

Complete valve solutions for the Delayed Coker industry



- Four-way switch, isolation ball, ring, and hydrodrill valves
- Programmable logic controller and local control panels

VELAN

VELAN AT A GLANCE

History

- Founded in 1950

People

- Over 1,900 employees

Product line

A world-leading range of valves across all major industrial applications:

- Cast steel gate, globe, check, and ball valves
- Forged steel gate, globe, check, and ball valves
- Triple-offset butterfly valves
- Knife gate valves
- Severe service valves
- Bellows seal valves
- Steam traps

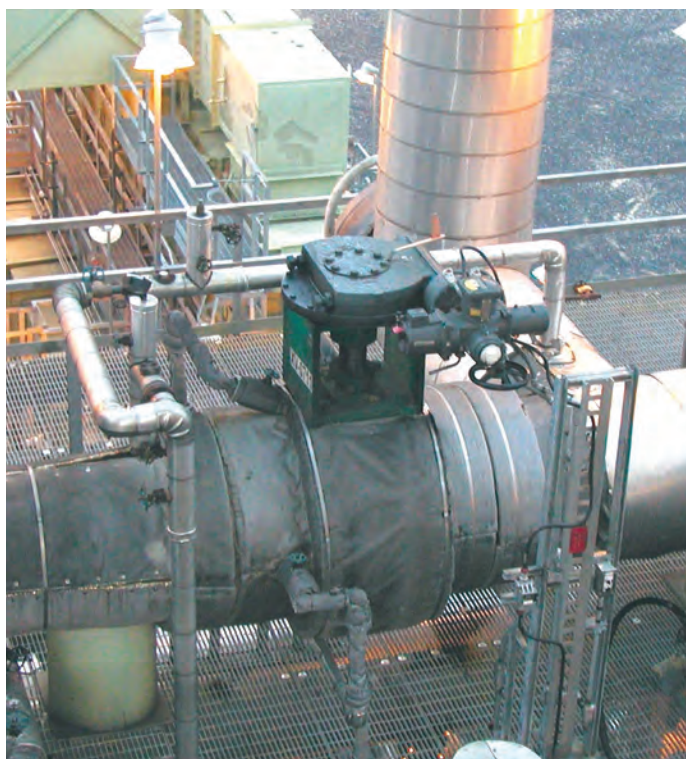
Primary industries served

- Fossil, nuclear, and cogeneration power
- Oil and gas
- Refining and petrochemicals
- Chemicals and pharmaceutical
- LNG and cryogenics
- Marine
- HVAC
- Mining
- Water and wastewater
- Pulp and paper
- Subsea

Velan holds major applicable approvals:

- ASME Section III N and NPT for nuclear valves (since 1970)
- ISO 9001 (since 1991) and ISO 14001
- OHSAS 18001
- PED
- SIL
- GOST
- API 6A and API 6D
- TA-Luft
- Comprehensive quality programs that are compliant with the most stringent industry standards such as ISO 9001, API Q1, API 624, NCA 4000, ASME NQA-1, and 10 CFR 50 Appendix B.
- Velan has been surveyed and audited by leading organizations around the world such as Bureau Veritas, API, ASME, NUPIC, Newport News Shipbuilding, and DCMA.
- Total Process Improvement Program, including Lean Manufacturing and Six Sigma.

A world leader in valve design, engineering solutions, and manufacturing



A large NPS 30 (DN 750) overhead vapor valve installed in 2000 in a delayed coker on the Gulf coast of the U.S.A.

Section III, ISO 9001:2000, PED, and API 6D. Many prominent companies have established partnerships or global supply agreements with Velan.

A global manufacturing leader

Velan uses the latest automation technology, including CNC machines and many special-purpose transfer machines, enhanced by proprietary production techniques. Thanks to a wide range of equipment, we can efficiently handle highly customized orders as well as large production runs.

Velan employs over 1,900 professionals, the majority of whom are located in North America. International production centers are complemented by a global sales and distribution network, offering personal customer service and quick access to stock worldwide. Because customer requirements for immediate deliveries have escalated in the last few years, Velan has opened a number of quick-ship warehouses in North America to supplement the inventories of our stocking distributors.

Total quality commitment

Velan is totally committed to offering products and service that exceed customer expectations. All Velan valves are designed and manufactured with an emphasis on low emissions, safety, simple maintenance, ease of operation, and above all, long, and reliable service life. In fact, several years ago when a leading North American repair shop did an analysis on the reliability and repairability of commodity valves, Velan finished first. Whether we are manufacturing commodity valves or specialty valves, we deliver excellent long-term value to our customers.

Leading the way...

Velan is one of the world's largest manufacturers of industrial steel valves, recognized as a leader in quality and innovation.

Founded by A.K. Velan in 1950, our company leverages advanced engineering capabilities and innovation to continuously expand our offering of industrial valves.

Today, Velan gate, globe, check, ball, triple-offset, knife gate, and engineered severe service valves and steam traps are installed throughout the world, handling diverse applications in cogeneration, fossil, nuclear power, oil and gas, refining and petrochemicals, chemicals and pharmaceutical, pulp and paper, LNG and cryogenics, marine, mining, water and wastewater, and HVAC industries.

Engineered solutions

Velan's Engineering Group has vast experience, sophisticated software, and testing tools that enable us to find solutions to any customer challenge.

Whether it is for valves to handle liquid helium at -458°F (-272°C) in the world's largest particle accelerator at CERN, Geneva; four-way switch coker ball valves to handle one of the refining industry's toughest services; or valves for main steam isolation service in an operating nuclear power plant, Velan has been selected by most of the world's leading engineering construction firms and industrial end users. A long-standing commitment to quality has kept Velan at the forefront of industry standards.

Velan holds all major industry certifications, including ASME

Over 170 delayed cokers worldwide chose Velan coker ball valves (over 2,000 valves in-service)



Over 30 years experience and worldwide references

The first switch valve built to our design was installed in 1983. It operated 10 years before it was taken out of service for evaluation. The internal components were in perfect condition. The valve was reinstalled using the original components.

