Packaging Vents

Reliable Protection for Extreme Challenges and Everyday Applications

Packaging Vents

Why Vent?

Because venting is the safe, reliable way to relieve pressure differentials that would otherwise cause containers of liquids to deform, leak or burst.

For liquid manufacturers, such defects can reduce productivity and efficiency in palletizing/warehousing. Such defects also hurt profits and brand image, when defective goods are returned … or cannot be sold at all.

For cap and container manufacturers, diagnosing and resolving packaging problems can be time-consuming and costly – and can compromise customer satisfaction as well.

And all along the supply chain, leaks can create huge risks for end-users and hazards to the environment, as well as costly clean-ups.

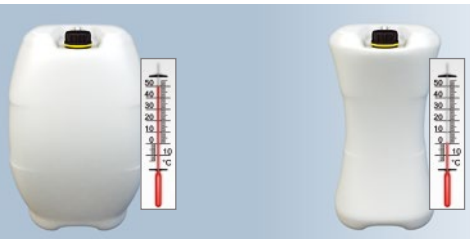
GORE® Packaging Vents minimize all these risks. They reliably and continuously equalize pressures, to minimize the potential for leaks and maintain the integrity of containers and their contents.

Causes of Pressure Differentials

Releasing gases (off-gassing) Consuming gases (oxygen scavenging)

Releasing and Consuming Gases

Some active ingredients “off-gas,” releasing gases within the container. If those gases cannot escape, the container will bloat, leak or even burst. Other active ingredients consume, or “scavenge” oxygen, creating under-pressure that can cause the container to collapse.



Rising temperatures Falling temperatures

Temperature Differences

Temperature changes, or exposure to different climates, can also deform containers. Rising temperatures expand the gas in the headspace of the container and accelerate the decomposition of reactive chemicals, which can cause over-pressures and bloating. Falling temperatures can cause under-pressures and collapse. Sudden or extreme temperature changes accelerate these deformations.

Increasing altitude Decreasing altitude

Altitude Changes

Altitude changes during transport create pressure differences between the outside and inside of the packaging. Increasing altitude creates over-pressure in the container, leading to bloating. Decreasing altitude creates under-pressure, leading to collapse. Sudden or extreme altitude changes accelerate these deformations.

Original state After dispensing

Dispensing Liquids

Dispensing liquids creates under-pressure within the container. If this imbalance is not relieved, the container may collapse.

For various application needs

Hazardous Chemicals and Institutional Cleaners

The UN Orange Book* recommends that if a dangerous good is vented, no leakages are allowed. Packaging engineers must address these challenges to maintain package integrity throughout the whole product life cycle.

These chemicals require venting according to the UN Orange Book:

- Chlorine bleach: UN 1791
- Hydrogen peroxides: UN 2014, UN 2015, UN 2984
- Hydrogen peroxide and peracetic acid mixtures: UN 3149
- Organic peroxides: UN 3109, UN 3110, UN 3119, UN 3120

> *"A venting device shall be fitted if dangerous over-pressure may develop due to normal decomposition of the substances. The vent shall be so designed that, [...] leakages of liquid and the penetration of foreign substances are prevented under normal conditions of transport."*
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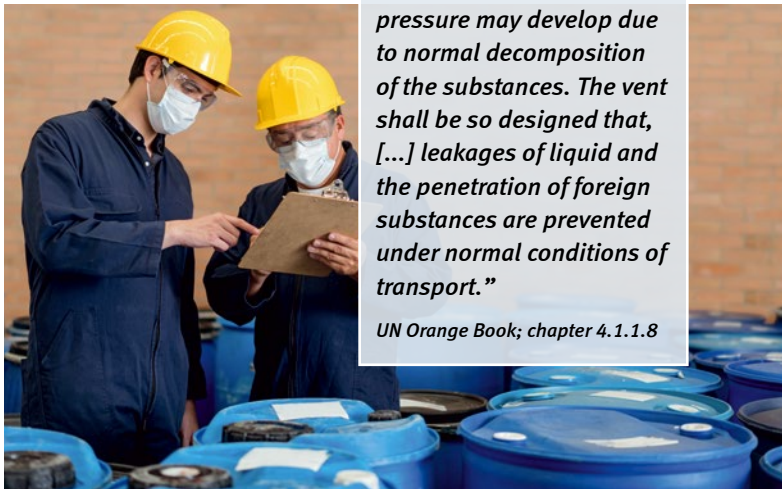
> *UN Orange Book; chapter 4.1.1.8*



Agrochemicals

The UN Orange Book recommends venting for any formulation that could cause package deformation. Highly-concentrated pesticides or fertilizers produce higher levels of off-gassing or oxygen-scavenging. Venting protects their packaging from deformation, leaks and label damage.

