# HOW TO START A STEAM SYSTEM MAINTENANCE PROGRAM

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http://www.trapbase.com

Starting a Steam System Maintenance Program might seem like a large undertaking for many facilities; however, the benefits far outweigh any costs and effort involved. Implementing a steam system maintenance program can save time, reduce costs, and improve operating efficiency and product.

Steam system inefficiency causes lost profit in areas such as:

$ **Steam loss** through tracing and packing leaks.

$ **Steam loss** through open bypass valves

$ **Steam loss** through failed open traps

$ **Heat loss** through uninsulated or improperly insulated piping and equipment.

$ **Insulation and piping damage** through tracing leaks under and near insulation

$ **Inefficient process** production due to lower quality of steam.

$ **Reduced** equipment reliability and life

$ **Increased downtime**/equipment repairs from wet steam and carbonic acid

$ **Increased Equipment and piping damage** from freezing of improperly installed or maintained systems

## Typical Problem Areas

To determine if your facility could benefit from a steam system maintenance program, make a quick inspection and see if any of these problem areas are in your facility:

❑ Tracing leaks

❑ Packing Leaks

❑ Reduced life of turbine nozzle block, carbon, and shaft

❑ Manual adjustment of steam supply/discharge on or around heat exchangers

❑ Sub-optimal heat exchanger performance

❑ Waterhammers

❑ Open bypass valves

❑ Poor Energy Rating (EII)

If these problems seem familiar, chances are your steam system would benefit from a systematic survey and maintenance program.

# Key Components of a Successful Steam System Management Program

## Personnel

You must decide who will do the work – in house personnel, an outside contractor, or a combination of the two. There are also two task components to steam system management – surveying the steam system and performing maintenance/repairs on the steam system. You may elect to outsource the survey, using an outside contractor, and have in-house personnel perform the maintenance. Another option is to have an outside contractor perform the initial steam trap survey, catalog and enter all steam trap information into a database, and conduct training for in house personnel to continue the survey program

### Using In-House Personnel

**Pros:**

1. In-house personnel can become "experts" in their facility's steam system if given enough time and are then able to troubleshoot complex, longstanding problems such as waterlogged heat exchangers, turbine damage, waterhammers, etc.

2. Management has control of how and when surveys and maintenance are done.

3. Data files and reports are owned and maintained by the facility.

4. In-house personnel may not be biased towards any particular hardware manufacturer.

**Cons:**

1. Expert training needed is costly and time consuming.

2. Difficulty in keeping the same personnel in position long enough or consistently enough to develop necessary skills to become experts in steam system maintenance.

3. Lack of available personnel due to downsizing or other higher priority maintenance activities.

4. Management personnel in charge of the Program may not be familiar with the requirements of maintaining a steam system and therefore support may be lacking.

### Using an Outside Contractor

**Pros:**

1. Fixed cost for surveys and/or maintenance.

2. Regular yearly surveys can be easily scheduled without regard to plant personnel vacations, turnarounds, etc.

3. Personnel should be experts in the field.

4. Contractor should supply reports.

5. Contractor may be able to supply traps at a reduced cost due to agreements with steam trap manufacturers or distributors.

6. Experts from a variety of manufacturers and/or distributors may be available to help solve complex problems with the steam system.

7. The facility is not required to maintain a pool of steam system experts.

**Cons:**

1. Level of contractor expertise varies widely.

2. Contractor usually has control of data and reports.

3. Some contractors are distributors for various hardware manufacturers and could have a bias in trap replacement.

## Combination In-House Personnel and Outside Contractor

**Pros:**

1. Expert assistance is readily available.

2. Facility has more control of the program due to the involvement of its onsite In-House personnel.

3. Contractor proposals can be validated by the In-House personnel.

4. In-House personnel can facilitate a more productive relationship can be forged between the facility and the contractor.

