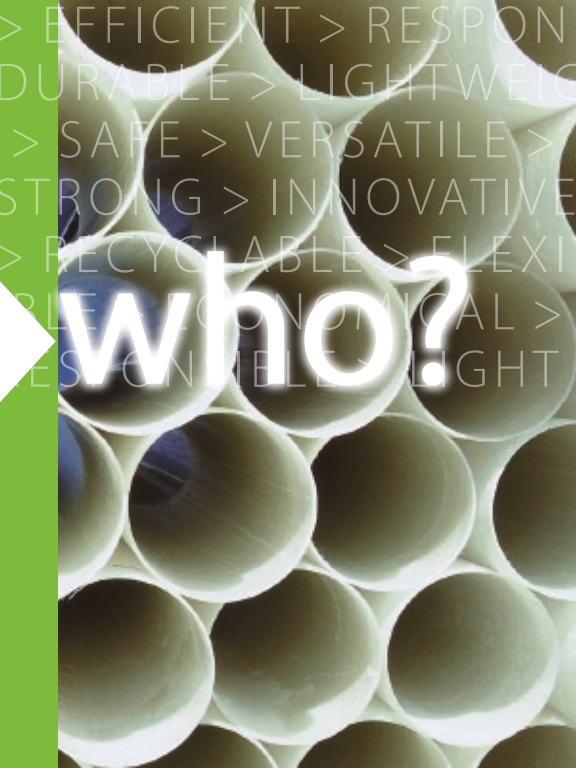


> EFFICIENT > RESPONSIVE
DURABLE > LIGHTWEIGHT
> SAFE > VERSATILE >
STRONG > INNOVATIVE
> RECYCLABLE > FLEXIBLE
BLE > ECONOMICALLY
RESPONSIBLE > LIGHT

vinyl

A Little Guide to the Big Questions





The Vinyl Institute (VI), a national trade association formed in 1982, is the leading advocate for the responsible manufacture, lifecycle management, and promotion of vinyl.

The VI sponsors scientific and technical research, maintains a technical library, and monitors regulatory activity affecting the industry. In addition, the VI funds an education program for architects and designers called Vinyl In Design.





what?

Vinyl is the world's most versatile plastic, used to make everything from blood bags to flooring. Depending on the additives used, vinyl can be rigid or flexible, clear or opaque, thick or thin, and any color. It can be molded, extruded, calendered, or used as a coating.

Vinyl starts with two simple building blocks: chlorine (57%) from common salt, and ethylene (43%) from natural gas. The resulting compound, ethylene dichloride, is converted at very high temperatures to vinyl chloride monomer (VCM) gas. Through the chemical reaction known as polymerization, VCM becomes a stable powder, polyvinyl chloride resin.

- > Vinyl is the third largest-selling plastic
- > More than 15 billion pounds of vinyl are produced annually in North America
- > Used for more than a half century, vinyl is one of the most analyzed and tested materials



Vinyl has many attributes that make it a safe, responsible, and efficient choice for many different products.

Versatility

Vinyl is used for a variety of applications in all areas of life. In healthcare, vinyl's reliability, safety, and ease of maintenance make it ideal for blood bags and medical tubing, as well as for healthcare facility furnishings. As a packaging material, vinyl helps to keep food safe and fresh. Because it does not corrode, vinyl is widely used in water and sewer pipes. Its flexibility and resistance to breakdown under high electrical voltage make vinyl the leading material for wire and cable insulation. Vinyl is also used in automobile and appliance parts, footwear, credit cards, toys, upholstery, and many other everyday products.

Energy efficiency

Vinyl is the most energy-efficient major plastic. It is largely derived from salt — an abundant and inexpensive resource. Vinyl products consume less energy, generate fewer emissions, and save more energy than many competitive products.

Durability

Vinyl is the most widely used plastic for building and construction. Because it's strong and resistant to moisture and abrasion, vinyl is ideal for siding, windows, roofing, fencing, decking, wallcoverings, and flooring. Vinyl will not rot or corrode like many other materials and does not need cleaning with harsh chemicals or frequent painting.

Excellent fire performance

Vinyl's chemical makeup makes it inherently flame resistant. Rigid vinyl building products are slow to ignite, their flame spread is slow, and they cease to burn after the flame source is removed. Flexible vinyl building products may contain plasticizers, which are flammable, but either because the amounts are sufficiently low or because the materials also contain fire retardants, most flexible vinyl building products also resist burning.

The products of vinyl combustion are no more hazardous than those produced by burning many other common materials, both natural and synthetic.

- > Vinyl is one of few materials that meet the stringent National Fire Protection Association (NFPA) requirements for insulating electrical and data transmission cables, including in plenum applications

Thermal efficiency

Vinyl has low conductivity, so finished products like vinyl windows reduce heat exchange. Also, vinyl frames are chambered to help insulate. Reflective vinyl roofing membranes are excellent at reflecting heat and reducing the need for air conditioning.

Water efficiency

PVC pipes are less prone to breaks and failures than pipes of traditional materials, so it's no wonder they continue to be used for our water and sewage systems. Because PVC pipes do not rust or corrode and break infrequently, they save precious water resources. They also require less energy to pump water through than pipes prone to internal corrosion build-up.

- > Every year, 2.2 trillion gallons of treated water are lost because of leaks in corroded metal and concrete pipes

Recyclability

The scrap, trim, and off-spec material recycled from the vinyl production process adds up to more than 1 billion pounds per year, almost all of which is recycled. This means that 99% of all manufactured vinyl is made into products — not sent to landfills. In fact, post-industrial vinyl recycling has proven so viable that its price is indexed in leading plastic industry publications.

