A trap Cost - Rs 78,000

ROI = Cost of STJ Trap ÷ Monthly steam Savings : 78,000 ÷ 5443.8= 14 months

STJ Trap warranty: 10 years

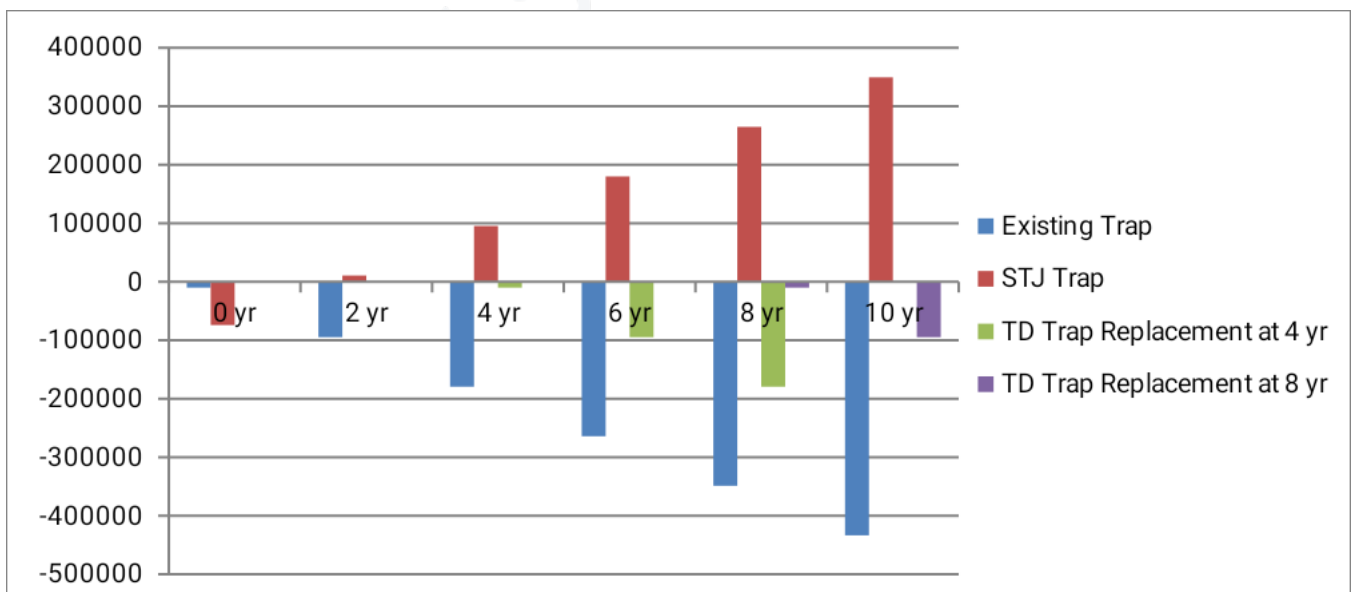
Total Savings over Warranty Period: 6,53,256

LIFE of STJ Trap: 20 to 30 years

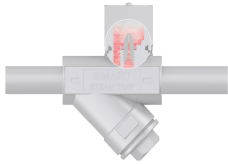
Total Savings over Life of Trap @ 20 years : Rs. 13,06,512

Total Savings over Life of Trap @ 30 years : Rs. 19,59,768

PERFORMANCE COMPARISON :

