



brands you trust.



Solutions for Refining



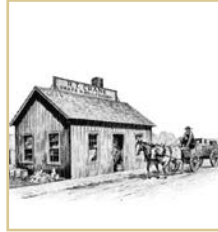
Crane ChemPharma & Energy

www.cranecpe.com

Welcome to CRANE ChemPharma & Energy

Strength Through Integrity

This is not a new idea for CRANE. We have been committed to the highest standards of business conduct since our founding in 1855. Our founder, R.T. Crane, wrote and spoke extensively about the importance of business ethics and values, about the confidence and goodwill among employees and customers, and how this can be a competitive advantage. Today, his words continue to drive our business philosophy and serve as a benchmark by which we measure our success.



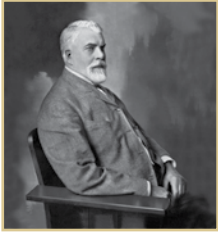
Thank you for your interest in our products. We are pleased to be able to present you with this overview of the outstanding portfolio of products and services we offer. Inside these pages you will find valves that solve your problems, provoke ideas, or raise your awareness of the broad range of valves we have available to meet a myriad of applications and service conditions.

When you look inside our products you will find more than just iron or steel. There you will find the latest technology in design, metallurgy, casting and machining all founded on our Operational Excellence principles that drive out waste and increase repeatability. In the long run, we strive for competitive products that meet or exceed your specifications, and are delivered to you on-time. Every product also contains a promise that has been built in since the very first valve CRANE made over 150 years ago. The promise allows customers to be assured of quality, engineering excellence and a legacy of performance that has been a formula of success throughout our history.

CRANE today is not only a single brand, but rather a collection of some of the best known brands in flow control history—Flowseal, Krombach, Duo-Chek, Pacific, Stockham, Center Line, Noz-Chek and Aloyco to name a few. Each of these brands have their own highly engineered product legacy and are brought together to serve the global energy infrastructure markets including Power Generation, Oil & Gas, and Petroleum Refining among others. There truly is no other portfolio like it today.

The 2,000 people who make up CRANE Energy Flow Solutions are also a big component of the products and services presented here. The people who design, manufacture, purchase, build, ship, quote, sell and support the products are dedicated to providing you with the best products at the lowest total cost of ownership. We work hard, because we know your processes demand it. From the simplest service to the most critical process in your facility, CRANE Energy Flow Solutions stands ready to deliver brands you know, technology you want and solutions you need.

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Performance Culture Based on Trust and Respect

To R.T. Crane, this meant being both hard headed and open minded. It's not as easy as it sounds. We question our assumptions; we listen carefully to coworkers' ideas, then add our own thoughts to see if we can build that idea into a more valuable contribution; and we trust that our suggestions will receive the same respectful treatment. At CRANE, new ideas are welcome, along with equal doses of trust and respect.

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Corporate Overview

CRANE Co Significant Events 1855 - Present.

1855

Founding of R.T. Crane Brass & Bell Foundry in Chicago. CRANE produces valves, fittings, and specialty castings for a growing industrial America.

1860s

As Northwest Manufacturing Co., CRANE supplies essential steam components to the railroads and enters the steam heating business. CRANE Elevator Company begins making hoists, elevators and steam engines, becoming one of the major names in the field for 30 years.

1870s

CRANE pioneers improvements in manufacturing, including the use of multiple purpose machines invented by R.T. Crane and a conveyor system of moving molds and pouring metal - the beginning of line production in foundries.

1880s

CRANE's business is booming. The company operates four manufacturing facilities and employs over 1500 people. Branch houses extend the company's business to the Western U.S.

1885

CRANE Co. is adopted as the Company name.

1890s

R.T. Crane establishes a metallurgical laboratory, probably the first in the Midwest.

CRANE products have the strength and quality to meet the challenges of ever higher fluid pressures and temperatures.

1900

CRANE produces steel valves and fittings in its own steel foundries.

CRANE's rigorous approaches to metallurgical science and material testing become the model for the valve and fitting industry.

1912

Founder R.T. Crane dies. CRANE Co. is the leader in the valve and fitting business. R.T. Crane, Jr. assumes the Company's presidency.

The company builds the first truly modern factory, switching wholly to electricity for power. In Chicago, "The Great Works" built on 160 acres is the most modern factory of its time.

1920s

CRANE Co. conceives the idea of the modern bathroom, creating the first practical decorative bathroom ensembles. The American bathroom becomes a sign of affluence and social pride. CRANE plumbing fixtures, many designed by noted industrial designer Henry Dreyfuss, are celebrated for their styling, color and innovation.

1930

Company-owned branch distribution operations grow to 190 from only 86 in 1920. The highlight is the lavish \$1 million showroom on the Atlantic City Boardwalk.

1936

CR listed on the New York Stock Exchange.

1937

The Golden Gate Bridge opens with its railing material supplied by CRANE Co.

CRANE Co. is a diversified manufacturer of highly engineered industrial products with a substantial presence in a number of focused niche markets. With approximately 10,000 employees working together in five business segments across 25 countries, CRANE generated 2009 net sales of \$2.2 billion.

Over 150 Years of Making History

CRANE's founder, R.T. Crane, was ahead of his time. Founding the business in 1855 he wrote and spoke extensively about the importance of business ethics and values, the confidence and goodwill among employees and customers, and the competitive advantage that can be obtained by taking the high road. Today, his words continue to drive CRANE's business philosophy and serves as a benchmark by which performance is measured.

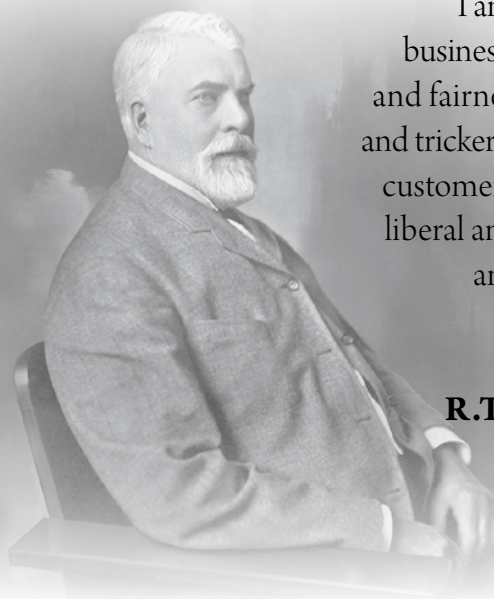
CRANE Innovation

CRANE innovation can be found behind the scenes virtually everywhere, helping everyday life run efficiently. CRANE has five strong business segments, each strategically positioned to produce excellent returns and high cash flow over the business cycle. By growing these segments and transitioning to a more integrated operating company with a common business system and a common intellectual capital process, CRANE continues to create value for its shareholders and important returns for other stakeholders in the Company—employees, customers and suppliers.

CRANE's Business Segments

- Fluid Handling: 48%**
- Aerospace & Electronics: 27%**
- Merchandising Systems: 13%**
- Engineered Materials: 8%**
- Controls: 4%**

For more information on CRANE Co., please visit our website at:
www.craneco.com.



"I am resolved to conduct my business in the strictest honesty and fairness; to avoid all deception and trickery; to deal fairly with both customers and competitors; to be liberal and just toward employees and to put my whole mind upon the business."

R.T. Crane, July 4, 1855

Company Overview

CRANE Energy Flow Solutions is headquartered in The Woodlands, Texas, and is part of CRANE Co.'s Fluid Handling Business Segment. With 14 manufacturing facilities worldwide, CRANE Energy has a staff of approximately 2,000 employees.

CRANE Energy Flow Solutions' History

Although diverse, CRANE Energy's products all meet high standards for product quality. However, one element remains at the center of everything we do: Integrity. This began with the founder who, in 1855, resolved "to conduct my business in the strictest honesty and fairness." At 23 years old, Richard Teller Crane started business in a one-room foundry with the premise not to make his products better than anyone else, but to "be fair to both customers and competitors." So, while his name is on the outside of our products and our buildings, his ideals are at the heart of everything our company has accomplished.