About 18 million pounds of post-consumer vinyl are also recycled annually. A tremendous amount of post-consumer material is not available because it is still in service as pipe, siding, and other products that last decades.

- > The VI is working to build a nationwide vinyl recycling infrastructure
- > Take-back programs, such as those for old vinyl-backed carpeting, have been very successful



how about ...?

Although the benefits of vinyl have been well established over the years, the VI recognizes there are some misconceptions about vinyl's impact on the environment. That's why we are committed to raising awareness of the following issues and how they relate to vinyl.

Chlorine

Vinyl won't harm the atmosphere. Once chlorine is processed into vinyl, it is chemically locked into the product more tightly than it was in salt. When vinyl is recycled, landfilled, or disposed of in a modern incinerator, chlorine gas is not released into the atmosphere.

Dioxin

Vinyl is an extremely small source of dioxin, so small that levels in the environment would be essentially unchanged even if vinyl were not being manufactured and used every day in important products. The vinyl industry has studied and worked to reduce its contribution to dioxin. In fact, vinyl manufacturing creates only grams of dioxin per year. Other dioxin sources

include forest fires, volcanoes, burning wood in fireplaces, vehicle emissions, and manufacture of other building materials. Overall dioxin levels in the environment have been declining for decades, according to data from the U.S. Environmental Protection Agency (EPA). During this time, production and use of vinyl have more than tripled.

According to the EPA:

- > Dioxin emissions in the United States have decreased by more than 90% since 1987
- > Vinyl's dioxin emissions are a tiny fraction of the overall total, constituting less than 0.5%

Hydrogen chloride (HCl)

HCl is a byproduct of burning vinyl, but it does not incapacitate or become dangerous until it reaches concentrations far higher than those that have been measured in actual fires. Because it is

an irritant with a pungent odor, burning HCl serves as a warning to evacuate. Furthermore, HCl air concentration declines rapidly as it adheres to surfaces. Since the 1970s, fire incidence and deaths have declined steadily.

Incineration

Vinyl can be safely incinerated and its energy recaptured and reused. A large-scale study by the American Society of Mechanical Engineers found no link between the chlorine content of waste like vinyl and dioxin emissions from controlled combustion processes. Instead, the study stated, the scientific literature is clear that the operating conditions of combustors are the critical factor in dioxin generation.

Indoor air quality (IAQ)

Properly installed vinyl products have no adverse impact on IAQ, and the small amount of volatile organic compounds (VOCs) emitted will dissipate quickly through normal ventilation. In fact, tests have shown that the initial odor of vinyl wallcoverings dissipates much faster than odors from most paints.

Vinyl products are able to meet low VOC requirements in standards such as FloorScore™, Green Label Plus, and GREENGUARD.

IAQ can be affected by biological factors, as well. In hot and humid climates, vinyl wallcoverings can cause condensation to occur inside the walls. Manufacturers have addressed this issue with innovations such as mildew-resistant or “microvented” products that allow moisture to circulate.

> By discouraging moisture and resulting microbial growth, vinyl flooring products and vinyl-backed carpet are some of the vinyl products that contribute to IAQ

Landfilling

Vinyl products are extremely resistant to the corrosive conditions found in landfills and will not break down or degrade under them. In fact, vinyl is often used to make landfill liners and caps because it is inert and stable.

- > Vinyl accounts for less than 0.6% of landfilled waste by weight
- > About 18 million pounds of post-consumer vinyl is diverted from landfills and recycled into second-generation products

Life cycle assessment (LCA)

Many experts agree that to truly understand a product’s environmental impact, its entire life cycle should be evaluated. This is known as LCA.

Environmental effects associated with a product’s manufacture can be counterbalanced over time by a long, beneficial, low-impact life. For example, emissions associated with vinyl

window production are far outweighed by decades of energy-saving benefits.

- > Vinyl products perform favorably in terms of energy efficiency, thermal-insulating value, low contribution to greenhouse gases, low maintenance, and product durability
- > Recent life-cycle studies show the health and environmental impacts of vinyl building products are comparable to or less than the impacts of most alternatives

Phthalates and other vinyl additives

Because of vinyl's physical nature, additives such as stabilizers and antioxidants are tightly held in the fabricated product, limiting the potential for human contact or release into the environment. Yet concerns have surfaced in recent years regarding exposure to phthalate plasticizers. The accumulated scientific data from years of research into this issue suggest that phthalates do not pose a threat to human health or well-being.

- > Vinyl additives have been studied closely by independent scientists, the federal government, and industry and used safely for more than 50 years

Worker safety

In 1973, doctors at a company making vinyl chloride monomer (VCM), an intermediate material in the vinyl production chain, noticed several cases of a rare form of liver cancer among the employees. Within two years, the U.S. Occupational Safety and Health Administration (OSHA) and the EPA issued regulations reducing workplace exposure and environmental emissions, and the entire vinyl industry completely re-engineered its production operations.

- > There have been no documented cases of this cancer among vinyl workers whose careers began after the regulations took effect



Since it debuted decades ago, vinyl has been an important part of life. Always changing with the times to become more efficient and safe, vinyl has proven itself time and again to be a responsible and relevant material. Its benefits have been confirmed by a lifetime of usage, testing, and research, and no doubt these benefits will continue to be seen in the years ahead.

For more detailed information, please visit our websites or contact the VI directly.

The Vinyl Institute

1300 Wilson Boulevard

Arlington, VA 22209

phone 703.741.5670

fax 703.741.5672

www.vinylinfo.org

Vinyl In Design

www.vinylindesign.com



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