

Services for Heat Management Systems

General Qualifications



Total Care in Heat-Tracing Services

tyco
Thermal Controls

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We manage the heat you need

Dear Customer,

Tyco Thermal Controls provides a range of heat-tracing products and services encompassing engineering, procurement, fabrication, site services and maintenance specifically targeted towards providing a “Best in Class” Heat Management System. We invest continuously in extending infrastructure and services for our customers.

This document gives an overview of the products, services and capabilities on offer. We are proud of our reputation for putting the customer first - a philosophy that is at the heart of both our success and the success of our customers.

SAFETY AWARENESS

Throughout all phases of projects, Tyco Thermal Controls implements a total management approach to Environmental Health and Safety to assess risks and identify appropriate measures to control and minimise risks and hazards.

Competent persons are appointed to ensure compliance with the company policy, client requirements and statutory regulations. They will take the necessary steps to promote personal safety awareness and therefore achieve an accident-free workplace.

Managers and supervisors take the initiative in ensuring a safe working environment in their respective areas. All employees are aware of their responsibilities to take care of themselves and others who may be affected by their work and to co-operate with the company to fulfil its duties.



Jim Thompson

CEO Tyco Thermal Controls

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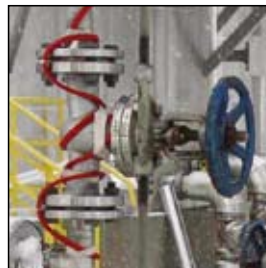
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Tyco Thermal Controls

Tyco Thermal Controls is the world leader in heat-tracing solutions for the industrial, commercial and residential markets. It has a worldwide customer base and employs over 2,000 employees. The company's business philosophy is characterised by commitment to quality and continuous improvement. Multi-discipline teams composed of sales, marketing, product development, engineering, construction and manufacturing specialists work closely together — from concept through design, delivery and construction — to deliver solutions to meet challenging customer requirements for projects and applications.

Tyco Thermal Controls offers high quality industry proven products and services under industry renowned brand names. We continually strive to improve response to customer requirements and to beat delivery commitments. With a global network of sales and technical support representatives —working in more than 85 countries — Tyco Thermal Controls provides expert field and application assistance. Extensive investment in research and development programs ensure that Tyco Thermal Controls will continue to pioneer new technologies and products to meet the needs of rapidly evolving worldwide markets. Customers recognise Tyco Thermal Controls as a partner whose global capabilities translate into global solutions.

Tyco Thermal Controls offers high quality products under industry renowned brand names



Heat-tracing



Leak detection



Snow melting / de-icing



Control and monitoring



Wiring



Tank insulation

Raychem **HEW-THERM®**



DigiTrace



TraceTek®

TRACER

Tyco Thermal Controls serves the following industry sectors:

- **Oil Exploration / Production / Refining**
- **Food**
- **Chemical**
 - **Sulphur**
 - **Phenol**
 - **Caustic**
 - **Melamine**
 - **Chlorine**
- **Power generation**
- **Water**
- **Pharmaceutical**
- **Cryogenic**
- **Biofuels**
- **Automotive**
- **Paper**
- **Gas industry**
- **Cosmetic**
- **Bitumen/Asphalt**
- **Fertilizers**
- **...and more**

