Pres-Vac Solutions for Inland Tankers

We make venting equipment that protects your cargo, your crew and the environment.

PRES·VAC

Pres-Vac products make it safer - not necessarily more expensive

Safe and reliable operations of inland tankers require ship owners and ship operators to rely on highly critical components that can meet the requirements from cargo owners and at the same time optimize operation costs. Pres-Vac offers a range of products, which all work together to prevent accidents and hazardous situations on board inland tankers, and at the same time are cost effective.

For over 60 years, Pres-Vac has been dedicating to producing safe and reliable venting equipment that helps handle liquid cargo in relation to fire safety and environment protection. We are today the world's largest supplier of high velocity pressure/vacumm valves. Pres-Vac pressure/vacuum (P/V) valves and venting equipment are approved by all class certifying bodies and have for years set the standard for safe and reliable P/V valves and venting equipment in the industry.

Venting solutions on inland tankers

How is the venting system on an inland tanker different from an ocean going tanker

An inland tanker is a much smaller vessel than an ocean going tanker, but it is required that it uses some of the same venting techniques and equipment as an ocean going tanker. Compact design and maximum utilization of the equipment within the space limits are thus necessary in order not to crowd the deck of the vessel.

The rules applied to inland tank barges have historically been governed by SOLAS, IMO and local authorities implementing restrictions and guidelines on how venting systems on inland tankers should work, all in a combined attempt to achieve safety rules that are aligned with the technological solutions available on the market.

SOLAS and the International Bulk Chemical Code (IBC) dictate 3 protection levels that must be present to protect cargo tank structure against pressure or vacuum in tankers:

1. Venting arrangements for loading, discharging and ballasting;
2. Thermal variation when the tank is isolated from the inert gas system (if installed);
3. Redundancy venting in case of failure, or alternatively an alarm sensor in each tank.

For inland tankers, local rules are often not as strict as IMO rules, and therefore inland tankers are normally only designed for two protection levels: loading and discharging as well as thermal variation. Two means can be utilized to achieve this on inland tankers:

1. End-of-line high velocity p/v valves mounted 3+ meters above deck;
2. In-line p/v valves and end-of-line flame/detonation arresters (long endurance burning certified for some installations) mounted a minimum of 3 meters above deck (outlet).

In general, venting systems on inland tankers are installed as a common venting system for all tanks, or as an individual full flow system with connection to each cargo tank. However, some inland tankers carrying more than one type of cargo are installed with seperated venting systems for some of the tanks in order to have cargo vapor seperated. When using a Pres-Vac product, there are virtually no limits to the number of different cargo systems that can be designed.

Why are P/V valves installed on inland tankers and how

P/V valves are placed on cargo tanks to ensure that the pressure in the cargo tanks does not exceed the allowed limits for pressure and vacuum levels. When a valve opens to equalize the tank pressure, there is a direct access to the cargo, and in such a situation any flames on deck would have catastrophic consequences. A P/V valve must, therefore, also prevent flames from entering the tanks.

For inland tankers it is important that P/V valves can be installed as high as possible to further reduce the chance of cargo vapor flowing back on deck.

Pres-Vac high velocity P/V valve

By placing the P/V valve 3+ meters (10 feet) above deck in a vent tower can be accomplished in a simple and efficient matter.

Because of the small size of the inland tanker, it is often possible to only install 1 or 2 P/V valves on the vessel to take care of the entire venting requirements.

"Pres-Vac P/V valves ensure a high tank pressure and minimize cargo loss and cargo emissions"

The only challenge by doing this is that this introduces an additional pressure drop in the pipes installed from the tank to the P/V valve and therefore the valve needs also to be able to work properly on long pipes. If the pressure drop from the tank to the P/V valve is high due to the length of the pipes, a further pressure drop due to the characteristics of the valve is the last thing that the ship owner wants. A P/V valve should be able to have the same pressure characteristics on pipes that are 50% of the length of the cargo deck.

How can a P/V valve be mounted when low installation height is important

In some countries, the height of inland tankers and the equipment mounted on them are limited by bridges that have very low passing height. Installing P/V valves 3+ meters above deck is therefore not possible.

Some inland tankers have been designed with P/V valves installed lower than the recommended 3+

Pres-Vac P/V ECO valve

meters but with a safety zone around the valve. Other inland tankers have adopted a design where only the pressure unit of a P/V valve is installed on a rotating joint that enables the crew to lay down the valve when going under low bridges. Using a modular Pres-Vac P/V valve like HS-ISO or PV-ECO that can be separated into a pressure unit and a vacuum unit makes this possible.