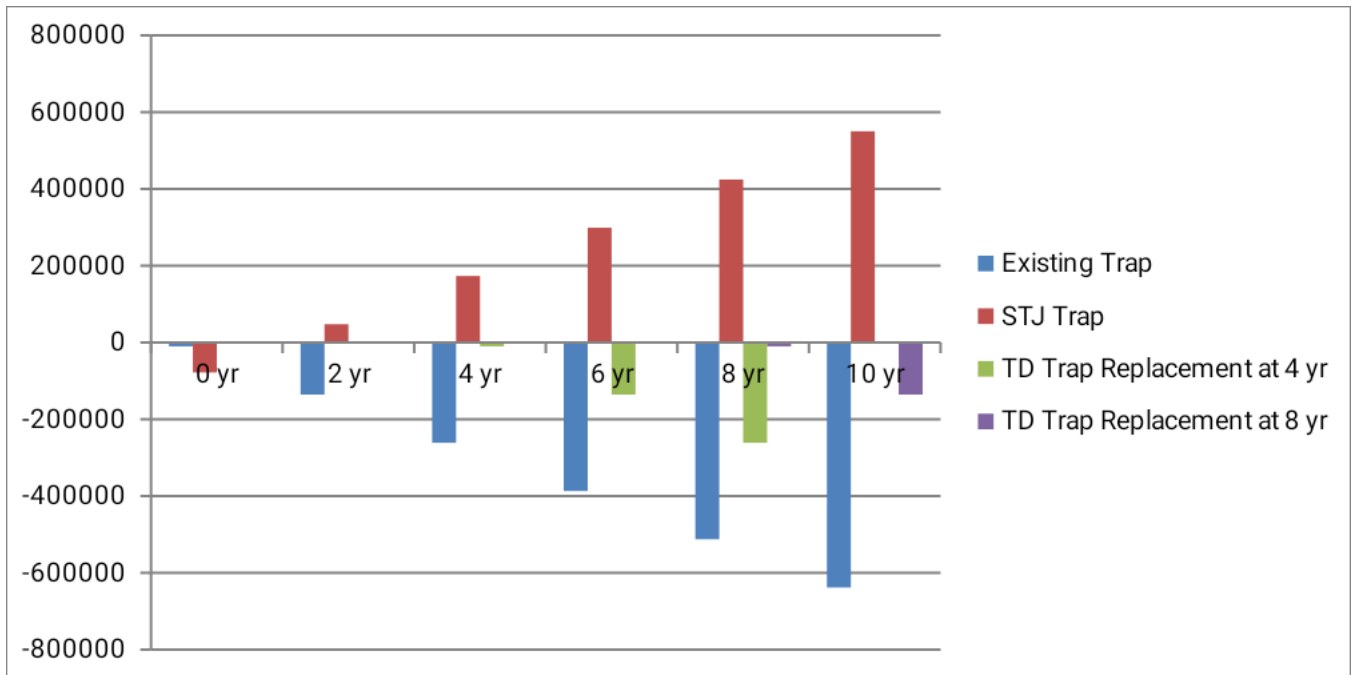


LOCATION : DIGESTION 1 PERFORMANCE ANALYSIS



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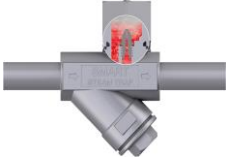


LOCATION : DIGESTION 3 PERFORMANCE ANALYSIS

12/07/2019, FRIDAY

FOR STEAM SOLUTIONS LLP
SEEMANSH GROVER

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STEAM TRAP PERFORMANCE COMPARISON TEST REPORT

Test Team : Mr. Kishor Jain (Steam Solutions), Mr. Aditya Jain (Steam Solutions) and Mr. Seemansh Grover (Engineer – Steam Solutions)

Test Witness : Mr.K.N. Mahesh (Power and Utility) and Sri. D K Sharma (DGM- Power and Utility)

1. Test execution place : Co Generation Plant 1 (13/06/2018)

Test Parameters: UKL Trap Age : 7-8 months

Weighing time : 8 min

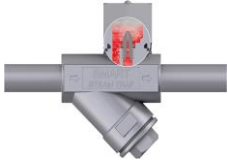
Primary Steam Pressure :13 kg/cm²

[Superheated Steam Temperature = 320°C], Sensible Heat : 197.115 kcal/kg , Latent heat of Steam : 468.658 kcal/kg

[First time]

	UKL TD Trap 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.56 kg	6.70 kg
Initial water temperature	33.5 C	36.8 C
Final weight	6.93 kg	6.87 kg
Water temperature after draining	56.6 C	47.7 C
Drain weight	0.37 kg	0.17 kg
Saving in drain weight		54.1 %
Initial Heat Quantity	219.76 kcal	246.56 kcal
Final Heat Quantity	392..24.9 kcal	327.70 kcal
Heat Quantity Increase	1293.59 kcal/h	608.54 kcal/h
Energy Savings %		53.0%
Loss of Heat		685 kcal/h
Loss of Steam		685/468.658 = 1.46 kg/h

(The drain weight is the mixture weight of saturated liquid and saturated steam.)



