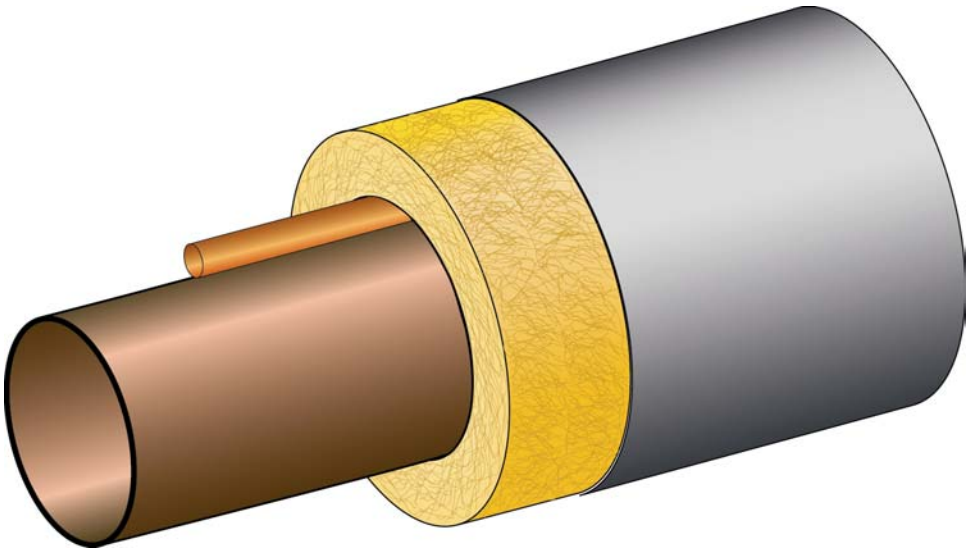
THERMOTips

Bare Convection Tracing: A Blessing And A Curse

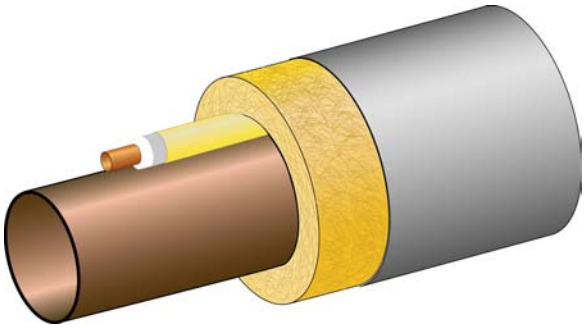


Bare Convection Tracer

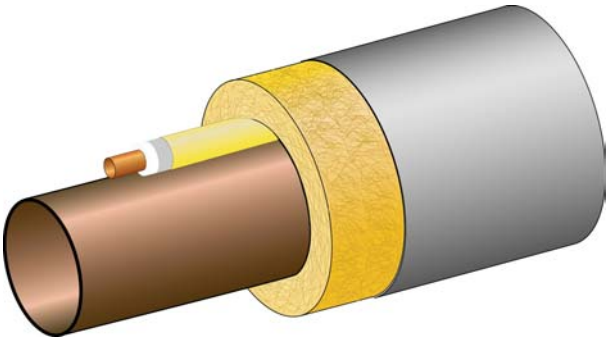
THERMON

The Heat Tracing Specialists®

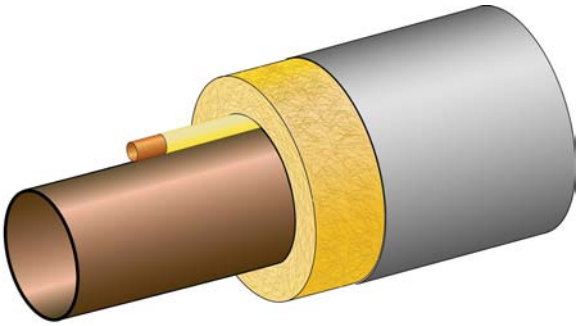
Steam Tracing Options



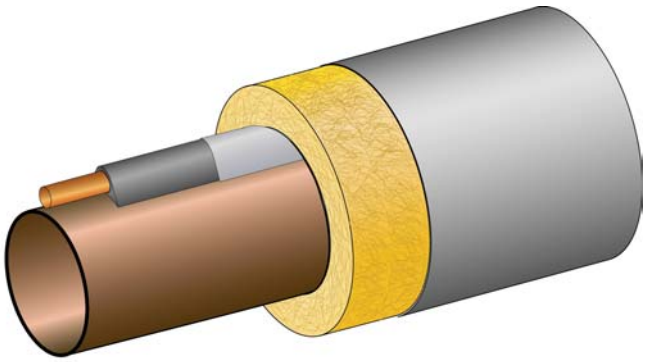
Extra Light Heat- DLS-IT
Isolated Convection Tracer



Light Heat - SLS-IT
Isolated Convection Tracer



Medium Heat – Convection Tracer
With A Safety Jacket



High Heat – Conduction Tracer
With A Strap-On Steel Jacket

Bare Convection Tracing: A blessing and a Curse

Introduction

Bare convection tracing which generally provides what is known as “medium” heat output is a mainstay in steam tracing designs but the “one type fits all” concept of the past, where a bare convection tracer would be selected for freeze protection in almost every case, or multiple bare convection tracers would be selected for high temperature applications, is no longer an economically sound practice. 21st Century steam tracing methods allow the engineer to choose convection tracers from several levels of heat delivery rather than just bare convection tracing in order to match the heating requirements of a plant piping system. These convection methods provide Medium Heat, Light Heat, or Extra-Light Heat. For High Heat delivery, one conduction tracer with a strap-on tracing jacket and heat transfer compound generally eliminates the need for multiple bare convection tracers while reducing the number of trap stations and manifold points required for them to function.