Velan delayed coker valves are currently installed in over 170 delayed coker units (DCU) in 35 countries. This includes over 300 four-way switch valves, some of which have been in service for over 25 years.

Over 2,600 isolation valves are also currently installed in the following applications:

- Inlet transfer line
- Bypass
- Drain
- Quench
- Heater isolation
- Overhead vapor
- Blowdown
- Backpressure control
- Vent
- Hydrodrill water cutting

We have also supplied over 450 logic control panels with hard-wired or Programmable Logic Controller (PLC) driven logic. Many of our panels now interface with a PLC or directly with a Distributive Control System (DCS) for remote indication or operation.

These valves are not modified commodity valves. They are specifically designed for delayed coker applications.

All valve sizes and classes shown in this brochure have been designed and built and are currently installed and operating in a delayed coker unit.

(A reference list is available upon request)

Velan's delayed coker products

Four-way switch valves

NPS 3–18 (DN 80–450)
ASME Classes 300–900



Isolation ball valves

NSP 2–36 (DN 50–900)
ASME Classes 150–900



Ring valves

NPS 14–36 (DN 50–200)
ASME Classes 150–300



High pressure hydrodrill valves

NPS ¾–12 (DN 12–300)
ASME Classes 1500–2500

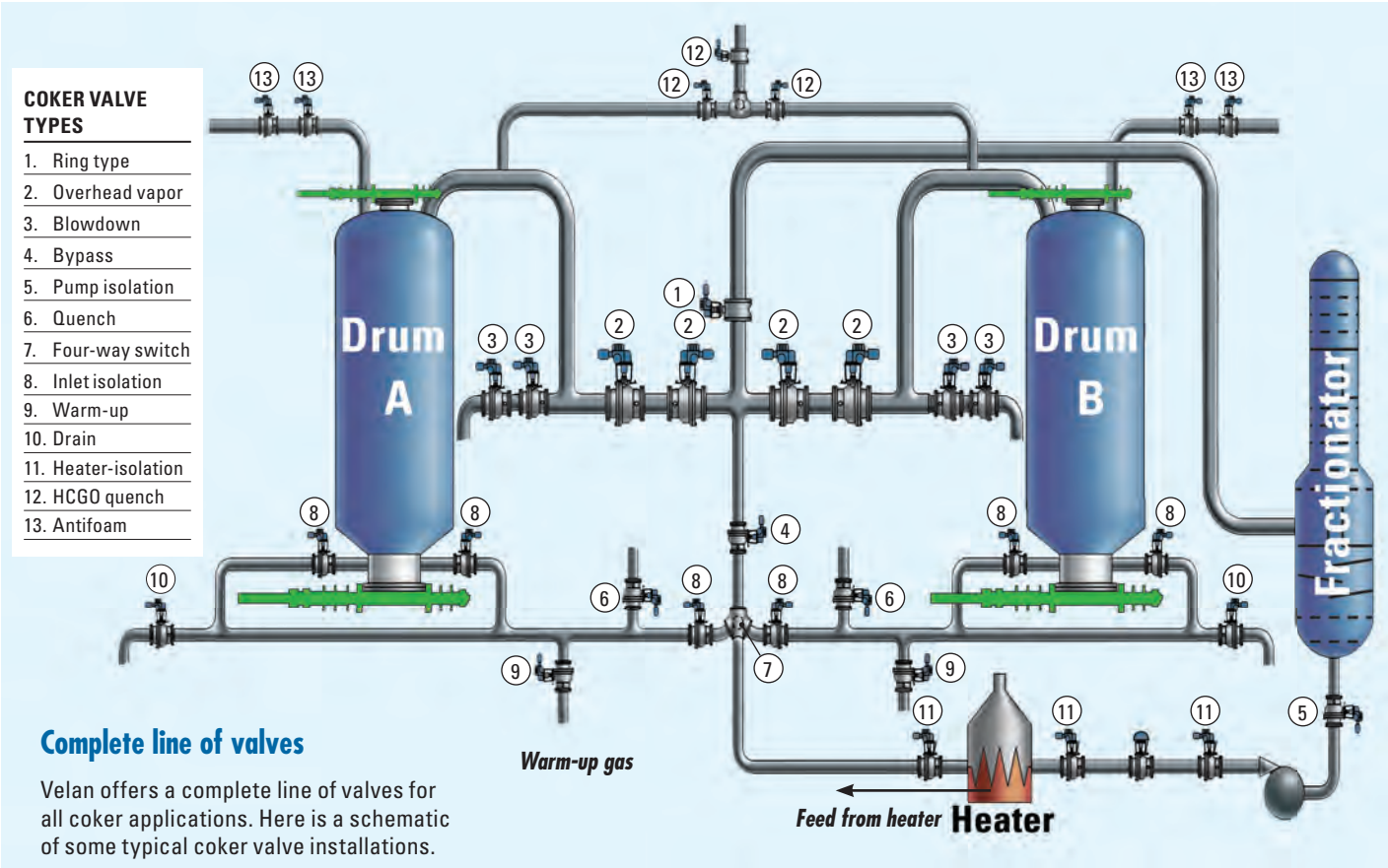


Programmable logic controller and local control panels

Hard wired or PLC driven



Velan delayed coker ball valve applications



Design feature comparisons

Velan ball valves offer a number of advantages for delayed coker service, for example:

ADVANTAGES	VELAN BALL	MODIFIED COMMODITY BALL	PLUG
EXPERIENCE	Over 2,000 valves are currently installed in delayed cokers worldwide. Valves have been in service since 1983.	Few installations and, in some cases, a short time period in service make it difficult to evaluate performance.	Certain essential design features have limited their use in newer installations.
AUTOMATION RELIABILITY	Single 90° rotary motion allows for simple, inexpensive and reliable actuation	Few installations and, in some cases, a short time period in service make it difficult to evaluate performance.	Automation requires accommodating linear and rotary motion. The mechanism to achieve this continues to be a maintenance concern.
SEALING	Sturdy bellows maintain constant ball to seat contact, and as a result avoid a buildup of coke on the sealing surfaces. A positive seal is maintained through the life of the valve.	Seat loading methods for delayed coker applications have yielded mixed results: 1. Weak springs allow the buildup of coke between the ball and seat, which may result in poor sealing. 2. Belleville type springs load adequately, but have shown some difficulties in adapting to high temperature coking environments.	The “lift and reseat” method allows for the accumulation of coke between seat and plug every time the plug is lifted. In fact, the coke is compacted into the seating area every time the valve is resealed. The ensuing coke buildup may result in poor sealing.
FULL BORE	Standard: Valves are lightweight and compact.	Available: In some cases valves are 10 to 50% heavier.	Available: Valves are substantially larger and up to 50 to 200% heavier.
MAINTENANCE	Seats are easily and quickly replaced.	Certain manufacturers rely on integral seats. These seating areas are difficult to service as they often form an integral part of the body end. As a result, the end user may have to rely on a spare body end, which is costly and still requires lapping. Depending on the valve’s size, lapping may be difficult.	Seating areas that require weld repair may be difficult to service as they form an integral part of the body. Substantial weld repair of C5 or C12 castings necessitates PWHT, which may further complicate the process of repairing previously machined surfaces.

The above comparison table is intended to highlight some of the advantages of Velan coker ball valves and is not intended to downgrade competitors designs.

Four-way switch valves

Valve range

- NPS 3–18 (DN 80–450)
ASME classes:
150–300–600–900

Materials

Valves are generally supplied in:

- A217 Gr.C5 and C12
- A351 Gr.CF8M and CF8C

As well as WCB for lower temperature applications.

Lantern ring

A lantern ring with steam block and extra deep stuffing box minimizes the risk of leakage occurring through the packing chamber.

Sturdy one-piece ball and stem

The sturdy one-piece ball and stem provides optimal strength, and is well suited to applications where fouling due to coke fines are a concern.

The one-piece design avoids the problems generally associated with the more conventional two-piece ball and stem, which is highly susceptible to solids buildup in the ball-stem joint and a resulting increase in operating torques.

Automation

The electric, hydraulic or pneumatic actuator is selected in function of coker service. A large torque safety factor ensures the valve will cycle under the most stringent conditions. When selecting actuators, special attention is paid to the coker deck environment.

The stem coupling

The stem coupling is designed to perform three main functions:

- Protect against “overtorquing” of the stem.
- Protect the actuator components.
- Protect against an unintentional switch into bypass.

Steam purges

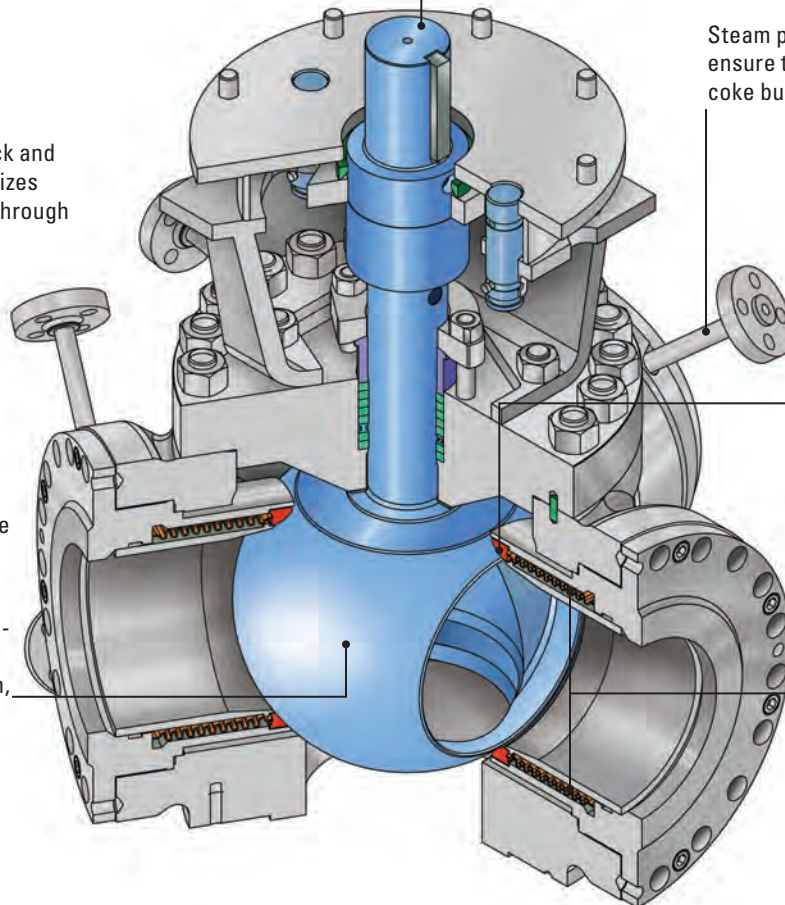
Steam purges to bellows and body area ensure the valve cavities are kept free of coke buildup.

Scraper type seats

Velan’s unique seat design scrapes coke buildup from the surface of the ball during each cycle. Seats are hard-faced to ensure a long, trouble-free service life.

Strong bellows

Strong bellows offer a unique seat loading design that maintains the floating seats in constant contact with the ball and ensures a positive seal.



Over 300 Velan four-way switch valves in delayed coker installations

The first switch valve built to our design was installed in 1983. It operated 10 years before it was taken out of service for evaluation. The internal components were in perfect condition. The valve was reinstalled using the original components.

Since then we have installed over 300 delayed coker switch valves worldwide.



Isolation ball valves

Valve range

- NPS 2–18 (DN 50–450)
ASME classes:
150–300–600–900
- NPS 20–36 (DN 500–900)
ASME classes: 150–300

Materials

Valves are generally supplied in:

- A217 Gr.C5 and C12
- A351 Gr.CF8M and CF8C

As well as WCB for lower temperature applications.

Lantern ring

A lantern ring with steam block and extra deep stuffing box minimizes the risk of leakage occurring through the packing chamber. Live-loading is available upon request.

Scraper type seats

Velan's unique seat design scrapes coke buildup from the surface of the ball during each cycle. Seats are hardfaced to ensure a long, trouble-free service life.

