



CONNECT AND PROTECT

HEAT-TRACING SERVICES

For heat management systems—general qualifications


nvent

RAYCHEM



INDUSTRIAL SOLUTIONS

As the world's largest provider of complete electrical heat management systems, primarily for the general process, oil and gas, chemical, and power generation industries, nVent provides innovative products and turnkey solutions under market-leading brands— RAYCHEM, and TRACER. Our premiere turnkey solutions include full life cycle support—ranging from front-end engineering and installation to maintenance and operation services. Our global experience and office presence in 48 countries uniquely position us to manage the heat needed for projects of any size and scope.

THE HEART OF OUR SOLUTIONS

The nVent TRACER brand of Turnkey Solutions is widely regarded as the premiere provider of industrial turnkey heat-tracing solutions. With our full suite of services, from front-end engineering and installation to maintenance and operation services, we are capable of handling heat-tracing projects of any size and scope. By focusing on safety and utilizing time-tested methods and solutions, nVent's heat-tracing designs and installations are timely, thorough, and cost-effective.

For complete, reliable heat management systems, call the experts—nVent.

Contents

nVent provides a range of heat-tracing products and services such as engineering, procurement, fabrication, site services and maintenance specifically targeted towards providing a “Best in Class” Heat Management System.

The enclosed material highlights our General Qualifications for the products and services we offer. We are proud of our reputation for putting the customer first in every area of our operations. We feel that this attitude is one of the most important contributors to our success and to the success of the customers we serve.

nVent	2
Services	3
Heat Management System Overview	4
1 Safety	6
2 Quality Assurance & Quality Control (QA/QC)	8
3 Pre-Project Planning (P3) Program.....	10
4 Engineering & Design	12
5 Project Controls	14
6 Site Services	16
7 Audits & Maintenance.....	20

This document is the sole property of nVent and has been submitted to you solely for your use in evaluating nVent’s qualifications in connection with engineering, procurement, and site services, for which this document was prepared and is to be held proprietary to nVent Services.

By acceptance or use of this document, you agree to return it upon nVent's request, and not to reproduce, copy, lend, or otherwise disclose or dispose of the contents, directly or indirectly, and not to use them for any purpose other than that for which this document was specifically furnished.

nVent offers top-notch products under industry renowned brand names.

NVENT HEAT TRACING SOLUTIONS

nVent is the world leader in heat-tracing solutions for the industrial, commercial, and residential markets. We have a worldwide customer base in both mature and emerging markets. We employ over 2,500 employees around the world. nVent's business philosophy is characterized by a commitment to quality and continuous improvement in everything we do. Cross-functional teams composed of sales, marketing, product development, engineering, construction, and manufacturing employees work closely together—from concept to design to delivery—to ensure high-quality solutions that meet demanding customer requirements.

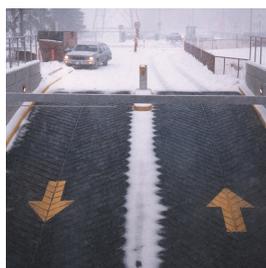
nVent offers top-notch products under industry renowned brand names. We continually strive to improve response to specific customer requirements and to meet on-time delivery commitments. Our global network of sales and technical support representatives—speaking more than 60 languages and working in more than 85 different countries—provide hands-on field training and expert application assistance. Extensive investment in research and development programs ensures that nVent will continue to pioneer new technologies and products to meet the needs of rapidly evolving worldwide markets. In an increasingly global economy, customers recognize nVent as a partner whose global capabilities translate into global solutions.



Heat Tracing



Leak Detection



Snow Melting / De-Icing



Control & Monitoring



Wiring Products



Tank Insulation

SERVICES

nVent is comprised of various entities positioned around the world to meet local practices and requirements for heat-tracing and heat management solutions in the industrial, commercial and residential markets. We have more than 30 years of heat-tracing experience and have delivered over 700 million feet of heat-tracing cable and installed our products in more than 100 countries worldwide.

With nVent, you can realize the same level of design excellence, ingenuity, quality, integrity, and product expertise throughout each phase of your project. We have a world class safety record, a commitment to quality, and provide one-stop shopping, from conception to commissioning. Our network of full-service centers provide you with regional experts familiar with specific codes and requirements, who can complete your project in a timely, safe manner. Our service centers are strategically positioned to execute your specialty project anywhere in the world.

Offering advanced products, superior technical support, proven project execution strategies, and a global organization, nVent is an ideal partner for customers all over the world who count on us to supply the knowledge, products, and services they need to solve their heat management needs.

We manage the heat you need

nVent serves these industry sectors:

- Airline
- Biotechnology
- Biodiesel / Ethanol
- Chemical
- Fabricators
- Food Production
- Manufacturing
- Mining
- Offshore Production
- Petrochemical
- Pulp & Paper
- Pharmaceutical
- Pipelines
- Power
- Production
- Refineries
- Semiconductor
- Terminals
- Waste Management





The typical cost for an HMS system ranges from 2-3% of total project cost for a simple freeze protection system, to 4-6% of total project cost for a process maintain system.

Typical HMS cost breakdown:

Heat Delivery System	10-15%
Control & Monitoring	15-20%
Utility Distribution	25-30%
Thermal Insulation	30-40%
Instrument Winterization	10-15%

