



VENT-TECH WATER AIR RELIEF VALVES

with Designed Air Passage Science (DAPS)



- Air Release
- Vacuum Protection
- Surge Control



MADE IN THE USA

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*Product Catalogue
Summer 2010*

International Valve Introduces New Technology
Vent-Tech Combination Water Air Relief Valve

Summer 2010

International Valve has been servicing and marketing advanced air valve technology to the North American market since 1996. In its tradition of innovation and providing solutions to its customers – municipalities, engineers and consultants – International Valve has developed significant advancements in multi-orifice air relief valve technology which are now available in its exclusive product line of **Vent-Tech Combination Water Air Relief Valves**.

With over 100 years of operating and technical experience, our management team at International Valve understands its customer needs, in the field, where performance counts. Using our proprietary “*Designed Air Passage Science*” (DAPS), our new Vent-Tech technology takes the multi-faceted float design to new levels of greater efficiency, with lower operating and maintenance costs.

For your water and wastewater needs, our Customer Service and product offerings use a ‘systems approach’, providing benefits to new and existing pipeline infrastructure, including:

- Site assessment and design support using “*Designed Air Passage Science*” (DAPS)
- Vent-Tech Combination Sewage Air Relief Valves (see separate product catalogue)
- **Vent-Tech Combination Water Air Relief Valves:**
 - **WTR-C Series** - High Air Flow Intake and Discharge with Surge Control
 - **WTR-B Series** - High Air Flow Intake and Controlled Air Out
 - **WTR-V Series** - High Air Flow Discharge with Surge Control (No Air Intake)
- Odor control treatment technology for removal of hydrogen sulfide (www.odorcontroltech.com)
- Fiberglass “Drop-in-Place” assembled Valve Vaults
- Customer support 24/7 (815) 744-9330
- Local sales representation (www.internationalvalve.com)

International Valve is a family owned and operated business, serving your water and wastewater air relief valve needs. Whether your concern is surge, water hammer, leakage, premature valve closure, or air release - our pledge is to provide you with the right solution. First time. Every time.

Vent-Tech Combination Water Air Relief Valves
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Vent-Tech Combination Water Air Relief Valves

Product Overview

Background

Water pipeline operations vary widely in the field, from steady state conditions to pump stoppage, pump start up to valve closure. Water hammer (hydraulic shock or transient pressures) occurs when there is a sudden change in the direction or velocity of water, and the magnitude of the transient condition depends on the flow rate velocity, pipeline material and sizing, and operation of the infrastructure (pumps, air valves, control valves, etc).

When water hammer is not controlled, pipes and check valves can be damaged, causing leaks and a reduction in the projected life of the infrastructure, or worse, a complete collapse of the pipeline. Proper design, installation, and operation of air relief valves can mitigate the effects of high pressure changes. While there are several different types of relief valves which have been designed to alleviate the effect of water hammering, many are inefficient and costly to operate and maintain.

Multi Orifice Valves

A review of literature will reveal that multiple orifice valves are shown to be “effective in mitigating surge pressures as well as meeting the primary criteria of air elimination and vacuum relief when scouring a pipeline”¹ and have a history of operating with greater efficiency and less maintenance than traditional ball and control floats². For example, unlike traditional valve systems, multiple orifice floats can trigger partial closure, which will decelerate fluids rather than dynamically stopping them. When a sudden pressure rise and fluid velocity are controlled, severe hammering effects are eliminated.

During pump shut down, column separation can create a vacuum, and when the liquid is rejoined, severe loading on the pipes will occur. Multiple orifice valves allow air to enter the chamber and control the release of air through the floats to allow the column separation to rejoin, while dampening pressures caused by high surge conditions. In addition, when properly designed, multiple orifice floats can also minimize float damage due to high velocity wear and temperature spikes.

