

An Innovative Technology Company Providing Custom
Energy Efficiency and Emission Reduction Solutions

The GEM logo consists of a dark teal circle with three curved, overlapping lines in shades of teal and grey that suggest motion or a turbine. The letters "GEM" are written in a bold, white, sans-serif font across the center of the circle.

GEM™ STEAM TRAPS

The background of the middle section is a photograph of an industrial facility, likely an oil refinery or chemical plant, with various towers, pipes, and scaffolding. The scene is dimly lit, suggesting dusk or dawn. Overlaid on the right side of this image is a large, semi-transparent graphic of a recycling symbol (three chasing arrows forming a triangle) with a grid of small, repeating characters inside it.

**Oil, Gas, Chemical &
Petrochemical Sector**

***Traditional mechanical steam traps fail at a rate of 10%-30%
per year with an unpredictable lifecycle***



***With no moving parts to wear out or fail, the
GEM™ Steam Trap provides a permanent solution***

Steam System Reliability is Critical in the Petrochem Industry

Traditional mechanical steam traps fail at a minimum rate of 5 to 10% per year with an unpredictable lifecycle.

When a typical refinery may have 10,000 traps, often in difficult to access locations with poor isolation, it is no surprise that surveys often reveal failure rates in the region of 20-30%.

The losses from these failed traps considerably impact the efficient operation of the refinery and, left unattended, will impact process performance with condensate pressurization, waterhammer and other issues.

Thermal Energy International's (TEI) GEM Trap is your permanent solution to steam trapping problems.



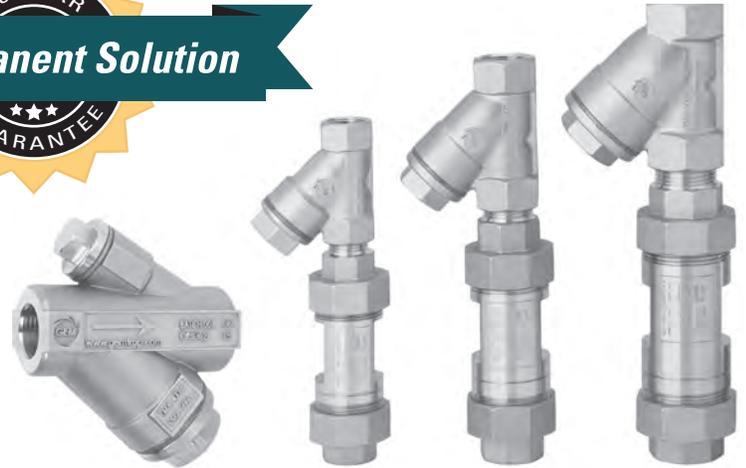
STEAM TRAPS

- ▶ No moving parts to wear or fail
- ▶ Suitable for high pressure steam systems
- ▶ Guaranteed on superheated steam*
- ▶ No loss of live steam

10 Year Guarantee

- ⊘ No on-going trap surveys
- ⊘ No moving parts

The Permanent Solution



*GEM Steam Traps used on superheated steam are supplied with a 3 year guarantee.

End the 'Fail - Survey - Replace' cycle of mechanical steam traps



CASE STUDY:

A leading Middle East oil company has achieved the following benefits since implementing a refinery conversion from mechanical traps to TEI's GEM Traps in 2005:

- ▶ No failed traps since GEM Trap installation
- ▶ Improved condensate drainage from problematic sulfur storage area
- ▶ Significant energy savings to date, ROI < 18 months
- ▶ Improvement in refinery efficiency rating
- ▶ Solved steam trap stalling problems by eliminating condensate pressurization



Condensate line pressure gauge BEFORE GEM Traps (175 PSIG)



Condensate line pressure gauge AFTER GEM Traps (90 PSIG)



With nothing to wear out, we have been providing the GEM Trap with a 10 year guarantee for over 20 years. Since GEM Traps are guaranteed, maintenance is minimized and the cost of ownership reduced.



Energy and Maintenance are the Most Important Cost Factors in the Petrochem Industry (US Environmental Protection Agency)

GEM™ Steam Traps in the Petrochem Sector

TEI's extensive experience in the Petrochem sector has provided successful installations and energy savings for many large multinational corporations including:



- ▶ BASF
- ▶ BP Oil
- ▶ Dow Corning
- ▶ Exxon
- ▶ Huntsman
- ▶ Shell
- ▶ DuPont
- ▶ And many more

We understand your steam system and provide a durable solution with long lasting results.

- ▶ Ideal for troublesome applications
- ▶ Improved process temperature control
- ▶ No pressurization of condensate return system
- ▶ Continually discharges condensate
- ▶ Elimination of steam trap related water hammer
- ▶ Make-up water reduction

The cost of mechanical steam trap failures:

The following example estimates the annual steam loss on a typical refinery.

