



ENGINEERED PRODUCTS

This section provides an overview of engineered products available from Pentair Industrial Heat Tracing Solutions. For complete design assistance and product selection, contact your Pentair representative or phone Pentair at (800) 545-6258. Also visit our web site at www.pentairthermal.com.

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INTRODUCTION

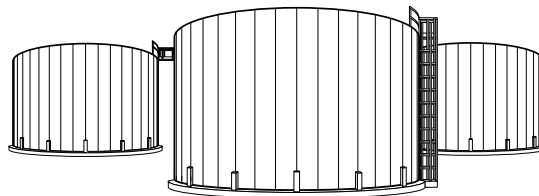
Pentair offers engineered products for the industrial market.

- Standing lock-seam tank insulation systems
- Weldless, clamp-on pipe shoes
- MI downhole flow assurance and enhanced oil recovery

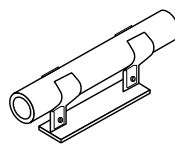
Each product is designed to add value to even the simplest of heat-tracing installations. Typical benefits served by these products include:

- Tank heat loss prevention
- Pipe support and control and power distribution optimization
- High flow rate temperature management and pressure equalization along long horizontal producing zones for downhole applications

A description of the features and benefits of each technology is provided in the following pages.



Trac-Loc vertical lock seam tank insulation



Interlock clamp-on pipe shoe

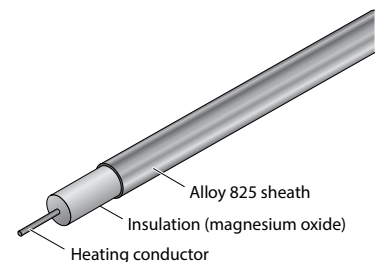
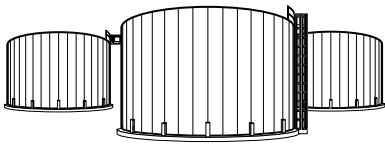


Fig. 1 Engineered products

TRAC-LOC VERTICAL LOCK-SEAM TANK INSULATION



DESCRIPTION

The Trac-Loc tank insulation system is a vertical double-locking standing seam insulation panel system that's unique in its design, panel construction and installation techniques.

APPLICATIONS

Trac-Loc is ideal for large, flat-bottomed tanks used for storage of materials that are sensitive to temperature fluctuations and require a covering of insulation and jacketing to reduce heat loss or gain.

DESIGN

The Trac-Loc advanced interlock panel system consists of prefabricated panels of insulation and jacketing material. These panels, fabricated to the height of the storage tank, include flanges that are mechanically seamed to an adjacent panel. This mechanical seam creates a homogeneous jacket that not only secures the panels to the storage tank, but also reduces moisture ingress, damage due to wind, and inherent expansion and contraction of the storage tank.

PANEL CONSTRUCTION

Panels are fabricated by laminating insulation material to a preformed jacket. Insulation can be made up of one or more insulating materials and jacket materials conform to industry standards. The following tables contain some of the typical insulation and jacketing materials used for panel construction.

TABLE 1 INSULATION MATERIAL

| Insulation | K factor* | T _{max} | |
|---------------------|---|------------------|---------|
| Polyisocyanurate*** | 0.19 BTU-in / hr - ft ² - °F | 250°F | (121°C) |
| Fiberglass | 0.24 BTU-in / hr - ft ² - °F | 850°F | (454°C) |
| Mineral wool*** | 0.26 BTU-in / hr - ft ² - °F | 1200°F | (649°C) |
| Calcium silicate** | 0.40 BTU-in / hr - ft ² - °F | 1200°F | (649°C) |
| Perlite** | 0.46 BTU-in / hr - ft ² - °F | 1200°F | (649°C) |
| Cellular glass | 0.30 BTU-in / hr - ft ² - °F | 900°F | (482°C) |