General Description of the Vent-Tech Air Relief Valve Product Line

The Vent-Tech Combination Air Relief Valves work in many different types of environments, protecting pipeline infrastructure against the effects of water hammering and vacuum. High quality stainless steel parts, HDPE floats, anti-wear inserts and air flow design enhancements are components of each Vent-Tech water air relief valve. When combined with Vent-Tech’s superior design elements, these materials ensure that the valve operates in many environments within a wide range of pressures and temperatures.

Each valve body is manufactured from 304 Stainless Steel and contains air flow enhancements to maximize flow under vacuum conditions. The valves come with a variety of options, including male and female outlets, swivel flanges, threaded male inlets for Bar 25 and Bar 40 valves (1” and 2” only), flanged screwed stud inlets, and relief ports. The valves are made in standard sizes (i.e., 1”, 2”, 3”, 4”, 6” and 8”); special order valves are also available. Depending on their standard size, the Vent-Tech Water Valves are designed to handle maximum pressures of 232 psi (sizes 3” and larger), 363 psi (all sizes) or 580 psi (all sizes). A complete description of all materials and parts are included with the product descriptions.

¹Geoffrey D. Stone (CP Engineer FIE Australia) “Avoiding Pressure Surge Damage in Pipeline Systems” 6/2005

² Sheldon Thomas (Clear Water Legacy Burlington Ontario Canada) “Air Management in Water Distribution Systems: A New Understanding of Air Transfer”, 1/2003

Vent-Tech Combination Water Air Relief Valves

Product Overview

Float Description

The Vent-Tech Combination Water Air Relief Valve product line typically houses three HDPE floats that are activated by a pipeline's fluid and gas pressures, opening and dynamically closing in response to the changing fluid and gas pressures within the valve.

In general, the floats operate as follows:

- Anti-Surge Float - Controls high air flow velocities, using multiple orifices protected by high wear inserts to prevent damage due to wear and high temperatures. It is designed to provide maximum air flow, surge control and dynamic closure.
- Nozzle Float – Provides pressurized release of accumulated air.
- Control Float – Closes the Valve orifice by seating the Nozzle Float against the Anti-Surge Float using the physics of buoyancy. Also activates the Nozzle Float when buoyancy is reduced.

Quality Products

The inlet components all meet ANSI B16.5 Class 150 Standards (16 and 25 Bar Valves) and Class 300 for 40 Bar Valves, all of which exceed the C-512 American Water Works Association Standards.

All Vent-Tech products are manufactured in the USA and are rigorously tested:

- Each valve is water filled and pressurized with a 2.0 Safety Factor to assure high pressure strength and non-leaking
- Each valve is low pressure tested to assure the valve closes at the minimum designed pressure rating
- Control Floats are selectively tested to assure proper operation between the Anti-Surge Float and Nozzle Float

International Valve is confident of its quality control procedures during manufacture and assembly. A 10 year parts warranty is offered on each Vent-Tech Valve. For more information on testing, please contact Customer Support at International Valve www.internationalvalve.com