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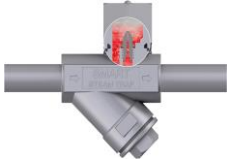
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 CIN NO : AAJ-2931

[Second time]

	UKL TD Trap 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.56 kg	6.54 kg
Initial water temperature	34.2 C	36.1 C
Final weight	6.910 kg	6.83 kg
Water temperature after draining	56.8 C	49 C
Drain weight	0.35 kg	0.29 kg
Reduction in drain weight	17.1 %	
Initial Heat Quantity	224.35 kcal	236.09 kcal
Final Heat Quantity	392.49 kcal	334.67 kcal
Heat Quantity Increase	1261.02 kcal/h	739.32 kcal/h
Energy Savings %	41.4%	
Loss of Heat	521.7 kcal/h	
Loss of Steam	521.7/468.658 = 1.11 kg/h	

[Third time]

	UKL TD Trap 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.55 kg	6.56kg
Initial water temperature	34.8 C	33.8 C
Final weight	6.96 kg	6.86 kg
Water temperature after draining	58.7 C	45.7 C
Drain weight	0.41 kg	0.30 kg
Reduction in drain weight	26.8 %	
Initial Heat Quantity	227.94 kcal	221.73 kcal
Final Heat Quantity	408.55 kcal	313.50 kcal
Heat Quantity Increase	1354.59 kcal/h	688.31 kcal/h
Energy Savings %	49.2%	
Loss of Heat	666.3	
Loss of Steam	666.3/465.658 = 1.42 kg/h	



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2. Test execution place : Co Generation Plant 1 (14/06/2018)

Test Parameters: Spirax Marshall Trap Age : 1 year

Weighing time : 10 min

Primary Steam Pressure : 13 kg/cm²

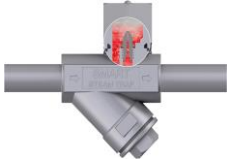
[Superheated Steam Temperature = 320°C], Sensible Heat : 197.115 kcal/kg , Latent heat of Steam : 468.658 kcal/kg

[First Time]

	SPIRAX MARSHALL 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.55 kg	6.50 kg
Initial water temperature	34.0 C	33.2 C
Final weight	6.94 kg	6.88 kg
Water temperature after draining	72.0 C	43.4 C
Drain weight	0.39 kg	0.38 kg
Reduction in drain weight	2.6 %	
Initial Heat Quantity	222.70 kcal	215.80kcal
Final Heat Quantity	499.68 kcal	298.59 kcal
Heat Quantity Increase	1661.88 kcal/h	496.75 kcal/h
Energy Savings %	70.1%	
Loss of Heat	1165.1 kcal/h	
Loss of Steam	1165.1/465.858 =2.49 kg/h	

[Second Time]

	SPIRAX MARSHALL 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.52 kg	6.50 kg
Initial water temperature	32.2 C	32.6 C
Final weight	6.94 kg	6.90 kg
Water temperature after draining	71.8 C	42.6 C
Drain weight	0.42 kg	0.40 kg
Reduction in drain weight	4.8 %	



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Initial Heat Quantity	209.94 kcal	211.90 kcal
Final Heat Quantity	498.29 kcal	293.94 kcal
Heat Quantity Increase	1730.09 kcal/h	492.24 kcal/h
Energy Savings	71.5%	
Loss of Heat	1237.8 kcal/h	
Loss of Steam	1237.8/468.858 =2.64 kg/h	

[Third Time]

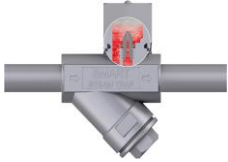
	SPIRAX MARSHALL 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.50 kg	6.55 kg
Initial water temperature	32.0 C	33.9 C
Final weight	6.91 kg	6.95 kg
Water temperature after draining	65.1 C	44.4 C
Drain weight	0.41 kg	0.40 kg
Reduction in drain weight	2.4 %	
Initial Heat Quantity	208.00 kcal	222.05 kcal
Final Heat Quantity	449.84 kcal	308.58 kcal
Heat Quantity Increase	1451.05 kcal/h	519.21 kcal/h
Energy Savings %	64.2%	
Loss of Heat	931.8 kcal/h	
Loss of Steam	(11101.62 + 7369.5) =36.65 kg/h	

