



Manufacturer
TLV® CO., LTD.
Kakogawa, Japan

ISO 9001
ISO 14001



Ravi Mishra

Sr Consulting Engineer,

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TLV® INDIA PRIVATE LIMITED



Established in 1950 in Kakogawa, Japan

Business
Philosophy

100 %
Customer Satisfaction

Providing “**SOLUTION**”
Consulting & Engineering Service

Company
Policy

Quality First = **TLV**

Incomparable
Originality = **Patent**

Trouble Less Valve
ISO 9001 : acquired – 1991
ISO14001 : acquired – 1997
ASME N :acquired – 2010

Patent held by TLV
2,000 (as of Feb. 2025)



3 Times Winner of METI Award for Energy Conservation System



2009 Grand Prize for Excellence in Energy Efficiency and Conservation
(Association Category)
"Director-General's Prize, the Agency for Natural Resources and Energy"
[Joint winner with Nippon Petroleum Refining Company]

**Reduction in Steam Losses
from 100,000 Steam Traps**



TLV.

(Sponsored by Ministry of Economy, Trade and Industry)
2009 "Grand Prize for Excellence in Energy Efficiency and Conservation" (Association Category)
Quoted award-winning case report issued by the Energy Conservation Center

2009



FY2019
Chairperson's Prize
Product/Business Model Category
Awarded to the
CES.Survey
Presented by the
Energy Conservation Center, Japan

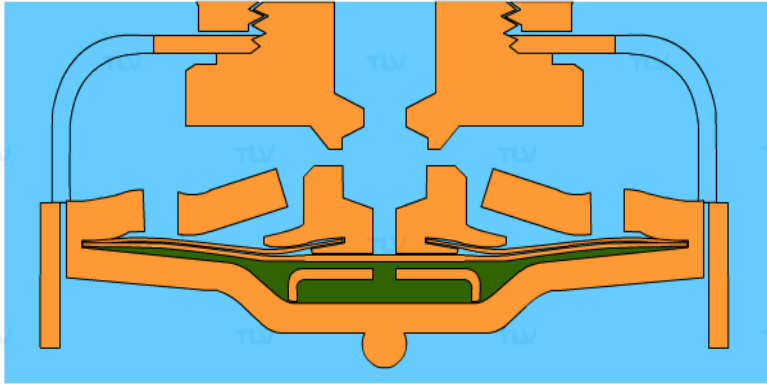
2019



2021
**Minister of Economy, Trade
and Industry (METI) Award**
Product/Business Model Category
Awarded to
iBPSSM.net.
Presented by the
Energy Conservation Center, Japan

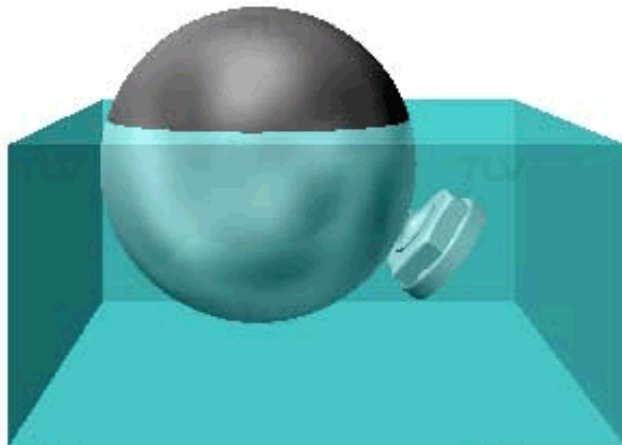
2022

Innovation : Free Float Steam Traps



If Diaphragm A Ruptures

Copyright TLV CO.,LTD.



Valve orifice
seen from
front view

Copyright TLV CO.,LTD.



Free Float Steam Trap

Higher Efficiency

Modulating Discharge
No Condensate Back up
Better Temp Control

High Air Venting Capacity

Rapid Air venting
Quick Startup
Extremely High-Pressure
Applications

TO MAXIMIZE ALL OF THE REQUIREMENTS OF A PROCESS STEAM TRAP'S FUNCTION

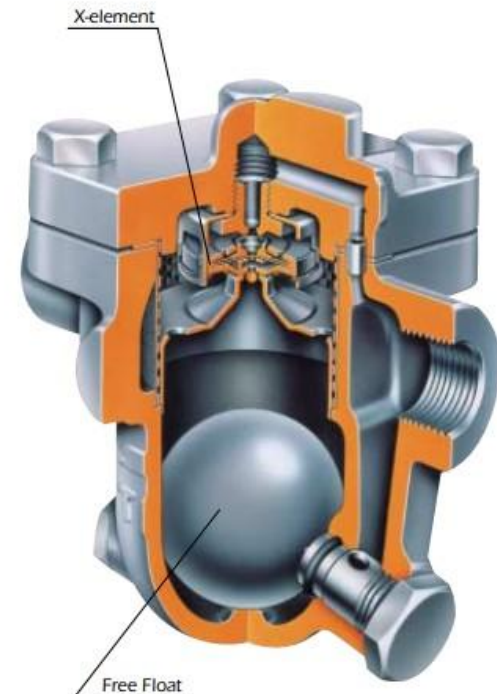
Functions Required of Process Traps

Improved Heating Efficiency and Production Quality

TLV's free float immediately adjusts the valve opening to perfectly match the amount of entering condensate. Condensate is continuously discharged, so no condensate backs up into equipment allowing process temperature to be maintained.

The Optimal Air Vent for Any Application

The JX and JH series offer a variety of air vents and venting devices to offer an optimized solution for any application. From rapid air venting to extremely high-pressure applications, TLV offers an air vent to fit even the most demanding needs.