Examples of agrochemicals that require venting:

- Organic/inorganic fertilizers
- Pesticides
- Biostimulants
- Gardening liquids

Household Chemicals

Venting is increasingly required for household chemicals – not only for today's more highly-concentrated formulations, but also because today's customers reject deformed, leaky or label-damaged packages. Reliable venting solutions are the key to successful packaging and satisfied customers.

Applications that typically vent for pressure equalization:

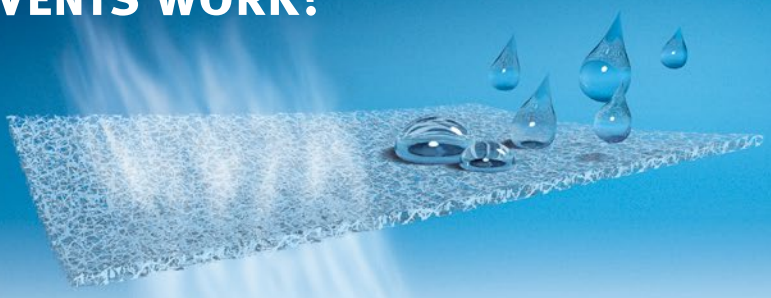
- Carpet cleaners
- Laundry stain removers
- Pipe clog removers
- Surface cleaners containing bleach and chlorine
- Anti-calc cleaners

* The UN Orange Book means the UN Recommendations on the Transport of Dangerous Goods Model Regulations, a guidance document developed by the United Nations to harmonize dangerous goods transport regulations. Most of dangerous goods regulations such as ADR, IMDG Code, IATA and other national regulations are developed based on the UN Orange Book.

Packaging Vents

How do GORE® Packaging Vents work?

GORE® Packaging Vents incorporate thin films of expanded polytetrafluoroethylene (ePTFE). The material's microporous nature allows gases to pass through to equalize pressures, but it blocks larger substances like liquids, dust and dirt, to prevent leaks or contaminant ingress.



Initial Airflow & Residual Airflow

What you normally find in data sheets for venting solutions is the "initial airflow." This is a measure of the airflow through a dry membrane prior to contact with any liquids.

To assess how a vent will perform in normal use – for example, when liquid splashes onto the vent as the container is transported or handled – it is important to understand the vent's "residual airflow." This is a measure of the amount of gas that can pass through the vent after liquid has splashed, and been repelled by, the membrane.

GORE® Packaging Vents maintain high residual airflow for a wide variety of chemicals. Unlike competitive products, the roll-off optimized GORE™ Membrane ensures fast airflow recovery after exposure to challenging liquids, such as high-viscosity or low surface-tension liquids, to prevent container deformation.

GORE® Packaging Vents effectively repel liquids and maintain sufficient residual airflow, to keep products safely packaged with no leakage.

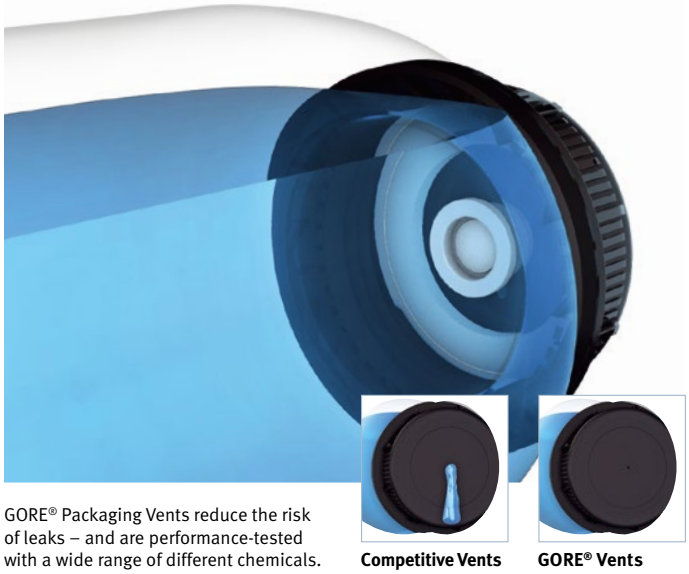
Competitive Vents **GORE® Vents**

"WEP" versus "LEP"

What you normally find in data sheets for venting solutions is the "Water Entry Pressure" (WEP) resistance. This measures how much water pressure a membrane can withstand before it leaks.

