PVC - Polyvinyl Chloride

PUBLIC INFORMATION

January 2023

A versatile and safe material for the modern world

Polyvinyl chloride (PVC) is synthesised by coupling ethylene (from oil or gas) with chlorine (from salt) using energy. Its unique properties make PVC the material of choice in many applications, including construction, transportation, electronics, and many more.

PVC (polyvinyl chloride) is the third most widely used plastic after polyethylene and polypropylene. It is also one of the three main uses of chlorine in Europe. Chlorine in turn is closely linked with caustic soda, caustic potash and hydrogen production and all their vital applications.

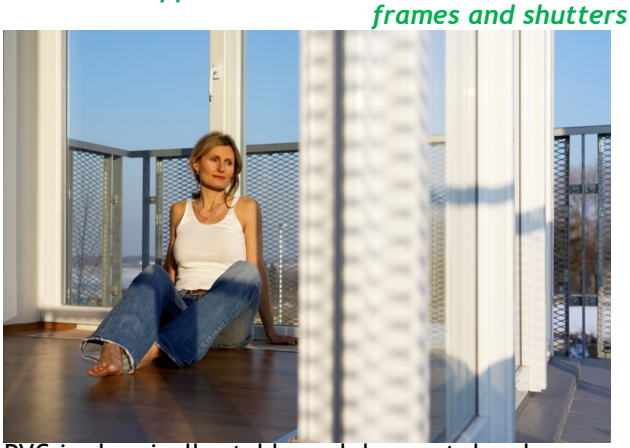
The European market of PVC resin in 2019 was around 5 million tonnes, representing about one sixth of the world market.

PVC is efficient in its use of resources, with 57% of its feedstock being salt; one of the earth's most abundant raw materials, and a low energy demand in manufacture. It is also used in many long life applications and can be recycled.

Properties and uses

The inherent properties of PVC make it valuable to many industries and in products which are highly valued by the general public. It has a high strength to weight ratio, does not corrode and is highly durable.

PVC application in construction as window frames and shutters



PVC is chemically stable and does not depolymerise. All these properties make this plastic an especially cost-effective material in both economic and environmental terms across a wide range of applications. The price/performance ratio of PVC is one of the best for any material.

About 60% of PVC manufactured has a service life of between 15-100 years. Main applications are in construction as window frames and shutters, water and waste pipes, and electrical applications such as cable and wire insulation.

PVC window profiles and PVC piping lasts for more than 40 and 100 years respectively, reducing both maintenance costs, consumption or resources and environmental impact. There are also environmental for shorter-life PVC products. For example, PVC used for medical devices such as blood bags, is less energy intensive to make compared with glass, but also lighter to transport, therefore causing comparatively less environmental emission of carbon dioxide. The same comparison is true of the use of PVC versus other materials in car components.

In addition, PVC presents a very low fire hazard. PVC is specified for building materials and its excellent fire prevention properties are widely recognised. It is difficult to ignite, and in the absence of a powerful external flame, will not continue to burn. However, if PVC does burn it releases hydrogen chloride, which irritates the nose and so provides an early warning of fire. Some carbon monoxide is also formed, but comparatively little heat, both of which are the major causes of fire related deaths. Furthermore, the production of dioxins in PVC fires is so low that no health effects have ever been detected in exposed people and fire-fighters.

PVC acts as a barrier against air, oxygen, moisture and odours, and has anti-bacterial properties, helping to keep packaged food fresh and clean. It also is used in medical applications from packing pharmaceuticals to hospital flooring. Blood stored in PVC bags tends to last much longer than in other storage materials.

Concerns over various additives, which are used to give different properties to PVC, are being addressed by industry. Progress has been made towards ensuring the sustainable use of additives. By 2011, the consumption of lead stabilisers decreased by 71.4 per cent in the then EU-27 compared to 2007 and was completely substituted by 2015. This trend was supported by the corresponding growth

in calcium organic stabilisers, used as an alternative to lead-based stabilisers.

PVC is a great material for medical applications

Production

Production of PVC involves the polymerisation of vinyl chloride monomer (VCM), which can cause a rare form of cancer. Despite this, for over 30 years the European industry has operated safely below the operational exposure limit. In addition, monitoring outside production plants indicates that VCM emissions are also well below the operational exposure limit. Furthermore, emissions of dioxin from PVC manufacture are small compared to other sources.

Recycling and disposal

The first year results of a ten year PVC sustainability initiative, VinylPlus, were presented at the close of the European PVC Value Chain's 2012 annual meeting. Despite significant challenges caused by the economic crisis, results indicated that the industry was on track to achieve the VinylPlus sustainability goals for 2020 set last year following the successful completion of its predecessor Vinyl 2010. Under VinylPlus, the industry has recycled over 6.5 million tonnes of PVC since 2000 saving over 13 million tonnes of CO_2. Thanks to the consolidation of collection and recycling schemes for PVC, 730,000 tonnes were recycled in 2020. There are also targets to recycle 1 million tonnes of PVC by 2030. This is despite the pandemic, continuing adverse market conditions and the decrease in volumes of PVC waste in construction.

For PVC waste that cannot be economically recovered and recycled, the best option is incineration with energy recovery. In this case, plastic is an important constituent of waste as it provides the calorific energy necessary for burning. The chlorine in PVC helps to remove heavy metals during incineration, producing a cleaner slag that can be reused in construction.

The presence of PVC in waste does not appear to increase dioxin formation during incineration. Dioxin emissions are controlled through correct operation of the incinerator and containment. Measurements have shown that the contribution of PVC to the formation of dioxins in a fire is no greater than that from natural materials, such as wood.

The use of landfills for waste is the last option. PVC is inert in landfills, and there is no evidence that it creates gases or increases toxicity of any leach ate. While PVC is not biodegradable, its additives are.

Euro Chlor Position on PVC

Due to the intricate link between chlorine/ caustic soda/ potash/ hydrogen production and PVC, Euro Chlor strongly supports the PVC industry and its applications. The industry is responsible and operates to the highest standards. The PVC industry is also working via the production chain to improve the environmental impacts of PVC, which is an inherently sustainable product.

The image of PVC has been negatively affected in the past by adverse publicity generated by environmental organisations that often ignore scientific realities. As a result, there has been a gap between fact and public perception. However, attitude surveys undertaken with industry stakeholders and consumers have indicated that this gap between perception and reality is narrowing and consumption of PVC indicates that the products versatility and qualities are still highly valued by society.

Much more about chlorine on www.eurochlor.org.

Chlorine chemistry applications: www.chlorinethings.eu

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