The background of the slide is a dark, industrial scene. On the left, two workers in blue hard hats and work clothes are looking at a set of plans. On the right, there are tall industrial towers and scaffolding. At the bottom, a large plume of white steam or smoke rises, partially obscuring the lower part of the image.

Steam System Optimization Program

SSOP®

Peace of Mind through Steam System Optimization

TLV®

MISSION is to Help

Build a Low Carbon Society
and Create **“Peace of Mind”** in plants through

SSOP®

Steam System Optimization Program®
Steam System Optimization Program

A Sustainable Asset Management Program

which Improves Safety, Reliability & Profitability

by Continuously Optimizing Performance of

the Entire Steam System through Visualization based on

“Condition Monitoring and Timely Consulting & Engineering Services”

to Minimize Condensate Problems, Energy Losses and CO₂ Emissions

TLV® **SteamWorld**®

As of April 30th 2024

SSOP Results

(188 Plants in Japan)

CO₂ Emissions
Reduction

Approx.

450,000

t/year

Equivalent to **0.8** % of CO₂ reduction target for 2024 (vs 2005)

2005 : 1.397 billion t-CO₂/y

Achieved a cost reduction of 100.5 mil. SGD/y

Steam Loss Reduction

Approx.

395

t/h

Potential Steam Savings:

**Oil Refineries
& Petrochemical Plants:**

4.6%

(Steam generation: approx. 640 t/h *)

General Industrial Plants:

12%

(Steam generation: approx. 4-40 t/h *)

SSOP® Can Help Your Plant...



Reduce CO₂ Emissions

- Stop steam loss
- Improve energy efficiency

Improve Safety, Reliability

- Eliminate problems caused by condensate
- Eliminate water hammer
- Prevent unexpected equipment failures
- Improve equipment longevity

Increase Profitability

- Increase production efficiency
- Reduce operating expenditure
- Mitigate production bottlenecks

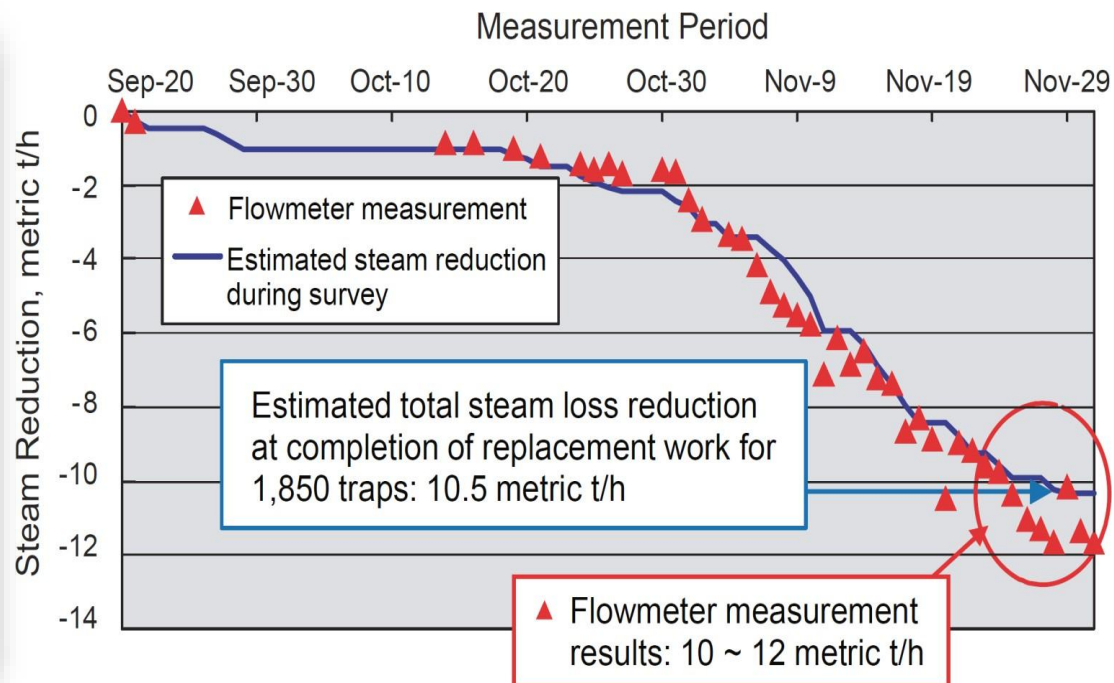
Verification of Implementation Results for 1 of the 7 Refineries

Total Plant Steam Generation

: ~ 760 t/h

Final Flowmeter-verified Measurement

: 19 t/h (2.5% of total) Reduction



How is plant steam managed?

“We know how much we generate, but that’s about it...”