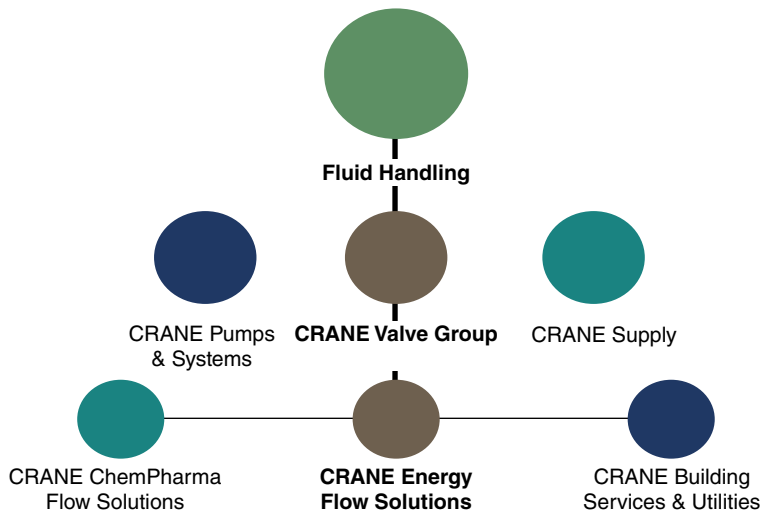
Today's challenges could not have been imagined in that foundry so long ago. But through the years, CRANE's revolutionary leadership, innovation, customer focus, and relentless pursuit of excellence have built our legacy and they are the roadmap for our future.

Our Markets

Focused on the oil, gas, refining and power markets, the Energy product portfolio brings well-known brands together to provide specifying engineers, process designers and end users with flow control solutions.

- General Industrial
- Oil & Gas/Refining
- Power
- Other

For more information on CRANE Energy Flow Solutions, please visit our website at: www.cranenergy.com.



1942
To meet wartime demand, CRANE increases steel valve output capacity four-fold to 25,000 tons annually. The U.S. Navy requires from 1,500 to 15,000 valves per ship.

1951
After the war, CRANE supplies flow control products for aircraft. Hydro-Aire, a manufacturer of highly developed precision aircraft products is acquired.

1957
CRANE introduces "Technical Paper 410", building on the classic "Flow of Fluids" of 1942. Today, this quintessential guide to understanding the flow of fluids through valves, pipes and fittings is available as software.

1959
T.M. Evans is elected Chairman and CEO. A new management philosophy moves CRANE to streamline the distribution network and concentrate on industrial manufacturing.

1960s
Industrial expansion is furthered through domestic and international acquisitions such as Chapman Valve, Cochrane Corporation, Deming Company and Chempump.

1969
CRANE pumps are on the moon. Hydro-Aire and Chempump pumps are used in the Gemini and Apollo Space programs.

1970s
CRANE is well-positioned in four major areas of concentration: fluid and pollution control, steel, building products and aircraft/aerospace.

1980s
CRANE exits the plumbing and plumbing distribution businesses in the U.S.

1981
CRANE provides braking system for the first NASA space shuttle.

1984
R.S. Evans elected Chairman and CEO.

1990s
Evans leads CRANE as a growth company with strong acquisition program in areas of fluid handling, engineered materials, merchandising systems, aerospace and controls.

2001
Eric C. Fast elected President and CEO. He continues strategic leadership of a collection of linked businesses to move CRANE from a holding company to an operating company.

Early 2000s
Foundation for future profitable growth is laid with the implementation of new Operational Excellence tools, greater development of intellectual capital, strategic linkages and strong customer focus.

2005
CRANE celebrates its 150th anniversary.

Post-2005
The strong foundation laid in the early part of the decade enables CRANE to make significant acquisitions in the Merchandising Systems, Engineered Materials and Controls segments. At the same time, the Company implements a disciplined, Company-wide business system and realigns businesses in all segments to focus on customer solutions that create value and deliver results.

Refining

Important Customers

Integrated Oil Companies

BP
CEPSA
Chevron
China NPC
ConocoPhillips
ENI Agip
ExxonMobil
IOCL
Lukoil
Maersk Oil
Marathon
MOL Group
Petrobras
PetroSA
Reliance Industries
Repsol
Shell
Sinopec
Sonatrach
Statoil
Total

“Pure Play” Refiners

Flint Hills Resources
Petroplus
Sunoco
Saras S.p.A.
STIR
Valero

National Oil Companies

ADNOC
EcoPetrol
EGPC
Kuwait Oil Co
PDVSA
Qatar Petroleum
Saudi Aramco
Sirte Oil

Engineering, Procurement & Construction (EPCs)

Aker Solutions
AMEC
Bechtel
CB&I
Fluor
Foster Wheeler
GS Engineering
Jacobs
JGC
KBR
MW Kellogg
Petrofac
Saipem
SK Engineering
Técnicas Reunidas
Techint
Technimont
Technip
UOP
WorleyParsons

Refinery Suppliers

Air Products
Air Liquide

CRANE Energy Portfolio for the Refining Industry

Whether yours is a topping plant or a highly complex refinery and whether you run an Asphalt Plant, a Hydrocracker or a Coker, CRANE has the valves you need to ensure safe, reliable and cost effective operations. For over 100 years, CRANE has been designing and building high-quality, reliable valves for the refining industry. In fact, we literally wrote the book (TP-410) on understanding the flow of fluids in refining applications.

With our portfolio of well-known brands, products and services, CRANE can meet your demanding needs throughout the refinery. The following pages will highlight the wide range of our products and services as well as the benefits each solution provides. Our portfolio is unique in both its breadth and depth.

When you buy valves for your refinery from CRANE, you get much more than just the valves. Behind each CRANE product is a highly energized team of professionals, including Engineering, Quality Assurance, Manufacturing, Customer Service, Sales and Valve Services to name a few, who support you not only with completing the purchase, but with installation, best practices and long-term maintenance as well.



Meeting Your HSE and Capacity Utilization Goals

In refining, every piece of equipment needs to help you meet your Health, Safety and Environmental (HSE) requirements to maintain your license to operate. At CRANE Energy, we know you count on the integrity of your valves to keep your operators, your communities and your environment safe and healthy. That's why we strive to produce valves you can count on to meet these needs. Whether it is our Krombach Lethal Emissions Metal Ball Valve or our Emission Containment XOMOX Sleeved Plug and Pacific Gate, Globe & Check HF Alkylation valves or our Pacific High Integrity Shutoff Bolted Bonnet valve, we make the products you need to meet today's high HSE standards.

Beyond meeting your HSE requirements, we know you are focused on achieving a high level of capacity utilization. To achieve this goal, however, you need equipment that you can count on not to fail. Our portfolio of products can help you achieve these utilization goals by providing consistent, reliable and repeatable service over the long term. Sometimes our customers will try a cheaper competitor to save money, but will come back to CRANE because they realize that the money saved on the valve is quickly overcome by the money lost in an unplanned shutdown or with costly repairs and replacements. CRANE Energy continually receives customer reports of Crane portfolio valves, such as our CRANE bolted bonnet and Pacific Wedgeplug, achieving decades of reliable service.

CRANE Energy has the portfolio of valves you need to not only meet today's stringent Health, Safety and Environmental requirements, but also to achieve the highest level of reliability you demand. Let us help you achieve your goals – **contact a CRANE Energy representative today!**

Why Buy from CRANE Energy

Quality & Certifications

The following is a partial list of certificates held by CRANE Energy Flow Solutions. All certificates are available upon request.

- ASME 16.34, 16.10, 16.5, 16.25
- ISO 9001: 2000 (Det Norske Veritas, TÜV)
- ISO 14001: 2005 (TÜV Nord)
- Zertifikat DGRL Certificate PED (TÜV Nord)
- Directive 97/56/EG
- API 6D
- QS - Certificate of Assessment PED (Det Norske Veritas)
- Technical Standards & Safety Authority
- Laboratorio De Pruebas De Equipos Y Materiales
- Welding Procedure Approval (Det Norske Veritas)
- Russian GOST R
- Water Regulation Advisory Scheme
- Design Assesment (American Bureau of Shipping)
- Konformitätserklärung ATEX - Declaration of Conformity ATEX
- DVGW - Baumuster-Prüfzertifikat Gasversorgung (DVGW Zertifizierungsstelle)
- Certificate of Recognition (Bureau Veritas)
- AD 2000-Merkblatt HP 0/TRD 201/GGVE/GGVS
- AD 2000-Merkblatt A4
- Shipbuilding approval according to MODE IBV/Mode II
- EN 729-2
- KTA 1401
- TA Luft 2000
- API 622 emissions testing
- EPA Method 21 emissions testing
- CE
- 10CFR50 Appendix B
- ASME N45.2
- ASME N-Stamp N-2 899
- ASME NPT Stamp N-2900
- ASME NCA-4000
- ASME NB Registration
- Repair and Testing of Valves and Actuators in Compliance with 10CFR.50 Appendix B and ASME NQA-1
- "NR"- Field Repair or Replacement of Class 1, 2, & 3 Line Valves and Section III Class 1, 2 and 3 Pressure Relief Devices
- "VR"- Field Repair of ASME Section I, III and VIII PRV



Faster, Better and Easier

The world is moving ever more quickly. Customers have new demands and competition is keen. Success depends on our ability to become faster, better and easier to do business with tomorrow, next month, and next year, which means moving our comfort zone from the old way to the best way.

