

Quick Reference

SAFE > VERSATILE > STRONG > INNOVATIVE
WEIGHT > RECYCLABLE > FLEXIBLE > ECONO
> ECONOMICAL > EFFICIENT > RESPONSIBL
IBLE > DURABLE > LIGHTWEIGHT > SAFE > P



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

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

Vinyl chloride monomer (VCM)

The EPA estimated that the industry's VCM emissions have been reduced by more than 99% since the 1970s. Moreover, there is no confirmed case on record in which a member of the general population has been harmed by exposure to VCM. The actual risk among the five million individuals presumed to live within five miles of a VCM or vinyl production facility has been calculated to be less than 0.1 case of cancer in the next 70 years. No other confirmed community health effects have been linked to the presence of vinyl or VCM production facilities.

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 more than 30 years, according to data from the U.S. Environmental Protection Agency (EPA). During this time, production and use of vinyl 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%

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. 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

Recycling

The vinyl industry has a history of supporting the development of a vinyl recycling infrastructure through funding and technical support. Millions of pounds of vinyl are recycled at the post-consumer level.

>WasteCap Wisconsin, a nonprofit organization that provides waste handling, reduction, and recycling assistance to businesses, honored the Vinyl Institute with the 2006 Innovative Achievement Award for its role in implementing a vinyl siding scrap recycling program

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

Fire retardance

Vinyl's chemical makeup makes it inherently flame resistant. Rigid vinyl building products are slow to ignite, have slow flame spread, and 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.

Low toxicity

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

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.

Dioxin

Systematic investigations of large-scale accidental fires in Germany, Sweden, and Canada have indicated that dioxins will be produced in accidental fires whether vinyl is present or not, and that the quantities produced in such fires pose no threat to human health or to the environment. Testing of water supplies, water runoff, soot, soils, and vegetation showed ambient levels of substances tested returned to normal ranges within a few days after the fires. Individuals most exposed to fire gases showed low blood-dioxin levels.

Electrical applications

Unlike metal tubing, vinyl conduit will not arc or short, thereby reducing the hazard of fires in electrical applications. Its flexibility and resistance to breakdown under high electrical voltage make vinyl the leading material for wire and cable insulation.

>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

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.

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.

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

Infection control

When lives are on the line, healthcare providers around the country trust vinyl medical products. For decades, these products have played a crucial role in hospitals, clinics, and other healthcare settings. Vinyl's unique characteristics meet the healthcare industry's tough performance standards while also being durable, easily sterilized, and non-breakable. Similarly, vinyl upholstery, wallcoverings, and flooring are widely accepted and specified by healthcare providers.

> Vinyl is the material of choice for blood bags, medical tubing, and other devices

> Vinyl interior products such as flooring, wallcoverings, and upholstery have easy-to-clean surfaces that help control pathogens and promote a sterile environment

> Mildew-resistant or "microvented" wallcoverings discourage moisture accumulation and microbial growth

> The almost impermeable nature of vinyl flooring and vinyl-backed carpet also prevent moisture build-up

Energy efficiency

Vinyl is the most energy-efficient major plastic. Its principal raw material is chlorine derived from common salt—an abundant and inexpensive resource. Vinyl takes less energy to produce than many competing products, and 20% less than other plastics. It also saves fossil fuels.

- > PVC building products are highly energy-efficient
- > In transportation and construction applications, vinyl is one of three plastic materials with the lowest energy requirements of the 12 major plastics used
- > Vinyl saves more than 34 million BTUs per 1,000 pounds manufactured compared to the highest energy-consuming plastic

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 made from other materials.

- > Every year, 2.2 trillion gallons of treated water are lost because of leaks in corroded metal and concrete pipes
- > The estimated annual "break rate" per 100 km (62 miles) is 0.5 for vinyl water distribution pipe, versus 32.6 for cast iron and 7.9 for ductile iron

Reduced material use

Advances in vinyl formulations have made today's vinyl products durable, low-maintenance, and lightweight, all which translate into reduced use of other materials.

- > Vinyl building products like siding and fencing don't require the use of paint, stain, or harsh cleansers, unlike some wood products that need these treatments on a regular basis
- > Vinyl roofing eliminates the need for asphalt, tar, and other materials used in built-up roofing, and is easily maintained without additional resource expenditures
- > Vinyl is lighter to transport than most other building materials, reducing the amount of fuel and other resources used for delivery. Also, PVC products that are lighter than alternatives save time in cutting and installation

Efficient products

PVC building products have numerous energy and environmental benefits. Since the late 1980s, more than 20 life-cycle evaluations have been completed on PVC building products, many of them comparing those products to ones made of other materials. PVC products were found to perform favorably in terms of energy efficiency, thermal-insulating value, low contribution to greenhouse gases, and product durability.

- > Vinyl windows and doors conserve energy. For example, chambers in the frame of vinyl windows resist heat transfer
- > Some vinyl frames and sash corners are fusion-welded for maximum strength and protection against air and water infiltration
- > Many vinyl windows, glass doors, and roofing membranes have received EnergyStar® ratings
- > Because vinyl roofing membranes typically are light in color, their “reflective” roof surfaces help structures to stay cool and reduce energy use for air conditioning

Even after a useful lifespan of decades, vinyl products can be recycled into new applications lasting decades more. Recycling programs are now an important part of the vinyl lifecycle and these programs will only continue to expand in the coming years.