Production Process



Managed Precisely

Steam



Often Not Managed



Steam System Optimization

**Generate significant value from
efficient use of steam**

Typical Scenes from a Steam Plant



Principles of Steam Utilization



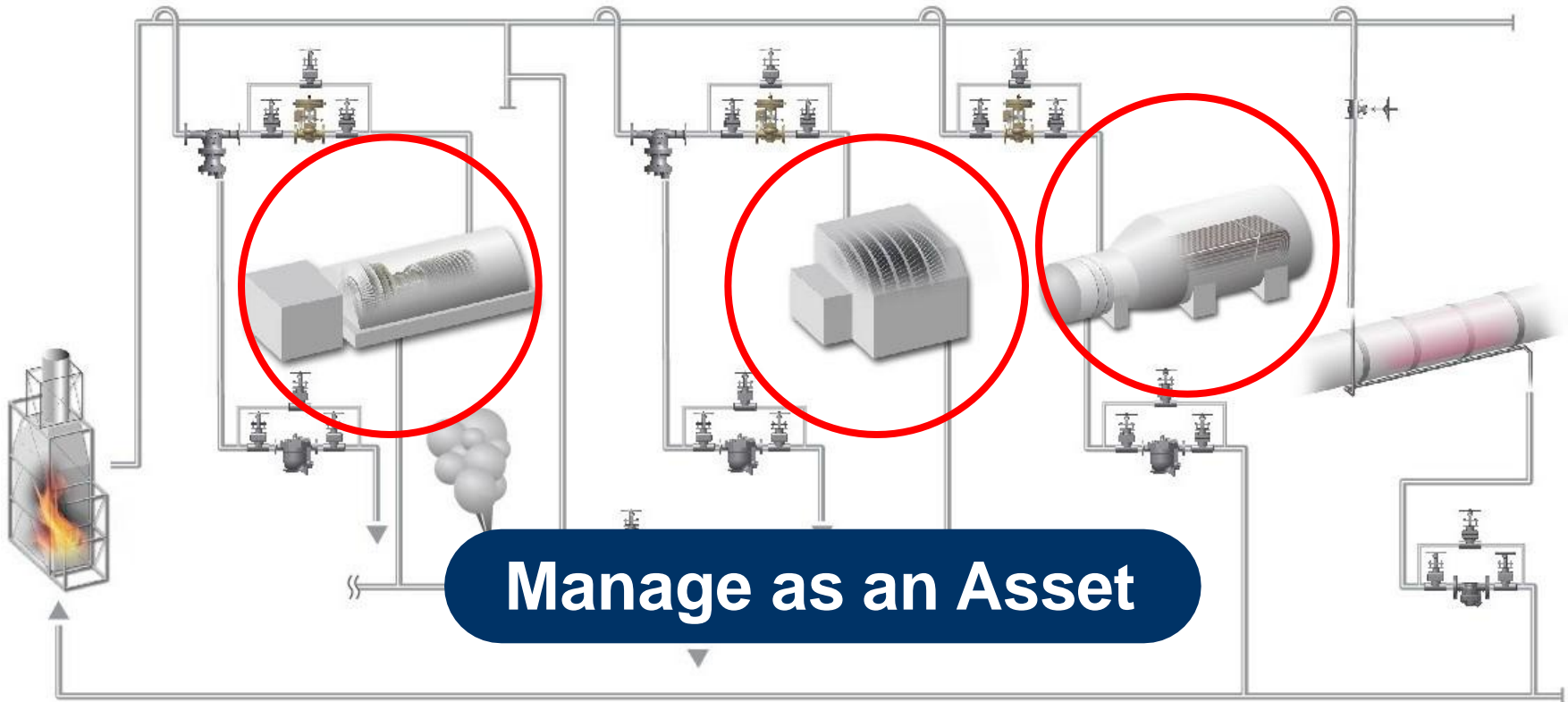
- 1 Supply “dry steam” at the optimal pressure and flow rate**
- 2 Discharge generated condensate quickly without leaking steam**
- 3 Fill steam-using equipment with steam at all times**

Is steam being used in an optimum state?