Strong bellows

Strong bellows offer a unique seat loading design that maintains the floating seats in constant contact with the ball and ensures a positive seal.

Automation

The electric, hydraulic or pneumatic actuator is selected in function of coker service. A large torque safety factor ensures the valve will cycle under the most stringent conditions. When selecting actuators, special attention is paid to the coker deck environment.

The stem coupling

The stem coupling is designed to perform two main functions:

- Protect against "overtorquing" of the stem.
- Protect the actuator components.

Sturdy one-piece ball and stem

The sturdy one-piece ball and stem provides optimal strength and is well suited to applications where fouling due to coke fines are a concern.

The one-piece design avoids the problems generally associated with the more conventional two-piece ball and stem, which is highly susceptible to solids buildup in the ball-stem joint and a resulting increase in operating torques.

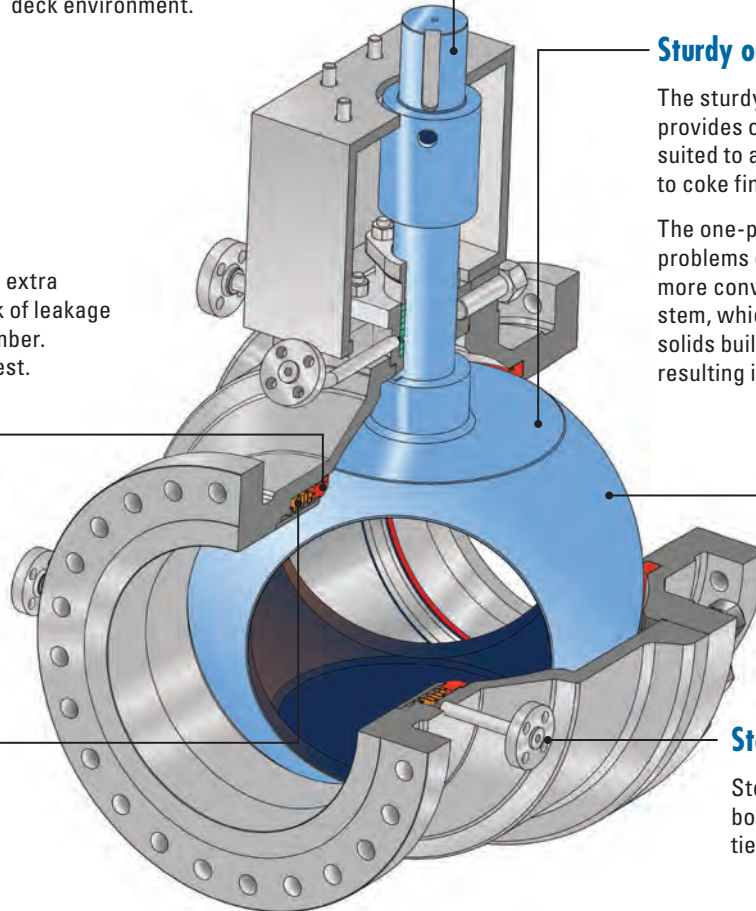
Full bore

Valves are full bore, High Cv and light weight.

High quality castings
RT & MT inspected per
ASME B16.34.

Steam purges

Steam purges to bellows and body area ensure the valve cavities are kept free of coke buildup.



Over 2,600 of this type of Velan isolation ball valve in delayed coker installations

The valves shown in the adjacent photograph were installed as part of a de-bottleneck project aimed, among other things, at increasing the units' liquid yield. As this was an existing structure it was important to minimize piping changes. Because the existing valves were 70% plug valves, the engineering firm evaluated full bore plug valves, but found the units weights to be

substantially higher. Rather than evaluate the structural changes required in order to accept these heavier, larger units the end user opted to use our lighter full bore ball valves. As a bonus, the ball valves provided a better seal than was possible with the previous valves. Two years later the same end user installed NPS 24 (DN 600) Velan overhead ball valves on their number 2 coker.



Ring valves – for backpressure control

Valve range

- NPS 14–36 (DN 350–900)
ASME class 300

Materials

Valves are generally supplied in:

- A217 Gr.C5 and C12

Automation

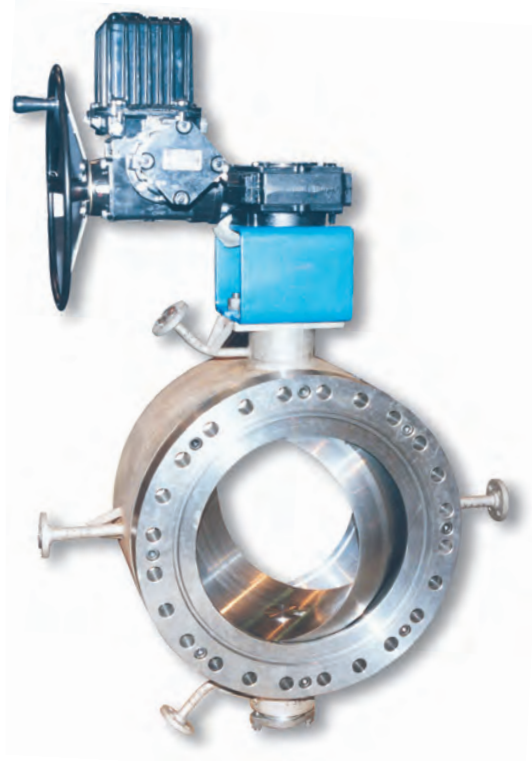
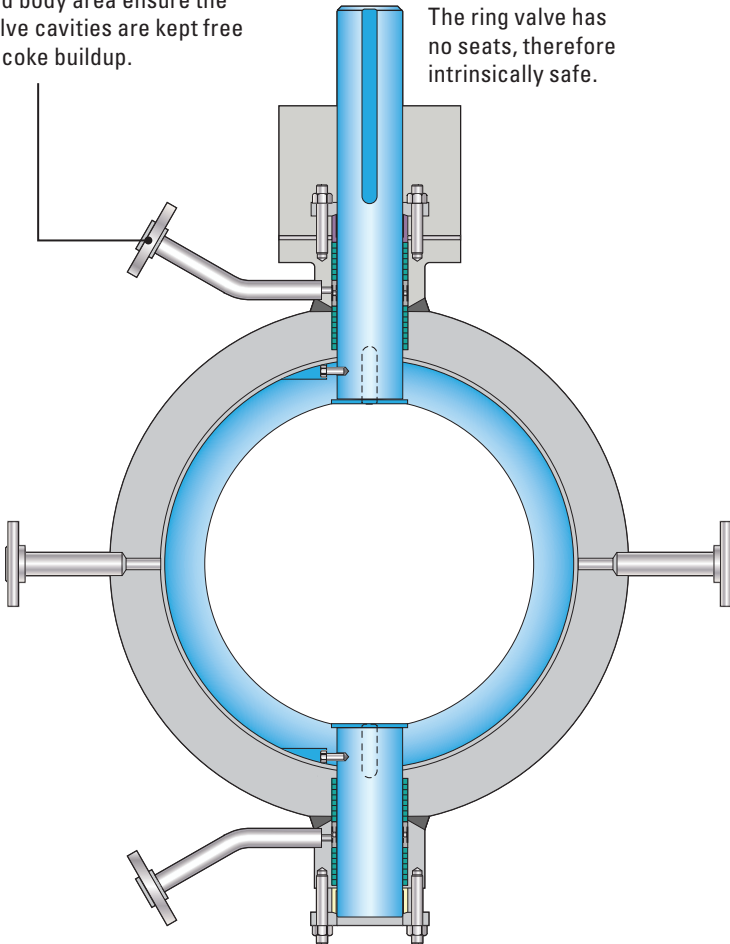
The electric, hydraulic or pneumatic actuator is selected in function of coker service. A large torque safety factor ensures the valve will cycle under the most stringent conditions. When selecting actuators, special attention is paid to the coker deck environment.