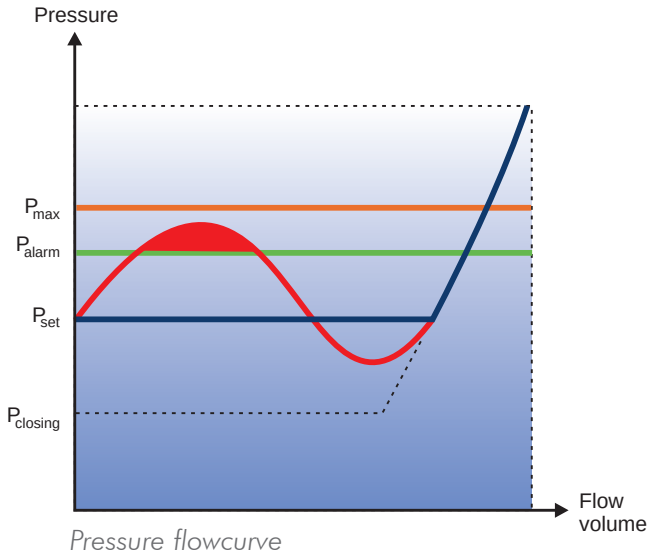
Why increase the tank pressure and is it safe

The evaporation of the cargo depends on the pressure in the tank. The higher the tank pressure is, the lower the evaporation rate is. Therefore, a positive high tank pressure is important for bringing down the cargo evaporation rate. If evaporation decreases, so do pressure surges.

During the last 10 years, the average tank pressure has increased due to the lower cost of high tensile steel and increased global competition in the ship building industry. The trend is that tank pressure will continue to increase in order to minimize evaporation rates.

What type of valve should be selected

With a conventional purely weight-loaded P/V valve, repeated pressure surges and alarms occur frequently during the opening phase. The reason for the pressure surges is that the weight-loaded valve reacts slowly on the pressure increase thus allows a pressure build-up and triggers the the alarms for overpressure (See red line in Pressure flowcurve).



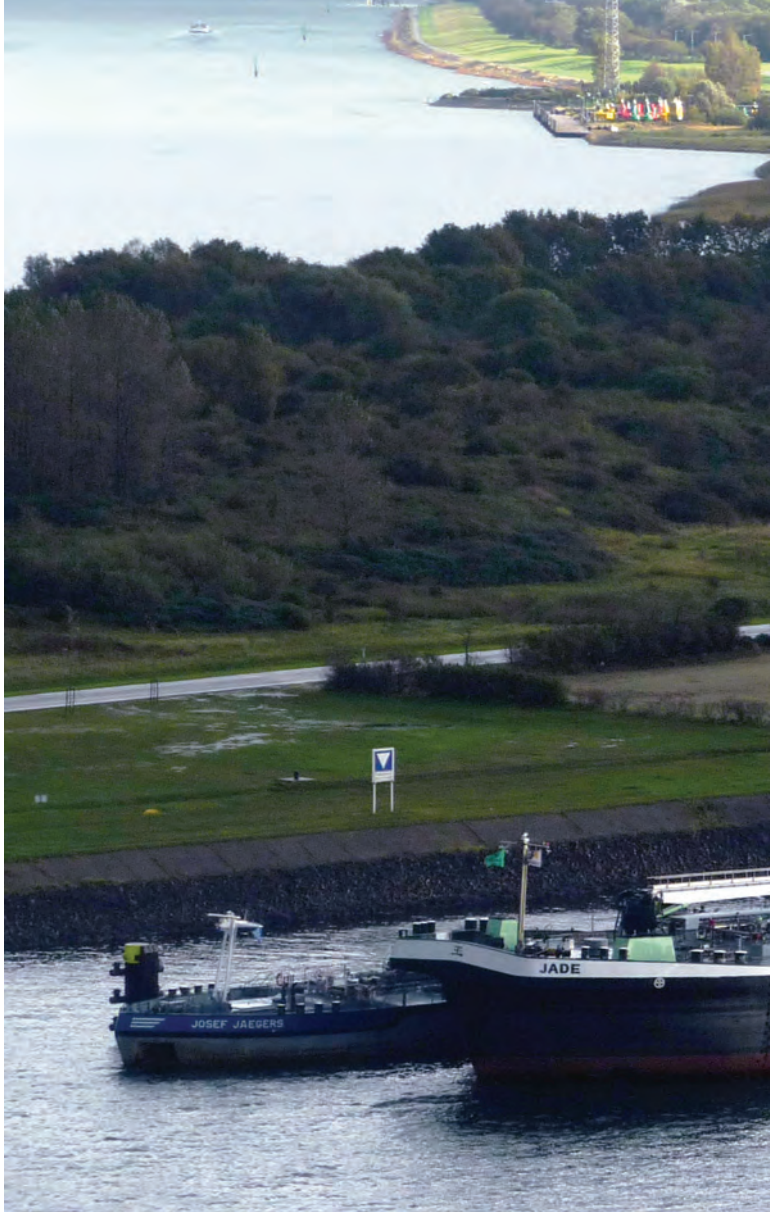
Pressure flowcurve

Repeated alarms can cause the crew losing faith in the P/V valves and choosing to manually vent the cargo tank/short circuit the alarm system.