While a membrane must pass the WEP test to meet regulatory packaging requirements, the surface tension of most chemical formulations is typically much lower than that of water. So, vents that test "water-tight" may leak or spill chemicals if containers fall over during transportation or handling.

To know how a vent will perform in real-world conditions, it's important to test for "Liquid Entry Pressure" (LEP) resistance. Gore performs extensive LEP testing, exposing our oleophobic membranes to a wide range of chemicals with diverse surface tensions and viscosities. This ensures our membranes will perform as expected in real-world conditions.

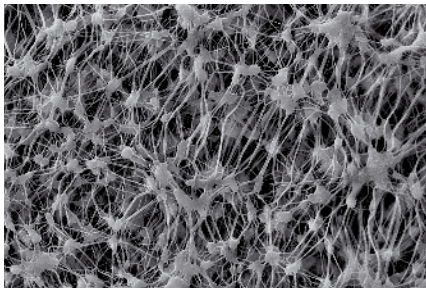


GORE® Packaging Vents reduce the risk of leaks – and are performance-tested with a wide range of different chemicals.

Competitive Vents **GORE® Vents**

Why Gore?

When you seek solutions for packaging that bloats, collapses or leaks, there are compelling reasons to make Gore your preferred partner:



Membrane Technology Leadership

- We invented the first ePTFE membrane, and have continued to develop and patent numerous advanced membrane technologies.
- Unlike competitors who purchase their membranes, we use only GORE™ Membranes: those that are designed and manufactured by Gore.
- Our proprietary processes convert “plain” PTFE to ePTFE, and then further tailor the ePTFE to achieve various different characteristics for specific application needs.

Chemical Expertise

- We have developed an advanced level of expertise in chemicals that require venting due to off-gassing or oxygen scavenging.
- Our research and development teams have conducted in-depth investigations into the ways fluid viscosity and surface tension affect venting performance.
- We also developed proprietary testing procedures for “Residual Airflow” and “Liquid Entry Pressure,” to assess venting response to real-world conditions.

Quality Assurance

- We conduct in-line airflow, in-line camera, and Water Entry Pressure tests, to ensure the consistent quality and reliability of our Packaging Vents.
- We laser-mark most Plug-In Vents with an individual tracking code that links to actual production data and certain in-process performance characteristics. If there is ever an issue, we can retrieve this data at any time, for troubleshooting.
- Our vents meet strict performance requirements. They pass rigorous approval tests for dangerous goods, and meet DOT and ADR standards.

Global Resources and Support

- We offer worldwide application engineering support, including extensive testing facilities (if needed), to help find the most appropriate venting solution – or to assist with troubleshooting in case of an emergency.
- Our global network of sales representatives makes purchasing fast, easy and convenient.
- Our manufacturing facilities in the US, Germany and Japan provide dedicated centers of excellence for specific product families.

Experience

- We have more than 20 years’ experience in packaging applications including hazardous chemicals, agrochemicals, institutional cleaners and household chemicals.
- Our products are trusted by every leading chemical formulation company as well as cap and container manufacturers worldwide. Collectively, they have installed hundreds of millions of GORE® Packaging Vents!

Packaging Vents

Our Customers Prove that GORE® Packaging Vents Perform As Promised

Premium Performance And Efficiency Over Time

Miele "TwinDos" Detergent Dispensing System

Germany's Miele manufactures environmentally-sustainable washing machines engineered to optimize water, energy and detergent use. Its "TwinDos" system uses cartridges that dispense cleaning agents for 27 loads, without further refills. To maintain the precision and life-span of this dispensing system, effective venting was critical. Gore partnered with Miele to identify a prompt and effective solution: the GORE® Packaging Vent D15 Converse. Its continuous bidirectional airflow quickly equalizes pressure differences caused by offgassing detergents, or the temperature swings inherent in switching from hot- to cold-water washes. The vent's press-fit construction integrates easily and creates a highly reliable seal that prevents cleaning agents from leaking out. And, the vent reliably blocks ingress of liquids and other contaminants like dust and lint that are part of every home laundry environment.