Steam purges

Steam purges to bellows and body area ensure the valve cavities are kept free of coke buildup.

Ring valves are an intrinsically safe design

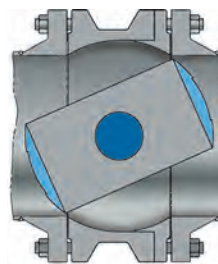
The ring valve has no seats, therefore intrinsically safe.



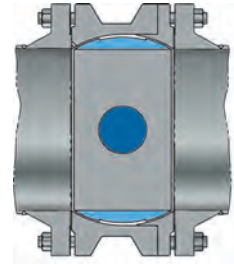
Excellent throttling characteristics

The ring valve is a throttling valve. As a result, it does not require a mechanical stop in order to avoid full closure and the resulting drum overpressurization.

In the “maximum obstruction” position, the valve provides a pressure drop equals to a butterfly valve set at 15° open. The valve in the image shown is in the minimum pressure drop position.



Maximum pressure drop position



Minimum pressure drop position

Over 120 Velan ring valves in delayed coker installations

This patented Velan ring valve was installed to replace an existing butterfly valve. The end user required the use of this valve only when shorter cycle times required quicker drum “backwarming”.

The end user could not justify the high pressure drop across the butterfly valve with his efforts to increase liquid yield. They required a valve with good throttling characteristics, but which provided no obstruction

in the full open position and the ring valve fully met these requirements.



High pressure valve (hydrodrill valve)

Valve range

- NPS ¾–12 (DN 20–300)
ASME class 2500

Materials

Valves are available in A105 or low temperature steels with stainless steel internals. Both uni-directional and bi-directional are available.

Over 100 Velan hydro-drill valves in delayed coker installations

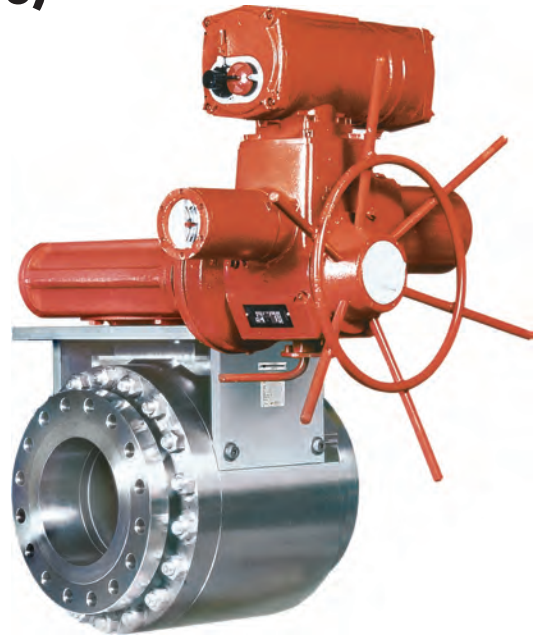
Automation

General supplied with pneumatic or electric actuators that can be integrated into an existing OEM Logic.

Full bore ball valves

Velan Securaseal® full bore ball valves are generally installed in high pressure applications where the highly erosive and sometimes corrosive reclaimed waters (used to drill the coke out of the drum) can significantly shorten valve life.

In order to ensure long, leak-free, reliable operation all valve wetted parts are hardfaced.



HOW TO ORDER COKER METAL-SEATED BALL VALVES

Type of connection	Size of connection	Pressure rating	Port	Type	Body	Trim	Coatings	Special service
A	B	C	D	E	F	G H	I	J
	 				 	 		
F	1 6	— 2	1	K	0 9	— C A	2	R

Example: Flanged B16.5 (B16.47 Series A), NPS 10, 600 Class, full port, split-body, one bellow seat and one fixed seat, C12 Body, CA6NM one-piece ball/stem, chrome plated ball and CoCr alloy seat, coker design.

