

# Crane's TP-410: Leadership

*When it comes to the fluid handling industry, there is one publication that every engineer has heard of, studied, and refers to often regarding the flow of fluid through valves, pipes and fittings, and that document is the CRANE Technical Paper 410 (TP-410). Intended for use by a wide range of plant engineers, technicians, maintenance personnel, and plant operators, the TP-410 has become the quintessential guide in selecting the correct equipment and parameters when designing and operating any piping system. This year marks its 75th anniversary, and since its inception in 1942, the TP-410 has undergone multiple revisions and updates to remain relevant to generation after generation of engineers.*

By Aneta Stephens, Crane ChemPharma & Energy

Crane was founded in 1855 by one man, Richard Teller Crane, who built his company on a set of values that have guided its employees for over 160 years. Since then, Crane has been the world's leading innovator and pioneer of practical flow control solutions, addressing and exceeding the needs of the industry, enabling customers to operate better, faster and safer. With a heritage of innovation built upon a dedication to technical design and manufacturing excellence, combined with standards and values that center on honesty and fairness, it's no wonder the company was behind such an influential and educational publication as the TP-410.

It was Crane that realized the importance of truly understanding the principles behind the flow of fluids in order to effectively design piping systems and properly select the most appropriate valves, pipes and fittings for that system. The TP-410 was a product of this discovery that would help engineers for years to come, its relevance never weakening as new applications and environments were explored.

In recent years, the global industrial base has continued to expand and fluid handling is still at the heart of new, more complex processes and applications. Today, almost every conceivable fluid is handled in pipe during its production, processing, transportation, or utilization. In the current decade of new technologies, heat-transfer fluids from solar plants, mineral slurries,

and new chemical compounds process pressures and temperature much more extreme than ever before. And as new technologies, fluids and applications were introduced to the industry, the TP-410 provided updates, adding new chapters and technical references. The current edition consists of seven chapters that cover the theory and calculation methods used in the design of piping systems as well as the sizing and selection of valves, pumps and fittings, and is published in two versions Metric (using SI units) and ASME.

In recognition of the more complex processes and applications which engineers encounter, in the late 1990s Crane partnered with Engineered Software, Inc. to produce a branded software product to complement the TP410 Publication. This software, Flow of Fluids Premium, is piping system simulation software for use in the design, optimization and troubleshooting of fluid piping systems. The history between Crane and Engineered Software goes back much further than the nineties however, to 1978 when two innovative and driven engineers with an early microcomputer and a 1970's version of the TP410 started developing software to calculate pipeline headloss, followed by software for pump, control valve, flow meter, and orifice calculations. Over the past 39 years, Engineered Software has continually developed features and functionality to improve communication between design engineers, plant man-



agers, and system engineers and operators through software analysis of fluid handling operations. Flow of Fluids allows users to model fluid piping systems on their computers, before costly downtime or product quality issues occur. The current program analyzes open or closed loop systems containing either liquids or gases, supports the design of new systems or modifications to existing systems, assists in the sizing and selection of equipment, troubleshoots to find the root cause of operational problems, and identifies opportunities for system optimization. It gives engineers a clear picture of the entire system, demonstrating how all equipment works together, rather than focusing on individual pieces of equipment. Through this software, engineers simply enter design details (equipment and pipeline data), specify operating conditions, run the required calculations, simulate operating scenarios, and troubleshoot existing systems or design new systems based on the analysis provided.

Flow of Fluids Premium Software proved to be a tremendous aide to en-

gineers in the fluid handling industry, so in 2009 Crane and ESI partnered again to provide TP-410 readers with additional tools to assist with their fluid handling needs. A Flow of Fluids website was created at [www.FlowofFluids.com](http://www.FlowofFluids.com), which offers users a suite of web-based tools to solve equations found in the paper. Nomographs that were originally printed in hard copy were replaced online with new calculators, facilitating the work for its users by providing a more efficient means of performing these same calculations. Such calculators include head loss, pressure drop, power required for pumping, gas volume and density, equivalents of resistance, flow through nozzles, flow through orifices and unit convertors. Additional content and updates were incorporated into a new version of TP410 and the website provides up-to-date errata for all versions purchased since 2009 so users can always receive updates on edits as they're made. The website also offers online training on piping system principles and system

## ABOUT CRANE

Crane Co. is a diversified manufacturer of highly engineered industrial products. Founded in 1855, Crane provides products and solutions to customers in the hydrocarbon processing, petrochemical, chemical, power generation, unattended payment, automated merchandising, aerospace, electronics, transportation and other markets. The Company has four business segments: Fluid Handling, Payment & Merchandising Technologies, Aerospace & Electronics and Engineered Materials. Crane has approximately 11,000 employees in the Americas, Europe, the Middle East, Asia and Australia. Crane Co. is traded on the New York Stock Exchange (NYSE:CR). For more information, visit [www.craneco.com](http://www.craneco.com).

