CHOOSING A BETTER STEAM TRAP

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Seven years of extensive testing leads to an improved Engineering Design Guide.

Seven years of performance monitoring and testing of steam traps at ICI's Huddersfield and Grangemouth Works (England), along with performance and live steam loss tests at two manufacturers' laboratories, culminated in a revised ICI Engineering Design Guide for the selection of steam traps, EDG. PIP. 30. O1A.

The old selection standards had a number of shortcomings, the most notable being that there was no reference to the type of equipment being drained nor to the method of drainage. Traps were often being selected for duties to which they were not suited. In particular the thermodynamic disc trap (around which the standards were largely based) has come to be regarded as a 'trap for all seasons', especially at the plant level.

Monitoring of trap performance began at Grangemouth Works in 1980 and two years later at Huddersfield Works, following complaints from engineering maintenance fitters of poor service life on steam distribution main drains.

Trap surveys were carried out to establish the types in use and to check the original selection for the duty. Testing programmes were also implemented. Initial results were quite startling. One plant survey of 415 traps showed 19% had failed and 63% were declared wrong for duty.

A distribution main survey of 132 traps classified 42% as failed. Monitoring of service life also began in 1980 and is continuing to this day. Average service life results for specific trap types are shown in Table 1.

To determine the energy efficiency of the various types, live steam loss tests on used traps were carried out on test rigs in the laboratories of two manufacturers. These tests were conducted: 20°C and still air. No measurements were made to assess heat losses from the trap bodies. Applied condensate loads were 10-20 kg/hr, a fairly typical loading. Results are summarized in Table 2. The most interesting feature of the tables is that the thermodynamic disc trap (the general purpose and most widely used trap) is the least energy efficient and, compared with the inverted bucket trap, has a poor service life.

On applications where only modest heat input is required, substituting the thermostatic types for the disc trap would increase energy savings without reducing service life.

The tests also revealed that the mechanical types of trap, i.e. inverted bucket and float traps, kept the steam space clear of condensate under both light and heavy load conditions, whereas the thermostatic types tended to back up condensate as load increased. Furthermore the bimetallic traps tended to be erratic in operation. The new guide includes a trap selection chart.

Today's Recommendations

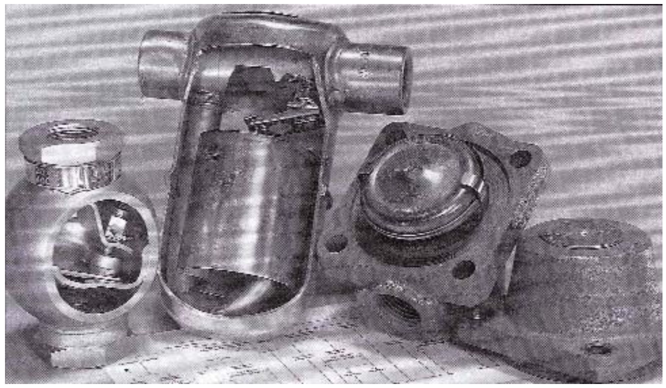
Inverted bucket (IB) traps
Select as first choice for all process duties and steam mains drainage i.e. where the steam space must be kept clear of condensate.

Float and thermostatic traps
Use on process applications especially on temperature controlled duties below 3.5 bar(g) or if an IB installation would lead to problems with excessive air loads.

Balanced pressure traps
Select for non-critical tracing systems and heating systems.

Bimetallic thermostatic traps
Select for low temperature or frost protection on traced pipelines or heating systems. The recommended model is adjustable to allow maximum use of sensible heat in the condensate or to prevent overheating of the products. Its body is all SS.

Thermodynamic disc traps
Limit use to steam mains drainage and tracing systems up to 17 bar(g) as an alternative to inverted bucket traps and for replacement purposes on higher pressures if previous experience has shown that they have operated satisfactorily. Because of their poor energy efficiency and relatively poor service life they are not recommended (and, at Huddersfield or Grangemouth Works not allowed).



L to R - Adjustable Bimetallic trap, Inverted Bucket trap, Balanced Pressure Thermostatic trap

Table 1: Average service life for different trap types.

Trap Type	HP 650 psi (45 bar) (g)	IP 200 psi (14 bar) (g)	LP 30 psi (2 bar) (g)
Thermodynamic Disc	10 - 12 months	12 months	5 - 7 years
Float and Thermostatic	—	*1 - 6 months	*9 months / 4 years
Inverted Bucket	18 months	5 - 7 years	12 - 15 years
Balanced Pressure Thermostatic	—	6 months	5 - 7 years
Balanced Thermostatic	*3 - 12 months	2 - 3 years	7 - 10 years

* Model dependent

Table 2: Live steam losses - kg/hr.

Trap Type	IP	LP
Thermodynamic Disc	1.09	0.84
Inverted Bucket (average of 2 suppliers traps)	0.44	0.42
Balanced Pressure Thermostatic	Not Tested	0.1
Balanced Thermostatic	NIL	NIL
Subcooled Bimetallic Thermostatic	NIL	NIL

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