A	TYPE OF CONNECTION
F	Flanged B16.5 (B16.47 series A)
P	Flanged B16.47 series B (API 605)
R	Flanged ring joint

B	SIZE OF CONNECTION	Sizes shown NPS (DN)
04	¾ (20)	10 3 (80) 16 10 (250) 21 18 (450) 26 26 (650) 34 34 (850)
05	1 (25)	12 4 (100) 18 12 (300) 22 20 (500) 28 28 (700) 36 36 (900)
07	1½ (40)	14 6 (150) 19 14 (350) 23 22 (550) 30 30 (750)
08	2 (50)	15 8 (200) 20 16 (400) 24 24 (600) 32 32 (800)

C	PRESSURE RATING
0	150
1	300
2	600
3	1500
4	2500
7	900

D	PORT
0	Reduced port
1	Full port
4	Full port, unidirectional

E	TYPE (valve)
E	Ring
F	Four-way switch: split-body, 4-way, floating ball, four bellow seats
K	Isolation: split-body, 2-way, floating ball, one bellow seat and one fixed seat
R	Type R for hydrodrill application: split-body, floating ball, one belleville-loaded seat and one fixed seat

Standard trim codes	E	F	G	H	I	J
Ring valve	E	04 09	Y	G	X	R
Four-way switch valve	F	04 09	C	A	2	R
Isolation valve	K	04 09	C	A	2	R
Type R valve for hydrodrill application	R	02 13 32 54	E or A	E	B	W

F	BODY MATERIAL	Other materials available upon request
02	A105, WCB	13 F316 SS, CF8M ⁽¹⁾ 31 LCC
04	F5, C5	15 F347, CF8C 32 F51
09	F9, C12	28 F317, CG8M 54 LF6

G	TRIM MATERIAL (ball/seat)
A	410 SS
C	CA6NM
G	Inconel 625
Y	C12
B	316 SS
E	630 SS (17-4PH)
H	Nitronic 50

H	TRIM MATERIAL (stem)
A	One-piece ball/stem
E	630 SS (17-4PH)
G	410 SS

I	COATING (ball/seat)	Note: Seat and ball same unless noted.
B	Chrome carbide	2 Ball: Chrome plated / Seat: CoCr alloy
X	No coating	6 Ball: Chrome carbide / Seat: CoCr alloy

J	SPECIAL SERVICE
R	Coker
I	NACE ⁽²⁾ Sour gas
W	Hydrodrill (water cutting)

Note: CoCr alloy as used throughout this catalog refers to cobalt chrome hardfacing alloys as supplied by Kennametal Stellite™, and other approved manufacturers.

(1) Forged F316 material code "13", is not suitable for temperatures above 1000°F (538°C) as it is dual certified (F316/F316L).

(2) Velan valves for NACE service (as indicated by figure number and/or description) comply with the metallurgical requirements of the current NACE MR0103 and MR0175 / ISO 15156. Material selection is dependent on the actual environment and it is therefore the equipment End User's responsibility to ensure that the materials are suitable for the intended service. Please contact Velan for any questions regarding the application of our products for NACE service.

Complete, turnkey automation solutions for safe coker valve operation

Fully automated Velan switch valves

Velan supplied the first, fully automated switch valve controlled from a local panel some 30 years ago. Shortly after that we supplied a control panel that included interlocks to the inlet transfer line valves in order to avoid dead ending of the pump.

Over time we worked with the world's leading licensors in order to provide a comprehensive interlock system that allowed for the automated operation of valves with a minimum of risk.

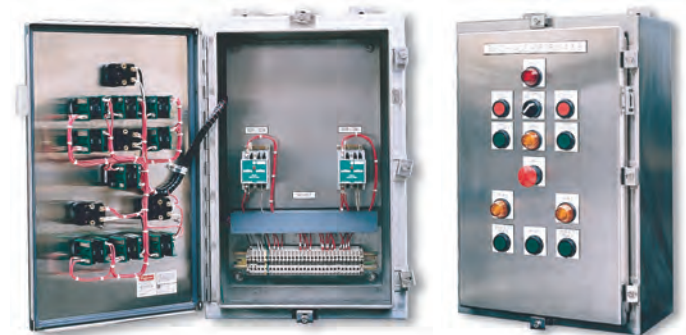
Velan has now been offering fully automated four-way switching and isolation valves for the coker deck for over 30 years. We have also been supplying modulating backpressure control valves with full feedback capability. Each of these valves is operated by a local control panel (LCP) which provides safety interlocks that are either hardwired to the actuator and DCS or function through a standalone PLC for more comprehensive controls and interlocking.

Turnkey valve automation solutions

Velan provides turnkey valve automation solutions that include intrinsically safe panels as well as SIL rated components. Systems can be fully redundant and may provide a number of options including field touch screen interface diagnostics and remote operation capability.

Velan has a full staff in-house capable of handling every detail of these complex integrations and offers a full factory acceptance test (FAT) where valves, actuators, panels and PLC are tested as a system to ensure proper functioning prior to shipment. End users are often invited for training on these systems during the FAT.

Our field team then performs a site acceptance test (SAT) and assists in the commissioning and startup of the unit. Velan also provides full training packages for operators and maintenance personnel.



Velan supplies hard-wired or PLC driven panels to operate as stand-alone units or through a PLC/DCS for safe, sequential valve operation.

Focus on delayed coker applications

Delayed coking technology

Velan has maintained a group of engineers entirely dedicated to delayed coking technology for over 25 years.

Working closely with the end users as well as the technology providers has given us the possibility to maintain designs that are well adapted to the changing needs of the delayed coker industry.

Over the last few years we have been able to address issues arising from significantly shorter cycles and increasingly exotic crude slates.

Preventive maintenance

Velan provides baseline values and can work with the coker Units maintenance staff to implement a preventive maintenance program that includes periodic torque verifications, steam evaluations and general valve performance. These programs, already implemented in many refineries can substantially lower the cost of turnarounds and significantly reduce the possibility of unscheduled shutdowns.