VENT HEAT MANAGEMENT SYSTEM OVERVIEW

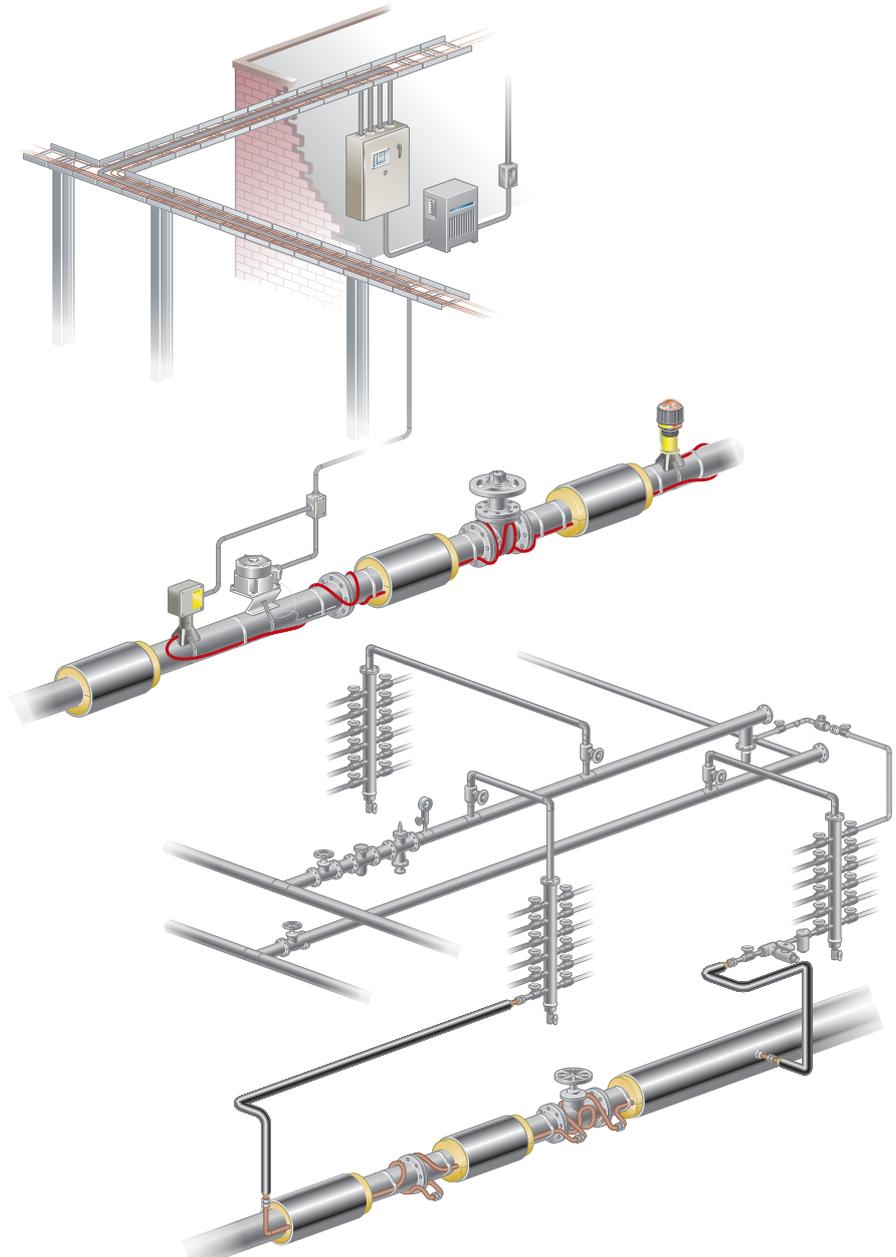
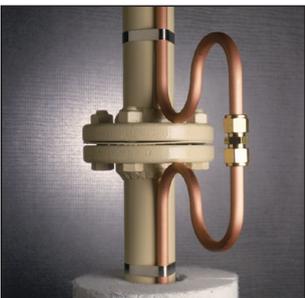
A Heat Management System (HMS) is an engineered system designed to maintain or protect process piping, equipment, vessels and instrumentation at pre-determined temperatures and within defined design criteria. A Heat Management System includes the following components:

- **Heat Delivery System** which is either electrically powered or transfers heat through re-circulating fluids such as glycol, steam or hot oil.
- **Control & Monitoring System** of the heat delivery system.
- **Utility Distribution System** which can be electricity, steam/condensate, hot oil, or glycol to the heat delivery system.
- **Thermal Insulation System** installed over the heat delivery system.
- **Instrument Winterization** in the form of pre-packaged instrument enclosures and pre-traced/pre-insulated tube bundles.

Electric Heat-Tracing System



Steam-Tracing System



nVent offers the individual components of a Heat Management System as “specialty items.” However, the true power of these components is realized when they are combined into one integrated specialty system that is strategically planned and executed by our Engineering, Procurement, Project Management, Construction and Maintenance personnel. When you take advantage of our full services approach, it looks like this:



Our full services approach offers customers these benefits:

- Highest safety, both in its inherent design and operation, as well as in its installation
- Highest reliability as measured in process upsets directly attributable to a failure in the HMS
- Lowest capital expenditure (CAPEX)
- Lowest cost to operate in the form of maintenance and utility costs (OPEX)
- Adherence to project schedule
- Eliminates interfaces between subcontractors
- Full HMS documentation



nVent offers the most complete line of heat-tracing systems and has manufactured over 700 million feet of heating cable through our RAYCHEM and RAYCHEM brands.

nVent offers the most complete line of heat-tracing control and monitoring systems—from single circuit mechanical thermostats to multi-circuit, microprocessor-based networked systems.

nVent is widely regarded as the premiere provider of heat-tracing solutions in the industrial and commercial markets today.

1 Safety



A sound and dedicated Safety Program results in lower costs to a project or operation; a commitment that nVent accepts as second to none.



nVent has achieved safety statistics that are better than the CII (Construction Industry Institute) safety statistics, which are often considered to be the best in the industry.

nVent was selected by Work Safe Alberta as one of the "Best Safety Performers."

nVent believes that the safety of its employees ranks highest on its priority list because the health and well-being of its employees—both on and off the job—is of paramount importance. nVent holds all levels of management, from the top executive to the first line supervisor, accountable for the implementation of our principles of safe work performance. We are committed to providing adequate job-training, education and a safe work environment.

nVent's Safety Program centers on five principle commitments:

1. MANAGEMENT COMMITMENT:

nVent holds all levels of management accountable for the implementation of our principles of safe work performance.

2. SAFETY GOAL SETTING:

nVent Services firmly believes in the goal of Zero Incidents.

3. EMPLOYEE PARTICIPATION:

Employees at all levels are encouraged and expected to participate in "their" safety program from their first day on the job

4. TRAINING:

Employee Safety Training is the first activity a new employee undertakes; and continual safety training occurs throughout each employees' stay with nVent.