NO

There is a problem with the current definition of assets

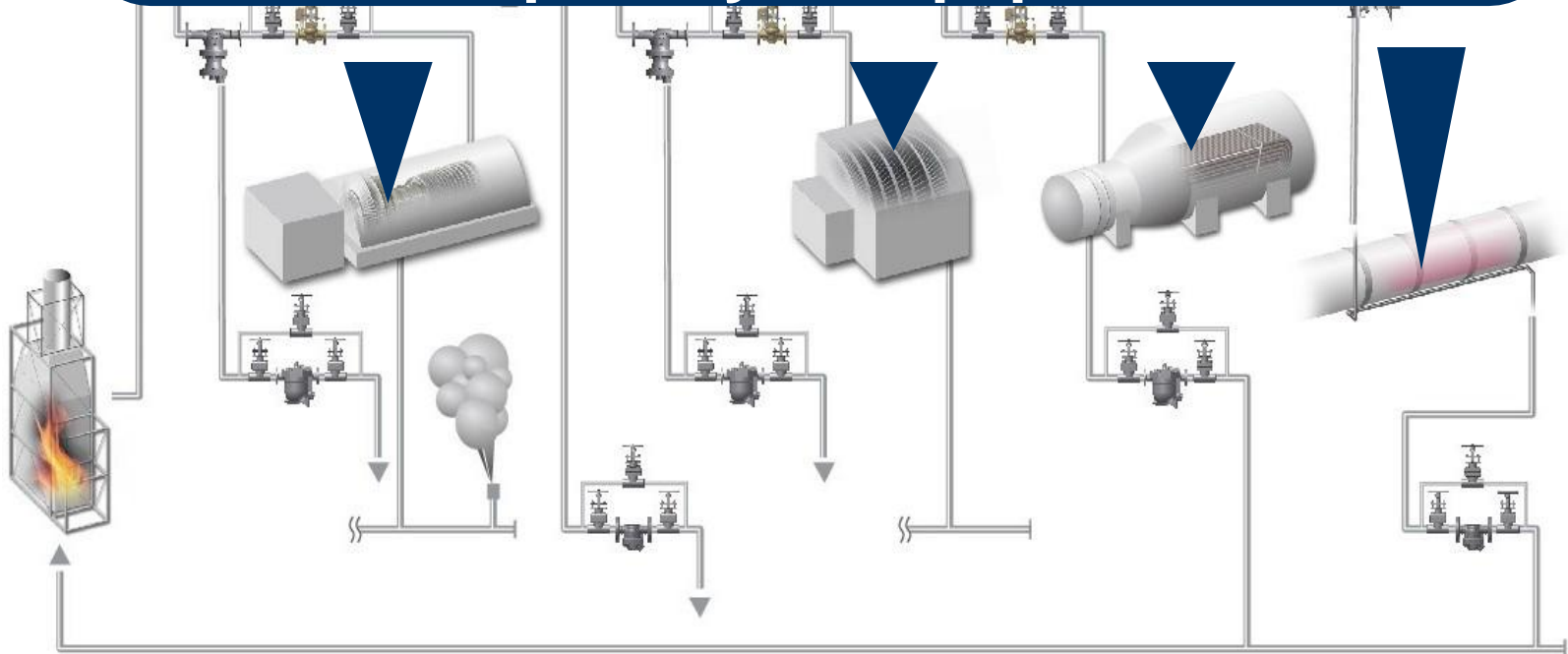
Steam Plant



Stand-alone management of equipment is inadequate

Contributing to Safe & Stable Plant Operation

Bring Forth Full Function and Capability of Equipment



Steam is an Asset

The Structure of SSOP®

3

Phase

How can the entire steam system be optimized?

Create optimum balance with the entire steam system treated as a valuable asset.

2

Phase

How can all SA (Steam Applications such as steam-using equipment, tracing) be optimized?

Newly define everything from steam supply to condensate discharge as an asset.

1

Phase

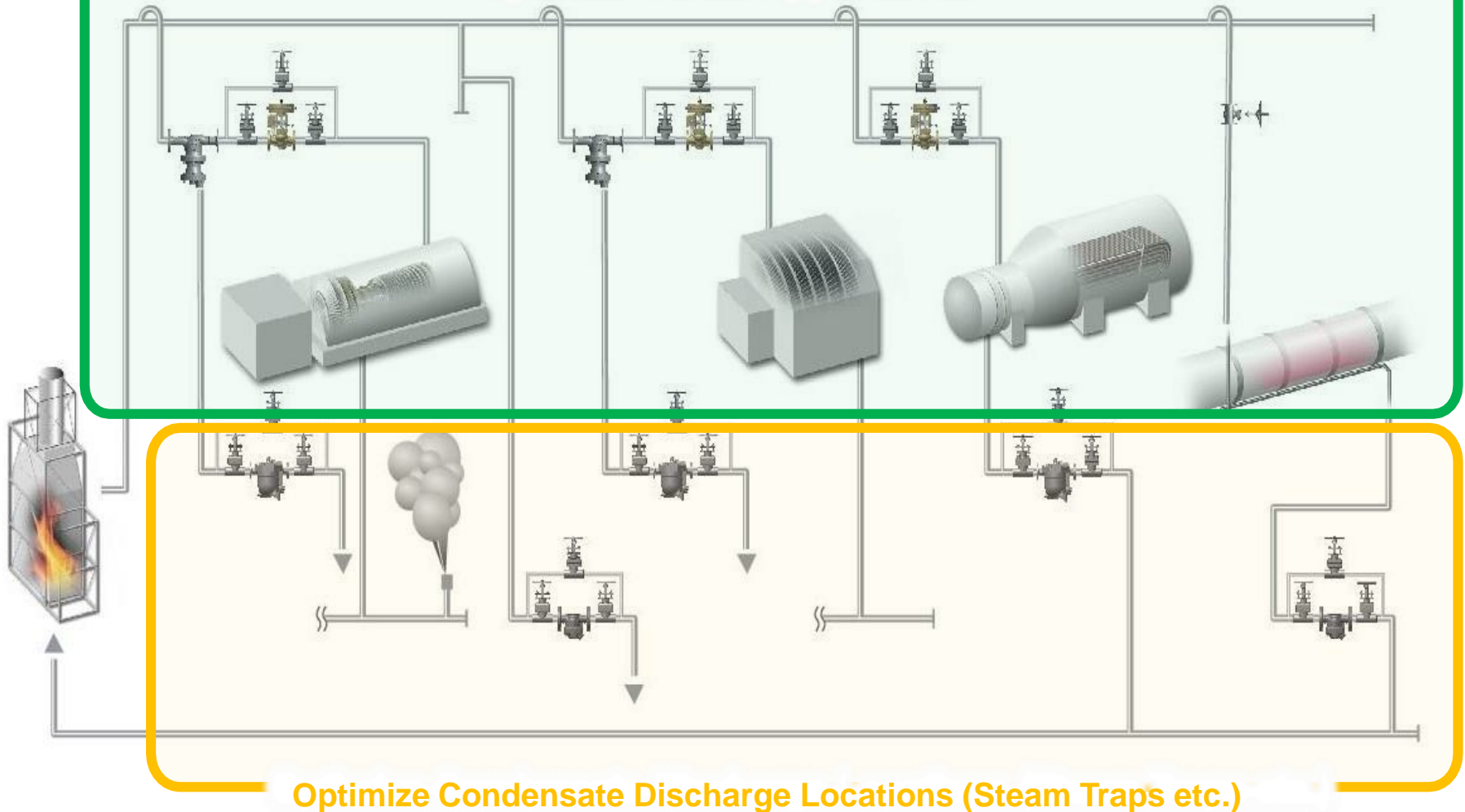
How can all CDLs (ex. 10,000) be optimized?

Necessary conditions for the steam system to function.

Phases of Steam System Optimization:

Optimize Steam System Balance

Optimize Steam Applications



Optimize Condensate Discharge Locations (Steam Traps etc.)

The Structure of SSOP®

How can the entire steam system be optimized?

Create optimum balance with the entire steam system treated as a valuable asset.

How can all SA (Steam Applications such as steam-using equipment, tracing) be optimized?

Define everything from steam supply to condensate discharge as a new asset.