3. Test execution place : Low Pressure Steam Line (15/06/2018)

Test Parameters: Weighing time :10 min

Primary Steam Pressure :4 kg/cm²

[Saturated Steam Temperature = 151.5°C], Sensible Heat : 143.43 kcal/kg , Latent heat of Steam : 509.45 kcal/kg



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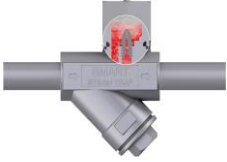
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[First Time]

	SPIRAX MARSHALL 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.52 kg	6.02 kg
Initial water temperature	36.7 C	31.0 C
Final weight	6.82kg	6.16 kg
Water temperature after draining	51 C	32.7 C
Drain weight	0.30 kg	0.14 kg
Reduction in drain weight	53.3 %	
Initial Heat Quantity	239.28 kcal	186.62 kcal
Final Heat Quantity	347.82 kcal	201.43 kcal
Heat Quantity Increase	65122 kcal/h	88.87 kcal/h
Energy Savings %	86.4%	
Loss of Heat	562.3 kcal/h	
Loss of Steam	562.3/509.45 =1.10 kg/h	

[Second Time]

	SPIRAX MARSHALL 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.05 kg	6.06 kg
Initial water temperature	35.9 C	32.8 C
Final weight	6.31kg	6.23 kg
Water temperature after draining	48.4 C	34.7 C
Drain weight	0.26 kg	0.17 kg
Reduction in drain weight	34.6 %	
Initial Heat Quantity	217.20 kcal	198.77 kcal
Final Heat Quantity	30.40 kcal	216.18 kcal
Heat Quantity Increase	529.25 kcal/h	104.48kcal/h
Energy Saving %	80.3%	
Loss of Heat	424.8 kcal/h	
Loss of Steam	424.8/509.45 =0.83 kg/h	



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[Third Time]

	SPIRAX MARSHALL 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	6.46 kg	6.06 kg
Initial water temperature	33.3 C	32.7 C
Final weight	6.82kg	6.23 kg
Water temperature after draining	46.6 C	34.8 C
Drain weight	0.36 kg	0.17 kg
Reduction in drain weight	52.8 %	
Initial Heat Quantity	215.12 kcal	198.16 kcal
Final Heat Quantity	317.81 kcal	216.80 kcal
Heat Quantity Increase	616.16 kcal/h	111.85 kcal/h
Energy Savings %	81.8%	
Loss of Heat	504.3 kcal/h	
Loss of Steam	504.3/509.45 =0.99 kg/h	

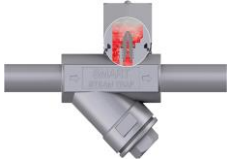
4. Test execution place : Co Generation Plant (15/06/2018)

Test Parameters: Penant Trap Age : New Trap

Weighing time : 10 min

Primary Steam Pressure :13 kg/cm²

[Superheated Steam Temperature = 320°C], Sensible Heat : 197.115 kcal/kg , Latent heat of Steam : 468.858 kcal/kg



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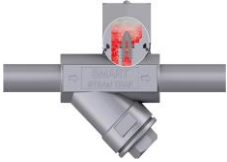
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[First Time]

	PENANT TD TRAP 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	10.14 kg	10.02 kg
Initial water temperature	32.8 C	34.7 C
Final weight	10.23 kg	10.41 kg
Water temperature after draining	45.2 C	42.8 C
Drain weight	0.09 kg	0.39 kg
Reduction in drain weight	(-) 333.3 %	
Initial Heat Quantity	332.59 kcal	347.69 kcal
Final Heat Quantity	462.40 kcal	445.55 kcal
Heat Quantity Increase	778.82 kcal/h	587.12 kcal/h
Energy Savings %	24.6%	
Loss of Heat	191.7 kcal/h	
Loss of Steam	191.7 /468.858 = 0.41 kg/h	

[Second Time]

	PENANT TD TRAP 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	10.02 kg	10.02 kg
Initial water temperature	32.2 C	32.6 C
Final weight	10.37 kg	10.41 kg
Water temperature after draining	44.8 C	42.2 C
Drain weight	0.35 kg	0.39 kg
Reduction in drain weight	(-) 11.4 %	
Initial Heat Quantity	322.64 kcal	326.65 kcal
Final Heat Quantity	464.58 kcal	439.30 kcal
Heat Quantity Increase	851.59 kcal/h	675.90 kcal/h
Energy Savings %	20.6%	
Loss of Heat	175.7 kcal/h	
Loss of Steam	175.7 /468.858 = 0.37 kg/h	