5. INSPECTIONS:

nVent requires that every job site receive a documented inspection at least once per week by supervision and follow-up inspections are made by management and safety professionals.

nVent is committed to zero incidents worldwide and is guided by an established incident prevention policy. This policy is based on nVent's dedication and sincere desire to eliminate personal injuries, occupational illness, and damage to equipment, as well as to protect the general public around the world who may be affected by our company's activities.

Employees are empowered and obligated to manage and perform work activities in compliance with company, client and regulatory standards. As we drive our incident rate to Zero, our customers become part of the Project Safety Team. Everyone is a winner!

nVent developed an Environmental Health and Safety program that we use as a guideline for managing workplace safety. The program consists of regulatory agency-directed and company specific items, such as:

- OSHA required topics: Electrical Safety, Fall Protection, Respiratory Protection, Hazard Communication Hearing Conservation, Confined Space Entry and Lock Out/Tag Out
- Safety Responsibilities, Accident Investigation, Back Safety, Fire Protection, Material Handling, Housekeeping, Ladders & Scaffolds, Motor Vehicles & Mobile Equipment, Office Safety, and more

Training to each topic is included and required for all field personnel.

nVent's commitment to safety excellence is evident by the levels of involvement that key nVent Services personnel undertake in various national and international safety committees and organizations. Organizations such as:

- Associated Builders & Contractors (ABC)
- Construction Users Roundtable (CURT)
- National Safety Council
- Alberta Construction Safety Association
- Work Safe Alberta
- Texas Safety Association
- Houston Area Safety Council
- Area Safety Councils across the U.S.

Our robust and dedicated Safety Program benefits customers because the program:

- Ensures the well-being and safety of people, equipment and other assets involved in any operational or project-related exercise
- Increases productivity from all assets, whether they be people or equipment
- Lowers overall Total Installed Cost (TIC) by minimizing down-time of people or equipment from incidents
- Lowers insurance premiums because of our superior Safety record which in turn, increases savings to the client



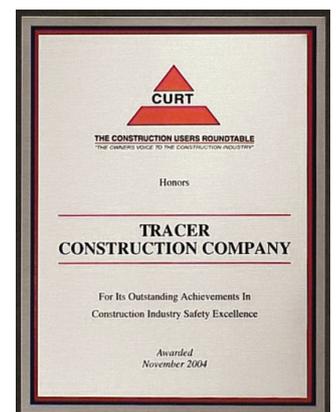
nVent was awarded the following prestigious awards...



Associated Builders & Contractors National Safety Merit Award for safety excellence in the one to two million hours worked category.



Platinum Level S.T.E.P. Award by the Associated Builders & Contractors organization.



CURT Construction Industry Safety Excellence Award (CISE).

2 Quality Assurance & Quality Control (QA/QC)



nVent's QA/QC program directly contributes to a lower Total Installed Cost (TIC) and lower Total Operating Cost (TOC) by establishing a higher-quality system while minimizing costly rework.

A sound and consistent QA/QC program minimizes risk in a project and enhances system reliability.

nVent has developed and implemented a Quality Management System in accordance with the intent of ISO 9001. The Quality Management System covers the organizational and operational management aspects of our services business and addresses all processes including the design, supply, installation and commissioning of Heat Management Systems (HMS). As part of our Quality Management System, nVent has developed a comprehensive Quality Assurance/Quality Control (QA/QC) program that encompasses the Best Practices from our engineering, manufacturing, pre-assembly and installation programs. Our QA/QC program ensures that a high degree of quality is incorporated into all nVent-provided products, services or systems resulting in the lowest cost of ownership to the customer.

DESIGN

nVent designs the HMS using in-house design tools and databases. These tools standardize the engineering process and ensure that designs are optimized and executed in accordance with standard design processes and procedures. All designs are reviewed to ensure that they meet or exceed the customer's expectations.

The use of the design databases facilitates the tracking of drawing revisions and progress measurement. If the customer revises incoming documents (piping isometrics, P&ID's, Line Designation Tables, and 3D model files) after the heat-tracing designs are initiated, our tools and databases determine which heat-tracing designs may be affected. This ensures timely and accurate management of design changes and revisions. We share 'live' design data internally to ensure that groups such as Procurement, Construction and Start-up/Commissioning use the most current design information.

SUPPLY OF MATERIALS

The Procurement Department orders, ships and receives materials. The materials are ordered based on approved requisitions using the 'live' information from the Heat Management System design databases.

We order, receive and ship materials to your project in accordance with established procedures and ensure that materials meet the requirements specified on the requisitions.

INSTALLATION

nVent has a comprehensive Quality Control program for the installation of HMS Systems. Quality Plans and Inspection/Test Plans (ITP's) are developed to ensure that construction activities are performed in accordance with our Quality Management System and our customer's expectations.

COMMISSIONING

Where feasible, nVent Services utilizes commissioning specialists independent from the craftspeople that installed the HMS system to perform commissioning activities. This independent test ensures that each HMS is tested and commissioned in accordance with nVent, customer and manufacturer requirements. The commissioning processes and procedures are designed to ensure that each HMS functions within the design parameters.

The Quality forms that Construction and Commissioning crews use are typically pre-populated with data from the HMS design database to ensure that the most accurate design information is used in these activities.

REVIEW OF CUSTOMER SYSTEMS

nVent can perform independent reviews of existing Customer Heat Management Systems. These reviews are used to ensure that each HMS:

- Is installed in accordance with established procedures
- Functions properly
- Operates within design parameters

DEVELOPMENT OF CUSTOMER QA/QC SYSTEMS

nVent can assist customers with the development of HMS QA/QC programs to ensure a system that is tailored to a customer's requirements. This is done through any, or all, of the following activities:

- Developing HMS specifications (design, construction, commissioning, or maintenance)
- Developing field QA/QC procedures or forms
- Reviewing documentation to ensure that HMS QA/QC processes are optimized



nVent provides our customers with thorough turnover documentation at the conclusion of each project to make the hand-off from construction to operations as smooth as possible.

nVent's QA/QC program is designed to provide our customers with the most operable and maintainable HMS in the industry.