1

Phase

TMS (Trap Management System)

- ⇒ Eliminate Problems Caused by Condensate
- ⇒ Reduce Steam Loss

Create
Infrastructure

Condensate Discharge Location (CDL[®]) Management Program

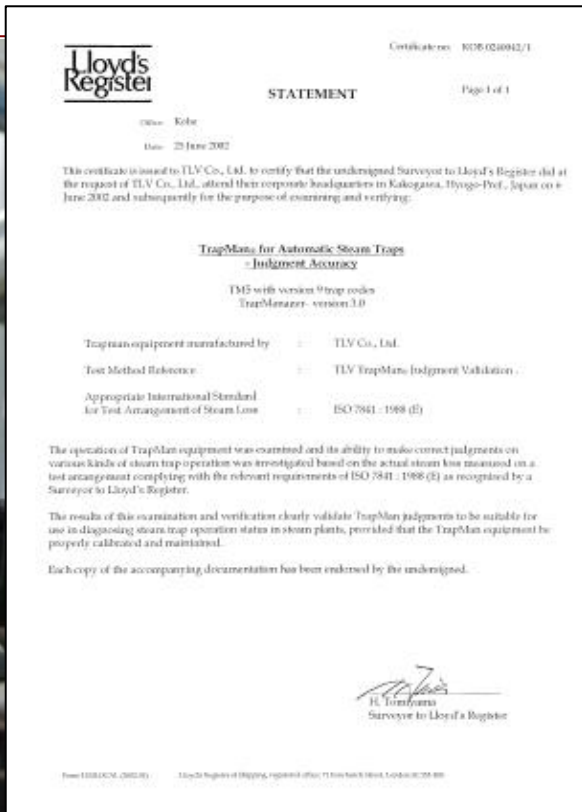


Trap Management System **TMS** Survey



TrapMan[®] Has Been Independently Validated as “Objective” & “Reliable”

Verified Diagnoses in 5 Operating Statuses for 17 Typical Trap Models



All inspectors are certified professionals

Evaluation Sheet

Evaluation Sheet for Certification
 Technical Task by BPSTM Criteria
 Instructor: APT/Est
 Evaluability:

Evaluation Draft BPSTM Survey (090307)iss

Check Item	Importance	Full Score	Exam Date					
			A	B	C	D	E	F
1. Purpose	3	3	3	3	4			
2. Detail	3	3	3	3	4			
3. Confirmation	3	3	3	3	4			
4. Understanding of Order BPSTM	3	3	3	3	3			
5. Understanding of Order TrapMan	3	3	3	3	3			
6. Evaluation Item	3	3	3	3	3			
Preparation								
1. Place of Working & Information to be Collected	3	3	3	3	3			
2. Project Planning and Time Schedule	3	3	3	3	3			
3. Personnel	3	3	3	3	3			
4. Pre-Management	3	3	3	3	3			
5. Work Handover	3	3	3	3	3			
6. Safety Setup	3	3	3	3	3			
7. Preparation of Survey Implementation	3	3	3	3	3			
Initial Data Collection								
1. Data Collection	3	3	3	3	3			
2. Reporting	3	3	3	3	3			
3. Quality	3	3	3	3	3			
4. Inspection	3	3	3	3	3			
5. TrapMan Pro Map Modification	3	3	3	3	3			
6. TrapMan Pro & TMS Preparation	3	3	3	3	3			
7. Inspection Procedure	3	3	3	3	3			
8. Actual Survey Implementation	3	3	3	3	3			
9. Data Check	3	3	3	3	3			
10. Working Confirmation	3	3	3	3	3			
Report Work & Confirmation Activity								
1. Trap Report Log Sheet	3	3	3	3	3			
2. Reporting	3	3	3	3	3			
3. Data Transfer Sample Inspection	3	3	3	3	3			
4. Analysis and C/B Proposal	3	3	3	3	3			
Post-Inspection								
1. Trap Site for Proposal	3	3	3	3	3			
2. Trap Replacement Request	3	3	3	3	3			
3. Trap Replacement Procedure	3	3	3	3	3			
4. PMS	3	3	3	3	3			
5. Feedback Procedure	3	3	3	3	3			
6. Replacement Work Schedule	3	3	3	3	3			
Case Report								
1. Working Trap Replace Job	3	3	3	3	3			
2. Actual TMS Survey Implementation	3	3	3	3	3			
3. Trap Report Log Sheet	3	3	3	3	3			
Data use update								
1. Database Control	3	3	3	3	3			
Confirmation Meeting								
1. Actual Report Survey Implementation	3	3	3	3	3			
2. Trap Report Log Sheet	3	3	3	3	3			
Total	100	64	0	0	0	0	0	
Training evaluation level			3	3	4	Fail	Fail	

Confirmation

Level	Assignment	Approved by	Checked by
01-00	Participate again		
01-00	Supplementary		
01-00	Review		
01-00	Interview Class		
01-00	Review office		
01-00	Work Class		
01-00	Work Class		

1/1

Certificate

Inspector Certification

No. 105 Name Masahiro Honjo

Certificated Inspection Menus

- BPSTM Survey
- TrapMan Survey
- PEC Support

This is to certify that the person shown above has received the training courses listed and has successfully passed the examinations.