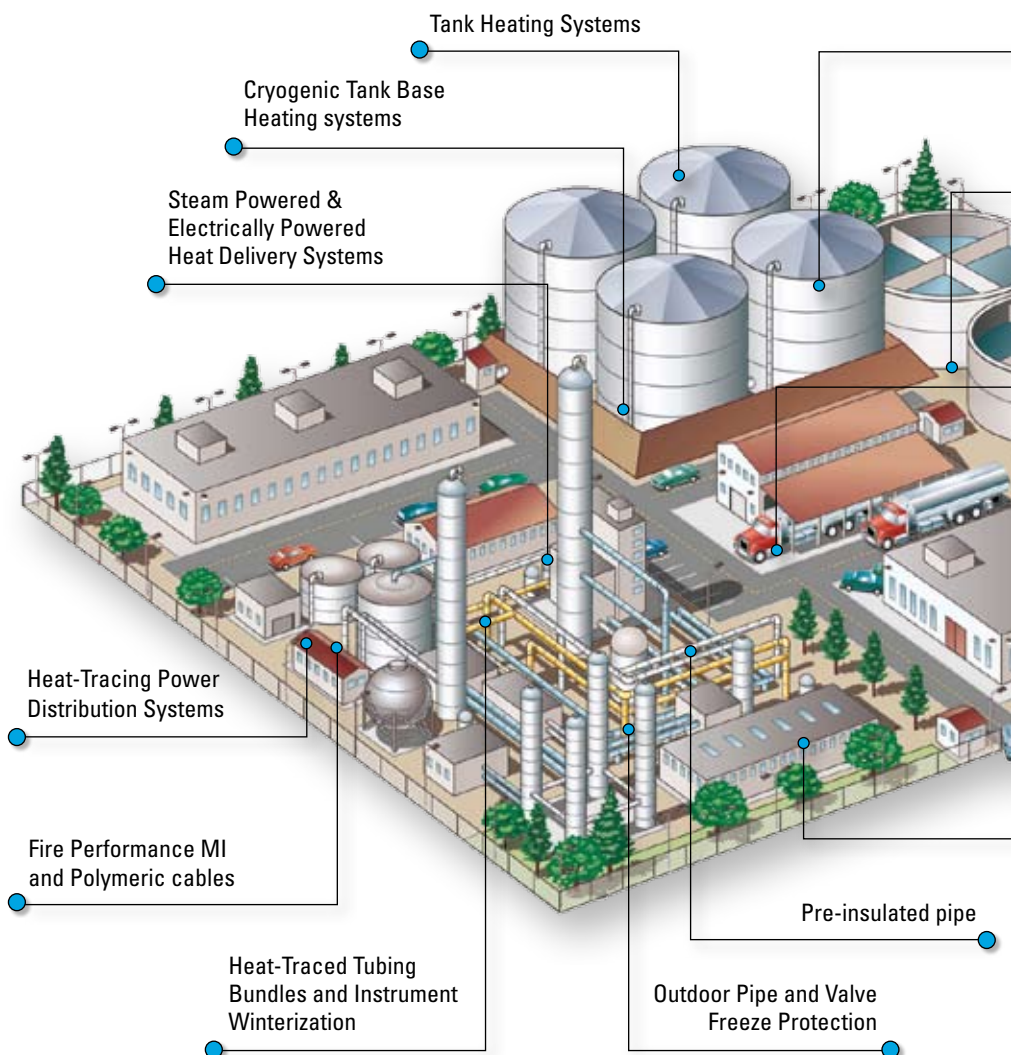
TRACER

Tyco Thermal Controls' total care in heat-tracing services

Services

The company is strategically positioned around the world to meet local practices and requirements for heat management solutions in the industrial, commercial and residential markets. With Tyco Thermal Controls, customers can realise the same level of design excellence, ingenuity, quality, integrity and product expertise throughout all phases of a project, from conception through to commissioning. Tyco Thermal Controls has a world class safety record, is committed to quality and provides single source shopping. The network of service centres provides customers with regional experts familiar with specific codes and requirements who can complete projects in a timely and safe manner. Service centres are strategically positioned to execute projects anywhere in the world and provide a full array of Heat Management System (HMS) services. These services are offered by Tyco Thermal Controls under the brand name Tracer, total care in heat-tracing.

By offering advanced products, superior technical support, proven project execution strategies, high safety standards and a global organisation, Tyco Thermal Controls is an ideal partner for customers worldwide who count upon its expertise, products, and services to meet the heat management requirements.



Heat Management System overview

A Heat Management System (HMS) is an engineered system designed to maintain process piping and equipment at pre-determined temperatures within defined design criteria. The true power of a HMS system is realised when all items are combined into a strategically planned integrated system executed by the engineering, procurement, project management, construction and maintenance team. In providing a complete HMS for your Heat-Tracing requirements, considerations must be made from initial process design through start-up and commissioning, to ensure total reliability and to reduce total installed (TIC) and operating cost (TOC). From a product point of view this is achieved by applying heat-tracing solutions in the most optimised way:

Heat delivery methods

For delivering heat to the process equipment there are several types of technologies available. These include self-regulating electrical heat-tracing cables, constant wattage cables, mineral insulated cables, etc. As each cable type has its own features, functions and benefits, Tyco Thermal Controls provides expertise to identify the most appropriate solution optimised to the specific needs of the plant or application.