		INSPECTION AND TEST PLAN (ITP)										
Project Number:		000001			ITP Number:							
Project Name:		ABC Company			ITP Revision:		0					
Item Tag Number:		N/A			Page:		1 of 2					
Item Description:		STS System										
T - Tracer		S - Surveillance (Review of work practices and installation techniques)										
S - Subcontractor		V - Verify (Check Quality Records)										
O - Others		W - Witness (Client must be notified 24 hours in advance of witness points – may be waived but an initial and statement that 'witness waived' must be provided by Client)										
		H - Hold (Client must be notified 24 hours in advance of hold points – may not be waived)										
TASK #	TASK	TASK BY (T,S,O)	QC ACTIVITY	CONTROLLING PROCEDURE / DOCUMENT	ACCEPTANCE CRITERIA	VERIFYING DOCUMENT #	TRACER QA (SU,V,W,H)	INITIAL	DATE dd-mmm-yy	CLIENT (SU,V,W,H)	INITIAL	DATE dd-mmm-yy
System Installation												
1	Receiving of STS Cable	O	Visual Inspection, Insulation Resistance, Continuity	SP-861 CP-492	As specified by drawings	FM-424, FM-427	S					
2	Receiving of other Materials	O	Visual Inspection	SP-861	As Applicable	Packing Slip, FM-421, FM-427	S					
3	Installation of STS Cables and RTD	O	Visual Inspection, Insulation Resistance, Continuity	CP-492	As specified by drawings; Std. Details	FM-419	V					
4	Installation of Insulation	O	Visual Inspection		Visual Inspection Std. Details	FM-403	V					

3 Pre-Project Planning (P3) Program



nVent has been able to realize as much as a 20% reduction in Total Installed Cost, and as much as a 30% reduction in Total Operating Cost for Heat Management Systems through our P3 Program.

When you solicit nVent early—while your project is still in the conceptual planning phase—you get the advantage of our Pre-Project Planning (P3) Program where we integrate industry-proven optimization strategies to help you realize lower Total Installed Cost (TIC) and Total Operating Cost (TOC) for your project.

At this stage of your project, we:

- Review the project’s primary Heat Management System (HMS) specifications, and related specifications (i.e., Insulation, Electrical, Piping, etc.)
- Develop a comprehensive project-specific HMS Scope of Work that includes a Bill of Material from which you can get a power load estimate and a cost breakdown
- Develop project-specific Optimization Strategies
- Develop a cost analysis showing the baseline un-optimized design against an optimized design using our proven cost saving strategies

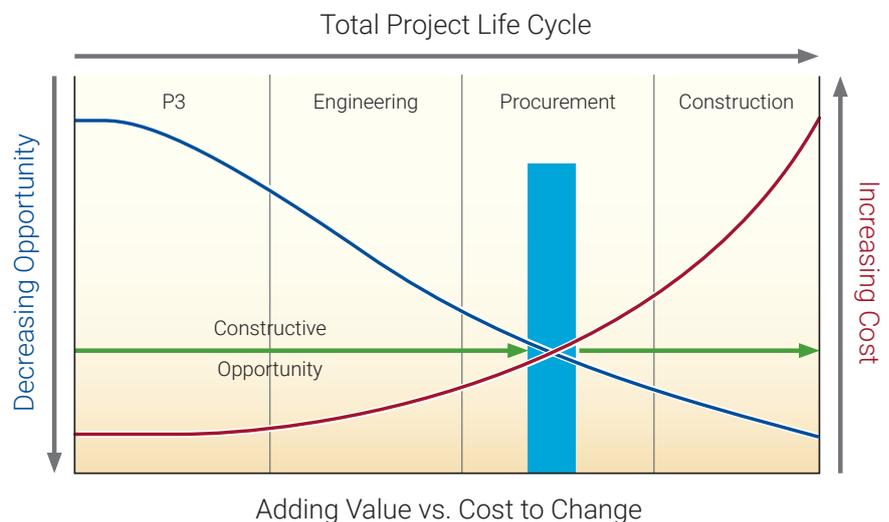
From these activities, we provide the following deliverables relevant to your Heat Management System:

- A detailed and accurate budget
- The HMS estimated power consumption
- A detailed and accurate Bill of Materials
- A series of project-specific Optimization Strategies developed to reduce project Total Installed Cost (TIC) and Total Operating Cost (TOC)

Ability to Influence the Curve

The following example indicates how the implementation of cost-reduction strategies/ technologies is most beneficial at the project’s P3 stage—prior to detailed engineering and the normal project procurement phases. As a project progress along a time-line, the ability to implement good cost-cutting measures diminishes.

A project’s TIC and TOC is best affected when addressed early in the project life cycle.



OPTIMIZATION STRATEGIES

The Optimization Strategies offered by nVent are of most value to the project when developed and implemented during the P3 phase (see figure Ability to Influence the Curve on the previous page). At this point, project requirements and specifications are still being developed and decided upon, and any adjustments to those requirements and specifications can be made with little or no impact to the project.

Optimization Strategies that have proven successful in the past include:

- Cool Down Analysis on Large Pipes in order to determine the need for heat tracing
- Alternative heat-tracing technology analysis; a cost and technical analysis can be performed on the client's scope to determine the most economic and technically advantageous heat-tracing system
- Alternate Pipe Shoe designs (i.e. Clamp-on Shoes) that reduce the amount of heat-tracing cable that is required for any given circuit
- Insulation Optimization; by closely evaluating the insulation material and thickness choices, the EHT design can be optimized resulting in less EHT cable required for pipe/equipment heating

Each strategy is carefully evaluated for the specific project at hand, taking in to account the timing of the project, the client specifications and the project's execution philosophy. The key, always, is to enhance quality while lowering the total installed cost and the total operating cost of the Heat Management System.



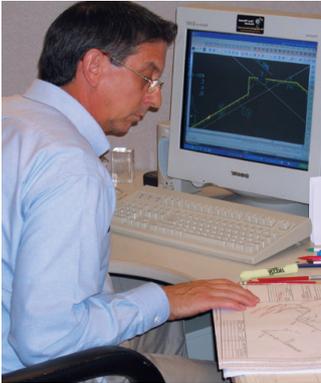
nVent can provide a full suite of Optimization Strategies through the P3 Program; directly benefiting the engineering and design quality, while lowering cost. Early entry to the project cycle is key to the success of the P3 Program.

The Optimization Strategies proposed by nVent are all industry-proven and enhance quality as well as lowering the TIC and TOC.