* K factor based on 100°F mean temperature

** Used in double-layer applications only

*** May be combined with a foil facer

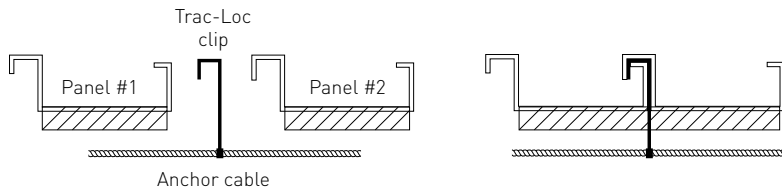
TABLE 2 JACKETING MATERIAL

| Material | Thickness |
|-----------------|-------------------|
| Aluminum* | 0.024" (0.610 mm) |
| Stainless steel | 0.016" (0.406 mm) |
| Steel | 26 gauge |
| Galvalume | 0.024" (0.610 mm) |

* Jacket material may be coated for corrosive environments and colored for aesthetics.

INSTALLATION

In order to temporarily secure the panels to the surface, a cable system is secured to the tank circumference. Trac-Loc clips secure the panels to the cables. A seaming tool forms the adjacent panels into a double locking vertical seam that includes the clip.

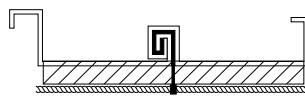


Step 1

Trac-Loc clip and panels prior to assembly. Clip is secured to anchor cable.

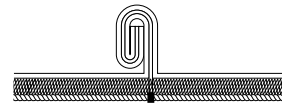
Step 2

Alignment of Trac-Loc clip and panels. Panels held in place by mating flanges with clip inserted between male/female flange.



Step 3

Double locking of panels creates seal. Mechanical crimping of seam accomplished by single pass of seaming tool.



Step 4

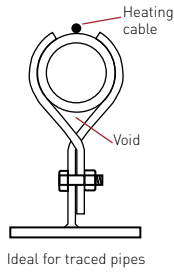
Final seam creates homogeneous jacketing along tank surface.

Fig. 2 Trac-Loc installation

The Trac-Loc system is provided as a complete turnkey system. Additional value-added services include:

- Estimates
- Thermal calculations
- AutoCAD® designs
- Tank heater pads and self-regulating cable designs
- Immersion heaters, circulation heaters, etc.
- Under tank designed heating systems

INTERLOCK CLAMP-ON PIPE SHOE



The Interlock clamp-on pipe shoe is a patented pipe support design that eliminates field-welding requirements for pipe supports.

DESCRIPTION

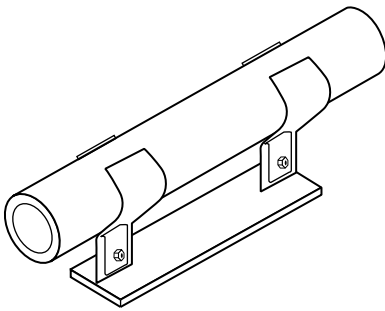
The Interlock shoe includes a base with either two or three (depending on the application) support tongs welded to it. These support tongs have a lever gap stamped in their base, through which a mating tong is inserted. When the mating tong is bolted to the support tong the pipe ends of the tong are drawn together, gripping the pipe.

The entire assembly is galvanized (6 mil thick) for corrosion protection.

The Interlock shoe can be used on nominal pipe sizes ranging from 1-in (25.4 mm) through 8-in (203 mm), and is available in heights of 3-in (76 mm), 4-in (102 mm) or 6-in (152 mm) to accommodate varying thicknesses of pipe insulation.

The Interlock shoe is made out of A-36 carbon steel, but is also available in other materials of construction for special applications. The standard (A-36) Interlock shoe can be used in services from -20° F (-29°C) to 400°F (204°C).

When the Interlock shoe is used on stainless steel pipe an optional isolation insert is available to isolate the dissimilar metals, in compliance with most pipe support specifications.