Pres-Vac non-oscillating P/V valves have avoided the occurrence of presure surges by utilizing the patented magnet control technology. Hence, the opening pressure is kept constant until the point when the valve is fully open (see blue line in Pressure flowcurve). This eliminates the pressure surges and the chances of triggering the alarms. Another issue affecting cargo emission through the tank venting system is the closing pressure of the P/V valves.

By minimizing the difference between the opening (Pset) and the closing (Pclosing) pressures of the valve, it is possible to reduce cargo emissions. Pres-Vac magnetically controlled P/V valves address this issue, and today they can achieve a difference as small as 4 kPa.

In Europe it has been common for years that the opening tank pressure is around 50 kPa (7.2 psi) and the opening vacuum is often lower than -3.5 kPa (-0.5 psi) that is the minimal requirement according to USCG CRF 46. The reason for having this low vacuum is to minimize the energy consumed by the cargo pumps during discharging.



How is cargo vapor removed from the deck

By using high velocity Pres-Vac P/V valves, it is normally possible to achieve a gas jet velocity of 40-80 m/s above the valve, ensuring that emissions from the P/V valves escape as far away from the deck as possible. It is important that valves are properly maintained and if the seat and disc of the valve are worn, there will in some cases be leakage from the valve to the deck. Leakage to the deck will increase emission, but more importantly, it can also jeopardize the health of the crew.

Vessels fitted with P/V valves that are built in with soft seal in the seat can have the leakage rate reduced by 80% compared to being fitted with new P/V valves without soft seals.

How is thermal variation minimized

Some vessel designs are based on the approach that in order to minimize cargo loss, the vacuum unit does not take in air when the cargo tank cools down and therefore there are no needs for a high opening pressure setting either.
This method looks to be logical, but from a structural design point of view, such a tank vessel will need to withstand both higher pressure and vacuum and is more expensive to produce than a vessel with standard tank pressures.

Implementing a pressure tank that can withstand up to 10 psi (70 kPa) will create a simple structure and at the same time allow for low vacuum setting to minimize energy consumption from cargo pumps.

Can P/V valves handle when there is ice on deck

For inland tankers that work in areas where there are chances of encountering icy conditions, there are normally procedures describing what to do if equipment on the deck is covered by ice. Especially in loading and discharging situations, it is very important that venting equipment is not only checked before loading and unloading, but also when the vessel is in transit.

Inland tankers working in icy conditions for longer periods, sometime are fitted with heating elements around the vital venting equipment, to ensure that all moving parts work according to specification and that no venting passages are blocked by ice.

The venting equipment also needs to have surfaces and drains so that water cannot accumulate, thus minimize ice buildup. Pres-Vac P/V valves can be supplied with heating elements and drains that prevent valves from being frosen or blocked by ice.

Can noise levels be lowered

When small inland tankers discharge in ports that are close to populated areas, it is important that the inland tankers do not produce excessively high level of noises, e.g. from the P/V valves. Normally sounds from P/V valves are generated because of the speed of air pushed through the valves. Full lifting of the valve and the design of the seat and disc are very important in avoiding the turbulence, lowering the speed of the main jet and therefore lowering the noise level.

