

## Recycling

Because vinyl is a thermoplastic, vinyl products can be melted and remolded repeatedly. A recent study found about 18 million pounds of post-consumer vinyl recycled from sources such as carpet backing, medical products, windows, siding and packaging – all



diverted from landfills. Products made of recycled vinyl include non-pressure pipe, window frames, electrical boxes and shake roofing shingles. Some companies offer take-back programs for vinyl-backed carpet that result in 100 percent post-consumer recycling.

The Vinyl Institute has a long history of supporting vinyl recycling. For example, VI helped fund optical sorting technology used today in high-tech materials recovery facilities, and it has supported a number of start-up recycling operations.

The key to recycling all building wastes is to find a way to collect, separate and trans-

port wastes for recycling cost effectively. The Vinyl Institute has a searchable database at [www.vinylinfo.org](http://www.vinylinfo.org) that lists some 280 North American companies that recycle or manufacture from recycled vinyl.

Where recycling is not economical, vinyl can also be disposed of in landfills just like any other municipal waste material. Landfilling vinyl products poses no special challenge to the environment relative to other materials. In fact, vinyl is used to line landfills to prevent leachate from seeping into groundwater.

# end of building life – recycling and disposal

## Fire

Fire science shows that the greatest hazards in a building fire are heat and carbon monoxide (CO), a lethal gas produced in abundance by virtually all burning materials. Vinyl building products are based on a polymer that, by its nature, resists combustion. This can help slow fires and save lives. Vinyl is one of the few materials meeting the stringent National Electrical Code of the National Fire Protection Association for insulating electrical and data transmission cables.

## Incineration & Dioxin

Vinyl products do not adversely affect incinerator operations or contribute to unique emissions. Two major concerns are sometimes raised with respect to byproducts from vinyl incineration: the formation of dioxin and the generation of acid gases in incinerator exhaust.

U.S. EPA and other international agencies have concluded that appropriate design and operation of an incinerator, not vinyl in the waste stream, have the most significant impact on dioxin emissions.<sup>1</sup> Adding or removing vinyl materials does not affect the generation of dioxin. Properly designed and operated systems will also neutralize a range of acid gases, including hydrogen chloride (HCl), generated when vinyl waste is incinerated.

The good news about dioxin is that emissions are declining. This has happened even as vinyl production has climbed in recent decades.

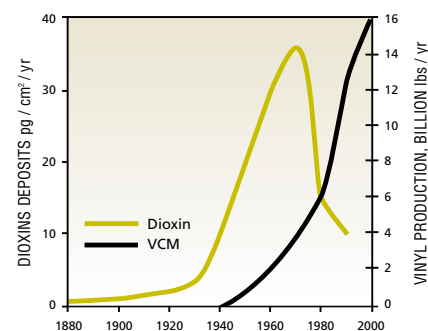
Here is what EPA has to say:

“Dioxin levels in the environment have declined significantly since the 1970s, following EPA regulatory controls and industry actions. EPA’s best estimates

of emissions from sources that can be reasonably quantified indicate that dioxin emissions in the United States decreased by about 80 percent between 1987 and 1995, primarily due to reductions in air emissions from municipal and medical waste incinerators, and substantial further declines continue to be documented.”

(“Dioxin: Summary of the Dioxin Reassessment Science,” Information Sheet 1, U.S. EPA, June 12, 2000.)

Dioxin Emissions Declining as Vinyl Chloride Monomer Production Rises



<sup>1</sup> Part I: Estimating Exposure to Dioxin-Like Compounds, Volume 2: Sources of Dioxin-Like Compounds in the United States, Exposure Assessment and Risk Characterization Group, National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, September 2000.

# straight talk

vinyl building materials and the environment

All buildings have environmental impacts involving use of land, energy, water and materials. Architects, designers and builders concerned about minimizing such impacts are looking more for “sustainable” building practices. There are different approaches to sustainable building, and the term is still being defined. One environmentally sensible approach to building considers the building’s impact from “cradle to grave” – from design, siting and construction to operation of the building through its lifetime to final disposition of the building and its materials at the end of their useful life.

When it comes down to making the environmentally preferable choice among products of different materials, one should look at the entire life cycle of the product from raw materials and energy use through manufacturing, processing, transportation and distribution, use and maintenance and ultimately to reuse, recycling and waste management.

How vinyl building materials perform on a life cycle basis compared to alternative products is an important question. Vinyl products have an impact (as do all products) but generally vinyl has a relatively low impact on the environment compared to alternatives, and offers a number of benefits compared with those alternatives.

# raw materials & manufacturing

While most polymers and plastics come 100 percent from fossil fuels, vinyl is more than half derived from common salt, an abundant and inert natural resource. Worldwide, vinyl production accounts for less than 0.3 percent of annual oil and gas consumption and about 10 percent of annual salt consumption.

Today's vinyl production process is essentially closed, automated and high tech, and nearly all waste is recycled back into the system. Lifecycle analysis has shown that production of the vinyl polymer uses less energy than production of some other building materials.