4 Engineering & Design

nVent is typically able to provide engineering and design deliverables at a lower cost than other engineering entities.



nVent manufactures a wide range of heat-tracing products, capable of providing solutions for any of the most demanding heat-tracing applications.



nVent has full-service Engineering Centers located strategically around the world, including Houston (TX, USA), Baton Rouge (LA, USA), Chicago (IL, USA), Philadelphia (PA, USA), Edmonton (AB, Canada), Amstelveen (Netherlands), Mumbai (India), and Shanghai (China). From these Engineering Centers, we provide a full array of Heat Management System services. Since a Heat Management System is considered an engineered and designed specialty system, Engineering & Design is one of our strongest core competencies.

Our project design teams use state-of-the-art design tools and a customer-first philosophy in order to deliver value-added solutions to your heat-tracing needs.

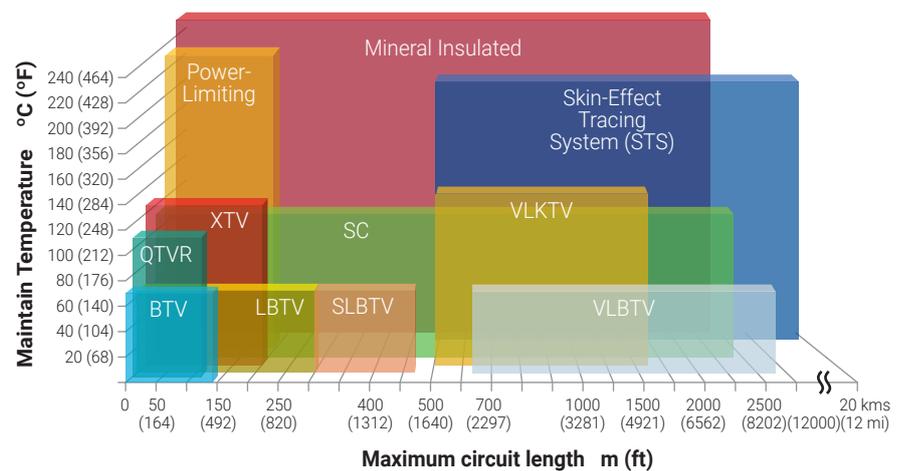
A unique suite of Engineering & Design tools allow us to be cost-competitive on the open market. These include:

- Design software that is able to select from a wide range of available heat-tracing technologies (i.e. Self-Regulating, Mineral Insulated, Power Limiting, etc.)
- nVent can receive raw design data exported directly from the customer's 3D model, and use the data in our engineering design so that it accurately matches the customer's data and reduces cumbersome paper transfer.

Using these tools allows us to create a well-defined and accurate heat-tracing scope and choose the best products/systems for your project. At our disposal, we have:

- A wide range of manufactured heat-tracing products that provide solutions for any heat-tracing needs (see chart below)
- Engineered systems such as Skin-Effect Tracing Systems (STS) and Impedance Heat-Tracing Systems for specialty lines and services

Range of nVent Manufactured Products



nVent offers a complete list of Engineered deliverables specific to your project that are compiled for you in an Operations and Maintenance Manual (O&M Manual). We can also make these documents available to you electronically.

Depending on your project, deliverables can include:

- Standard Installation Details
- Heat-Tracing Isometrics
- Skin-Effect Piping Spool Drawings
- Power & Control Cable Schedules
- Panel Board Schedules
- Heat-Tracing Schedules
- Name Plate Schedules
- Set-point Schedules
- Communications Block Diagram Drawings
- Control Panel Drawings
- Power Distribution Drawings
- Control Building Drawings
- Construction Work Packages
- As-built Drawings
- Custom deliverables by request



nVent engineering staff has the depth of experience needed to complete your project.



Sample O&M Manual

Heat-Tracing Isometric Drawing Sample

HEAT TRACE DATA												TEMPERATURE DATA				BILL OF MATERIAL																		
HEATER CABLE NO.	PIPE LENGTH	CABLE LENGTH	WATTS/FT REQUIRED	WATTS/FT SUPPLIED	SAFETY FACTOR	NO. OF PHASES	CABLE VOLTS	S/S AMPS	S/U AMPS	TOTAL WATTS	SYSTEM VOLTS	CABLE PART NUMBER	STRAND TEMP (W/ CABLE)	CONTROL PANEL NO.	CONTROLLER NO.	BREAKER PANEL NO.	CIRCUIT BRK. NO.	CIRCUIT BRK. SIZE	MAX. DKT LENGTH	MAINTAIN TEMP: 40°F	ITEM	QTY	CATALOG NUMBER	DESCRIPTION										
HTR-103	202'	301'	2.9	5.1	74%	1	120	12.8	22.5	1535	120	SKY1-CT-T3	N/A	HTPC-01	HIC-60P-NS	OSLP-N	OSLP-N-5	30A	315'	MIN. AMBIENT TEMP: 0°F	1	301'	SKY1-CT-T3	CHEMEXLY AUTOTRACE										
																				OPERATING TEMP: 100°F	2	1	05-100-A	POWER CONNECTION										
																				MAX. EXPOSURE TEMP: 400°F	3	1	E-150	END SEAL										
																				INSULATION TYPE: EXP. PERLITE	4	1	PS-10	PIPE STRAP										
																				INSULATION THK: 1.5"	5	7	OS-54	GLASS TAPE										
																				AREA CLASS: CRD2, TZA	6	16	ETL-TRACER	CAUTION LABEL										
TOTALS																																		

LINE / EQUIPMENT / INSTRUMENT DESIGNATION	REV	DATE	DESCRIPTION	DWN	CHKD	APP
1.5"-05-WP-3031-3360	0	6/1/03	ISSUED FOR O & M MANUAL TEMPLATE	MHE	DEC	

REFERENCE DRAWINGS	
05-DA-0260-FR1	P&ID
05-DA-0220-FR2	P&ID
05-WP-3031 SHT. 1-3	PIPING ISOMETRIC

SAMPLE DELIVERABLE

EHT PIPING ISOMETRIC - SR CABLE
FREEZE PROTECTION SAMPLE DRAWING
O & M MANUAL TEMPLATE

3333 SHAWNEE DR. • HOUSTON, TEXAS 77060	713 988-3333 • FAX 713 988-3333
JOB NO.: XX-XXXX	DWG NO.: XXXXXX.06.12.HT-101
	REV: 0

5 Project Controls



The ultimate goal of Project Controls is to communicate the project status accurately and timely to help the project team deliver a project that is on time and within budget.