Post-industrial

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.

- > Post-industrial vinyl recycling has proven so viable that its price is indexed in leading plastic industry publications
- > Scrap vinyl is recycled into a variety of products, including bottles, blister packaging, floor tiles and mats, garden hoses, fencing, truck bed liners, automotive applications, pipe, boots, notebook covers, and traffic cones

Post-consumer

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

Vinyl has become one of the most widely used materials in part because of its cost efficiencies. In fact, it consistently scores better than other materials in many economic and performance categories. At every point in its long life, vinyl offers significant savings.

Production

Vinyl does not require expensive raw materials.

> Vinyl is 57% derived from common salt—an abundant and inexpensive resource

Distribution

Vinyl is lighter to transport than most other building materials, reducing the amount of fuel and other resources used for such transportation.

Installation and function

Using low-maintenance, lightweight, and long-lasting vinyl products for building and construction can translate into savings on other material usage and labor costs.

> Products like vinyl siding and fencing don't require the use of paint, stain, or harsh cleansers.

Similarly there is no need for asphalt, tar, or other materials to be used with vinyl roofing

> PVC pipes are less likely to corrode or leak than traditional pipes. This translates into savings on repairs and replacement of parts

> Lightweight PVC pipes are cut and installed more quickly than alternatives

Disposal

Vinyl products have long lifespans. Once they are no longer usable, these products can be recycled (if local collection and sorting operations are available) or disposed of safely.

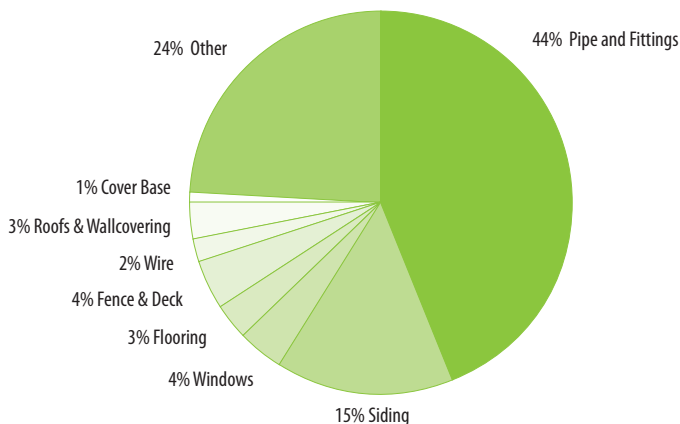
> Vinyl can be safely incinerated in state-of-the-art facilities and its energy recaptured and reused

> Post-industrial and post-consumer vinyl are highly recyclable

> "Take-back" programs are cost efficient ways to eliminate vinyl product that is no longer usable

Building and construction

Because of its durability, vinyl is used in building and construction. In fact, approximately 76% of all PVC goes to these applications. Not only is vinyl long-lasting, it's resistant to rot and corrosion, leaks and breaks.



Resource conservation

PVC's durability is an important environmental benefit, because the longer a product lasts, the less energy and other resources must be expended to make and install replacement products. PVC also conserves energy in manufacture and more importantly in use.

Low-maintenance

For many vinyl products, durability also means low-maintenance—a benefit that reduces material usage and labor.

- >PVC pipes, which do not rust or corrode and break infrequently, require very little repair
- >Vinyl building products like siding and fencing don't require the use of paint, stain, or harsh cleansers, unlike some wood products that need these treatments on a regular basis

Processes

Since it debuted decades ago, vinyl has continued to evolve. Changing with the times to become more efficient and safe, the vinyl industry has made many improvements in key areas such as:

- >Manufacturing
- >Formulations
- >Safety
- >Recycling

Applications

Vinyl is used in all kinds of areas—construction, healthcare, packaging, automotive, to name just a few. But what is particularly exciting about this material is that new ways to use it are continually being discovered. Vinyl is often chosen for pioneering architectural projects, as well as internationally recognized art installations including *The Gates* in Central Park by Christo and Jeanne-Claude.

Form and appearance

Vinyl is the world's most versatile plastic, found in everything from blood bags to flooring. It can be molded, extruded, calendered, or used as a coating. Depending on the additives used, vinyl can be processed to have very different characteristics:

- >Rigid or flexible
- >Thick or thin
- >Opaque or clear—in almost any color

Function

Because of the various properties vinyl can assume, it has infinite uses in a wide range of areas, including:

- >Building and construction
- >Healthcare
- >Packaging
- >Wire and cable insulation
- >Fiber optics
- >Automobile, appliance, computer parts
- >Upholstery
- >Consumer products

SAFE > VERSATILE > STRONG > INNOVATIVE
WEIGHT > RECYCLABLE > FLEXIBLE > ECONO
> ECONOMICAL > EFFICIENT > RESPONSIBL
IBLE > DURABLE > LIGHTWEIGHT > SAFE > P



1300 Wilson Boulevard
Arlington, VA 22209
phone 703.741.5670
fax 703.741.5672
vinylinfo.org

Vinyl In Design
vinylindesign.com