Trap Size	dia (in)	Steam loss lb/hr		
		90 PSIG	200 PSIG	460 PSIG
DN15	1/2"	18 lb/hr	42 lb/hr	95 lb/hr
DN20	3/4"	53 lb/hr	117 lb/hr	262 lb/hr
DN25	1"	121 lb/hr	267 lb/hr	595 lb/hr
DN40	1 1/2"	216 lb/hr	472 lb/hr	1054 lb/hr

Reference Spirax Sarco

- ▶ Steam pressure of 6 barg = steam loss of 53 lb/hr per 3/4" trap
- ▶ Assuming an industry standard failure rate of 10%, a site with 10,000 steam traps can expect 1,000 failed traps.



Site steam loss = 53,000 lb/hr
 Annual steam loss = 225,250 tons/yr
 Steam cost = \$10/ton
 Cost of failed traps = \$2,252,500/yr

- ▶ This figure does not include the costs of increased maintenance and downtime caused by failed traps, or the costs of make-up water.

Save Steam - Save Energy - Save Money - Reduce CO₂ Emissions

How the GEM™ Steam Traps Works

No Moving Parts



The GEM Trap consists of a custom sized orifice followed by a specifically designed staged throat.

Variable Loads

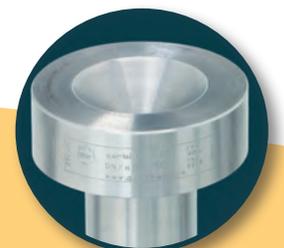
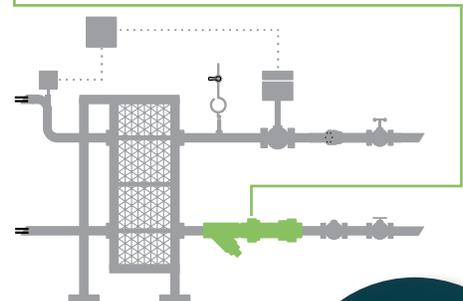
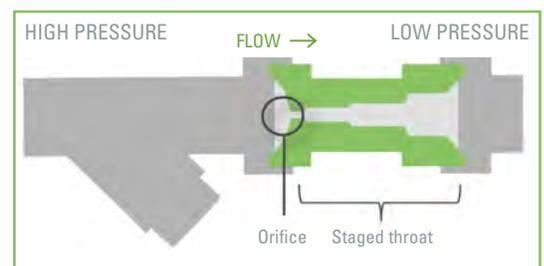


The GEM Trap uses the expansion of flash steam created from the pressure differential across the steam trap to regulate the flow of condensate.

Our Service



TEI's engineers calibrate the orifice and throat of the trap to ensure 99% of industrial variable loads are accommodated with ease.



GEM Traps are the most reliable steam traps on the market. They are perfect for the harsh environment of the Petrochem site and provide a permanent solution with energy and maintenance savings.

Advantages of the GEM™ Steam Trap

Permanent energy savings

- ▶ 10% to 30% permanent reduction in steam costs
- ▶ Superior design resulting in enhanced efficiency
- ▶ 10 Year No-Fail Performance Guarantee

Excellent return on investment

- ▶ No moving parts = no trap failures = minimal downtime
- ▶ Simple paybacks typically range between 1 and 2 years
- ▶ Significant operational benefits from avoided repair and maintenance costs

Ultimate reliability and safety

- ▶ Elimination of water hammer, condensate back-up and/or explosions from failed valves
- ▶ Solid stainless steel construction
- ▶ No "wire draw" and/or wear of orifice

Increased production

- ▶ Faster system warm up = quicker batch times
- ▶ No back pressure from failed traps
- ▶ Less thermal shock = increased plant reliability

Minimal maintenance

- ▶ Designed to minimize spares
- ▶ No kits to fit
- ▶ No endless trap surveys or test equipment and devices required
- ▶ Simple periodic cleaning of strainer and easy-to-clean bodies

More control and heat output

- ▶ Capable of operating under a full range of variable load conditions
- ▶ Self-regulating vs. opening and closing of mechanical trap valves
- ▶ Constant vs. intermittent condensate drainage

Superior product and service

- ▶ Full range of traps available
- ▶ Full traceability – each trap has individual serial and batch number
- ▶ Compact size – less heat loss and reduced space requirements
- ▶ Flexible orientation and configurations
- ▶ Tailor made insulation bags – GEM Traps do not need to lose heat to operate
- ▶ Optimal performance guaranteed – GEM Traps are individually sized for your requirements

Thermal Energy International (TEI): Supplying Innovative Award-Winning Energy Recovery, Conservation, Bioenergy and Emission Reduction Solutions

TEI is a full service, design-build firm with engineering accreditation, established in 1986. We have designed and built many energy and emission reduction solutions for our customers.

Our team of professionals is highly experienced in plant and process energy efficiency evaluations and innovative solution development. We conceptualize, design, manufacture and deliver custom solutions which reduce your energy costs, improve energy efficiency and reduce the environmental impact of your facility.

We pride ourselves on working with customers to gain an in-depth understanding of their business, corporate, social and fiscal challenges. With this sound footing, our team of professionals provides complete solutions from initial design concept to installation, to financing and servicing of varied technology solutions

Contact Thermal Energy today to discover how GEM™ Steam Traps can revolutionize your company's production efforts!



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