TTS TTS LTD. President *G. Fujiwara*

TMS Survey

Database Establishment

Condition Monitoring

Database Analysis

CDL[®] Improvement Proposal

Zero Reset Maintenance

Database Update

Database Establishment

Condition Monitoring

Database Analysis

CDL[®] Improvement Proposal

Zero Reset Maintenance

Database Update

Comprehensive Database

Database with Characteristics of the CDL®



Database Establishment

Condition Monitoring

Database Analysis

CDL[®] Improvement Proposal

Zero Reset Maintenance

Database Update

Comprehensive Database

Detailed Inspection

Data Analysis

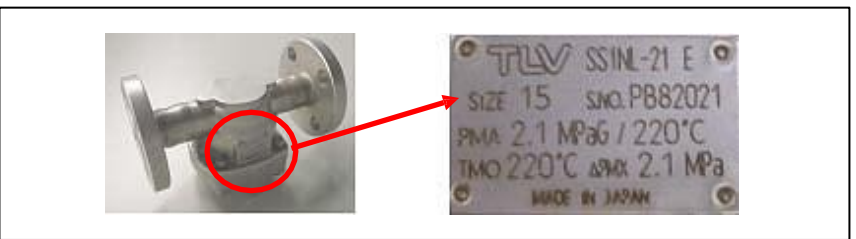
Selection of Best Solution

Installation Information

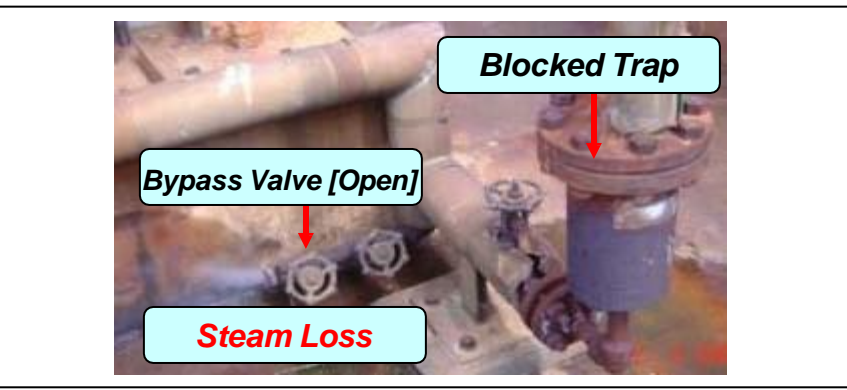
AP : EL :

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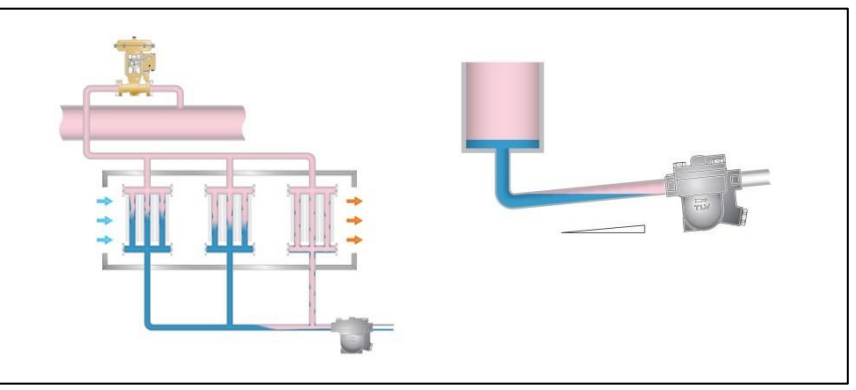
Steam Trap Information



Valves & Other Issues



Trapping Problems



Database Establishment

Condition Monitoring

Database Analysis

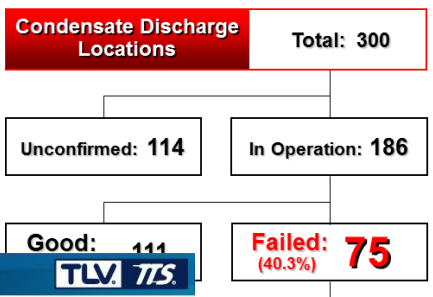
CDL[®] Improvement Proposal

Zero Reset Maintenance

Database Update

Automated Analysis and Benchmarking Study

Survey Summary TLV TTS

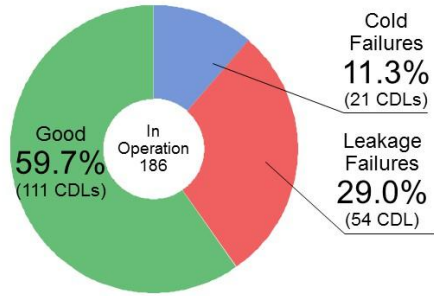


- Survey Period
19 August 2013 – 20 August 2013
- Steam Costs

LLP	10.00 \$/ton
LP	15.00 \$/ton
MP	20.00 \$/ton
HP	25.00 \$/ton
SHP	30.00 \$/ton

Overall Failure Analysis TLV TTS

Failure State 40.3% (75/186 CDLs)



Judgment	No. of CDL	% Failure
LOW TEMP	12	42.9%
BLOCKED	9	57.1%
FAIL ADJ-L		
TOTAL	21	100%

Judgment	No. of CDL	% Failure
BLOWING	3	5.6%
LEAK/L	13	24.1%
LEAK/M	7	13.0%
LEAK/S	11	20.4%
L/GASKET*	10	18.5%
L/BODY*	10	18.5%
FAIL ADJ-H		
TOTAL	54	100%

21 **Losses**

Leakage Failures: 54 (29.0%)
199 kg/hr

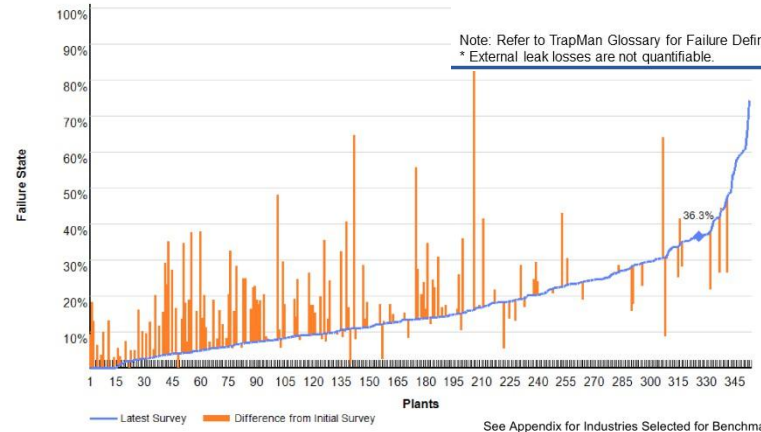
Leakage Losses 31,176 USD/yr

Overall Failure Analysis - Benchmark

7/17/2014

Failure State

Note: Refer to TrapMan Glossary for Failure Definitions
 * External leak losses are not quantifiable.