5. Credibility of proposed repairs is enhanced by the cooperation of both In-house personnel and outside contractor.

6. Investment in expertise is secured. It is unlikely that a facility would replace both the in-house personnel and the outside contractor at the same time. The contractor could easily train a new in-house person and an in-house person could easily secure a new contractor.

7. Data can be managed by in-house personnel.

**Cons:**

1. Some training of in-house personnel is needed.

## Determining the Number of Surveyors Required

If in house personnel are to be used, how many are needed? It is recommended that a steam trap survey be performed at least once a year on all traps. Some traps will need to be surveyed monthly. Troublesome or critical traps may need to be checked even more often. An average surveyor can test and record 100-150 traps per day or repair 7-10 traps per day. Using the total trap population and working days, you can determine the number of personnel needed to complete all steam system survey and repairs within one year.

In a population of 3,000 traps with 500 requiring survey monthly and 100 requiring a survey weekly,

100 * 52 = 5,200
500 * 12 = 6,000
2400 * 1 = 2,400
13,600 trap surveys annually
13,600 / 125 traps surveyed per day
                                    = 108.8 man days to survey
Assuming a 10% repair rate
3,000 * .10 = 300 traps to be repaired annually
300 / 8.5 trap repairs per day
                                    = 35.3 man days to repair traps
                              **= 144.1 man days annually**

# Training

## Classroom Training

In classroom training personnel should gain an understanding of the facility's steam system, properties of steam, the proper application and usage of various steam traps, and data management. Some steam trap manufacturers offer free training seminars both at their facilities and on the internet

## Field Training

Field training should prepare personnel to conduct steam trap surveys using an ultrasonic tester and temperature probe. Personnel should be trained to recognize proper trap installation and size, if a valved-out trap should be in service, or if the trap discharge is routed to the proper place.

# Testing Equipment

## Ultrasonic Tester and Temperature Probe

An ultrasonic tester and a temperature probe are necessary for accurate steam trap testing. It is strongly recommend that both



instruments be used in combination with visual inspection by trained personnel. Temperature alone cannot always determine trap status; however, it is useful for providing estimation of pressure, over or under heating, etc. Ultrasonic testing combined with a temperature reading can achieve accuracy in trap testing of 98+% using trained personnel.

## Tagging



The type of tags to be used should be decided early in the development of a steam system management program. If the database or software system purchased supports bar code tags, these tags save time in repeat surveys and are less likely to be removed and discarded from the traps. There are many types of bar code tags available for industrial environments including Teflon-coated aluminum, stainless steel, ceramic, etc.

# Data Management

To justify the expense of a steam system management program, carefully document all steam system management data and provide monthly reporting on your progress. Since steam system management can save a facility hundreds of thousands of dollars, the credibility of the reporting is extremely important. The following are a few components and features to look for in a steam system management software:
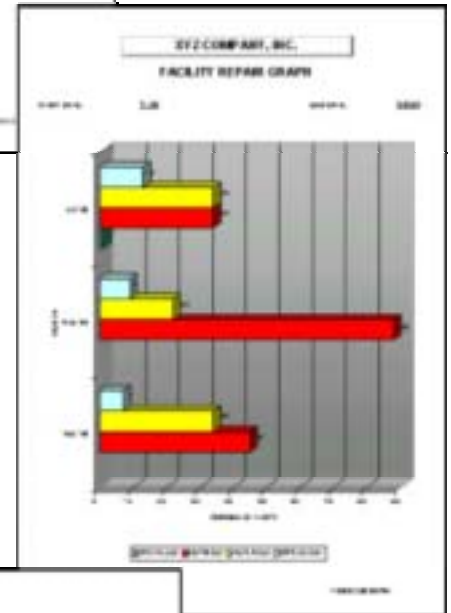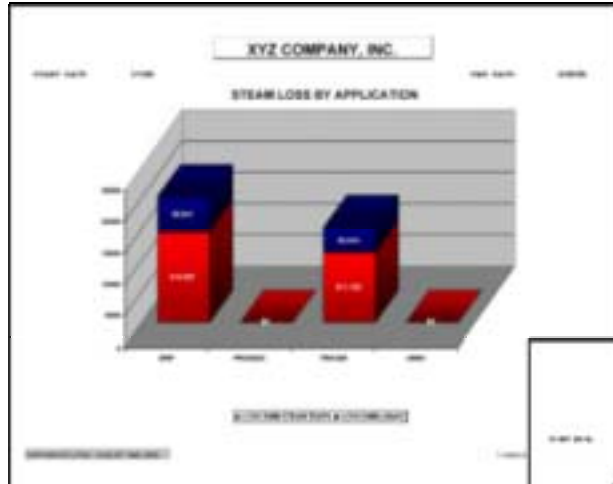
- The software should be easy to use and, if possible, use a handheld data collection device with bar code scanner for gathering data in the field.