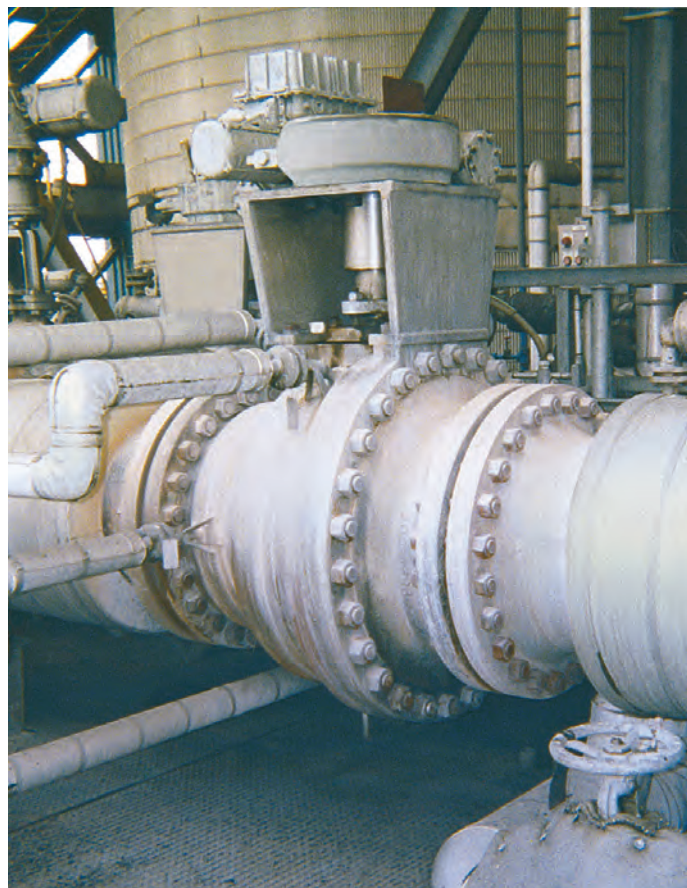
Turnaround preparation

Velan provides assistance during the preparation of a major turnaround by providing an assessment of the valves and actuators and expected spare parts requirements. We also assess local service shop capabilities and can work with the end user in preparing additional service shop capacity if required. These services ensure that all of the correct materials are available and that approved and knowledgeable personnel are on hand for the turnaround.

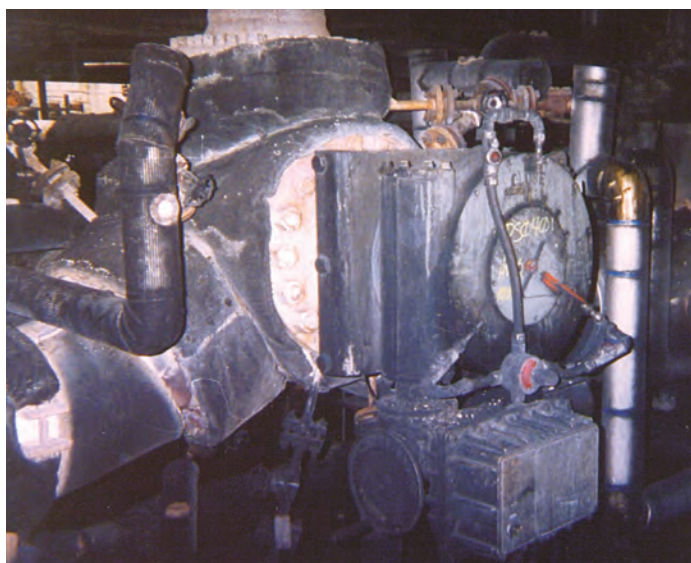
Velan also maintains coker-trained personnel in Asia, Europe, South America as well as North America who are available for turnaround support.

Spare parts

Locally available in Canada, U.S.A, Europe, and Asia.



These NPS 24 (DN 600) full bore overhead vapor valves have been in uninterrupted service for over 6 years. In an effort to maximize liquid yield delayed cokers worldwide are opting for larger overhead lines. In fact some of the newer DCU's have already installed our NPS 36 (DN 900) valves for overhead and blowdown service.

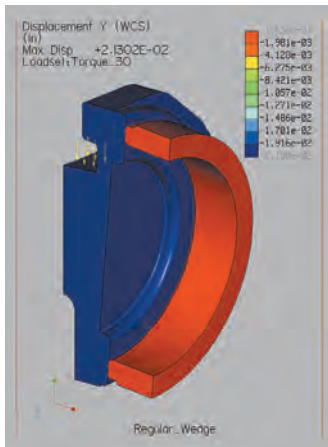


A typical switch valve provides uninterrupted performance from turnaround-to-turnaround. In many cases a switch valve can exceed 10 years of continuous operation.



NPS 30 (DN 750) overhead vapor valve prior to insulation.

Engineered solutions



Stress calculations are done using 3D Finite Element Analysis (FEA) software, like ANSYS and Pro/Mechanica, with 3D models developed in Pro-Engineer.

Engineering expertise

Over the years, Velan has brought together a strong team of professional engineers with extensive experience in critical applications. Using advanced software applications including Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD), and 3D Solid-Modeling, Velan's engineers design superior quality valves that meet the most demanding performance requirements. Our R&D facilities, equipped with steam boilers, superheaters, flow loops, and cryogenic test stands, enable us to run comprehensive testing programs.

Velan also has a long-standing history of partnering with major architects/engineers and end users to develop innovative solutions for their valving needs.

ENGINEERING SERVICES

- Stress analysis and finite element analysis
- System upgrades
- Flow analysis
- Weak link analysis
- Root cause failure analysis
- Commissioning
- Troubleshooting
- Application engineering
- Certified genuine spare parts
- Valve repair, refurbishment, and upgrading
- Custom testing and test data analysis (NDT, X-Ray, UT, etc.)

Aftermarket

Velan Aftermarket offers a complete range of Velan OEM aftermarket services, including Velan Field Engineering Services, Velan OEM Spare Part and tool support, and Velan maintenance training courses.

Velan Field Engineering Services offers customers in-line service, maintenance, and product support on all our valve products. Our team of engineers and technicians are equipped with Velan OEM tools, lapping equipment and Velan OEM parts. With over 60 years of valve servicing experience to nuclear and thermal power stations, refining and petrochemical plants, navy fleets, and many other industries, Velan offers true OEM service. Furthermore, Velan has a network of authorized service shops across the globe, ensuring we can meet your maintenance and service requirements whatever your location. We also have a complete library of Velan maintenance manuals.