APPLICATIONS

Pipes that can be installed on supports include bare pipe, painted pipe, insulated pipe, and heat-traced pipe. Using the clamp-on pipe shoe can allow you to:

- Minimize or eliminate wear on the pipe caused by normal movement of a pipeline. This movement can be attributed to many things, including thermal expansion of the pipe due to process temperature changes or changes in ambient temperature.
- Provide a means for guiding the pipe so that multiple lines within a rack do not rub against one another during normal movement.
- Allow spacing between the pipe support and the pipe itself to facilitate the installation of pipe insulation.

The Interlock clamp-on pipe shoe is not intended for anchoring or vertical support requirements.

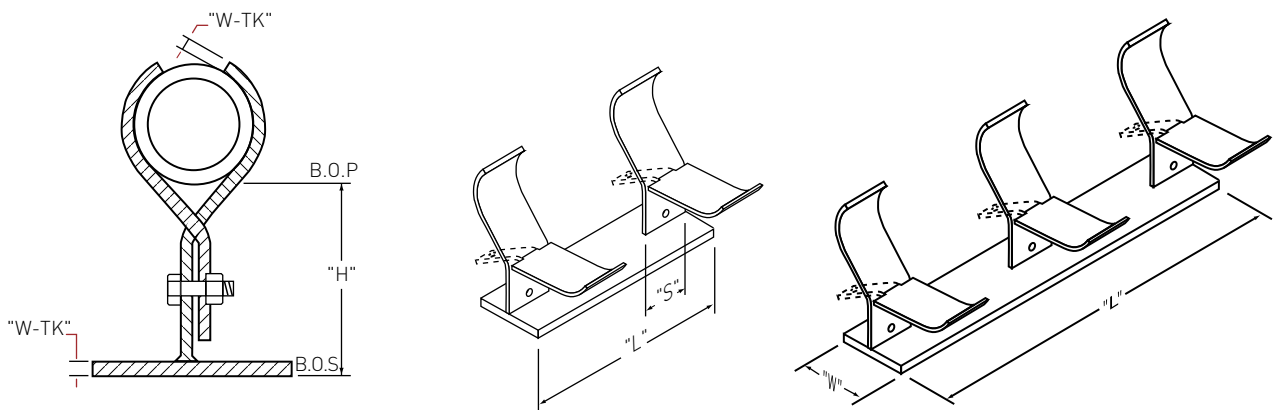


Fig. 3 Interlock pipe support

ADVANTAGES

- Reduced cross sectional area (as compared to conventional clamp on shoes).
 - Reduces space requirements in the pipe rack, minimizing rack congestion.
- Reduced heat loss at the pipe support.
 - Minimizes the need to serpentine or loop heat-tracing cable or tubing, eliminating as much as 15% of the heat-tracing requirements on a typical application.
- Eliminates field welding for supports.
 - Achieves a higher level of quality.
 - Eliminates rework because the shoe was not located correctly.
 - Eliminates the need for scaffolding or lift equipment.
 - Eliminates the need to paint pipe support field welds.
 - Eliminates the need for fire watch or full weld enclosures.
 - Eliminates the need for hot work permits.
 - Eliminates stress corrosion of pipe at welds.
- Easy to install.
- Doesn't retain moisture between the support and the pipe.
 - Eliminates corrosion by not allowing moisture (or other corrosive media) to collect between the support and the pipe.
- Less costly (as compared to welded-on supports).
 - The total installed cost of an Interlock shoe is significantly less than the total installed cost of a welded-on shoe.

PRODUCT SELECTION AND CATALOG NUMBER ASSEMBLY

Product Selection

- Determine pipe size
 - Available in sizes 1-in (25.4 mm) through 8-in (203 mm)
- Determine height requirement – considerations include:
 - Pipe rack spacing/density
 - Insulation thickness
 - Standard heights include 3-in (76 mm), 4-in (102 mm), and 6-in (152 mm)
- Determine length
 - Length is determined by analysis of piping conditions and is designed to accommodate expected movement based on expansion and contraction of piping system.