- The software should maintain <u>historical</u> survey, maintenance, and repair data. In other words will older survey information be lost when new survey information is entered.

- The software should track maintenance and repairs separate from surveys while still being linked to the correct survey.

- The software should be customizable for your facility for things such as steam cost, make up water costs, etc.

- The software should allow exporting of reports to other programs such as Microsoft Excel or Word for sharing with others, e-mailing, etc.

- The software should use a standard formula for calculating steam loss and should calculate losses separately for each individual trap or leak.
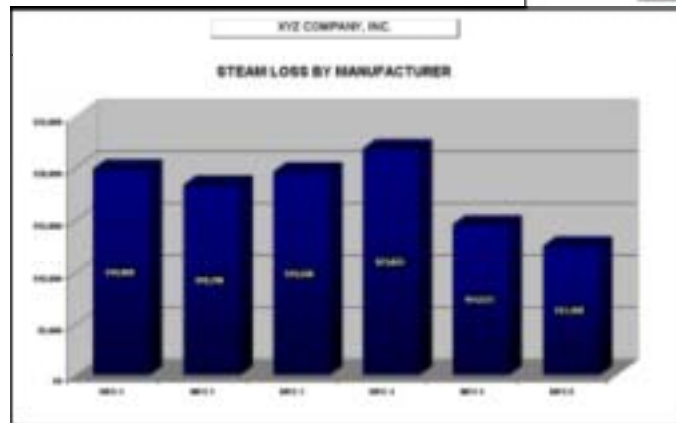
- The software should have the option to be used by one user or on a network.

- Reports and graphs should be easy to read.

## Steam Trap Survey Data Collection

Fundamental to the Steam Trap program is effective collection of good data. Managing the program using data that has poor integrity (i.e., does not correlate to what is really in the field) allows energy to be wasted, components to prematurely fail, and in some cases can expose your company to costly safety issues.  Poor data integrity makes managing the program time consuming and frustrating.

In general, data collection can be performed using one of two methods; using pen & paper or electronic data loggers.

### Pen & Paper

Using the "pen and paper" method, the Inspector goes out into the field with a form that has the list of steam traps to be inspected, along with pertinent location and trap information.  There is a place on the form for the inspector to write in the status of the trap ( Failed-open, Failed-closed, etc.) and any comments, repair information, etc. When all components are inspected, the inspector (or other person) keys the readings into the Steam Trap Management Software. Any other information such as steam tracing leaks, steam off, etc. is also keyed in at the PC.

**Pros:**

1. Lowest cost.

2. It is simple. Nominal training required.

3. No chance of "pushing the wrong button."

4. Little chance of losing a day's worth of inspection data.

5. Which order components are inspected in does not matter.

6. Inspector can scan the page and intuitively choose the order of inspection.

7. Missed inspections are obvious, no reading filled in.

**Cons:**

1. Requires the inspector to use both hands to write down the reading, could slow him down.

2. Requires data to be keyed in back at the office.

3. Hand writing may be hard to read resulting in wrong information.

4. Damp or wet conditions could damage the paper or make written information illegible.

5. Inspection results could be forged.

## Electronic Data Logger/HandHeld PC

With an electronic data logger or handheld PC, a list of steam traps to be inspected, along with pertinent trap location and other information is downloaded from the PC software to the hand held unit. Inspector takes the data logger into the field to record inspection results. Some hand held units have a way for the inspector to record other information such as tag needed (tag missing), previous status, new trap, etc. When all traps are inspected, the inspector connects the data logger to the PC and uploads all of the information collected directly into the Steam Trap Management Software.