See Appendix for Industries Selected for Benchmarking

Database Establishment

Condition Monitoring

Database Analysis

CDL[®] Improvement Proposal

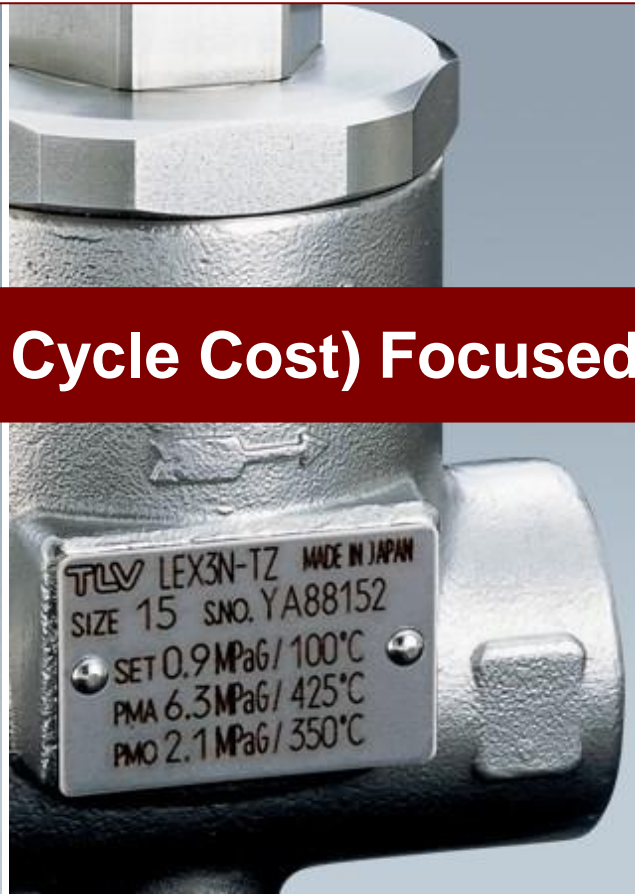
Zero Reset Maintenance

Database Update

Energy Efficiency

Long Service Life

Specific Application & Pressure



LCC (Life Cycle Cost) Focused Products

Database Establishment

Condition Monitoring
ZRIM
Database Analysis

CDL[®] Improvement Proposal

Zero Reset Maintenance

Database Update

ZRM® Replacement Support

Eliminating all failed locations requires significant manpower and costs

Focus on replacement work efficiency



Database Establishment

Condition Monitoring

Database Analysis

CDL[®] Improvement Proposal

Zero Reset Maintenance

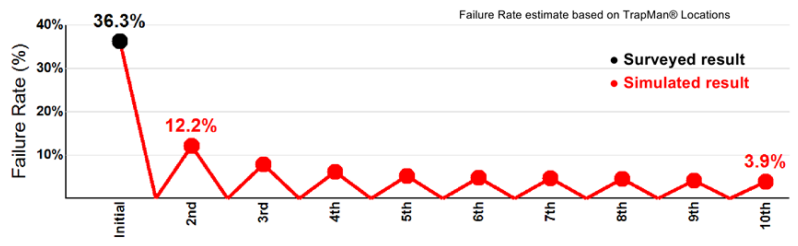
Database Update

Database Update

Continuous & Sustainable Optimization

Failure Rate Simulation TLV TTS

Current Failure State **36.3%** Estimated 10-yr Failure Rate **3.9%**



Regular Surveys with 100% ZRM*

Achieve Low Failure Target with:

1. Replacement of all Failed Traps
2. Replacement with Suggested Trap Models
3. Regular TrapMan® Surveys

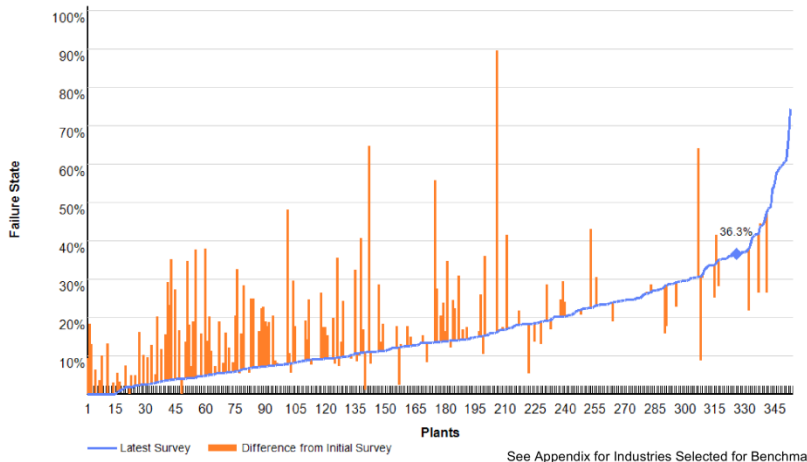
* ZRM = Zero Reset Maintenance, Replacement of and survey to verify proper operation all failed traps.

Overall Failure Analysis - Benchmark TLV TTS

7/17/2014

Failure State

60 Industries (353 Plants, 266,312 CDLs)



See Appendix for Industries Selected for Benchmarking

The Structure of SSOP®

How can the entire steam system be optimized?