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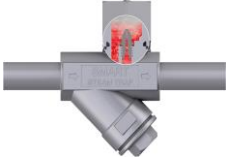
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[ThirdTime]

	PENANT TD TRAP 25 A	STJ Venturi Nozzle Trap 20 A Nozzle # E3
Initial weight	10.02 kg	10.02 kg
Initial water temperature	31.4 C	31.9 C
Final weight	10.41 kg	10.43 kg
Water temperature after draining	45.8 C	42.3 C
Drain weight	0.39 kg	0.41 kg
Reduction in drain weight	(-) 5.1 %	
Initial Heat Quantity	314.63 kcal	319.64 kcal
Final Heat Quantity	476.78 kcal	441.19 kcal
Heat Quantity Increase	972.90 kcal/h	729.31 kcal/h
Energy Savings %	25%	
Loss of Heat	243.6 kcal/h	
Loss of Steam	243.6 /468.858 = 0.52 kg/h	

OBSERVATIONS:

- TD Trap is erratic and inconsistent whereas, STJ Venturi Trap operates in steady and consistent manner. Therefore, performance of STJ Trap is better.
- TD Trap performance deteriorates with trap age which is visible physically.
- TD Trap is not provided with In - Line Maintenance. STJ Trap comes essentially with ball valve for flushing out any kind of debris.
- Durability of TD trap is always questionable. MOC of TD Trap is variable due to which some parts (disc) wear out faster than others.
- Manufactured entirely from SS304 Chances of corrosion are minimum in STJ Trap. STJ Trap is continuously discharging hence there is no accumulation of condensate. TD trap operates intermittently and condensate accumulates before it is discharged.



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Savings are directly proportional to the condensate discharge. TD traps losses live steam every time it opens and for higher condensate discharge number of trap cycles increases. Therefore, more savings are expected at higher condensate load for STJ Traps.

Results :

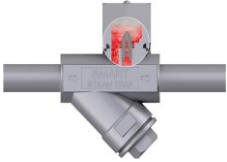
As per data provided, the plant operation time is 24 hours a day, 365 days a year.

Cost of steam Generation : Rs. 2.5 per kg

Loss of Steam in Terms of Value :

1. CGP 1 (13/06/2018) :
UKL TD Trap Average Loss of Steam : 1.33 kg/h \approx Rs. 29,127 per year.
2. CGP 1 (14/06/2018) :
Spirax Marshall Average Loss of Steam : 2.37 kg/h \approx Rs. 51,903 per year.
3. LP Steam Line (15/06/2018) :
Spirax Marshall Average. loss of Steam : 0.97 kg/h \approx Rs. 21,243 per year.
4. CGP 1 (15/06/2018) :
Penant New Trap Average Loss of Steam : 0.43 kg/h \approx Rs. 9,500 per year.

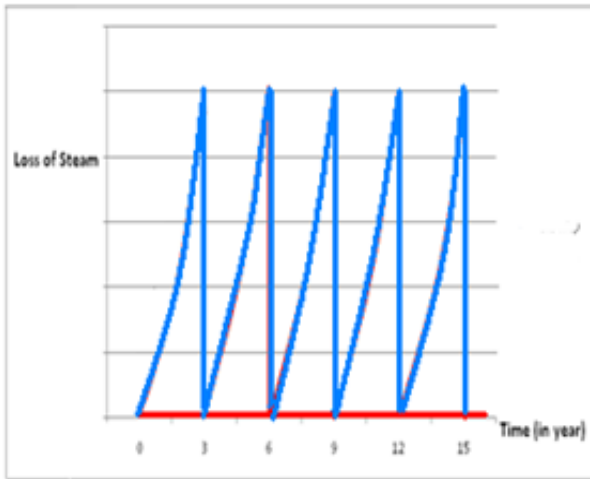
Note : Savings will be higher than predicted above. TD trap performance degrades with time and savings are based on consistent performance basis.