Vent-Tech Combination Water Air Relief Valves Product Line

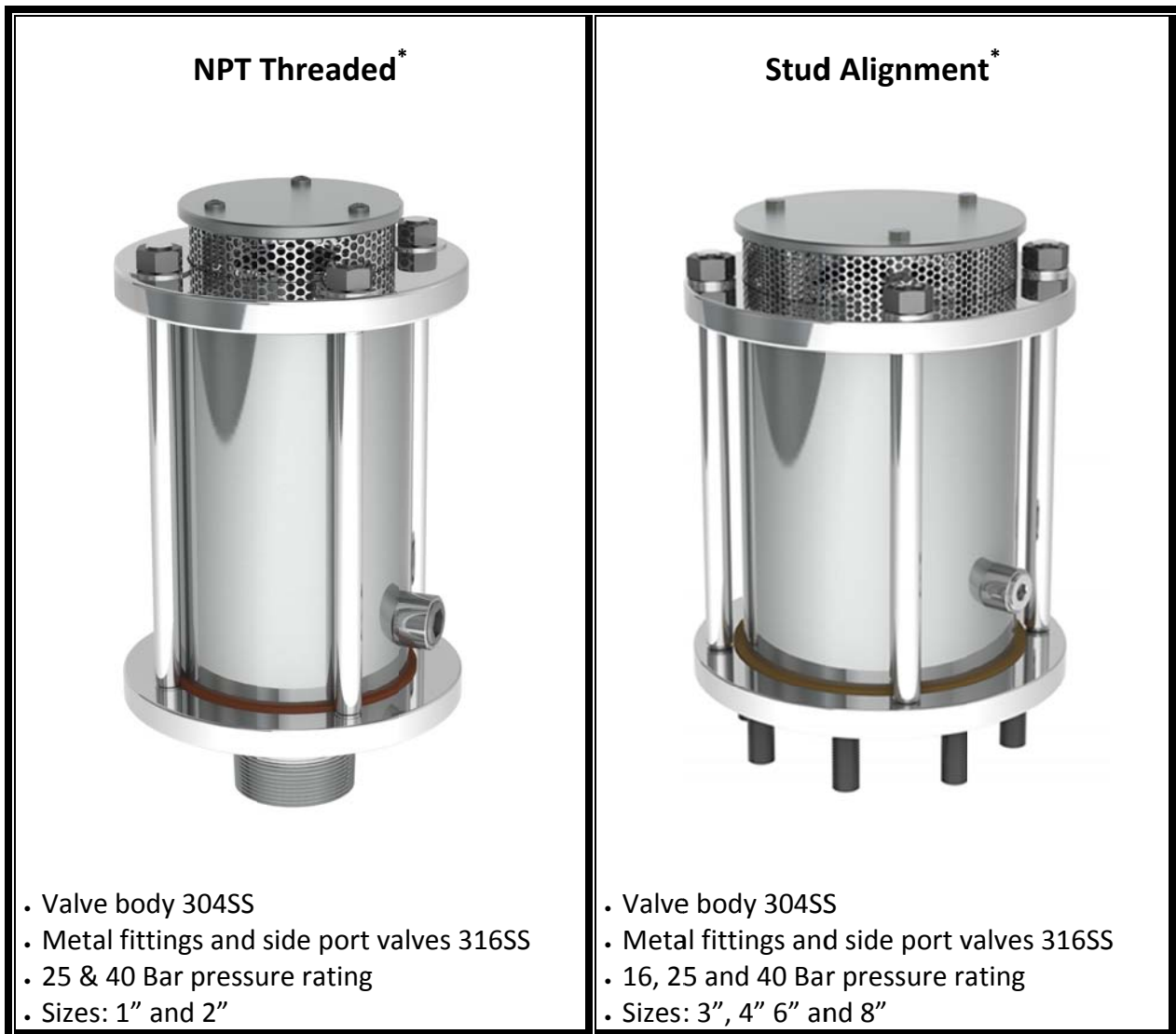
Vent-Tech Product Line

International Valve provides standard and high pressure stainless steel bodied combination water air relief valves for three distinct operating needs:

- **WTR-C Series:** High Air Flow Intake and Discharge with Surge Control
- **WTR-B Series:** High Air flow Intake and Controlled Air Out
- **WTR-V Series:** High Air Flow Discharge with Surge Control (No Air Intake)

A variety of inlet and outlet connections are also available. The Vent-Tech product line is described in detail in Product Specifications and Supplementary Information.