Create optimum balance with the entire steam system treated as a valuable asset.

2

Phase

BPSSM® (Best Practice of Steam System Management)

- ⇒ Safety, Reliability & Productivity Improvements
- ⇒ Recover and Re-use Condensate and Waste Heat

Optimize Steam Applications

TMS (TMS Management System) 全てのCDL (例えば10,000個) をどう最適化するのか？

蒸気システムを機能させるための必要條件
⇒ Reduce Steam Loss

Infrastructure

Phase 2: Steam Applications

Survey Implementation in 1 ~ 2 weeks

Consultation Meeting



Field Assessment



Analysis & Report



The Structure of SSOP®

3

Phase

Steam System Balance

- ⇒ Steam System (Electricity & BFW) Balance Optimization
- ⇒ Steam Load & Generation Balance Optimization

Optimize
Steam System

BPSSM® (Best Practice of Steam System Management)

- ⇒ Safety, Reliability & Productivity Improvements
- ⇒ Recover and Re-use Condensate and Waste Heat

TMS (CDL Management System)をどう最適化するのか？

蒸気損失問題を機能させるための必要条件

- ⇒ Reduce Steam Loss

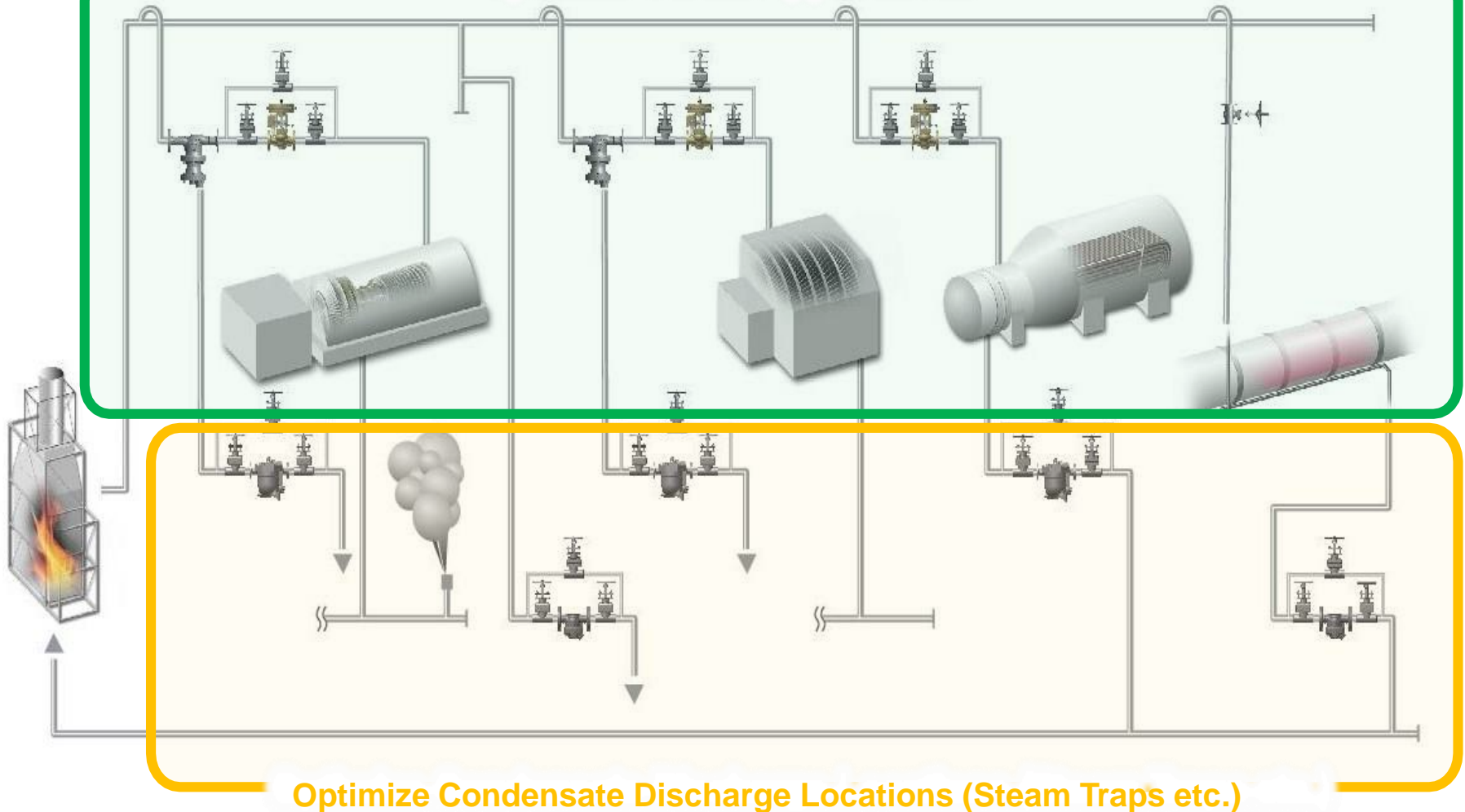
Applications

Infrastructure

Phases:3 Steam System Balance

Optimize Steam System Balance

Optimize Steam Applications



Barriers that inhibit the optimization of Condensate Discharge Locations

- 1 There are more than **10,000** condensate discharge locations in an average petroleum refining plant

Efficient and sustainable systems are needed.

- 2 The existing “**Stereotype**” that, “Steam traps are consumables, so cheaper is better”.

By considering the characteristics of each CDL[®], a selection that delivers energy efficiency, long service life, and excellent life cycle cost should be made.

- 3 Steam traps are seen as a matter for the maintenance team, **not for Top Management.**

Investment and budgeting from the viewpoint of asset management, is needed.

Thank you