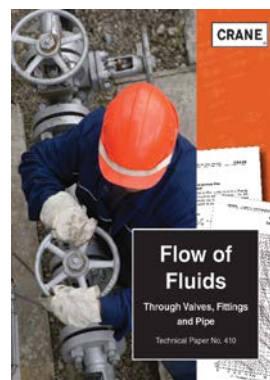
Continuous Improvement

Improving some of the time, in one or two areas, just won't cut it. Our success is built on an accelerated stream of incremental and breakthrough improvements in products, manufacturing, finance, distribution — the works. We look for new ways to create value, and then translate those ideas into advantages our customers understand, appreciate, and act upon.

Flow Expertise

CRANE Technical Paper No. 410 (TP-410) is the quintessential guide to understanding the flow of fluid through valves, pipes and fittings, enabling you to select the correct equipment for your piping system. Originally developed in 1942, the latest edition of CRANE TP-410 serves as an indispensable technical resource for specifying engineers, designers and engineering students.

TP-410 is published by the CRANE Valve Group, one of the world's leading suppliers of valve products and services. For more information about CRANE Technical Paper No. 410 (TP-410) or to purchase a copy please visit: www.tp410.com.



Refinery Flow Diagram

1. Atmospheric Distillation

Cast Steel Bolted Bonnet GGC*
Duo-Chek Valves
Metal Seated Ball Valves
Triple Offset Valves
Strainers

2. Vacuum Distillation

Cast Steel Bolted Bonnet GGC*
Duo-Chek Valves
Metal Seated Ball Valves
Triple Offset Valves
Strainers

3. Hydrotreating

Cast Steel Bolted Bonnet GGC*
Pressure Seal GGC* Valves
Metal Seated Ball Valves
Triple Offset Valves
Duo-Chek Valves
Noz-Chek Valves
Strainers

4. Catalytic Reforming

Cast Steel Bolted Bonnet GGC*
Chrome Bolted Bonnet GGC*
Wedgeplug Valves
Metal Seated Ball Valves
Triple Offset Valves
Duo-Chek Valves
Noz-Chek Valves
Strainers

5. Fluidized Catalytic Cracking

Cast Steel Bolted Bonnet GGC*
Duo-Chek Valves
Wedgeplug Valves
Metal Seated Ball Valves
Triple Offset Valves
Strainers

6. Alkylation

HF Specialty High Alloy Bolted Bonnet GGC*
HF Specialty High Alloy Sleeved Plug Valves
Sulfuric Alloyed Sleeved & Lined Plug Valves
Sulfuric API 603 Alloy GGC* Valves
Lined Ball & Butterfly Valves
Line Pipes, Fittings & Accessories
Duo-Chek Valves
Strainers

7. Hydrocracking

Cast Steel Bolted Bonnet GGC*
Pressure Seal GGC* Valves
Metal Seated Ball Valves
Triple Offset Valves
Duo-Chek Valves
Noz-Chek Valves
Strainers

8. Delayed Coking

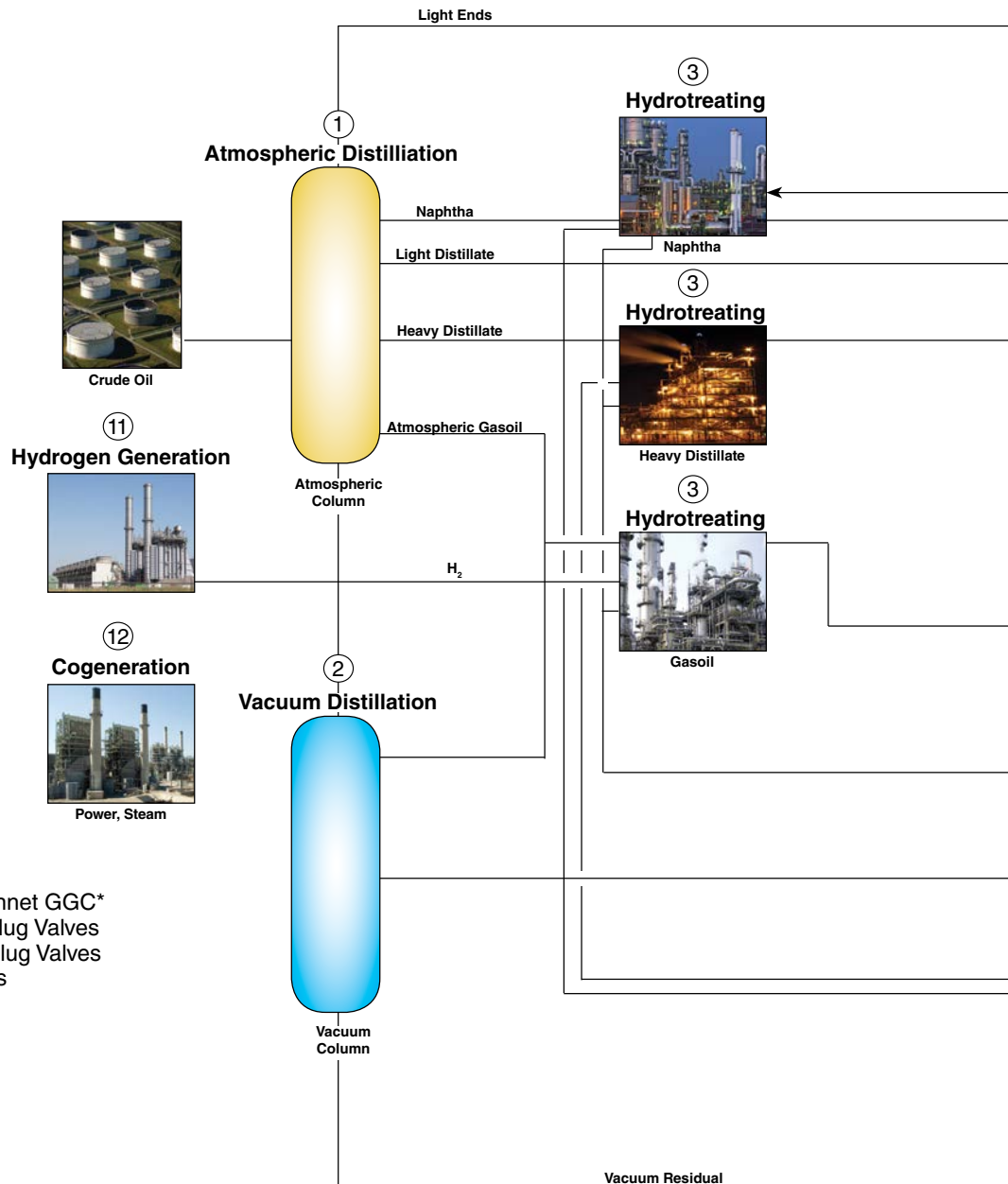
Cast Steel Bolted Bonnet GGC*
Wedgeplug Valves
Metal Seated Ball Valves
Triple Offset Valves
Duo-Chek Valves
Noz-Chek Valves
Strainers

9. Sulfur Recovery

Cast Steel Bolted Bonnet GGC*
NACE Trim Valves
Steam Jacketed Plug Valves
Steam Jacketed Butterfly Valves
Triple Offset Valves
Duo-Chek Valves