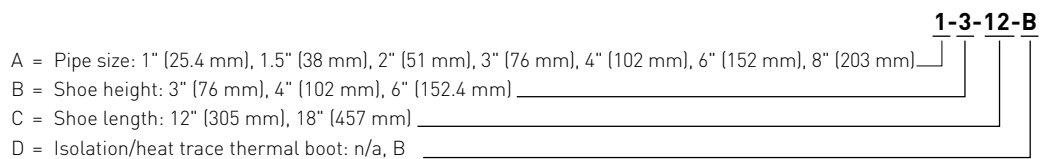
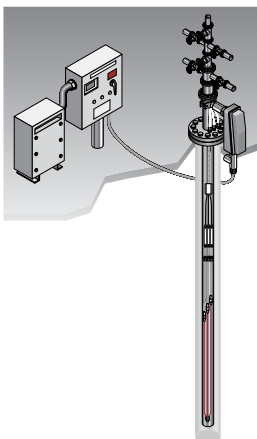


Fig. 4 Interlock catalog number

PETROTRACE MI FLOW ASSURANCE AND ENHANCED OIL RECOVERY



DESCRIPTION

PetroTrace MI Downhole Heating Systems for Flow Assurance (FA) applications are designed as an engineered solution to run external or internal to the production tube to deliver heat along the entire length of the production tube, or only in the locations where it is required to maintain production. PetroTrace MI Downhole Heating Systems for Enhanced Oil Recovery (EOR) applications utilize electro-thermal cables affixed to the outside of the production tube, at the perforation of the wellbore, to provide heat to the near wellbore area to reduce crude viscosity in Heavy Oil reservoirs.

A typical system includes the downhole electric heating cable, ESP electrical cable, power connection and end termination kits, clamping systems, temperature sensors, wellhead connectors and topside control and monitoring equipment.

PetroTrace MI heating systems can provide the power needed for applications ranging from high flow rate temperature management, to pressure equalization along long horizontal producing zones.

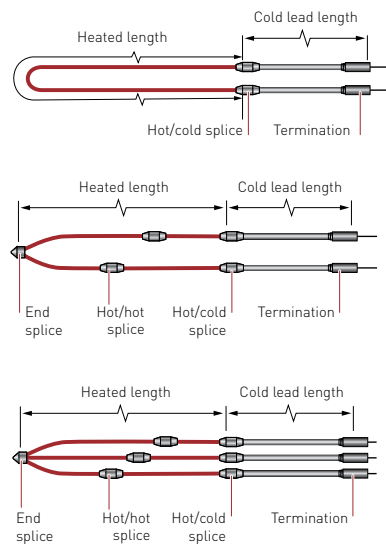
DESIGN

The downhole heater supplied as part of the system consists of one or more heating zones joined to a non-heating cold lead zone and is available in single-phase and three-phase configurations.

Cables of different sizes and power levels provide flexibility for use in Flow Assurance and Enhanced Oil Recovery applications in lengths of up to 5,200 ft. (1,580 m).

The downhole heater's Incoloy 825 sheath and mineral insulated cable construction provides for a rugged heater with superior corrosion resistance in downhole environments that require high power up to 305 W/ft. (1,000 W/m) and temperatures up to 1,112°F (600°C).

PRODUCT SELECTION



ENGINEERING SERVICES

Understanding the effects of heat transfer in oil wells is a complex study. Pentair can produce and supply wellbore thermal models and temperature profiles to better show the interaction of a PetroTrace Downhole Heating system within the wellbore.

In addition, Pentair utilizes computational fluid dynamics and other engineering tools to ensure that each PetroTrace Downhole Heating system is engineered to match the application and environmental requirements.

INSTALLATION

The Tracer Turnkey Solutions team has over 20 years of experience in the installation of PetroTrace Downhole Heaters and over 40 years of experience installing Heat Management Systems throughout the oilfield industry. Installation and commissioning services can be provided with all PetroTrace Downhole Heating Systems.

For proper design and installation of the PetroTrace MI downhole heating system, contact Pentair.



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