Combination Air Relief Valves

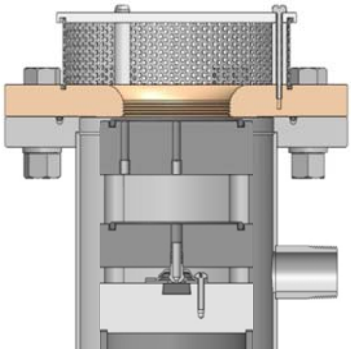
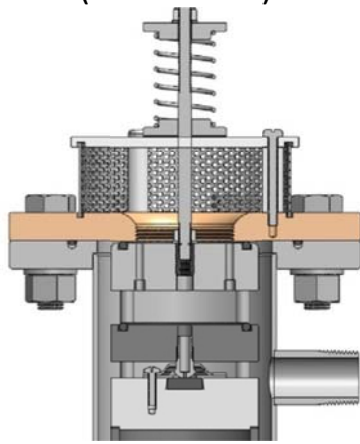
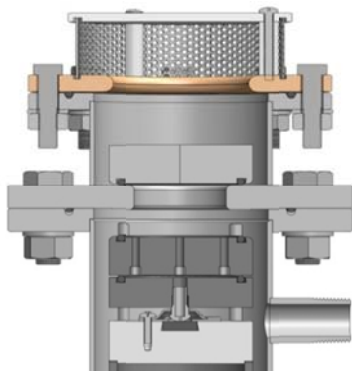


* Special orders available for larger sizes, 316SS valve body, isolation valves

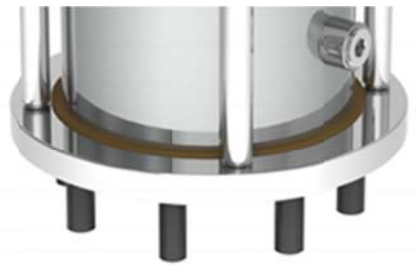

Vent-Tech Combination Water Air Relief Valves
Product Line

Float Configurations

The operating fundamentals of Vent-Tech’s WTR Series Water Valves follow the same mechanical layout as Vent-Tech’s SWG valves shown in the following table.

<p>SWG-C Valve Series High Air Intake and Relief (Combination ARV)</p>  <ul style="list-style-type: none"> • <u>Combination valve</u>: relieves air at start up and under pressure • Includes Anti-Surge Valve with multiple orifices and protective inserts; Nozzle Float and Control Float 	<p>SGW-B Valve Series Controlled Air Out (Bias Orifice)</p>  <ul style="list-style-type: none"> • Can be converted to combination valve • Has bias orifice closure • Includes Anti-Surge Valve with multiple orifices and protective inserts; Nozzle Float and Control Float 	<p>SWG-V Valve Series Controlled Air In (No Vacuum Relief)</p>  <ul style="list-style-type: none"> • Can be converted to combination valve • Has Closet Float for siphoning • Includes Anti-Surge Valve with multiple orifices and protective inserts; Nozzle Float and Control Float
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Inlet Options

<p>Screwed Stud Alignment</p>  <ul style="list-style-type: none"> • Bar 25 and 40 • Valve sizes 3", 4", 6", 8" • Number of studs vary with size 	<p>Male NPT Threaded</p>  <ul style="list-style-type: none"> • Bar 25 and 40 (1" & 2" only)
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Vent-Tech Combination Water Air Relief Valves Product Enhancements – The Vent-Tech Advantage