Control and monitoring

A proper control and monitoring strategy is of the highest importance to ensure a smooth-running process whilst, minimising energy consumption and production cycle downtime. The reduction in the number of on-site maintenance personnel coupled with the demand for safe and reliable operation has increased the need for centralised access to critical information on the integrity of heat-tracing systems. Tyco Thermal Controls DigiTrace control and monitoring systems have distributed architecture which reduce wiring costs significantly. Upsets in the heat-tracing system are reported to the user with clear messages and alarms, centrally and remotely via supervisory software.

Utility distribution

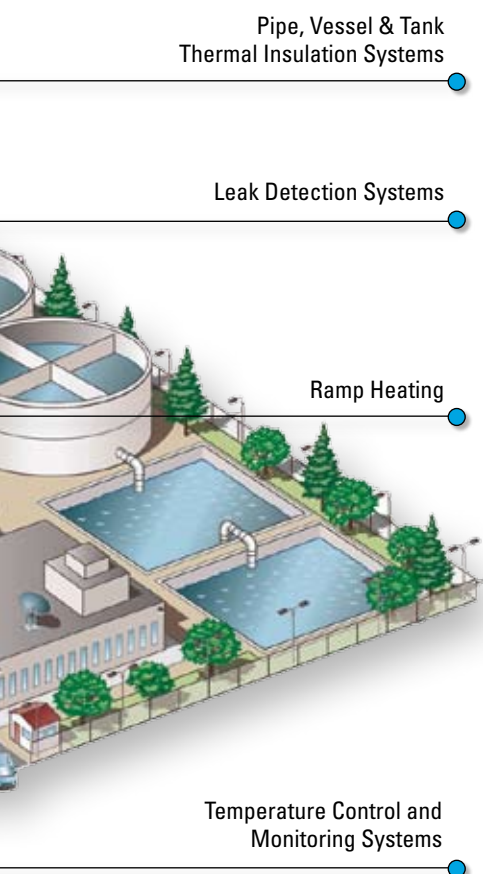
A well designed utility distribution system balances the power requirements and also saves time and money. Power distribution and control panels should be strategically placed to lower installed costs, as well as operating costs. The distribution system and panel design is highly interlinked with the optimised control and monitoring system.

Insulation selection

Often overlooked or ignored, the proper insulation choice may have a large positive impact on installation and energy costs. The insulation is an integral part of the Heat Management System. Insulation optimisation must be done in the early phase of the project. Tyco Thermal Controls has developed a pre-fabricated insulation panel design for storage tanks which reduces time, cost and eliminates scaffolding, known under the brand name Trac-Loc®.

Instrument winterisation

Instrumentation lines may require pre-traced, pre-insulated tubing bundles for process temperature maintenance or freeze protection. The instrument enclosures as well as the instrument cabinets can be fully pre-fabricated and winterised before delivered on site.



1 Project management systems



Any kind of services should be executed by utilising project management procedures. This applies to projects of any size as well as maintenance services like audits and emergency interventions. The critical factors to control on a project are cost, time, resource, flow of information and quality: if controlled properly, the risks will be minimised as a result. The following section examines systems and procedures that have been put in place to control the most important factors.

All Tyco Thermal Controls' service centres within Europe follow the same set of procedures and utilise identical systems. This enables the company to deliver the requested service efficiently, whilst meeting (and often exceeding) requirements in relation to time, quality and budgets.

Safety management

The implementation of a safety culture and a comprehensive Safety Management System (SMS) that is accredited by safety specialists such as SCC, VCA, OHSAS 18001 and ROSPA has contributed to an impeccable safety record for Tyco Thermal Controls.

The SMS contains methods and procedures to be adopted for the activities associated with project management; these activities include design, procurement and particularly the high risk activity of construction. In addition, Tyco Thermal Controls employs proficient people who attend regular training followed by assurance, competency and verification checks that are identified within the SMS. All elements are crucial to ensure implementation of safe working practices and to ensure compliance with legislation.