"We knew that venting our laundry dispensing containers was the key to maintaining Miele's premium-level precision, performance and efficiency over time ... [and] that Gore had the venting technology and expertise to deliver the optimal solution ..."

Maria-Paz Linaje
Product Manager, Miele

Excellence in High-Value Packaging

Mullackal Polymers' Bio-Fertilizer Packaging

India's Mullackal Polymers manufactures caps and blow-molded containers for the agrochemical industry. Their customer, Agrinos, was launching an organic liquid bio-fertilizer in India. Mullackal had to develop a high-quality package design for this high-value, high-offgassing product. Mullackal turned to Gore for its highly-breathable Pulp Induction Liner. It offered rapid pressure equalization and excellent roll-off for high residual airflow, to maintain the integrity of both product and package from manufacturing line to end-user. And, it integrated easily without any re-design. In partnership with Gore, Mullackal developed this successful solution in less than one month – and since the first container left the production line, Agrinos has had no reports of container deformation or leakage! Further, this leading-edge package and vented cap design were awarded the 2014 INDIASTAR Award for Packaging Excellence.

"We had a proven technology partner in Gore. We know that we can rely on their people and products. When you have all those elements in place, it is not surprising that excellence is the result."

Ramesh Pillai
Director of Mullackal

Plug-In Vents

Gore's Plug-In Vents can easily be installed via press-fit or snap-fit. Available for container sizes from 0.2 to 1,500 liters, they can be integrated into the closures of industrial drums, jerry cans and IBCs as well as consumer containers.

Plug-In Vents are designed to withstand harsh chemicals and rugged use. They consistently demonstrate compliance with the UN Orange Book test standards, including the stacking test and drop test.

Liners

Liners are the easy way to transform an existing non-vented package into a well-vented package – without modifying your existing cap or closure. All liners are available in single- and multi-up roll goods, as well as in various widths. Cut parts can also be offered. Gore offers two styles of Liners: Foam Liners and Pulp Induction Liners.

Foam Liners

- Two different Foam Liners are available: The High Roll-Off Series, for the most challenging formulations, and the Standard Series, for a versatile and economical solution to all your more typical or "everyday" flat-cap venting needs.
- Gore's Foam Liners offer a full-surface membrane for higher airflow and superior roll-off properties than vented "single-point" foam liners, which provide only a small venting surface.

Pulp Induction Liners

- Two different Pulp Induction Liners are available: the Low Diffusion Series, for reducing Moisture Vapor Transmission Rates* (MVTR), and the Standard Series.
- Pulp Induction Liners ensure tamper-evidence as they are welded to the bottle-neck. Any existing induction welding equipment can be used!

* Moisture Vapor Transmission Rate (MVTR) = The easiest way to demonstrate the performance of venting components in relation to moisture transfer is to carry out a moisture vapor transmission rate (MVTR) test. This involves filling a vessel with 100 ml of water, sealing it airtight, and fitting it with a venting product. The container is weighed daily for two weeks under laboratory conditions (22 °C, 50 % humidity) in order to measure the volume of water that has diffused every day.

Packaging Vents

About W. L. Gore & Associates

Well-known for its waterproof, breathable GORE-TEX® fabric, Gore is a technology-driven company focused on product innovation. We engineer creative solutions that deliver reliable performance in a wide range of applications, from fabrics and implantable medical devices to industrial manufacturing components and aerospace electronics. Gore products remain at the forefront of creative solutions because they are engineered especially for challenging applications where other products fail. Founded in 1958, Gore employs approximately 10,000 associates in 30 countries worldwide.

Learn more at gore.com.

What GORE® Packaging Vents Can Offer You

GORE® Packaging Vents are trusted, and have been proven in the field for over 20 years. With hundreds of millions of vents sold, we are the preferred partner of leading global companies and work diligently to provide proven, practical solutions to packaging challenges. Our expert engineers seek to identify and understand your unique packaging and brand requirements and drive your innovative products to completion.

Please watch our Competence Video

Please Contact Gore to Learn About the Right GORE® Packaging Vent for your Unique Application

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