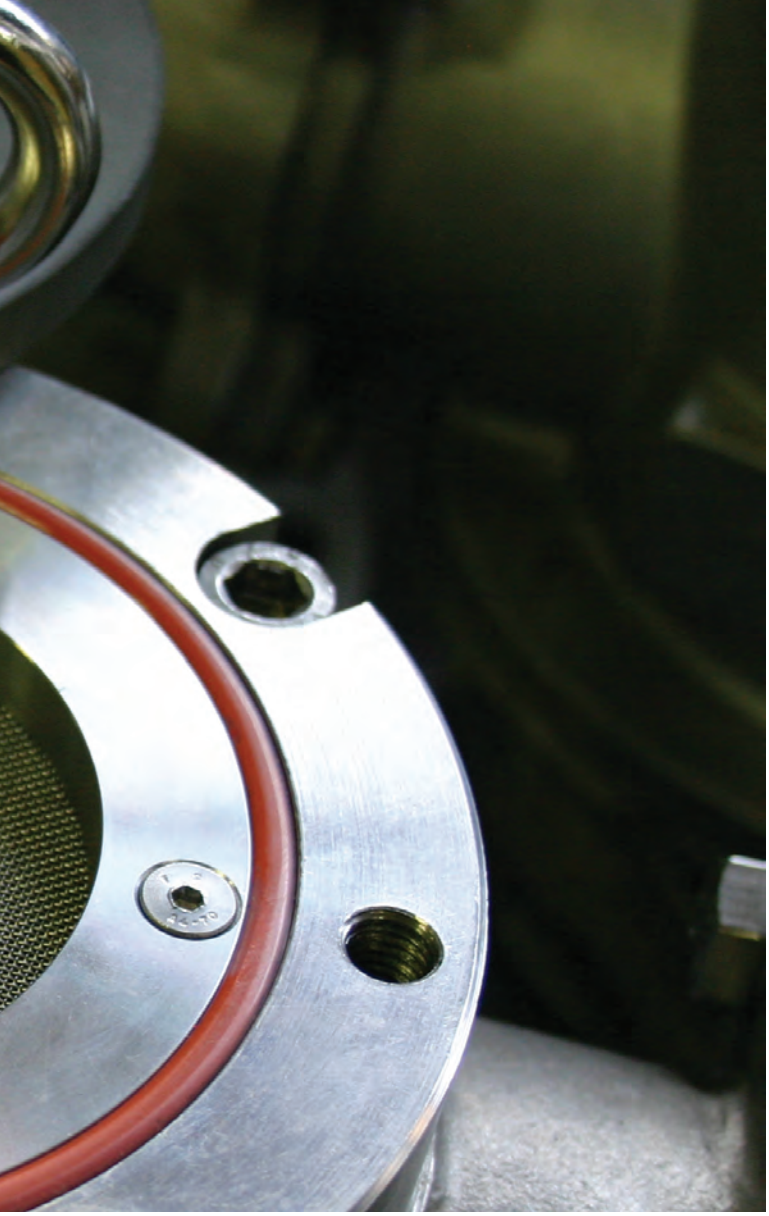
A gas freeing cover unit can be installed as an integrated part of a P/V valve or as a separate unit

Can an inland tanker vent through a common mast riser

According to IMO MSC/Circ. 677, the venting outlet devices (flame screens) do not need to be tested against endurance burning when the cargo tanks are inerted. For most inland tankers, due to the additional cost and space requirement, installation of an inert gas plant is not a feasible solution. Thus, the end of line flame screens cannot be installed directly on an inland tanker without being tested against endurance burning.

Local rules, e.g. in the US, it does not address the application of inert gas systems, but only requires companies to carry endurance burning test on their equipment according to ASTM F1273 or similar standards when installing flame screens as the end of line venting equipment. Very few flame screens on the market can withstand this kind of endurance burning test, as a result we therefore see less and less inland tankers built with flame screens. Instead, detonation arresters are used in line of P/V valves.

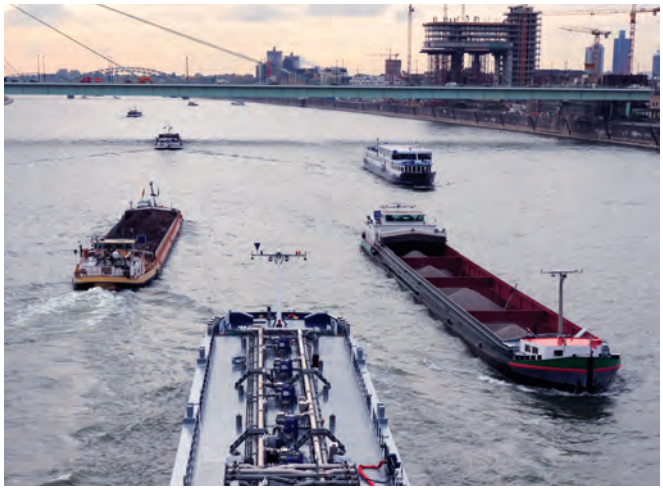
Pres-Vac VOR cover, combined detonation arrester and sampling cover.



Inland tankers in Europe use a system where a detonation arrester is placed as a cover on the tank and is connected to a common venting line. A detonation arrester cover like the Pres-Vac VOR cover prevents an explosion from travelling from one tank to another.