Specific safety plans are prepared for all site services to ensure compliance with project requirements, local legislation and site rules.

Quality Assurance and Quality Control (QA/QC)

Tyco Thermal Controls has developed and implemented a Quality Management System in accordance with ISO 9001:2000. As part of its Quality Management System, Tyco Thermal Controls has developed a comprehensive Quality Assurance / Quality Control (QA/QC) programme. The QA/QC programme ensures that a high degree of quality is incorporated into all Tyco Thermal Controls provided products, services and systems in combination with the objective to achieve the lowest cost of ownership for the customer.

Project controls

Project controls are the backbone of any successful project. These controls keep a project on schedule and within budget. Project controls include cost control, project scheduling, documentary and information control. These are all essential for effective project management.

– Cost control

Cost control represents the current actual costs and progress versus the control budget. It captures, in real time, the design and field changes accurately and represents the percent complete. The cost control provides timely and accurate forecasting information whilst documenting changes and the impact to project cost.

– Project scheduling

Project scheduling reflects the design, manufacturing and construction sequence accurately and guides the project teams of designers and supervisors whilst planning their work activities. The project schedule shows an up-to-date status including all changes since the start of the project. The resource planning and forecasting are an integrated part of the project scheduling activities.

– Document and information control

Tyco Thermal Controls has introduced a SharePoint® application for controlling the flow of information, documentation and especially electronic data, which occur within a project. This platform ensures that all incoming information from the client can be accessed by different users simultaneously without losing control of the information or time.

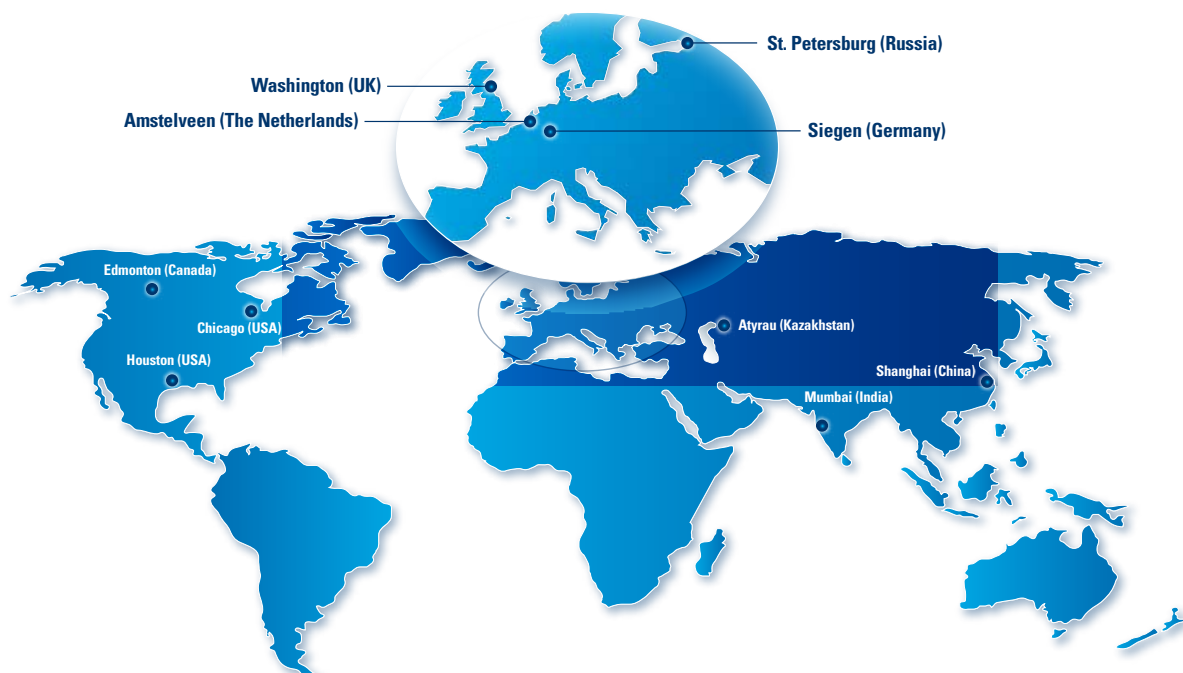
The platform is used to upload design deliverables, installation instructions, project specific certificates and site information and incorporates as-built information. Clients have access to the application to download information at any time during the project. This process substantially reduces turnaround time for documentation as well as total man-hours spent by clients on document control.

