

Technical Report - ST507
Steam Trap
Performance Testing

May 8, 2007

Technical Report – ST507

Steam Trap Performance Testing

Maintaining an efficiently operating steam and condensate system is a major step in energy management. A key component to insure the steam energy is utilized effectively is the steam trap. The correctly applied steam trap removes condensate, air, and CO₂ from the system as fast as they form. The correct trap also prevents loss of live steam, resists corrosion, handles dirt and scale, and provides long, dependable service.

Different steam conditions and condensate return applications require specific steam trap designs. Traps designed for high pressure, superheat conditions would not be recommended for high capacity heat exchangers or tracer service. Along with selecting the correct trap for the application, the trap design must insure efficient operating performance and be tested by approved methods accepted throughout the industry.

In January 1975, ASME (American Society of Mechanical Engineers) authorized the Performance Test Codes Supervisory Committee to write a test code on condensate removal devices. The committee proposed and approved the writing of two codes, PTC 39.1 on Condensate Removal Devices for Steam Systems and PTC39.2 on Condensate Removal Devices for Air Systems.

The committee was composed of design engineers from the major steam trap manufacturers from the United States and Europe as well as noted industrial and utility experts and academia.

The Code for Condensate Removal Devices for Steam Systems was approved by the ASME Performance Test Codes Supervisory Committee in April, 1980 and was further approved as an American National Standard by the ANSI Board of Standard Review in July, 1980. Through ANSI (American National Standards Institute), the international community adopted the ASME test method resulting in International Standard ISO 7841 “Automatic steam traps – Determination of steam loss – Test methods” in 1988.

ASME PTC 39.1 and ISO 7841 provide a common method for the testing of steam traps in order to determine performance characteristics. The test is based on the use of accurate instrumentation and the best analytical and measurement procedures currently available.

The current ASME PTC 39-2005 revision was adopted by ANSI in May, 2005.

In 1980, Armstrong International, Inc. adopted the original ASME PTC 39.1-1980 code to conduct industry accepted performance tests of steam traps. The test apparatus was constructed according to the Instrument & Apparatus (I&A) Supplement and the testing personnel were qualified to perform the procedures. See photo 1.



Live Steam Loss data per ASME PTC 39-2005 Testing Procedures:

Notes:

1. All steam traps new when tested, two identical traps.
2. All steam traps tested at 150psig saturated steam.
3. Live Steam Loss figures do not include radiation losses.
4. Testing procedure per ASME PTC 39-2005 at Armstrong Research Lab.
5. Trap Type:
 - IB – Inverted Bucket, 2-bolt connector
 - FF – Free Float & Thermostatic, 2-bolt connector
 - Disc – Thermodynamic, in-line configuration
 - Thermo – Thermostatic Wafer, in-line configuration

Test Results:

All the steam traps tested above have a metal to metal seating arrangement and as a result display similar shut-off characteristics when new. The cost of ownership now becomes a function of first cost, longevity, and replacement and/or repair costs.

First cost and longevity should be evaluated together because a low first cost steam trap with a short, inefficient operating life may not prove to be the optimum choice. Steam costs and process performance far outweigh any initial cost differential.

The cost to replace or repair failed steam traps can also be substantial. The physical location as well as the installation environment can make access difficult and time consuming. Limited available manpower is an important issue as well.

Trap Mfg.	Trap Type	Model No.	Live Steam Loss Lbs / Hr			
			Test #1	Test #2	Test #3	Average
ARM #1	IB	2011	2.06	1.86	0.84	1.91
ARM #2	IB	2011	0.97	1.80	1.87	1.55
TLV #1	FF	FS3-18	1.98	2.05	2.61	2.21
TLV #2	FF	FS3-18	1.89	2.18	2.01	2.02
YAR #1	Disc	710/720	3.33	4.40	—	3.86
YAR #2	Disc	710/720	2.61	1.66	—	2.13
GES #1	Thermo	MK25	1.69	1.98	—	1.84
GES #2	Thermo	MK25	1.52	1.82	—	1.67