Overview

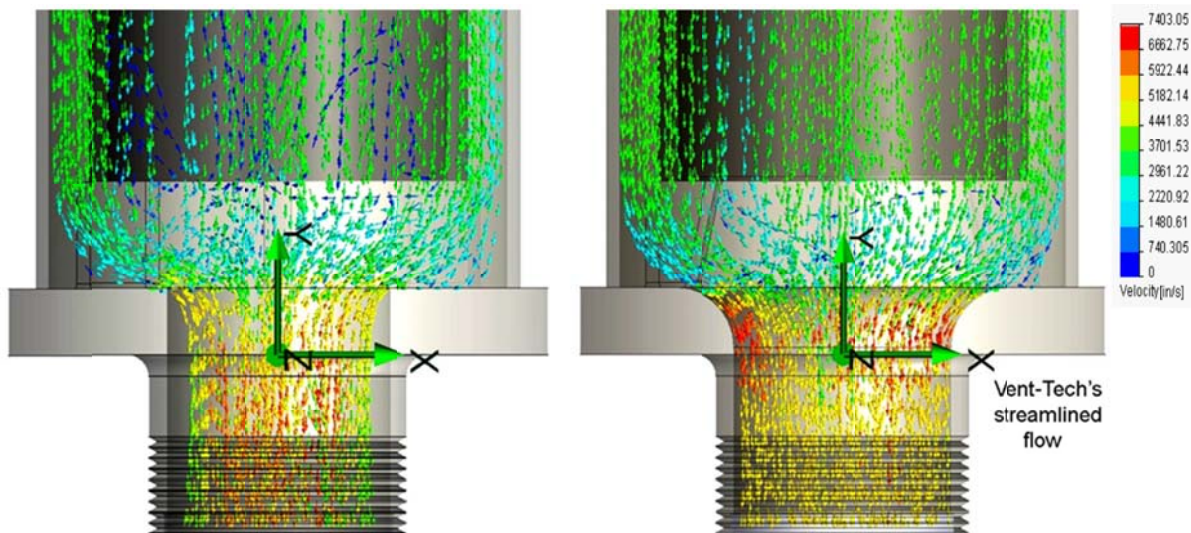
International Valve has recently designed a new generation of combination air relief valves, advancing the effectiveness of multiple orifice valve technology to:

- Increase valve flow rate
- Improve float wear
- Add dynamic surge control

When compared to the published performance of the traditional air relief multiple orifice valves, Vent-Tech valves **yield up to a 90% increase in efficiency**³. Greater efficiency can provide substantial savings by requiring fewer and smaller valves, less maintenance, lower operating costs and a longer life.

Increased Valve Flow Rate

Internal resistance to air flow limits how much air can be released and how much vacuum can be handled. This resistance determines the size of the valve needed for a given pipeline duty. International Valve has applied streamlining to inlet, outlet and float geometries on all its valves. Using leading edge Flow Simulation Software (Dassault Systèmes), Vent-Tech has recently increased the aerodynamic efficiency in its valves by up to 28%⁴, which means you can spend less by using a smaller valve.



Red arrows represent the fast air-flow, shifting across the spectrum to the slowest air in blue

- Exit flow in the valve (left) is forced into a tight stream away from the pipe wall; flow (right) uniformly expands to use the full capacity of the valve outlet's diameter.
- Exit gases (left) contain a mix of many velocities, which are an indication of turbulence.
- Gases transiting from between the valve wall and float (left) to the exit pipe are ten (10) times more turbulent than on Vent-Tech's streamlined design.
- Streamlining the internals makes the valve more self-cleaning.

Streamlining = Greater Flow + Lower Maintenance Costs + Less Energy Loss

³ "Vent-Tech Performance Analysis" by Technology Evaluations, Inc. June, 2010

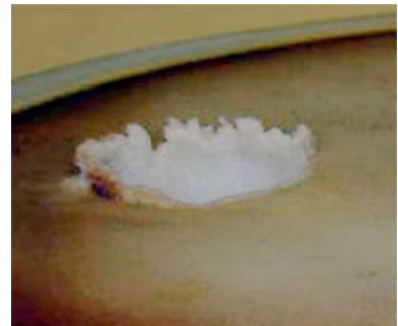
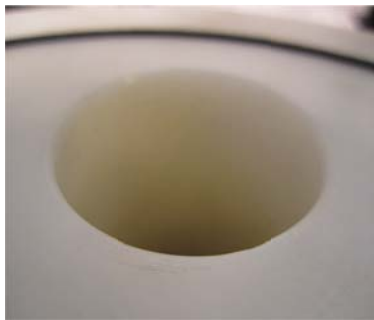
⁴ SIM3 "Flow Study and Comparative Analysis", June, 2010

Vent-Tech Combination Water Air Relief Valves Product Enhancements – The Vent-Tech Advantage

Improved Float Wear

Good air valve design is critical to facilitate the controlled release (and inlet) of large volumes of air during pipeline filling, after maintenance operations, and to dampen vacuum and surge oscillation that occur with sudden changes in flow and during emergency conditions. These high flow conditions are extreme and air flow through the valve may reach sonic velocities during the activation of anti-surge devices creating high temperature spikes as well as high wear.