Organisation

Across Europe there are local project offices containing Project management and project engineering capabilities which can respond quickly to project requirements (e.g. bid clarifications, technical discussions, progress meetings etc.) and understand the local culture, language, specifications and business needs.

In support to these local decentralised teams, Tyco Thermal Controls has a number of full-service engineering centres located strategically across Europe and beyond. From these engineering centres, Tyco Thermal Controls provides a full array of Heat Management System (HMS) services. Since a HMS is considered an engineered and designed specialty system, a large group of multi-discipline designers are based in these service centres to cope with the differing engineering aspects of the Heat Management Systems. Extensive training programs are provided in these centres for both Tyco Thermal Controls personnel and customers.

Full-service engineering centres



2 Front end loading and optimisation

When customers appoint Tyco Thermal Controls early — while projects are still in the feasibility / feed planning phase — they get the advantage of our estimation services and optimisation programs. These programs integrate design expertise and industry proven strategies to help realise lower Total Installed Cost (TIC) and/or lower Total Operating Cost (TOC) on their projects.

Tyco Thermal Controls has been able to realise 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 optimisation programs.

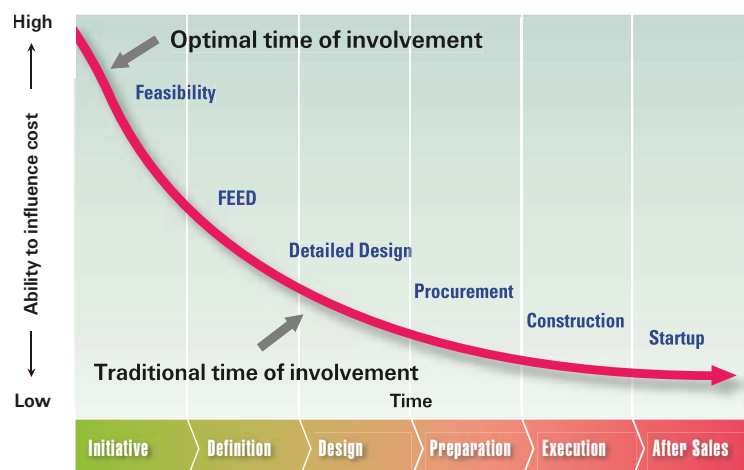
At this stage of projects, Tyco Thermal Controls can, in cooperation with the customer:

1. Review the project's primary HMS and related specifications (i.e., insulation, electrical, piping, etc.)
2. Formulate an outline project-specific HMS scope of work
3. Select appropriate project-specific optimisation strategies
4. Develop a cost analysis showing the non-optimised design baseline against an optimised design
5. Estimate budgetary HMS system CAPEX (Capital expenditures) and OPEX costs (Operating expenditures)
6. Prepare preliminary power loading calculations and distribution scenarios

The following illustration exemplifies how the implementation of cost reduction strategies / technologies are most beneficial to a project at the project's definition stage — prior to the normal detailed design and procurement phases. As time progresses along a project time-line, the scope to implement good cost reduction measures is reduced.

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

Ability to influence the curve



Optimisation strategies

The optimisation strategies offered by Tyco Thermal Controls are of most value to the project when developed and implemented during the definition phase (see figure 'Ability to influence the curve' on 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 on the project execution.

Optimisation strategies that have proven successful in the past include:

- Insulation optimisation; by closely evaluating the insulation material and thickness choices, the Electrical Heat-Tracing (EHT) design can be optimised resulting in lower heat-tracing power consumption and/or less insulation required for pipe/equipment heating
- 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
- Cool down analysis on large pipes in order to determine the need for heat-tracing
- Control and monitoring philosophy analysis to optimise the electrical supply infrastructure, reduced wiring cost, higher reliability operation and reduced maintenance.
- Alternative pipe shoe designs that reduce the amount of heat-tracing cable that is required for any given circuit

Each strategy is carefully evaluated for the specific project at hand, taking into account the timing of the project, the client specifications and the project's execution philosophy. The key, always, is to enhance quality while reducing the Total Installed Cost, the Total Operating Cost or the project schedule of the Heat Management System.