The vinyl industry is also committed to environmental improvements in manufacturing. Consistent with the American Chemistry Council's Responsible Care program, emissions from the vinyl production process have dropped significantly.

From 1987 through 2000, releases of ethylene dichloride (EDC) per ton of vinyl produced dropped 95 percent, and releases of vinyl chloride monomer (VCM) per ton of vinyl produced decreased by 74 percent. Producers also have characterized and reported to EPA's Toxics Release Inventory releases of dioxins from the production process. These data indicate that vinyl production accounts for a tiny percentage of all human sources of dioxin – less than fireplaces or diesel trucks, for example.<sup>1</sup>

Fabrication of vinyl products also conserves energy. For example, research by Franklin Associates comparing the manufacturing processes for vinyl and aluminum windows determined that vinyl used about three times less energy.<sup>2</sup> Lifecycle studies comparing the manufacture of vinyl building products with alternatives have found that using vinyl saves an estimated 260 trillion BTUs per year – the equivalent of 44.2 million barrels of oil.

## Additives

Vinyl, like many other materials, requires the use of additives such as stabilizers and plasticizers for performance. Stewardship efforts by the industry have led to continuous improvements in formulations. For example, use of lead-based stabilizers has been declining for years. Today, these stabilizers are used principally in vinyl wire and cable insulation to promote insulation properties required to meet UL specifications.

Phthalate plasticizers, used to make some vinyl products flexible, have been used safely for more than 40 years and are even accepted for use in life-saving medical devices like blood bags and tubing regulated by the U.S. Food and Drug Administration.

## Recycled content

Vinyl scrap from manufacturing is easily recycled. A recent study found that hundreds of millions of pounds of post-industrial scrap are recycled into finished products – accounting for a 71-79 percent rate. Some vinyl products also contain post-consumer content.

## Reduced material use

A key aspect of sustainability is durable products, which conserve materials and eliminate pollution associated with manufacturing shorter-life alternatives. Advances in vinyl formulations have made today's vinyl products highly durable.

Few products in building and construction today last as long as PVC drinking water and waste pipe. Properly designed and installed PVC pipe has an estimated life span of more than 100 years, with little or no loss of strength. The National Research Council of Canada estimates the "break rate" for vinyl water distribution pipe at 0.5 breaks per 100 km (62 miles) per year compared with 32.6 breaks per 100 km per year for cast iron and 7.9 breaks per 100 km per year for ductile iron.<sup>1</sup>

Vinyl building products like siding and fencing – which don't require the use of paint, stain or harsh cleansers – can directly replace wood products that do require the use of these treatments on a regular basis.

Vinyl roofing eliminates the need for asphalt, tar and other materials used in built-up roofing, and similarly is easily maintained without additional resource expenditures.

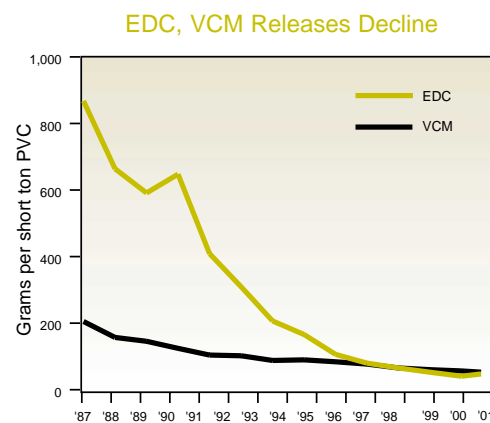
Vinyl is lighter to transport than most other building materials, reducing the amount of fuel and other resources used for such transportation.

## Infection control

Vinyl products such as flooring, wallcovering and upholstery fabrics provide easy-to-clean surfaces, helpful in controlling pathogens and promoting a sterile environment. Vinyl interior products are frequently specified in patient care areas as well as the public spaces of healthcare facilities for this very reason.

## Energy conservation in use

Vinyl windows and doors conserve energy. For example, chambers in the frame of vinyl windows resist heat transfer. Frames and sash corners are fusion-welded for maximum strength and protection against air and water infiltration. Many vinyl window and glass door products meet the energy efficiency standards of the National Fenestration Rating Council (NFRC). NFRC also qualifies vinyl windows for the Energy Star rating on the basis of the products' U-factor and Solar Heat Gain Coefficient.



Corrosion in iron pipe

# environmental effects of using vinyl

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. Many vinyl roofing membranes have been recognized by the Energy Star Roof Products Program.

Reflective vinyl roofing membrane

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<sup>1</sup> U.S. Environmental Protection Agency Database of Sources of Environmental Releases of Dioxin-Like Compounds in the United States: Reference Years 1987 and 1995 (EPA/600/C-01012), March 2001.

<sup>2</sup> Comparative Energy Evaluation of Plastic Products and Their Alternatives for the Building and Construction and Transportation Industries, Franklin Associates, March 1991.

<sup>1</sup> B. Rajani and S. McDonald, "Water Main Break Data on Different Pipe Materials for 1992 and 1993," National Research Council, Ottawa, Ontario (1995).