Resource-loaded schedules provide timely and accurate data on the following:

- Manpower requirements
- Sequencing
- Work plan
- Project Status

Project Controls is the backbone of any successful project. These controls keep a project on schedule and within budget. Project Controls include Cost Control, Project Scheduling, and Project Management.

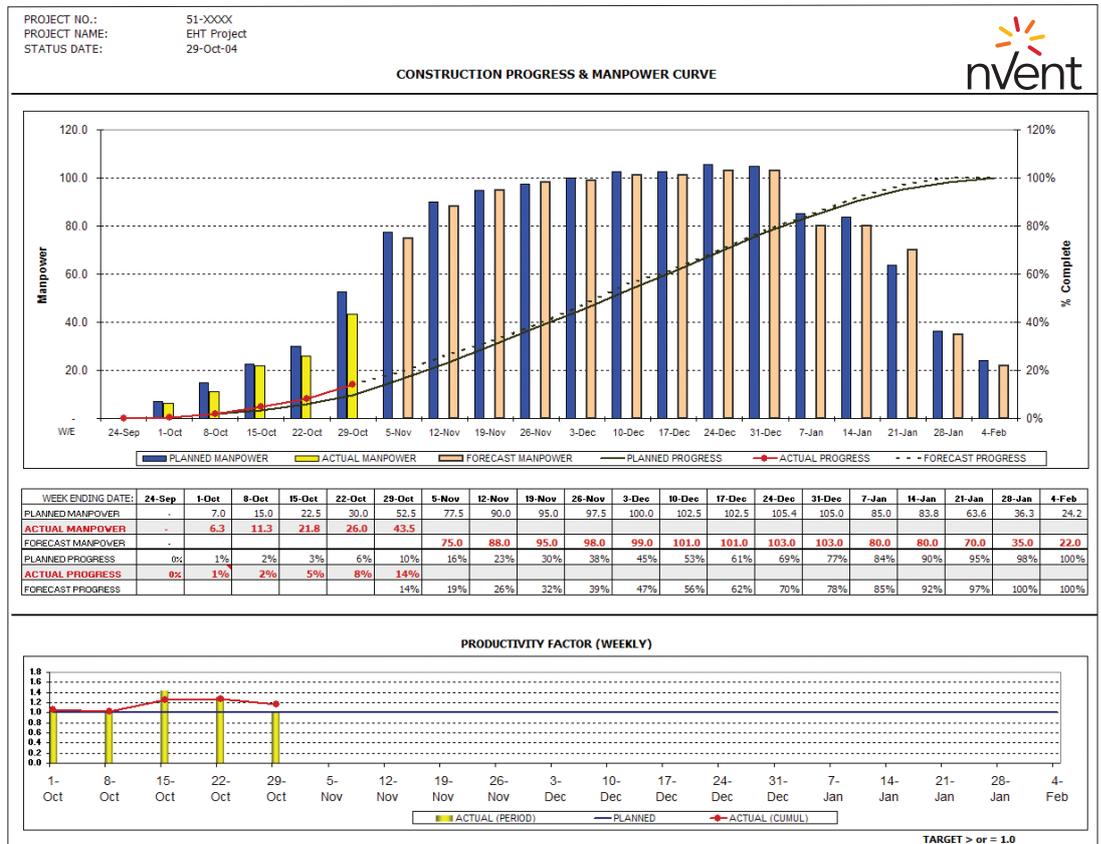
COST CONTROL

- Represents the current control budget man hours based on IFC drawings
- Captures field changes accurately and timely
- Represents percent-complete accurately
- Provides timely and accurate forecasting information
- Keeps a current log and documentation of change and impact to project cost

PROJECT SCHEDULING

- Reflects the construction sequence accurately
- Guides project supervisors to plan their work activities
- Reflects correct and up-to-date status
- Incorporates change to reflect current scope
- Represents proper resource requirements

Progressive and Manpower Curve



PROJECT MANAGEMENT

Management system includes Cost Control, Scheduling, Progress and Productivity Analysis, and Change Management. The tools we use to control a project are considered industry-standard tools.

The Project Management system provides:

- Accurate and timely cost reporting and forecasting
- Integrated, resource-loaded Schedules to ensure proper staffing requirements and sequencing of work
- Progress and Productivity Analysis to ensure that productivity problem-areas are identified early, and corrective-actions are taken to ensure that productivity and efficiency are kept at industry-accepted levels
- Effective Change Control to ensure that Client Approved Variances are communicated and incorporated in the cost control system, progressing database, and the project schedule



With core competency in Project Management, nVent is adept at integrating our Project Management System tools with that of our client in order to create a seamless and efficient reporting and tracking system.

nVent's Change Management System provides timely notice of project cost and/or schedule deviations so corrective action can be taken to minimize the impact.

The weekly Productivity Analysis provides a detailed look at the project status. With the backbone of a powerful progressing database, this tool allows real-time progress and productivity measurement.