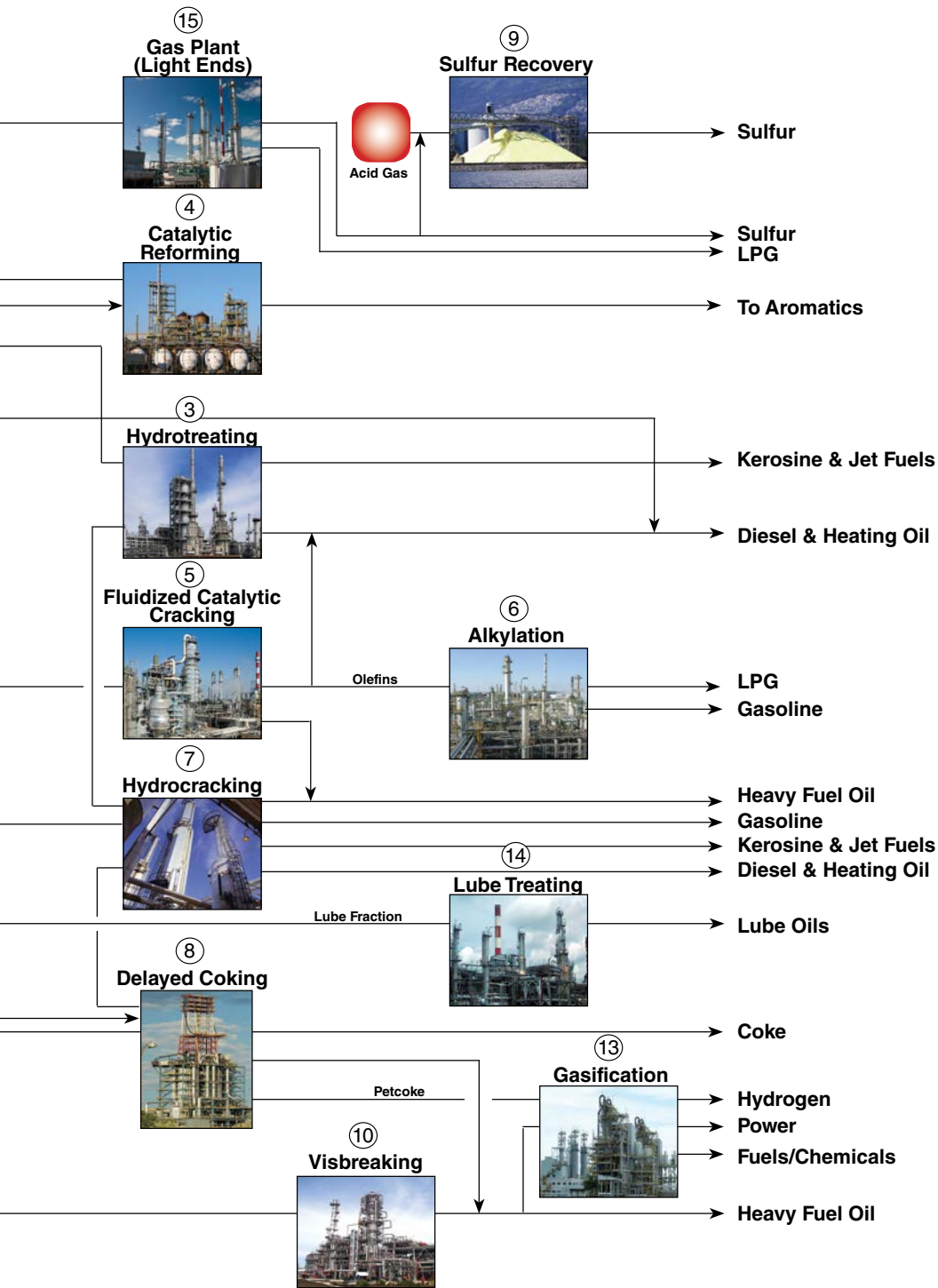
10. Visbreaking

Cast Steel Bolted Bonnet GGC*
Wedgeplug Valves
Metal Seated Ball Valves
Triple Offset Valves
Duo-Chek Valves
Strainers



*GGC = Gate, Globe & Check

Valves by Application



- 11. Hydrogen Generation**
 Cast Steel Bolted Bonnet GGC*
 Pressure Seal GGC* Valves
 Metal Seated Ball Valves
 Triple Offset Valves
 Duo-Chek Valves
 Noz-Chek Valves
 Strainers

- 12. Cogeneration (Power & Steam)**
 Cast Steel Bolted Bonnet GGC*
 Pressure Seal GGC* Valves
 Pressure Seal Non-Return Valves
 Vent & Drain Valves
 Extraction Check Valves
 Butterfly Valves
 Lined Valves

- 13. Gasification**
 Cast Steel Bolted Bonnet GGC*
 Pressure Seal GGC* Valves
 Wedgeplug Valves
 Metal Seated Ball Valves
 Fire-Safe Soft Seated Ball Valves
 Triple Offset Valves
 High Performance Butterfly Valves
 Lined Butterfly Valves
 Duo-Chek Valves
 Noz-Chek Valves
 Strainers
- 14. Lube Treating**
 Cast Steel Bolted Bonnet GGC*
 Fire-Safe Soft Seated Ball Valves
 Triple Offset Valves
 Duo-Chek Valves
 Strainers
- 15. Gas Plant (Light Ends)**
 Cast Steel Bolted Bonnet GGC*
 Metal Seated Ball Valves
 Fire-Safe Soft Seated Ball Valves
 Fire-Safe Sleeved Plug Valves
 Triple Offset Valves
 Duo-Chek Valves
 Strainers

Other Applications

- Steam Systems**
 Cast Steel Bolted Bonnet GGC*
 Pressure Seal GGC* Valves
 Fire-Safe Soft Seated Ball Valves
 Triple Offset Valves
 High Performance Butterfly Valves
 Duo-Chek Valves
 Noz-Chek Valves

- Crude Oil / Product Storage**
 Cast Steel Bolted Bonnet GGC*
 Fire-Safe Soft Seated Ball Valves
 Sleeved Plug Valves
 (double block & bleed)
 Triple Offset Valves
 High Performance Butterfly Valves
 Lined Butterfly Valves
 Butterfly Valves
 Duo-Chek Valves

- Product Blending / Loading Rack Marine Dock**
 Cast Steel Bolted Bonnet GGC*
 Fire-Safe Soft Seated Ball Valves
 Sleeved Plug Valves
 (double block & bleed)
 Triple Offset Valves
 High Performance Butterfly Valves
 Lined Butterfly Valves
 Butterfly Valves
 Duo-Chek Valves

- Cooling Towers**
 Cast Steel Bolted Bonnet GGC*
 Lined Butterfly Valves
 Butterfly Valves
 Duo-Chek Valves

Multi-turn Valves



Bolted Bonnet Gate & Globe

Brands: Aloyco, CRANE, Jenkins, Krombach, Pacific, Stockham, Triangle

ASME Class: 150 - 1500

PN: 10 - 100

Sizes: ½" - 36"

DN: 15 - 900

Materials: Carbon Steel, Stainless, Special Alloys, Iron, Bronze, Special Materials

Connections: Flanged, Welded, Threaded, Soldered

Features & Benefits:

- Globe valves are available in globe stop and stop-check (non-return) configurations
- Body is cast with straight through ports to minimize turbulence, erosion and pressure drop
- Seat rings are seal welded to eliminate leak path behind rings and for long trouble-free service
- CRANE's gate valve includes a one piece flexible disc providing accurate alignment of mating seating surfaces so the valve can absorb piping strains without leakage and avoid any tendency to stick in the seated position
- Packing contains corrosion inhibitor to avoid stem pitting
- Stuffing box is deep, assuring long packing life
- Gland eyebolts swing aside for ease in repacking the stuffing box

Pressure Seal Gate & Globe

Brand: Pacific

ASME Class: 600 - 4500

Sizes: 2" - 36"