Velan OEM spare part and tool support offers support on all Velan products. You are ensured of Velan OEM parts built to the same configuration as originally supplied. We can advise on recommended spare parts and on new projects we can advise Spare Part Interchangeability Reports (SPIRs).

Velan also offers maintenance training courses on our entire product line to ensure customers and service shops are aware of the latest and proper maintenance techniques on Velan products.

A wide range of actuation options

Velan and our distribution channels offer OEM actuators that meet the most demanding on/off and control applications.

Velan offers a wide range of products to address each customer application, from multi-turn electric actuators on rising-stem valves to scotch-yoke or double-opposed piston actuators on rotary valves.

Whatever your industrial valve needs, we can meet them with the highest quality products.

SIL capable

Velan in association with Exida have assessed coker designs for Failure Modes, Effects, and Diagnostic Analysis (FMEDA) to meet the needs of system designers for reliability data. Velan offers the capability to integrate the valves into a Safety Instrumented Function (SIF) and evaluate Partial Valve Stroke Test (PVST) requirements.

AUTOMATION CAPABILITIES

- Electric, hydraulic, and pneumatic actuation
- Pre-installation of switches, positioners, thrust and torque sensors, signal conditioners
- Integral control actuation and two-wire control
- OEM actuators through Velan stocking distribution or other actuators of your choice
- Overrides, limit stops, and most standard accessories



Velan supplies turn-key automated packages with integral control actuation for two wire and closed loop systems (Profibus, Modbus, Fieldbus, etc.).

The most comprehensive line of industrial forged and cast steel gate, globe, check, ball, butterfly, and knife gate valves and steam traps.

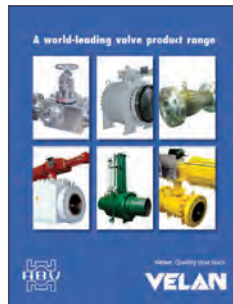
ASME pressure classes 150–4500 in carbon, alloy, and stainless steel



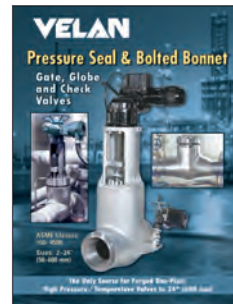
BRO-FLB



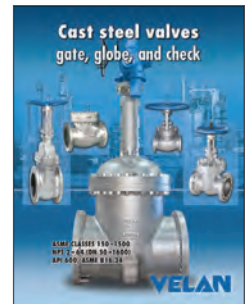
SAS-FLB



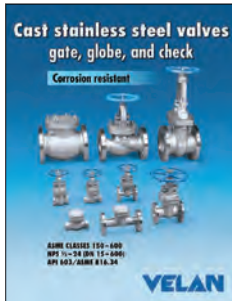
ABV-FLB



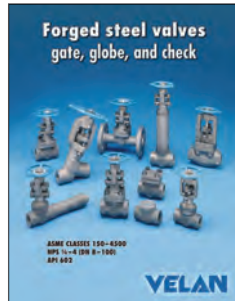
VEL-PS



CAT-CSV



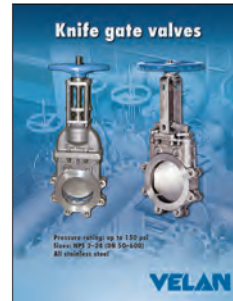
CAT-CSSV



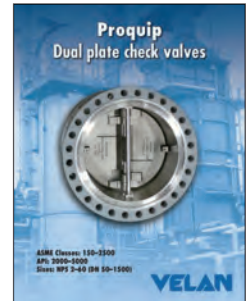
CAT-SFV



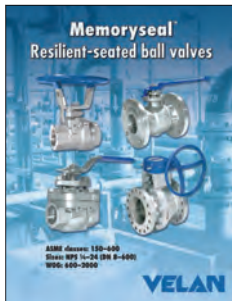
CAT-BG



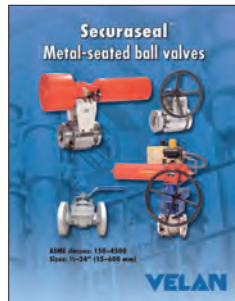
CAT-KGV



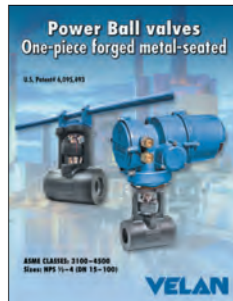
CAT-DPCV



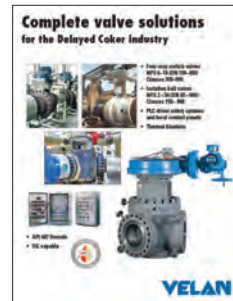
CAT-BV



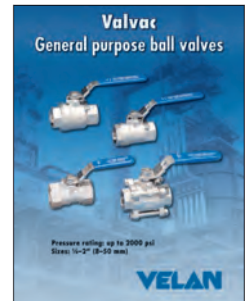
VEL-MS



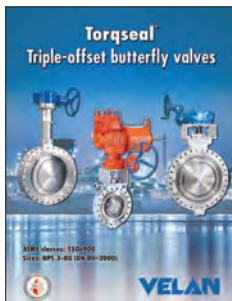
CAT-PBV



BRO-CBV



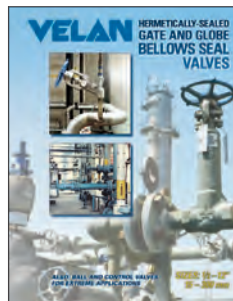
CAT-GPBV



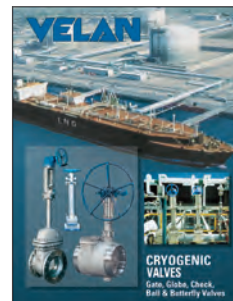
CAT-BF



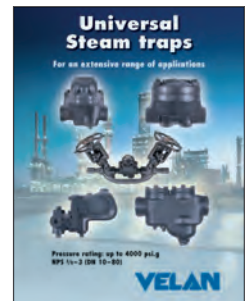
SAS-CCV



VEL-BS



VEL-CRYO



CAT-ST

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