Productivity Analysis

PROJECT NO: 51-0000 PROJECT NAME: EHT Project STATUS DATE: 29-Oct-04		PRODUCTIVITY ANALYSIS - CONSTRUCTION																
PHASE	DESCRIPTION	UNIT	QUANTITIES					%	MANHOURS						PROD. FACTOR TGT>=1	PLACEMENT RATES (UNITS PER MH)		
			ORIGINAL BUDGET	REVISED BUDGET	CONTROL BUDGET	INSTALL	FORECAST		COMPL	ORIGINAL BUDGET	REVISED BUDGET	CONTROL BUDGET	EXPEND	EARNED		FORECAST	BUDGET	TO-DATE
			A	B	C	D	E	F=D/C	G	H	I=C/N	J	K=F X I	L=(IF F>.3,E/0,E/R)	M=K/J	N=B/H	O=D/J	
Electrical Distribution																		
1300	Conduit	LF	94,000	94,000	95,600	29,450	95,600	30.8%	18,800	18,800	19,120	5,467	5,890	17,747	1.1	5.00	5.39	
1400	Wire & Cable	LF	145,000	145,000	145,000	18,300	145,000	12.6%	7,250	7,250	7,250	870	915	7,250	1.1	20.00	21.03	
Insulation																		
2200	Equipment Insulation	SF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
2300	Pipe & Tubing Insulation/Cladding	LF	35,000	35,000	35,000	-	35,000	0.0%	12,250	12,250	12,250	-	-	12,250	0.0	2.86		
2400	Removable Blankets	EA	450	450	450	-	450	0.0%	347	347	347	-	-	347	0.0	1.30		
2500	Trac Loc Insulation	SF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
2520	Trac Loc Shop Fabrication	SF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
Instrumentation & Tubing																		
3200	Tube Bundle, Fittings	LF	150	150	150	-	150	0.0%	615	615	615	-	-	615	0.0	0.24		
3400	Bare Tubing, Fittings	LF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
Mechanical																		
4200	Fluid Tracing	LF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
4300	Pre-Insulated Pipe	LF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
4500	Safety Showers	EA	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
Electrical Heat Tracing																		
5200	EHT - Equipment	LF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
5300	EHT - Conventional Pipe	LF	42,567	42,567	42,567	1,565	42,567	3.7%	13,600	13,600	13,600	450	500	13,600	1.1	3.13	3.48	
5400	EHT - Instruments	LF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
5800	Testing, Commissioning & Startup	LF	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
Controls & Monitoring																		
6340	Control Panels - Fld. Install.	EA	16	16	16	1	16	6.3%	1,344	1,344	1,344	80	84	1,344	1.1	0.01	0.01	
6360	Control Panels - Computer	EA	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
6740	EHT Building - Field	EA	-	-	-	-	-	0.0%	-	-	-	-	-	-	0.0			
PROJECT TOTAL								14%	54,205	54,206	54,526	6,867	7,389	53,152	1.1			

6 Site Services



nVent has a full suite of Construction capabilities; including Heat Tracing, Power Distribution and Insulation for various phases of a project life-cycle, including pre-assembly, off-site locations and sites.

When you use nVent for your Engineering, Procurement and Construction needs, you maintain a single point of responsibility and accountability through the entire Heat Management System process, and you ensure continuity of project knowledge from engineering through start-up.

Our Project Management Team offers site services that significantly enhance the quality of your installed Heat Management System, while mitigating the coordination and interface issues inherent in most projects. Services include, but are not limited to:

- Construction Supervision/Management
- Materials Management
- Installation (Labor)
- Field Coordination
- Quality Assurance & Quality Control (QA/QC)
- Commissioning & Start-up

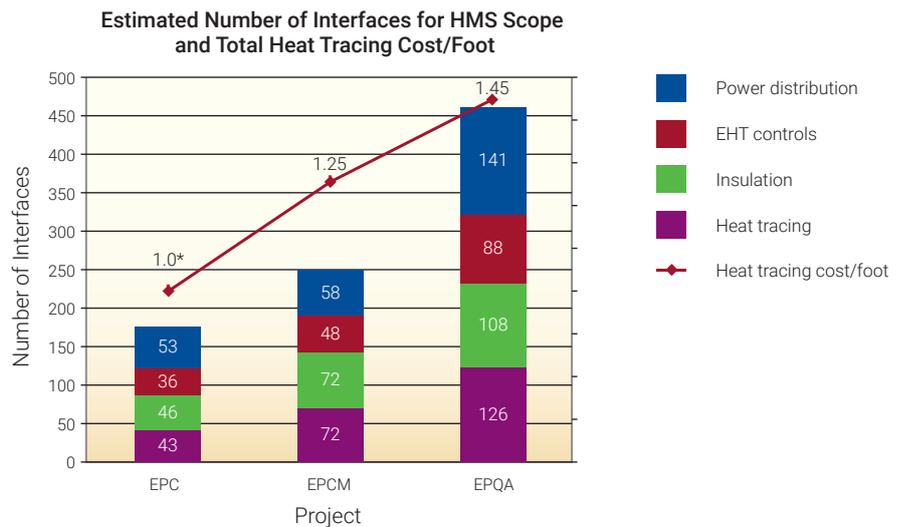
One of the greatest benefits to having sole-source accountability for a Heat Management System is that it directly reduces the Total Installed Cost of the system because of the reduction of the total number of interfaces. An interface is the hand-off point between one entity and another. As the number of interfaces increase, the efficiency of the work decreases. A recent study was completed on three similar projects, each with a different project delivery methodology:

- Engineering, Procurement, Construction (EPC)
- Engineering, Procurement, Construction Management (EPCM)
- Engineering, Procurement, Quality Assurance (EPQA)

From the chart below, you can see how the total installed cost of the system steadily rises as the number of subcontractor interfaces increases.

Assigning sole-source responsibility to a turnkey provider substantially reduces the number of interfaces, thereby reducing the Total Installed Cost.

Interfaces for Heat Management Systems



FIELD COORDINATION

nVent Services provides construction coordination, field engineering, and as-built drawing services to ensure that scope interfaces are properly managed between various subcontractors and that work is completed according to plan. nVent Field Coordinators support the Project's Construction Management Team at both off-site locations, where applicable, and the site, by providing a single point resource that oversees the "global" HMS construction effort.

To achieve these goals, nVent Services will:

- Help establish and maintain objectives and scope alignment across the various HMS entities.
- Provide performance monitoring of the HMS subcontractors (in conjunction with nVent's Cost Control team), allowing for quick identification and resolution of work constraints and problem areas.
- Provide and/or facilitate training to the various entities regarding recommended HMS installation details.
- Identify and expeditiously resolve scope and interface conflicts.
- Facilitate the change management process by communicating engineering changes to the various entities.
- Facilitate the quick resolution of, and response to, subcontractor's Requests for Information (RFI) process.
- Collect, review and manage field red-lined documents to facilitate more efficient and accurate as-built drawings.



nVent has developed a detailed work process for the engineering and design of Heat Management Systems associated with modularized work, allowing for faster delivery of material to off-site locations, and more reliable systems at site.