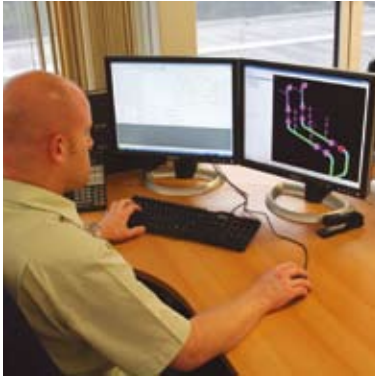


Tyco Thermal Controls can provide a full suite of optimisation strategies; directly benefiting the engineering and design quality, while lowering cost and reducing schedule. Early entry to the project cycle is key to success.

The optimisation strategies proposed by Tyco Thermal Controls are all industry-proven and enhance quality as well as lowering the TIC, TOC and schedule.

3 Engineering & design

The input data required for the detailed heat-tracing design requires the generation and transmissions of numerous documents. The cost and schedule impact for this activity is rarely quantified by engineering contractors and end customers. However a typical piping isometric will pass through the process, piping, electrical and document control departments before being received by the heat-tracing contractor typically taking 2 hours for each document transmitted. The impact upon cost and schedule is further multiplied when design changes are required.



New developments in heat-tracing design

In recent years Tyco Thermal Controls has developed computer aided design tools using industry standard software as a platform to interface directly with most 3-D modelling packages used by customers such as PDMS and PDS. A new highly productive workflow enables Tyco Thermal Controls to import electronic IDF (Intermediate Data Files) and/or PCF (Piping Component Files) from the customers' model directly into our bespoke heat-tracing design tools. The client does not need to generate and transmit hard/electronic copies of isometrics. The tool generates accurate reports identifying missing data such as continuation drawings. As the project progresses there are always changes to the input data which often have substantial impact on both cost and schedule. The tool incorporates a 'Revision Identifier' so customers don't have to invest time sorting, reviewing and filtering before issuing this information to the heat-tracing contractor.

Optimal engineering via integrated 3D design tools.