What implications does a vapor return system have

According to IMO rules, it is mandatory to have detonation arresters installed on the venting system when transferring cargo from vessel to vessel or to a land installation that uses gas return lines. The reason for implementing these rules is to limit damages in case a fire starts in one of the vessels or in the land installations. A detonation is defined as a fire that reaches a speed of app. 1,800 m/s within 10 meters. Many European inland tankers have chosen to integrate detonation arresters and gas freeing covers in order to minimize the number of openings in the tanks and have an installation height that is as low as possible.



How can gas freeing be done safely and quickly

Gas freeing is perhaps the most dangerous operation on a tanker, because the most flammable gas mixture from tanks is always experienced at some point during this operation. When such a gas mixture is emitted, a spark occurring several meters above the outlet can cause a tank explosion if proper gas freeing equipment is not installed.

The gas-freeing blowers are used to overcome the pressure drop in the piping between the tank and the gas outlet and must be sized to gas-free three tanks simultaneously, according to the IG code.

Based on the available static pressure and associated capacity, proper end-of-line flame screens shall be selected (gas-freeing covers) to facilitate venting at an efflux velocity of 20 m/s. Selecting a system yielding 20 m/s efflux flow allows the fastest possible gas-freeing operation. The already in-place pressure relief valves may be used, but the static pressure is likely to be inadequate.

"Pres-Vac delivers approved and certified gas freeing equipment that complies with IMO/MSC/Circ. 1324"

What does the new IMO/MSC/Circ. 1324 mean for your inland tankers

The IMO and a dedicated workgroup have spent several years on redrafting IMO/MSC/Circ. 677 regarding gas groups and the requirement to utilize equipment "dedicated" to specific flame groups. On 5 June 2009, an amendment was issued to ensure that the Maximum Experimental Safe Gap (MESG) value for the medium to be used for testing a device is appropriate to the product which the cargo tank is certified to carry, and also complies with the device installed.

In accordance with IMO/MSC/Circ1324, tankers carrying cargoes belonging to gas group IIA are required to have P/V valves installed which have been certified using propane; whereas, tankers carrying cargoes belonging to gas group IIB are required to have P/V valves installed which on the pressure and vacuum side have been certified using ethylene. If a gas-freeing cover is integrated in the P/V valve, this must also comply with IMO/MSC/Circ.1324. See the table below.

Gas Group Comparison			
USCG liquid cargo grade	MESG	IBC gas group	MESG
A (acetylene)	-	IIC (acetylene & hydrogen)	MESG<0.5
B (hydrogen)	0.4<MESG<0.45		
C (ethylene)	0.45<MESG<0.75	850	0.5<MESG=0.9
D (propane)	0.75<MESG	995	0.9<MESG

Service and support

How is the maintenance cost of the P/V valve kept low

Classification societies and governing bodies have over the years tightened the demands for keeping the venting system, in connection with the cargo tanks, at a level that ensures that all components work according to specifications. Several investigations have shown that the lowest cost of operating P/V valves can be achieved by continuous inspecting and overhauling of the valves - possibly as a part of a planned maintenance schedule.

By implementing 3 service levels for a P/V valve installed on a tanker it will be possible to keep valves at an acceptable performance level during the life time of the valve.

This could be:

1 Before cargo operation (according to SOLAS)
2 Recurring on-board inspection (done by the crew)
3 Special service overhaul (every 2.5 or 5 years)

The frequency of the inspection depends on the condition of the valve and the types of cargo that are carried.

Where can Pres-Vac P/V valves be serviced and are spare parts available anywhere

Pres-Vac offers a global network of certified Service and Repair Centers (SRCs) that provide the technical skills and marine experience to resolve service issues.

For a ship owner, easy access to spare parts is important to keep a vessel running. Pres-Vac keeps spare parts on stock and readily available, and can be reached of in most locations worldwide within 48 hours.

Supplying spare part kits which include instructions as a complete product is commonplace in the marine industry, because it enables the vessel to carry inexpensive parts in a structured way, and provides cover for the most frequent repairs that may be required.

Pres-Vac offers specialized tools allowing the crew to solve specific tasks. Sometimes it seems that it is not worth having the tools installed on an inland tanker considering the relatively high cost, but it is practical and wise to have them on board when shipping on a non-routine route where access to these tools are limited.

Pres-Vac Testrig

About Pres-Vac

Pres-Vac has for over 60 years been supplying high velocity P/V valves and venting equipment that help prevent cargo related accidents on board tankers. Focus has always been on delivering the safest, most reliable products on the market that comply with what are now the most complex set of rules ever. We are the world's largest supplier of high velocity pressure/vacumm valves.

The Pres-Vac product range has been continually expanded over the years and today includes a range of world class valves, marine inert gas systems and venting recirculation systems, all focusing on safety in relation to cargo tanks.

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