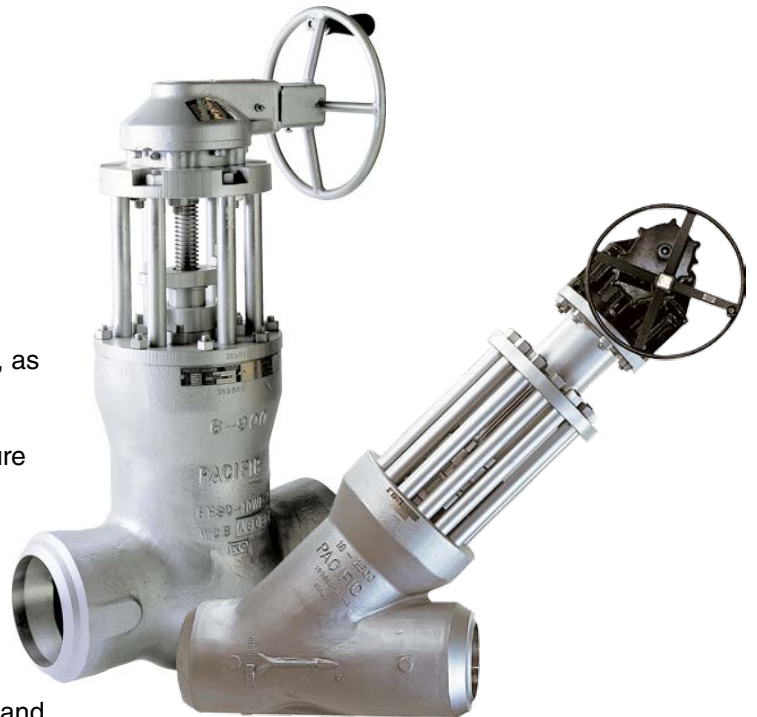
DN: 50 - 900

Materials: Carbon Steel, Alloy

Connections: Butt Weld, Flanged, Venturi

Features & Benefits:

- Gate valves offered in two designs: parallel disc and flexible wedge
- Globe valves available in both y-pattern and t-pattern, as well as both globe stop and stop-check (non-return) configurations
- Provides superior shutoff service for your high pressure and temperature applications
- The parallel disc gate valve eliminates excessive leakage, thermal binding and maintenance
- Globe valve bodies have streamlined flow path to minimize pressure drop
- Stainless steel, precision ground stems to minimize packing friction
- Globes have fully fabricated yokes designed to withstand seismic activity, while offering easy maintenance and actuator mounting



HF Alkylation Valves

HF Alkylation - Gate, Globe & Check

Brand: Pacific

ASME Class: API 600 (150 - 600) API 602 (300 - 800)

Sizes: 1½" - 36"

DN: 40 - 900

Materials: Carbon Steel or Monel®

Trim: Monel® or Hasteloy C®

Connections: Flanged, Socket Weld, Threaded

Features & Benefits:

- More than 60 years of refinery-proven performance
- Dependable, long-lasting shutoff
- Low emissions, testing to API Standard 622 and EPA Method 21
- UOP Process Division Approved
- COP Licensing Listed
- Inherently fire-safe design
- High integrity shutoff design combines Teflon®/metal to metal seating for true fire-safe/bubble tight isolation



HF Alkylation - Sleeved Plug

Brand: XOMOX

ASME Class: 150 - 600

Sizes: ½" - 24"

DN: 15 - 600

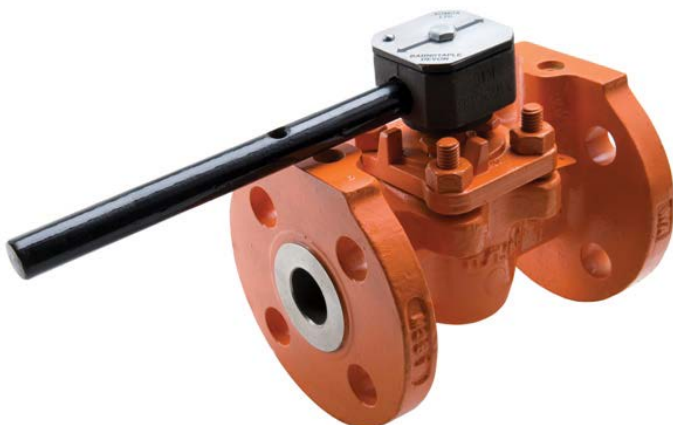
Material: Monel®

Connections: Flanged, Socket Weld, Threaded

Features & Benefits:

- More than 35 years of refinery-proven performance
- Dependable, long-lasting shutoff
- UOP Process Division Approved
- COP Licensing Listed
- PTFE seals ensure bubble-tight shutoff
- Multiple seals protect against stem leakage
- Full port available
- Full mechanically locked Teflon® sleeve/seat eliminates cold flow and provides best mean time between repair
- EPA method 21 emission testing

Note: CRANE's XOMOX Tuflin line of products also includes lined ball valves, lined butterfly valves and lined pipes, fittings and accessories used in both sulfuric and HF Alkylation.



Monel® is a registered trademark of the International Nickel Co., Inc.

Hasteloy C® is a registered trademark of Hayes International.

Teflon® is a registered trademark of E. I. du Pont de Nemours and Company or its affiliates.

Quarter Turn Valves



Wedgeplug

Brand: Pacific Wedgeplug

ASME Class: 150 - 1500

Sizes: 1/2" - 36"

DN: 15 - 900

Materials: Carbon Steel, Stainless Steel, Alloy Steel, Special Alloys

Connections: Butt Weld, Flanged, Threaded

Body Styles: Special Configurations Available

Features & Benefits:

- More than 80 years successful experience addressing hot, dirty and severe refining applications, including **delayed coking, ethylene cracking, fluidized catalytic cracking and asphalt production**
- Superior total cost of ownership in delayed coking for future maintenance and steam costs
- Provides outstanding protection from: erosion damage; solids build-up on sealing surfaces and in cavities; residual freeze up which can prevent operation and cause leakage due to packing wear
- Easy low torque operation with Wedgetorque™ lift, rotate, reseal design preventing seat wear
- In-line repair, a significant operating and maintenance cost saving benefit

Metal Seated Ball

Brand: Krombach

ASME Class: 150 - 4500

PN: 10 - 600

Sizes: 1/2" - 16"

DN: 15 - 400

Materials: Carbon Steel, Stainless Steel, Special Materials

Connections: Flanged, Welded, Threaded

Body Style: Two-Piece

Features & Benefits:

- Low repair cost (single parts exchangeable)
- Bi-directional with repeatable zero leakage
- Fire-safe and anti-static (API and BS)
- Anti-blowout stem
- Highest life span
- Best technical solutions
- Best after sales service
- Optimal torque transmission
- International DIN and ASME standards and rules
- High temperature applications to 800°C or 1500°F
- Highest reliability over 20 years of proven design and manufacturing experience



Quarter Turn Valves

Triple Offset Valves

Brands: Flowseal MS, Krombach

ASME Class: 150 - 600

PN: 10 - 100

Sizes: 3" - 96"

DN: 80 - 2400

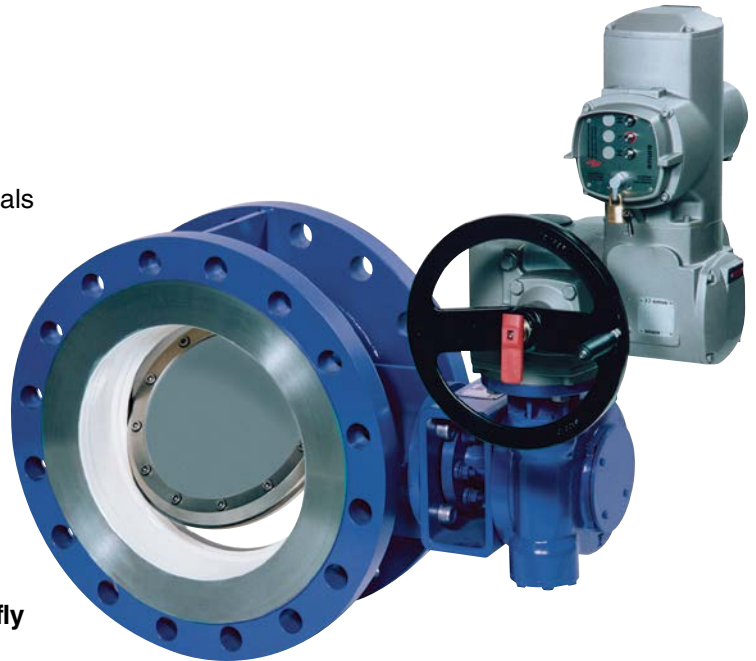
Materials: Carbon Steel, Stainless Steel, Special Materials

Body Styles: Lugged, Double Flanged Short or Long Pattern, Butt Weld Ends, Customize Ends

Features & Benefits:

- Bi-directional gas tightness
- Innovative self-centering, flexible disc sealing
- Pure graphite - spring loaded shaft packing
- Design flexibility provides customized solutions
- TA-Luft approved
- Optimal torque transmission
- Fire-safe design according to EN ISO 10497

Note: High Performance and Resilient Seated Butterfly valves also available.