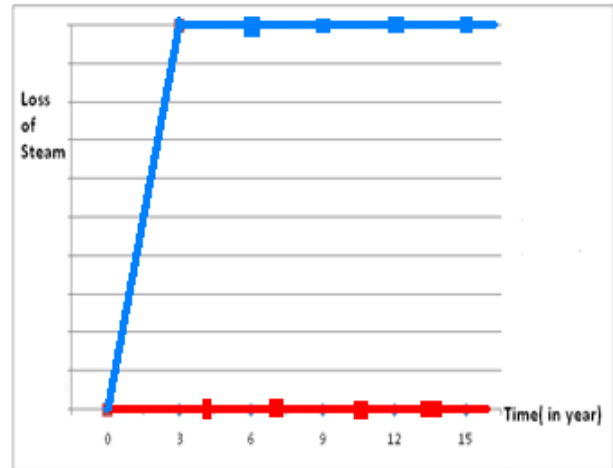
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COMPARISON BETWEEN TD TRAP AND STJ VENTURI TRAP

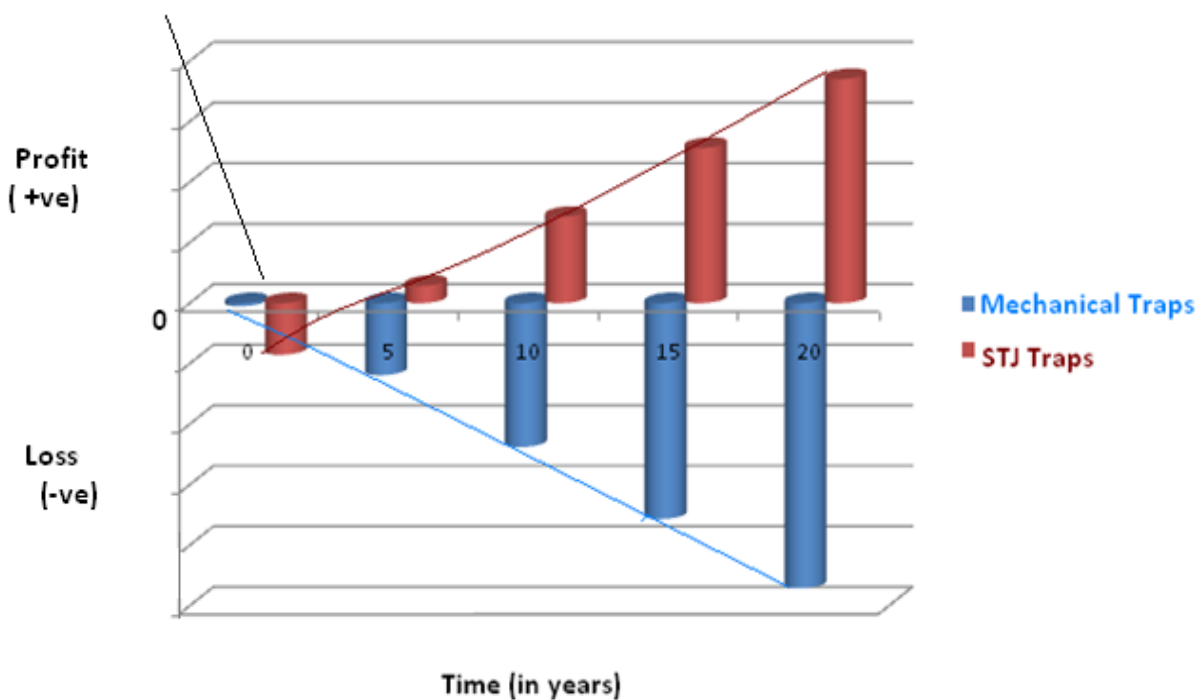


Loss of Steam if TD Trap is Replaced continuously at Maximum service life (3 years)



Loss of Steam if TD Trap is not replaced after max service life

Initial Investment





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The above graph depicts that the mechanical traps continue to lose money throughout their service life. These traps don't recover flash steam and also there is live steam leakage associated with traps(Thermodynamic and Inverted Bucket).The losses continue to amplify during Service life due to wear and tear of moving parts.

The STJ traps once set will start saving from the very first hour of operation. The unique venturi design provides complete reliability and better energy efficiency. There are no steam losses associated with STJ traps over the service life.

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