Major benefits

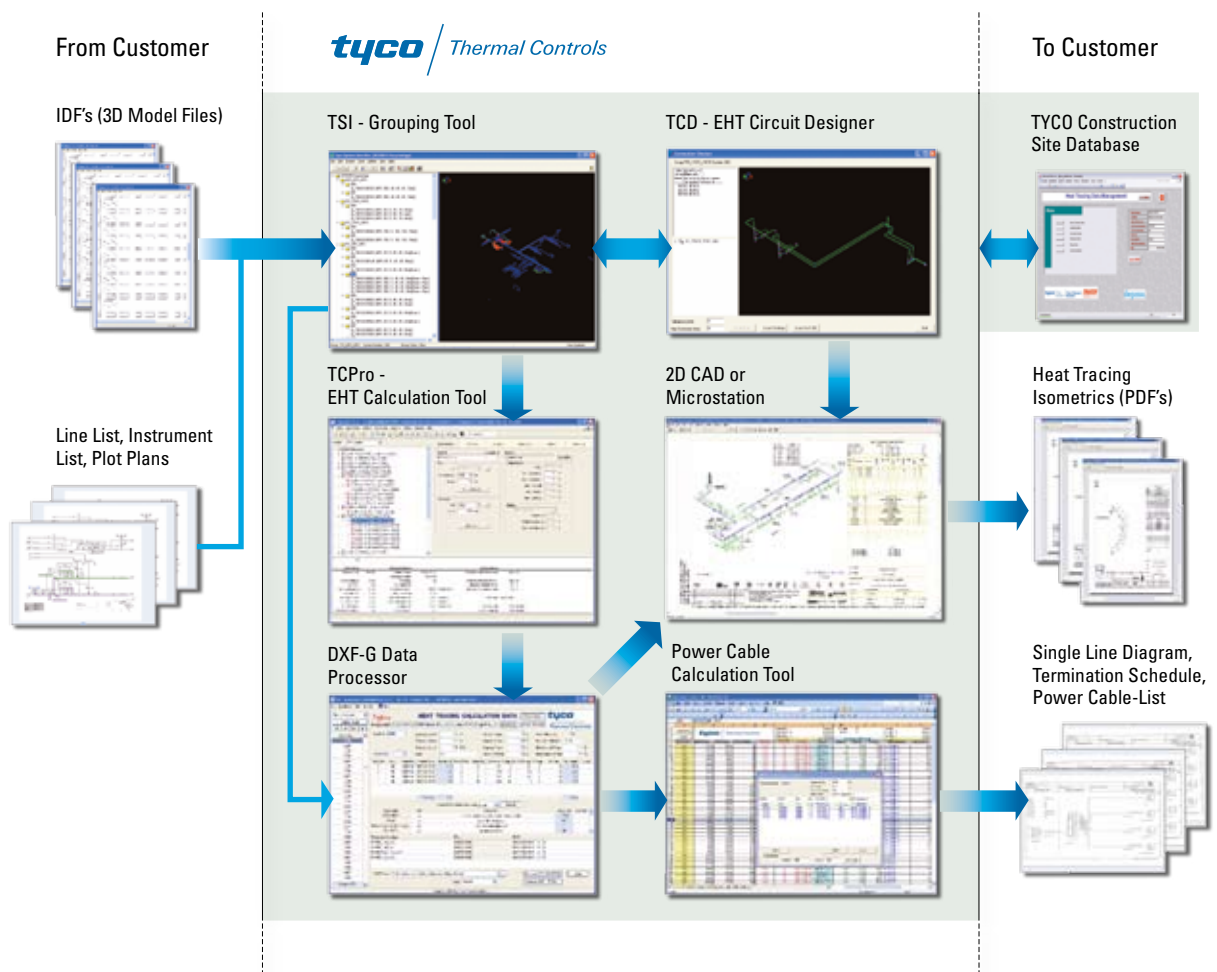
Schedule improvement:

- The work flow process reduces the data transmittal time by several weeks and allows flexibility to start the design later or gain the cost saving benefit of completing the design earlier than normal
- Data is taken directly from the clients model reducing the time required on technical queries
- Client checking time is greatly reduced as manual duplication of data during the design process has been eliminated and document 'turnaround' times are improved
- The Revision Identifier reduces time spent on modifications and design changes

Cost avoidance:

- Man-hour saving in document creation, handling and transmittal
- Man-hour saving in reviewing design deliverables
- Man-hour saving in handling design changes
- Earlier power distribution design with better definition avoiding any unnecessary capacity
- More accurate material estimates at an early stage
- Improved schedule reducing overall project overhead during the design phase

3D design data flow



4 Supply chain management

The supply chain management within Tyco Thermal Controls encompasses the planning and management of all activities involved in sourcing, procurement, conversion and logistics management. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, service providers and customers. By applying the lead-buyer concept, Tyco Thermal Controls' procurement professionals are responsible for customer and/or project specific purchases. Purchases can be distribution panels, pre-insulated pipes, power cables, contractor management, etc. The logistic management for projects is coordinated with project management to ensure that it is synchronised with the project needs and schedule.

Tyco Thermal Controls controls all movement and storage of required products, work-in-process inventory and deliverables from point-of-origin to point-of-delivery and commits to achieving the maximum added value through strategic sourcing, assessing local and worldwide opportunities whilst keeping in mind the 'total cost of ownership' principles for the customer.

Tyco Thermal Controls standard product offering is supplied from stock from its two main distribution centres in California, USA and in Leuven, Belgium. Logistics are executed using advanced planning methods under the umbrella of 'Operational excellence'.