Soft Seated Ball

Brands: Alloyco, CRANE, Jenkins, Krombach, Stockham

ASME Class: 150 - 2500

PN: 10 - 420

Sizes: ¼" - 24"

DN: 8 - 600

Materials: Carbon Steel, Stainless, Bronze, Brass

Connections: Threaded, Socket Weld, Soldered, Flanged, Wafer

Body Styles: One-Piece, Two-Piece, Three-Piece

Features & Benefits:

- Low repair cost (single parts exchangeable)
- Fire-safe and antistatic (API, BS, DIN)
- Anti-blowout stem
- Optimal torque transmission
- Highest reliability over 20 years of proven design and manufacturing experience
- Available in different designs (two piece and compact wafer)
- Full bore, reduced bore and T bore or L bore for 3-way ball valves
- Bi-directional
- Cryogenic applications
- Actuation mounting flange according DIN ISO 5211
- International DIN and ASME standards and rules

Quarter Turn Valves



Steam Traced & Jacketed High Performance Butterfly

Brand: XOMOX Tufline

ASME Class: 150, 300, & 600

Sizes: 6" - 48"

Materials: Carbon Steel Body with Stainless Disc optional materials available upon request

Body Style: Lug

Features & Benefits:

Steam Traced Jacketed High Performance Butterfly valves offer a full 3-point valve heating system including the stem, body, and disc. This is a must for processing sulfur or other agglomerating media (any material that must be kept above a particular temperature to avoid solidification). The customer can have years of trouble free operation and inline sealing with this valve.

- Integral, full-body steam jacket
- Integral steam tracing of shafts and disc circumference
- Steam tracing means sulfur does not solidify in the valve
- Optional NACE trim
- Optional seal bearings
- Optional double-packed stems with lantern rings
- Optional fire tested and high-temperature seat designs

Sleeved Plug

Brand: XOMOX Tufline

ASME Class: 150, 300, 600

Sizes: ½" - 16"

Materials: Carbon Steel, Stainless, Special Alloys

Connections: Butt Weld, Flanged, Threaded

Features & Benefits:

- Provides exceptional sealing to atmosphere
- Adjustable in-line seal to maintain tight shutoff
- Double stem seal is standard – enhanced stem seal options are available
- No cavities or pockets where media can collect, contaminate or build up excessive pressure
- The sleeve provides all the lubrication the valve will ever need
- Bi-directional sealing
- Steam jacketed version available
- 2-way and 3-way configuration available
- Double block & bleed configuration available



Quarter Turn Valves

High Performance Butterfly

Brands: Flowseal, Stockham

ASME Class: 150 - 600

Sizes: 2" - 48"

DN: 50 - 1200

Materials: Carbon Steel, Stainless, Aluminum Bronze

Body Styles: Wafer, Lugged (Double Dead End)

Features & Benefits:

- Soft seat design provides bubble tight shutoff
- Metal seated; ASME Class IV Leakage
- Wafer and lug body styles
- ASME pressure classes 150, 300 and 600
- Fire-safe, meets API 607, Rev. 4
- MSS-SP-68
- Unparalleled service in vacuum-to-low pressure
- Automated valves: pneumatic, electric and hydraulic



Resilient-Seated Concentric Butterfly

Brands: Center Line, CRANE, Jenkins, Krombach, Stockham

ASME Class: 150 CWP

Sizes: 1½" - 54"

DN: 40 - 1350

Materials: Carbon Steel, Stainless, Cast Iron, Ductile Iron

Body Styles: Wafer, Lugged, Double Flanged

Features & Benefits:

- Qualified for both gaseous and liquid service
- Positive shutoff bi-directionally
- Phenolic backed cartridge seat
- PTFE bushing standard
- Locking handle standard 2" - 12"
- End of line service standard on lug style
- Ease of automation
- Field repairable 2" - 24"
- Complete size range: 1½" - 54"

Flow Reversal Protection Valves



Nozzle Check (Compact & Full Body)

Brands: Compac-Noz, Noz-Chek

ASME Class: 150 - 4500

Sizes: 2" - 84"

DN: 50 - 2100

Materials: Iron, Steel, Stainless

Connections: Flanged, Hub-End, Weld-End

Standards: ASME, DIN, JIS

Features & Benefits:

- Engineered and sized for the application, not the line size
- One piece body casting (no body penetration, no fugitive emission to atmosphere)
- One moving part resulting in minimum wear and long life
- Short stroke length resulting in quick dynamic response and minimizing the reverse velocity through the valve, thus preventing water hammer risks
- Suitable for reciprocating compressor service (removal of chatter effects frequently associated with conventional check valves)
- Stable behavior due to the Venturi type design, the opening characteristics ensure a fully opened check valve
- Choice of spring torques to suit critical velocity systems and improve valve response time
- Anti-spinning device to stabilize disc
- Tight shutoff
- Maintenance free design

Engineered Check/Extraction Check

Brand: Krombach

ASME Class: 150 - 300

PN: 16 - 40

Size: 6" - 72" (others upon request)

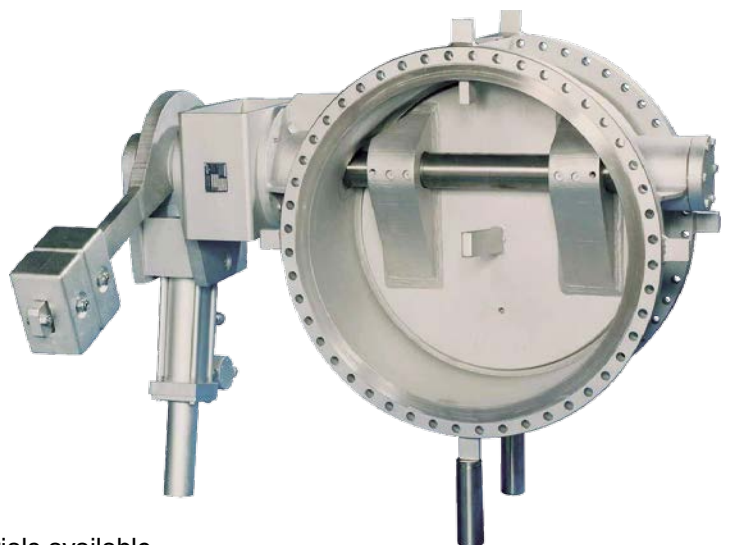
DN: 150 - 1800 (others upon request)

Material: Steel, Stainless Steel, Welded Design

Connection: Double Flanged, Butt Weld Ends

Optional Features:

- Free swinging disc
- Hardened seating surfaces
- Canted seat angle
- Hardened bushings
- Graphite packing
- Counterweights & actuation packages available
- Customized seat diameter & disc thickness to minimize pressure drop
- Special face-to-face dimensions, flanges, and materials available
- Special approvals (ASME, CRN, IBR)



Flow Reversal Protection Valves

Dual Plate Check

Brand: Duo-Chek

ASME Class: 125 - 4500

Sizes: 2" - 84"

DN: 50 - 2100

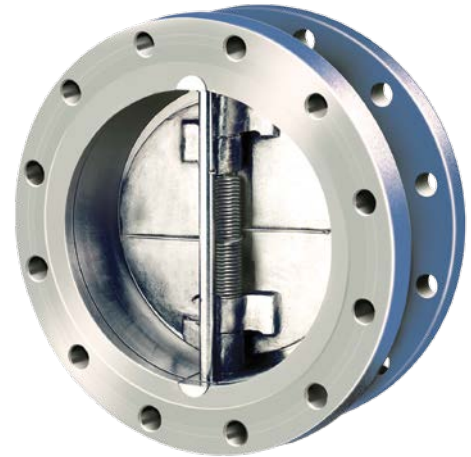
Materials: Steel, Stainless, Exotic Metals

Connections: Wafer, Lugged, Flanged

Standards: ASME, DIN, JIS, AS

Features & Benefits:

- Lightweight & compact compared to the traditional swing check valve
- Spring assisted closure (independent spring design), plates are more responsive to changes in flow conditions
- Faster response time improved by the use of independent springs and support sleeves, minimizes water hammer risks for non-slam applications
- Retainerless design available (no fugitive emission to atmosphere, valve is inherently fire-safe)
- Choice of spring torques to suit critical velocity systems and improve valve response time (can be engineered to the application)
- Wide range of body configuration & materials wafer, lug, double flanged, weld-end & hub-end connections
- Lower life cycle cost provides lower initial cost, no maintenance and low pressure loss over the long service life of the valve



Swing Checks Bolted Bonnet Check Pressure Seal Check Uni-Chek

Brands: Aloyco, CRANE, Pacific

ASME Class: 150, 300

(600 Bolted Bonnet), (600 - 2500 Pressure Seal)

Sizes: 2" - 24" (2" - 36" Uni-Chek)

Materials: Iron, Steel, Stainless

Features & Benefits:

- Used to prevent reversal of flow in horizontal pipe lines
- Swing checks can be furnished with outside lever and adjustable weight to assist disc in closing
- Tilting check valve design reduces slam by reducing the disc travel distance
- There is no tendency for the seating surfaces to gall or score, because the disc meets the flat seat squarely without rubbing contact upon closing
- CRANE cast steel swing check valves can be furnished with outside lever and adjustable weight in certain sizes, to assist in closing the valve more rapidly, thus minimizing reversal of flow and resultant surge and shock
- With the lever and weight mounted to balance the weight of the disc, the valve becomes more sensitive to low flow velocities
- Also available in a tilting disc configuration

Automated Valve Packages



Pneumatic (Direct or Bracket Mount)

Types: Double Acting, Spring Return

Brands: Revo, CRANE, CRANE Air

Sizes: ¼" - 48"

DN: 8 - 1200

Torque Range: lbf-in: 30 - 6,000,000; Nm: 12 - 677,908

Features & Benefits:

- Aluminum alloy construction provides superior corrosion resistance and durability
- Patented three-point guiding system
- Precision machining for tight tolerances to minimize gear backlash
- Standard NAMUR accessory interfaces
- ISO 5211 mounting flange

Electric (Direct or Bracket)

Brand: CRANE

Sizes: ¼" - 16"

DN: 8 - 400

Torque Range: lbf-in: 347 - 17,359; Nm: 39 - 1,960

Features & Benefits:

- Compact and lightweight
- Available for on/off or modulating duty
- All circuitry encapsulated to protect against moisture, heat and vibration
- Instantaneous motion stop circuit (modulating version eliminates hunting and overrun and guarantees 250 steps over entire 90° range)
- Self-locking final reduction worm gear holds last position if power is lost
- Valve position indicator built into actuator
- Maintenance-free design



Strainers & Specialty Products

Strainers (Y-type, T-type & Basket Type)

Brand: Krombach

ASME Class: 150 - 1500

PN: 6 - 400

Sizes: ½" - 40"+

DN: 15 - 1000+

Screen: Stainless Steel

Materials: Carbon Steel, Stainless Steel, Cast Iron, Ductile Iron, Special Materials

Body Styles: Flanged, Welded, Threaded

Features & Benefits:

- Cover lift and swivel devices
- Differential pressure connections/indicators
- Vent & drain connections/valves
- Supporting legs
- Special materials
- Special painting/coating
- Internal rubber lining
- Gasket according to TA-Luft for Fugitive Emissions
- Special sealing surface
- Oil & grease-free (for O₂)
- Heating or cooling jacket
- Special mesh sizes



Specialty Products

Sight Glasses

Through our Krombach line, we provide a variety of sight classes available up to PN 40 (in DIN dimensions only).

Vessel Bottom Valves

Krombach also makes a vessel bottom ball valve for use in critical service applications.

Bottom Drain Valves

Our Krombach line includes a very useful valve design for vessel bottom draining systems. Available up to PN 40 (in DIN dimensions only).

Engineered Strainer Assemblies

Krombach also has the capability to design and build engineered strainers for specialty applications. These are designed and manufactured to meet customers needs.

Valve Services

Focus on the Customer

When we try harder to make a customer than a dollar, we often find that the profit will largely take care of itself. We know that our competitive advantage not only depends on selling products and services to our customers, but on finding solutions with our customers that expand their capacity for growth. Everyone's job at CRANE Co., no matter what it is, is really a job to please the customer.



CRANE Energy's Valve Services has the qualifications and experience to provide a complete range of on-site and off-site repair and maintenance services, from routine valve service to HF Acid decon to a complete valve diagnostic and optimization program. We are available **24 hours a day, 7 days a week** for services on virtually any valve type, size, manufacturer to include: process valves, motor-operated valves, air-operated valves, pressure relief valves, and field instruments. Additional services include on-site in-line machining, electric actuator service, and MOV / AOV diagnostics.

The Valve Services business unit is known for its expertise in the refurbishment of CRANE Products. This reputation has grown from the implementation of a process for valve refurbishment which takes a used valve back through the manufacturing process called "remanufacturing." This same process is also used for repair of all manufacturers' products regardless of whether the repair is performed in our shop or at your site. Our field equipment includes a fleet of 44' mobile machine shops and 44' valve actuator service trailers which are equipped with portable diagnostic equipment, portable seat grinders, weld machines, hydro-pik packing extractors, as well as various tools and equipment.

Remanufacturing Process

CRANE's unique remanufacturing process includes a fully operational quality management philosophy of continuous improvement. This process benefits the customer by reducing the long term costs of ownership, promoting safety in the workplace, protecting the environment, saving raw materials and conserving energy. Remanufacturing insures the valve is serviced and rebuilt resulting in a product that is as functional and reliable as new.

Our staff of certified welders, machinists, technicians project planners, and asset managers adhere to the most demanding industry standards. Additionally, valve repair reports accompany each valve serviced in order to satisfy the requirements of OSHA 1910.119 (PSM) and our customers.

Below is a list of the types of refinery valves we service:

- Process block valves
- FCC unit slide valves
- Coker unit isolation and switch valves
- Distillation unit gate, globe, check, butterfly and plug valves
- Alkylation unit high alloy valves
- Hydrocracking unit high alloy and high pressure valves
- Hydrogen unit high alloy and high pressure valves
- Reforming unit process block valves
- Oil movements MOV valves
- Electric actuated, multi-turn, quarter turn & ESD valves (all manufacturers)
- Control valves (all manufacturers)
- Pressure relief and safety valves (ASME I and VIII)

Certifications:

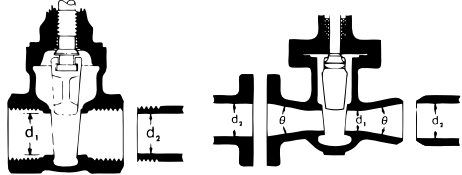
- ISO 9001 - 2000 facility
- ASME NBBI "VR" certified

VALVE SERVICES

Representative Resistance Coefficient K for Valves & Fittings

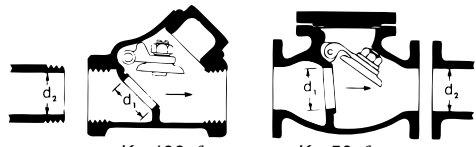
GATE VALVES

Wedge Disc, Double Disc, or Plug Type



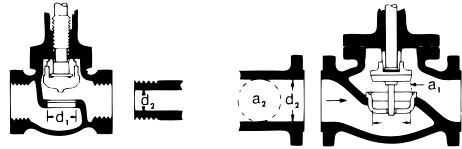
If: $\beta = 1, \theta = 0 \dots \dots \dots K_1 = 8 f_T$
 $\beta < 1$ and $\theta \approx 45^\circ \dots \dots \dots K_2 = \text{Formula 5}$
 $\beta < 1$ and $45^\circ < \theta \approx 180^\circ \dots \dots \dots K_2 = \text{Formula 6}$

SWING CHECK VALVES

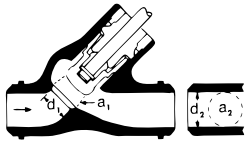


$K = 100 f_T$ Minimum pipe velocity (fps) for full disc lift = $35\sqrt{V}$
 $K = 50 f_T$ Minimum pipe velocity (fps) for full disc lift = $60\sqrt{V}$ except U/L listed = $100\sqrt{V}$