**Pros:**

1. All inspections are time and date stamped automatically.

2. Data is entered one time. No additional data entry at the PC is required. Less opportunity for error.

3. Some operations can be done with only one hand.

4. Small size and can be easily carried in the hand, pocket, or a pouch attached to a belt.

5. With some data loggers, each component comes up on the screen in the order that they are to be inspected.

6. Can be used in bad weather. Weather where paper would be useless.

7. Bar Code Tags can be scanned with unit, making inspections more efficient.

**Cons:**

1. Equipment cost can be higher.

2. Potential for lost data due to hardware failure. Although not likely due to newer platforms, failure can happen.

3. Can't use it if the battery is not charged.

4. Some training is required.

## Electronic Data Collection Stamped Tags VS. Barcodes

### What is a Bar Code?

A bar code is a pattern of bars and spaces which represent human readable numbers, letters or characters. These codes are scanned by the data collection device to automatically locate and display the related trap information.

### Why Use Bar Code?

Bar codes are accurate. They eliminate manual data entry errors. Research has shown that the error rate due to bar code misreads is less than one thousandth of one percent. Tests have shown that bar coded information had a throughput accuracy rate of 1 error in 10,000,000 characters. Compare that to keyboard entry error rates of 1 error in 100 characters. Bar codes speed data entry.

# Mission Statement

It would be helpful to formulate a mission statement to display on the wall as a reminder of the goals for starting a steam system management program. For example:

MISSION STATEMENT

Our mission is to improve reliability, reduce steam losses, and improve efficiency in our facility by:

Testing all steam traps, pressure powered pumps, and air vents for proper type, operation, and installation.

Repairing or replacing defective traps.

Replacing wrong type or size with the proper trap.

Identifying places where additional traps are needed such as low points or dead legs on headers that do not have a trap installed

Maintaining records of all surveys

Issuing monthly reports showing savings and improvements made.

Being a resource for information on Steam Systems.

# Steps Required to Initiate a Combination In-House and Contractor Program

- ❑ Select an individual to be the On Site Steam System Maintenance Expert

- ❑ Set up an Office with a modern computer large enough to run complex applications.

- ❑ Obtain the required equipment: Software, Ultrasonic tester, Temperature probe, and tags.

- ❑ Train the person in the use of the equipment.

- ❑ Contact the Contractor of choice for a site visit to discuss the initial survey and setting up the program.

- ❑ Train the in house person in Steam System Surveying and Maintenance. Some off site training may be desirable.

- ❑ Contact others as necessary for training, equipment, or assistance.

- ❑ Develop a procedure for requesting Steam System Maintenance. If repairs are made without consulting the On Site Expert, the program may suffer some setbacks due to improper installations.

- ❑ Develop a reporting procedure to monitor progress.

- ❑ Develop a Mission Statement

- ❑ Document and Publish improvements made to gain and maintain support.

Note: In addition to saving money and increasing profits, the facility with the most efficient steam system pays the least increase when energy costs rise.

# Internet Resources

There are many websites that offer information and products regarding steam system management including many steam trap manufacturers. The following is a list of helpful links.

Armstrong Steam University at http://www.armstrong-intl.com/university/su.html

Field Data Specialists, Inc. at http://www.trapbase.com

Steam Link at http://www.steamlink.com

Alliance to Save Energy at http://www.ase.org

Spirax-Sarco Training Information at http://www.spiraxsarco-usa.com/framedefs/faq.htm

Steam List Electronic Mailing List http://www.swopnet.com/engr/mail_lists/steam_list_info.html