The photos below on the left show the effect of high wear on anti-water-hammer control orifices. During high flow conditions, rust particles and aerosols containing fine debris can travel at sonic speeds, eroding areas around the orifice and potentially damaging the seal. The new valve (left) shows a float with a new orifice. On the used valve (middle), high wear is evident.



Effect of High Wear

Effect of High Temperature

Sudden changes in pipeline pressure will induce adiabatic temperature spikes, and when compression occurs, the temperature of gas will rise. Although heat will dissipate quickly, gas temperatures can spike hundreds of degrees and exceed the melting point of many polymers used in valve mechanisms (see photo above right). Although these spikes are not often reported in air valve literature, the theoretical temperature can be calculated⁵ as follows:

Every time the gas pressures doubles, the gas's temperature will increase ~120 degrees F.

Vent-Tech has addressed the issues of high wear and impact of high temperature spikes as follows⁶:

- Inserts are used to structurally protect the float polymers from erosion and are conducive to better disperse heat load from high temperatures
- The single anti-surge orifice is replaced with several smaller holes to better distribute the heat during transient high temperature events
- Dynamic surge control is designed to progressively slow gas flow during exceptionally high pressure surge events. Less hot gas passing through the valve means less heat to dissipate.

Wear Inserts = Lower Maintenance Costs + Less Frequent Replacements

⁵ Perry, R. H. and Green, D. W. (Editors) "Perry's Chemical Engineers' Handbook" (6th Edition), McGraw Hill (1984), p. 617.

⁶ International Valve – Patent Pending

Vent-Tech Combination Water Air Relief Valves
Product Enhancements – The Vent-Tech Advantage

Water-Hammer Control

“Dynamic surge control”⁷ provides graduated flow restrictions during periods of very high airflow exiting the valve. Air relief valves that can dampen surge oscillations will control water-hammer more effectively than relief valves which offer only one stage of flow reduction, such as fast or slow.

Where applicable, Vent-Tech’s anti-surge float mechanism incorporates dynamic surge control that progressively decreases the gas flows during high pressure peaks. Vent-Tech graduates the “flow” by using the dynamic reduction in O-Ring clearance near the exit of the flow limiting orifices (Patent App.). Thus, as the pressure increases, the O-Ring compresses more and the flow resistance to the gases allowed to exit is progressively increased by up to 50%.

This dynamic process better dampens surge oscillations and better controls water-hammering. In addition, the dynamic surge control has the added advantage of slowing the heat flow into the valve from a sudden spike in temperature caused by rapid compression.

Dynamic Surge Control = Improved Operating Efficiencies + Lower Maintenance Costs

Debris Control

Debris, such as rust particles, can enter the valve from a pipeline (valve inlet), and dust or dirt can enter the valve from its outlet (which is vented to the outside atmosphere within the valve vault). By improving the internal valve design and debris screen, the impact of debris on the operation and maintenance of the valve will be minimized.

The streamlined design of the valve internals help to better evacuate debris than that of the traditional multi-orifice air valve:

- Increased valve capacity will increase the valve’s flushing ability to make it more self-cleaning
- Streamlining the internals at the outlet will also minimize debris from getting hung up on the inside of the valve wall

Debris Control = Lower Maintenance Costs + Longer Operating Life

⁷ Dynamic Surge Control not yet available in all sizes.