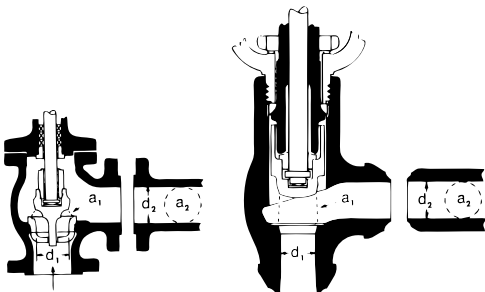
GLOBE AND ANGLE VALVES



If: $\beta = 1 \dots K_1 = 340 f_T$

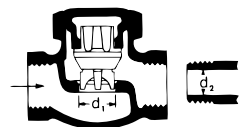


If: $\beta = 1 \dots K_1 = 55 f_T$



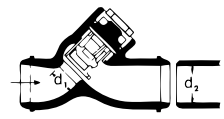
If: $\beta = 1 \dots K_1 = 150 f_T$ If: $\beta = 1 \dots K_1 = 55 f_T$
 All globe and angle valves, whether reduced seat or throttled,
 If: $\beta < 1 \dots K_2 = \text{Formula 7}$

LIFT CHECK VALVES



If: $\beta = 1 \dots K_1 = 600 f_T$
 $\beta < 1 \dots K_2 = \text{Formula 7}$

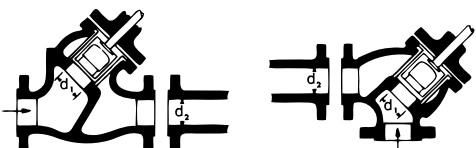
Minimum pipe velocity (fps) for full disc lift = $40 \beta^2 \sqrt{V}$



If: $\beta = 1 \dots K_1 = 55 f_T$
 $\beta < 1 \dots K_2 = \text{Formula 7}$

Minimum pipe velocity (fps) for full disc lift = $140 \beta^2 \sqrt{V}$

STOP-CHECK VALVES (Globe and Angle Types)



If: $\beta = 1 \dots K_1 = 300 f_T$ If: $\beta = 1 \dots K_1 = 350 f_T$
 $\beta < 1 \dots K_2 = \text{Formula 7}$ $\beta < 1 \dots K_2 = \text{Formula 7}$

Minimum pipe velocity (fps) for full disc lift = $60 \beta^2 \sqrt{V}$

Formula 1

$$K_2 = \frac{0.8 \left(\sin \frac{\theta}{2} \right) (1 - \beta^2)}{\beta^4} = \frac{K_1}{\beta^4}$$

Formula 2

$$K_2 = \frac{0.5 (1 - \beta^2) \sqrt{\sin \frac{\theta}{2}}}{\beta^4} = \frac{K_1}{\beta^4}$$

Formula 3

$$K_2 = \frac{2.6 \left(\sin \frac{\theta}{2} \right) (1 - \beta^2)^2}{\beta^4} = \frac{K_1}{\beta^4}$$

Formula 4

$$K_2 = \frac{(1 - \beta^2)^2}{\beta^4} = \frac{K_1}{\beta^4}$$

Formula 5

$$K_2 = \frac{K_1}{\beta^4} + \text{Formula 1} + \text{Formula 3}$$

$$K_2 = \frac{K_1 + \sin \frac{\theta}{2} 0.8 (1 - \beta^2) + 2.6 (1 - \beta^2)^2}{\beta^4}$$

Formula 6

$$K_2 = \frac{K_1}{\beta^4} + \text{Formula 2} + \text{Formula 4}$$

$$K_2 = \frac{K_1 + 0.5 \sqrt{\sin \frac{\theta}{2}} (1 - \beta^2) + (1 - \beta^2)^2}{\beta^4}$$

Formula 7

$$K_2 = \frac{K_1}{\beta^4} + \beta (\text{Formula 2} + \text{Formula 4}) \text{ When } \theta = 180$$

$$K_2 = \frac{K_1 + \beta 0.5 (1 - \beta^2) + (1 - \beta^2)^2}{\beta^4}$$

$$\beta = \frac{d_1}{d_2} \quad \beta^2 = \left(\frac{d_1}{d_2} \right)^2 = \frac{a_1}{a_2}$$

Subscript 1 defines dimensions and coefficients with reference to the smaller diameter. Subscript 2 refers to the larger diameter.

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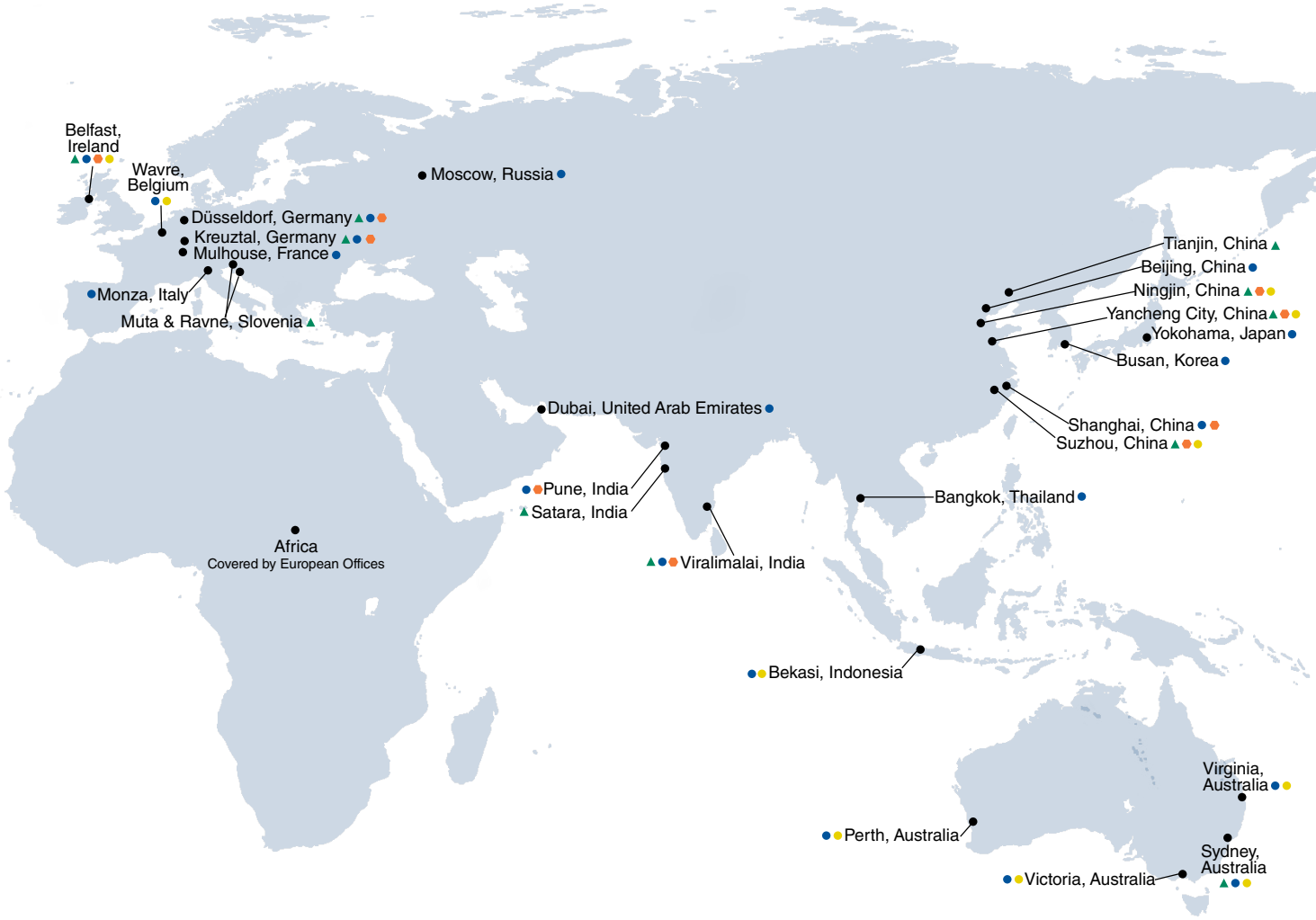
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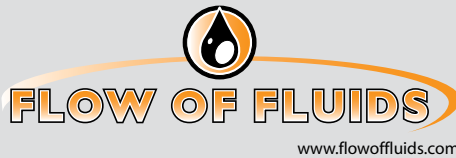
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