Today, it is possible to more closely match the heat output of a steam tracer with the specified temperature maintenance requirements of a particular process, service or utility line rather than accepting whatever heat output a bare convection tracer happens to provide.

Bare Convection Tracing: A Blessing And A Curse

Steam tracing generally has no area classification restrictions and is easily installed; therefore it is frequently the preferred tracing choice. However, the relatively low cost and ease of installing bare convection tracing is also a curse. Since bare tracing is simply tubing which is easily bent around valves and flanges and attached to plant piping with tie wire or other such methods, it is often used indiscriminately. Many times multiple bare tracers are installed when one tracer with heat transfer compound would suffice. Such choices result in the need for many additional tube fittings, isolation valves, steam trapping stations and expensive steam supply and condensate manifold points required to accommodate multiple tracers.

At other times bare steam tracers are installed for low temperature applications where they raise the pipe temperature higher than needed. Even where overheating will not harm the fluid in the pipe, it wastes energy. Modern isolated steam tracers can reduce energy consumption from 20% to as much as 50% over bare tracers as can be observed in Tables 1 and 2.

Installed Base of Steam Tracing Worldwide

It is estimated that the current installed base of steam tracing worldwide is 360,000,000 feet (110,000,000 meters) with the installed base in North America at approximately 150,000,000 feet (45,720,000 meters). It is further estimated that, bare convection tracing has made up 80% all the steam tracing in use. Engineers involved in the design of steam tracing systems indicate that at least

50% of the bare tracing is installed for low ambient freeze protection sometimes referred to as winterizing.

A typical petrochemical plant can have 144,000 feet (43,891 meters) of bare-convection tracing. The amount of bare tracing used for winter freeze protection would then be approximately 72,000 feet (21,946). A typical refinery can have 576,000 feet (175,565 meters) of bare convection tracing. The amount of bare tracing used for winter freeze protection would be approximately 288,000 feet (87,782 meters). It is easy to understand by reviewing Table 1 and 2, how steam consumption could be reduced considerably.

Energy Consumption and Pollution

A reduction in the amount of fuel burned also lowers the production of sulfur oxides, nitrogen oxides and carbon monoxide among other pollutants. Tables 1 and 2 provide typical examples of how to save energy and reduce hydrocarbon pollutants. The tracer temperatures in red are chosen because they most closely match the temperature requirements. Design conditions are given in the tables.

Table 1

50°F (10°C) Desired Maintain Temperature Actual Pipe Temperatures in °F (°C) • Steam Pressure 50 psig • Ambient Temperature 10°F (-12°C) • Wind 25 MPH (11 m/s)							
Mineral Wool Insulation Thickness Inches (mm)	Nominal Pipe Size Inches (mm)	Bare or BTS Tracer	SLS-IT (Isolated) Tracer	ΔT Bare - SLS	DLS-IT (Isolated) Tracer	ΔT Bare – DLS	Energy Savings
1 (25)	2	163 (73)	121 (49)	42 (24)	95 (35)	68 (38)	34%
1 (25)	4	135 (57)	87 (31)	48 (26)	69 (21)	66 (36)	37%
1-1/2 (40)	6	112 (44)	80 (27)	32 (17)	67 (19)	45 (25)	43%
1-1/2 (40)	8	95 (35)	65 (18)	30 (17)	56 (13)	39 (22)	44%
2 (50)	10	99 (37)	68 (20)	31 (17)	58 (14)	41 (23)	44%
2 (50)	12	87 (31)	59 (15)	28 (16)	50 (10)	37 (21)	46%

Table 2

100°F (10°C) Desired Maintain Temperature Actual Pipe Temperatures in °F (°C) • Steam Pressure 150 psig • Ambient Temperature 10°F (-12°C) • Wind 25 MPH (11 m/s)							
Mineral Wool Insulation Thickness Inches (mm)	Nominal Pipe Size Inches (mm)	Bare or BTS Tracer	SLS-IT (Isolated) Tracer	ΔT Bare - SLS	DLS-IT (Isolated) Tracer	ΔT Bare – DLS	Energy Savings
1-1/2 (40)	2	225 (107)	167 (75)	58 (32)	134 (57)	91 (50)	28%
1-1/2 (40)	4	183 (84)	125 (52)	58 (32)	101 (38)	82 (46)	36%
2 (50)	6	153 (67)	111 (44)	42 (23)	94 (34)	-	29%
2 (50)	8	135 (57)	94 (34)	-	82 (28)	-	-
2-1/2 (65)	10	132 (56)	92 (33)	-	79 (26)	-	-
2 –1/2 (65)	12	119 (48	81 (27)	-	69 (21)	-	-

In the past, bare tracers would have been chosen for many of the cases given in these tables. It is obvious that those selections would have caused a great amount of energy loss when considering the quantity of steam tracing currently in use.

21st Century Steam Tracing Systems

The installation and operation of steam tracing systems has been greatly enhanced with new and improved products and practices; a few of these include: 1) preassembled steam supply manifolds and condensate manifolds with freeze protection designs; 2) pre-assembled steam trap stations; 3) factory pre-insulated and jacketed steam supply and condensate return lines; 4) electronic leak detection systems for steam traps; 5) a range of steam tracers providing extra light heat, light heat, medium heat and heavy duty heat; 6) optimized steam trapping distances requiring fewer trapping stations; and 7) highly reliable thermal insulation and weather barrier systems.

References:

1. Pitzer, Barth and Bonorden, "Steam Tracing Technologies for the 21st Century." Insulation Outlook, May 1999.
2. Pitzer K. and Barth R. Steam Tracing for Energy Conservation." Presented at the Chemical Engineering Exposition and Conference Houston, Texas, June 7-8, 2000.

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