## ABOUT CRANE CHEMPHARMA & ENERGY

CRANE ChemPharma & Energy (within Crane's Fluid Handling segment) designs and manufactures a variety of high performance products including: highly engineered check valves, sleeved plug valves, lined valves, process ball valves, high performance butterfly valves, bellows sealed globe valves, aseptic and industrial diaphragm valves, multi/quarter-turn valves, actuation, sight glasses, lined pipe, fittings and hoses, and air operated diaphragm and peristaltic pumps. Its trusted brands (in alphabetical order) ALOYCO®, CENTER LINE®, COMPAC-NOZ®, CRANE®, DEPA®, DUO-CHEK®, ELRO®, FLOWSEAL®, JENKINS®, KROMBACH®, NOZ-CHEK®, PACIFIC VALVES®, RESISTOFLEX®, REVO®, SAUNDERS®, STOCKHAM®, TRIANGLE®, UNI-CHEK®, VALVES®, WTA®, and

XOMOX® offer customers complete and innovative product portfolio designed for the most demanding corrosive, erosive, and high purity applications. Among the industries served are the chemical processing, biotechnology, pharmaceutical, oil & gas, refining, and power generation.

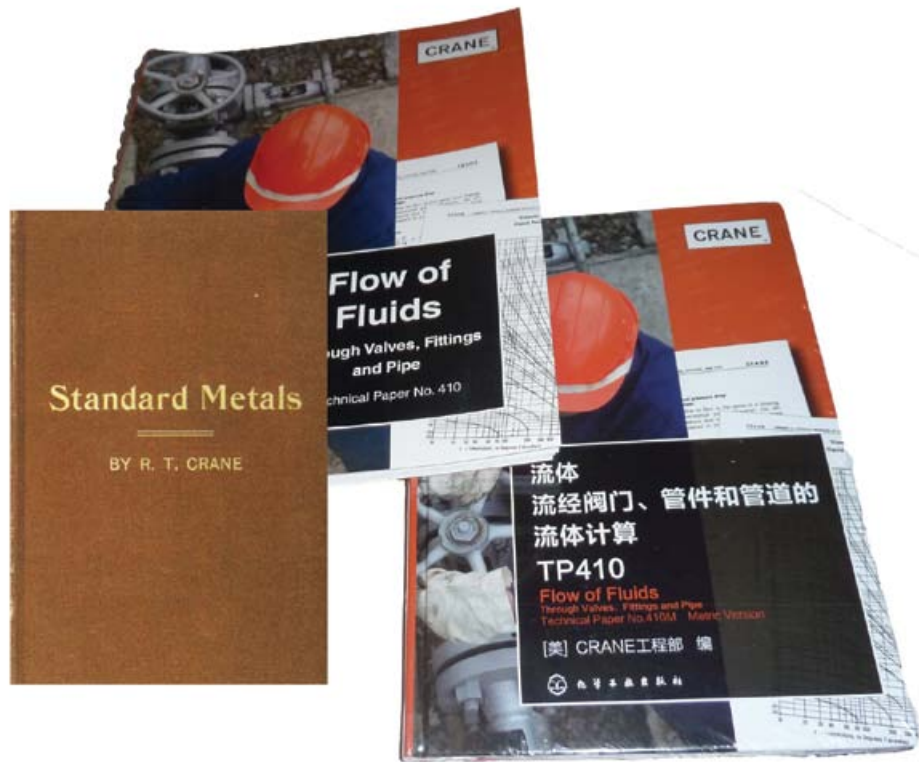


Crane TP-410 Current & the original 1942 books



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# Through Education Since 1942



components based on the knowledge found within the pages of TP410. The two-part Piping System Principles is a self-paced learning course which provides a comprehensive understanding of the hydraulic principles between components in a fluid system. Additional courses include an Overview of Piping Systems and webinars on Centrifugal Pumps, Process Measurement and Control, and Head Transfer. In addition, registration for in person software training at ESI's home state of Washington can be made via the site. The implementation of this website not only facilitated the work for existing users of the TP-410, it also recruited a generation of new users who were not already aware of the publication's benefits.