5 Site services

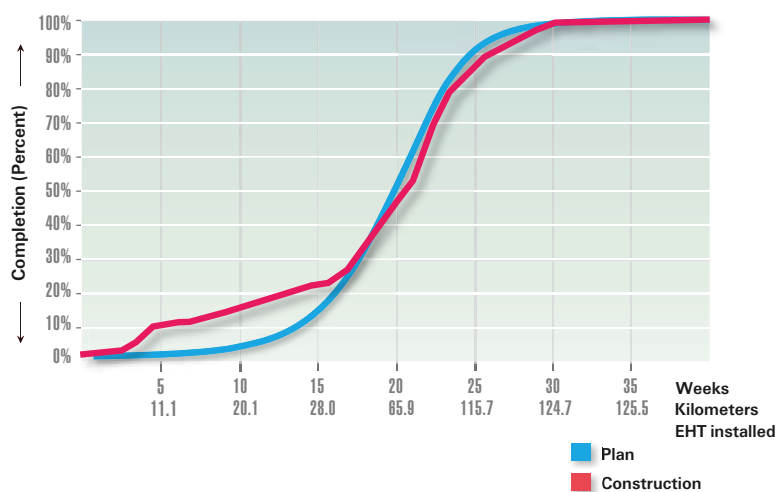
Tyco Thermal Controls has constructed Heat Management Systems (HMS) ranging from just a few meters to hundreds of kilometres. This experience has allowed us to develop tools, protocols and, most importantly, the expertise for successfully managing installation of HMS projects of any magnitude. Our multi-faceted Tyco construction database software is at the centre of all our resources tracking and reports the crucial elements of the projects progress.

Site service activities are guided by Tyco Thermal Controls construction quality plan. This plan, tailored to every construction project, provides the framework, via procedures and flowcharts, for all construction personnel's area of responsibility. All personnel are trained to be aware of all the mechanisms and documents for verifying construction quality commitments.

Management is committed to having a trained and effective construction workforce; employees performing specific assigned tasks are qualified on the basis of the appropriate education, training and/or experience required. Tyco's personnel is as diverse as the products it offers which enables Tyco Thermal Controls to provide, individually or as a whole, installers, site supervision, field engineering, quality assurance, quality control, and/or project management for any HMS project. The site engineers have the advantage of design background, product knowledge and application expertise to deal with any technical query which may arise.



Plan vs. Construction



6 *Commissioning and start-up*

The commissioning of a HMS is performed to ensure the correct installation and operation of systems prior to the handover to the end user. Tyco has developed a testing system and commissioning procedure, governed by an Inspection and Test Plan (ITP), which provides total insight into the condition of the tested circuits.

Tyco Thermal Controls' commissioning group verifies that:

- all HMS are tested and ready for operation.
- all insulation works are checked (using visual and infra-red techniques) and signed off.
- all required Inspection Test Records (ITR) for the power distribution panels and the individual electrical heat-tracing circuits are accurately completed and submitted to the end user.
- all As-Built conditions are recorded

Tyco Thermal Controls provides individuals who fully understand the characteristics of what they are testing: Heat Management Systems. This, coupled with an engineering and design background, provides the capability to undertake on-the-spot analysis and be able to troubleshoot the circuits should they not perform correctly. ITR values are compared with the design data to confirm they meet the controlling specifications. Throughout the commissioning process the ITRs and all other checklists are captured into the Tyco construction database to provide project status as well as valuable records for future troubleshooting and maintenance during normal operations.



A sound maintenance programme or annual audit could avoid high lost revenue due to down-time or equipment failure.



Audits and maintenance

Timely preventive maintenance is essential to assure the reliable operation of Heat Management Systems (HMS), and to avoid the high cost associated with unexpected downtime. Initiating a HMS audit, or implementing a maintenance agreement, provides the security of having the 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. Maintenance agreements and visits can be tailored to the specific requirements of the customer.

The audit process

Tyco Thermal Controls customises an audit based on the level of HMS detail required. A basic visual inspection often identifies physical damage or areas for improvement in craftsmanship, whereas a comprehensive audit involves recording HMS performance data and compiling a detailed report. In such an audit, data is collected through various inspection, testing procedures, HMS log files and then analysed against as-built information and design criteria. Once the final assessment is complete, potential risk factors will have been identified and actions to improve the performance of the Heat Management System recommended.

The following picture shows an example of the typical audit report generated out of Tyco Thermal Controls' maintenance database:

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Tyco Thermal Controls can also perform comprehensive damage assessments in respect of fires, explosions, or the recommissioning of old facilities.

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