Through proven materials management processes, nVent manages any overage, shortage, and damaged material conditions throughout the project and minimizes the potential for surplus materials at the end of the project.

MATERIALS MANAGEMENT

To help achieve the project's overall cost and schedule objectives, nVent can assume responsibility for the entire HMS materials management process. This will be in full support of a project's goal of ensuring that HMS materials are shipped on time from the various points of manufacture, staged appropriately by Construction Work Packages, and delivered to the work areas in support of each subcontractor's construction requirements.

nVent's Materials Management Team performs the following activities:

- Coordinate by Construction Work Packages, receipt, central storage, and disburse materials to the various work sites.
- Input cost-based data to more accurately and quickly communicate HMS materials management data to the Project Management Team.
- Marshall HMS materials at central locations for the off-site locations, and at site. The marshalling areas are necessary in the event of the off-site locations and site space limitations as well as the lack of storage space at the various points of manufacture.
- Manage "vertical integration" between Engineering and Product Suppliers through materials management in order to minimize communication breakdowns.
- React and adapt quickly to change, including adjusting ship dates as appropriate, reallocating materials to other work areas as needed, and adjusting future shipments accordingly. Additionally, if engineering changes result in the modification or replacement of manufactured components, nVent Services can intervene and implement the necessary material changes prior to field receipt.



COMMISSIONING & START-UP



nVent performs all HMS commissioning and start-up activities and serves as the single point of responsibility and accountability.

nVent performs all HMS commissioning and start-up activities and serves as the single point of responsibility and accountability for this effort. Experience has shown that HMS commissioning is best assured when led by “3rd party” HMS technical experts that oversee the commissioning teams to ensure quality of the commissioning effort and to prevent any potential conflicts of interest.

The HMS commissioning team works closely with, and under the direction of, the Client’s Operations Team to perform the following work activities:

- Establish a detailed commissioning and start-up plan.
- Manage and execute all commissioning and start-up activities for the HMS system.
- Provide work processes for proper commissioning and the documentation thereof.
- Facilitate the turnover process (Transfer of Care, Custody, and Control) and assemble the HMS turnover packages.
- Facilitate the training of the Client’s Operations and Maintenance staff.

7 Audits & Maintenance



A sound maintenance program or annual audit could save you millions of dollars in down-time or equipment failure.

Timely preventive maintenance is essential to assure the reliable operation of your Heat Management System, and to avoid the cost associated with unexpected downtime. Initiating a Heat Management System (HMS) audit, or implementing a maintenance agreement, provides you with the security of having your system regularly evaluated by experts in the heat-tracing industry, allowing for the timely resolution of potential system problems. Regular maintenance visits also result in the generation of accurate system documentation that can be referenced at any time.

THE AUDIT PROCESS

nVent customizes your audit based on the level of HMS detail your operation requires. A basic visual inspection often identifies physical damage or areas for improvement in craftsmanship, whereas a comprehensive audit involves recording specific HMS performance data and compiling it in a detailed audit report. In such an audit, data is collected through various inspection and testing procedures and analyzed against design criteria. Once the final assessment is complete, we identify potential risk factors and recommend steps to improve the performance of your Heat Management System.

The following table is an example of the type of data presented in an audit report:

EHT Field Audit – Control Panel 1000 & 2000, Selected Circuits							
EHT Circuit	Required Total Watts	Design Total Watts	Design Safety Factor	Actual Voltage at PC	Actual Current (Amps)	Actual Total Watts	Actual Safety Factor
1012	614.9	659.3	7.2%	114	4.3	490.2	-20.3%
1062	40.5	49.9	23.3%	113	0.4	45.2	11.6%
2090	455.8	505.1	10.8%	115	3.6	414.0	-9.2%
2093	614.9	659.3	7.2%	113	5.5	621.5	1.1%
2138	404.0	429.0	6.2%	113	2.8	316.4	-21.7%

- Insulation Resistance test
- Amperage reading
- Ohm reading
- Operational test of temperature controllers
- Visual inspection of all accessible heat-tracing components
- Evaluation of any existing fault conditions
- Visual inspection of insulation and protective jacketing
- Cable integrity test (dielectric test)
- Cable fault location test

nVent also can perform comprehensive damage assessments in the case of fires, explosions, or the recommissioning of old facilities.

MAINTENANCE AGREEMENTS

Heat Management System maintenance agreements are essentially a continuous audit of your system established on a monthly, quarterly, or semi-annual basis. Critical data from each circuit is evaluated and recorded systematically on a Maintenance Checklist. The data is then compared against the original design to determine if problems exist.

UPDATING DOCUMENTATION

nVent can edit and update existing drawings and design documents as part of our regular responsibilities within an audit or maintenance program. Do you have plans to add lines to your existing heat-tracing system? What additional load can your current transformer handle? How much additional footage can be spliced onto a certain circuit at the current breaker size? These type of questions can be answered quickly and accurately if you have a “real-time” analysis of your current system.

Virtually every Heat Management System application includes inherent factors that may cause system failure such as:

- Wet, damaged, or missing insulation
- Improperly installed heat-tracing cable or components
- Poor initial design
- Adjustments or “quick-fixes” made in the field
- Changes in system design or operation parameters/conditions

To combat these factors, nVent has tailored various maintenance programs for virtually every industry during the last 25 years. Contact your nVent representative to discuss an audit or maintenance agreement for your Heat Management System.



Up-to-date documentation of your Heat Management System allows you to quickly and accurately obtain information in order to maintain or amend the HMS.

nVent has 25 years experience executing audits and maintenance programs in virtually every industry.



Notes

Notes

Notes

Notes

North America

Tel +1.800.545.6258
Fax +1.800.527.5703
thermal.info@nvent.com

Europe, Middle East, Africa

Tel +32.16.213.511
Fax +32.16.213.603
thermal.info@nvent.com

Asia Pacific

Tel +86.21.2412.1688
Fax +86.21.5426.3167
cn.thermal.info@nvent.com

Latin America

Tel +1.713.868.4800
Fax +1.713.868.2333
thermal.info@nvent.com

Our powerful portfolio of brands:

CADDY ERICO HOFFMAN RAYCHEM SCHROFF TRACER



nVent.com