But the TP-410 is just one example of Crane's technical heritage. As an integrated fluid handling solutions provider, Crane is well equipped to deal with complex global projects and all requirements related to those projects across the chemical, power, oil & gas, refining, biotechnology and pharmaceutical marketplaces. Its extensive product portfolio consists of products that span the industry, including check valves, sleeved plug valves, lined valves, process ball valves, high performance butterfly valves, aseptic

and industrial diaphragm valves, lined pipe, fittings and hoses, to name a few. With its extensive network of worldwide locations, the company is able to use its global project management processes to coordinate and link all activities from feasibility through design, procurement, start-up, and final documentation, essentially creating a one-stop solution for its customers.

## Commitment to Innovation

For the last 160 years, Crane has prided itself on manufacturing excellence, continual customer service, and a commitment to innovation. The TP-410 and its evolution to an online platform is one example of such innovation, but another is Crane's dedication to product advancements, as is seen in its recent launch of the Crane®FKX 9000 Triple Offset Valve. For the harsh conditions of critical process applications, steam isolation and temperature extremes, this new TOV provides unmatched performance reliability and quality across multiple applications while delivering exceptional flow control, optimized Cv and low Delta P in a single valve. Engineered to address the inherent dangers of demanding applications, the Crane®FKX 9000 adheres to the industry's most stringent standards, delivering zero-leak\* shut off in high-temperature applications, hy-

## OUR HERITAGE

Crane employees share a proud 160-year-plus history of doing business the right way—treating people fairly, dealing honestly and ethically with customers, suppliers, and shareholders, and working hard to meet or exceed the expectations of customers. They also share a fascinating history of innovation dating from the early years of the Industrial Revolution to the current era of technology-driven product development and improvement. A career at Crane means you'll work toward a goal of continuous improvement in everything you do within a highly ethical environment that fosters personal development and advancement.

Since 1855 Crane has been the world's leading innovator and pioneer of practical flow control solutions addressing and exceeding our customers' needs to enable them to operate better, faster and safer. Crane's heritage of innovation is built upon our dedication to technical design and manufacturing excellence. Our world-class processes utilize the highest quality inputs, and every day, Crane delivers its highly engineered products, outstanding customer service, and support prior and post sales.

- 160 years of Crane Values
- Strong brands and innovative products
- Commitment to continuous improvement
- Focus on quality and safety
- Leading technical expertise
- Global presence with local support
- Training centers in all regions
- Personal service attitude

## ONE STOP SOLUTION

Crane's success is measured and earned by making its customers successful. As an integrated fluid handling solutions provider, Crane is well equipped to deal with complex global projects and all requirements related to those projects. Our extensive product portfolio enables Crane to offer product packages and timely proposals to simplify our customers' supply chain on a local level worldwide, at competitive market pricing.

Whatever the application or project requiring valves for flow control of media that may be demanding, toxic, corrosive, liquid, gas, or slurries, Crane is there to help.

From the largest to the simplest, from a single valve to a complex project requiring engineering to get it just right, Crane has the resources and dedicated staff to provide solutions to meet your daily needs and make your projects and MRO initiatives work. With its extensive network of worldwide locations the company is able to use its global project management processes to coordinate and link all activities from feasibility through design, procurement, start-up, and final documentation.

Wherever the location of those activities might be, Crane's processes link all teams throughout the world to present its customers with a single face (and interface) – that of Crane.



drocarbon service and emergency shut down (ESD) service. It directly addresses a growing concern of the industry regarding fugitive emissions, and is an example of Crane's mission to address such issues, solve problems for plant operators and work to make their jobs more efficient and profitable.

The development of the TP-410 as an educational resource for the industry, the consistent and meaningful product introductions such as the Crane®FKX 9000 and the strong ethical standards of excellence and service are what make up Crane and contribute to the advancement of the industry.



Alex Alcalá, President Crane CP&E Recommends TP410



The views and opinions expressed in this article are those of the profiled company and do not reflect the position of Valve World Americas.