

# A flagship for the circular economy

*The Director of the European Commission's DG Growth, Gweno Cozigou, acknowledged VinylPlus' pioneering contribution to the advent of a circular economy in Europe.*

PVC is one of the most widely used plastics in the world. Because it is so versatile, PVC is used extensively in a broad range of industrial, technical and everyday applications. PVC is intrinsically a 'low-carbon' plastic (57% of its molecular weight is chlorine, derived from common salt, 5% is hydrogen and 38% is carbon, compared for example to more than 80 % in most other thermoplastics, and PVC consumes less primary energy in the manufacturing phase than other commonly used plastics. There are several intrinsic benefits that PVC as a material brings, but of course, as any material and human activity, it has a carbon footprint and an impact on the environment.

Through the VinylPlus initiative, the European PVC industry seeks to progressively reduce GHG emissions along the entire production chain: identifying and measuring the GHG footprint of all components and production processes; establishing GHG reduction targets; endeavouring to increase use of renewable energy and of technologies enhancing the efficiency of materials used; and implementing these engagements with business partners and stakeholders.

Initiatives, in this sense, are already in place including, for example, the target of a 20% reduction, by 2020, of the energy consumption for PVC resin production (-10.2% to date); the definition of a new methodology called 'EPDplus' to evaluate the use of substances utilised as additives in PVC products from the perspective of sustainable development which integrates the current standard Environmental Product Declarations (EPDs) with The Natural Step's (TNS) criteria for sustainability; the assessment study on the feasibility of PVC resin production with ethylene from biomasses, thus decoupling plastic production from oil consumption.

"VinylPlus can be considered as a flagship for the circular economy" said Gweno Cozigou, the European Union's Director of DG Growth, at the Vinyl Sustainability Forum 2015. The European PVC industry is managing waste streams with a controlled-loop approach, and although there is still work to do in this area to reach VinylPlus' target of 800.000 tonnes of PVC recycled per year by 2020, PVC recycling is becoming an economically viable business. In 2014, the amount of end-of-life PVC recycled within the VinylPlus framework was 481.000 tonnes, equivalent to around 20% of the total waste arising from PVC, based on a 2013 estimate by the German market research company Consultic.

Using recycled PVC helps meet resource-efficiency targets and allows the preservation of natural resources. It has been calculated that CO<sub>2</sub> savings of up to 92% are achieved when PVC is recycled: recycled PVC's primary energy demand is typically between 45% to 90% lower than virgin PVC production (depending on type of PVC and the recycling process). Furthermore, according to a conservative estimation, for each kg of PVC recycled, 2 kg of CO<sub>2</sub> are saved. On this basis, CO<sub>2</sub> savings from PVC recycling in Europe is now at around 1 million tonnes of CO<sub>2</sub> saved per year.

In addition, according to a study by TAUW, an independent European consulting and engineering company, one employee, on average, is needed to recycle 500 tonnes/year of PVC. Hence the 481.000 tonnes of PVC recycled in 2014 contributed to the creation of about 1,000 direct jobs in recycling plants.



# Forest Opera

*The Forest Opera (Polish: Opera Leśna, German: Die Waldoper) is an open-air amphitheatre located in Sopot, Poland, with a capacity of 4400 seats, the orchestra pit can hold up to 110 musicians.*

Built in 1909, the amphitheatre is used for various entertainment events and shows, including opera performances and song festivals. After World War I and almost until end of World War II it was a place of operatic festivals and Sopot was recognised throughout Europe and frequently labelled as the Bayreuth of the North. Here, mostly Wagnerian operas and musical dramas were performed regularly each year.

The open-air amphitheatre was recently completely redesigned replacing the old roof structure with a more modern and durable one which consists of a 1500 square metre PVC membrane roof and a 4.500 square metre PTFE canopy. The most important function was to protect visitors against rain and wind, keeping them comfortable. The roof has an attractive shape and perfectly interacts with the long-span steel arch. The installation work was especially demanding due to difficult location access, as it was in the middle of a forest and connected with the large arch structure.

The canopy is supported by a large central arch structure.

Cables are connected to this arch and to the perimeter steel columns. The columns are stabilised by tie-back cables. Edge cables span between the columns to support the edge of the membrane panels. The membrane cladding is connected to the cables and steel arch. PVC membrane closures are added to provide a weather proof system.

The membrane cladding provides a perfect internal light ambiance and spectacular nighttime images.

**Project:** Forest Opera  
**Location:** Sopot, Poland  
**Architects:** J. Szczesny, A. Gołbiewski, W. Rosowski, Warsaw, Poland  
**Technical info:** PVC/PTFE membrane roof  
**Picture credits:** Halewicz  
**Website:** [www.operalesna.sopot.pl](http://www.operalesna.sopot.pl)



# The Edicola – Caritas Pavilion

*"Divide to multiply. Breaking the bread" is the theme represented in three dimensions in the pavilion with which Caritas takes part in the Expo 2015; indeed, the architectural concept centres around the idea of sharing as an opportunity.*

The Edicola, this is the name of the small pavilion designed by Milan-based architecture studio PiùArch, has the appearance of a fragmented cube, the structure has been designed keeping simplicity at the core of its composition and the unadorned nature of its appearance. The structure is divided into five sub-structures that are similar to each other but of different sizes and designed for different purposes. They are positioned on the ground and joined by vertices, a reference to the Edicola's typical square floor plan. The uniformity of the construction is provided by its structural profile characterised by the same external dimensions, colour and materials.

Thanks to its extremely simple structure, the Edicola is truly eco-sustainable. Externally, it is made of PVC pre-tensioned mesh that lets the air flow through without any need for air conditioning and lets in natural light which helps keep energy use to a minimum.

The plot occupied by Caritas presents a number of different features: a 200 sqm. outdoor paved area that greets visitors, a 150 square metre covered area divided into different rooms, and a 550 square metre green area. It is not just a place but five situations and five experiences that help visitors relate to the Caritas world.



**Project:** The Edicola – Caritas Pavilion  
**Location:** Expo 2015, Milan, Italy  
**Architects:** PiùArch, Milan, Italy  
**Technical info:** PVC mesh  
**Picture credits:** PiùArch  
**Website:** [www.piuarch.it](http://www.piuarch.it)





# Al Khor Stadium

*Preliminary work on Al Bayt, a proposed semi-final venue, has already started and construction is due to be completed in 2018. As one of the World Cup's semi-final venues, the new arena has a modular design, which includes an upper tier of removable seats.*

The stadium will seat 60,000 but after the tournament the design allows the upper tier of seating to be removed, reducing the stadium to 32,000 seats. The removed seats are planned to be donated to other countries "to leave a legacy for international football development.

The Stadium design is an entirely-Qatari concept, reflecting Qatar's proud history and culture. It is based on Bayt Al Sha'ar, a black-and-white tent used traditionally by nomadic people in Qatar and rest of the region.

This stadium will be one of the largest in the world covering a floor area of 96,900 m<sup>2</sup>. It includes many special features including a black PTFE cladding on the roof with black and white PTFE stripes on the facade. This represents the traditional Qatari tent with a black roof, and black and white horizontal stripes on the facade.

The interior of the stadium has a printed PVC liner to represent the interior of the Qatari tent. The centre portion of the roof features a folding, retractable system.



**Project:** Al Khor Stadium  
**Location:** Al Khor, Qatar  
**Architects:** DAR Al Handasah Consultants  
**Technical info:** PVC and PTFE membrane  
**Picture credits:** Al Khor Stadium DAR Al Handasah Consultants  
**Website:** [www.dar.dargroup.com](http://www.dar.dargroup.com)



# Velodrome Odense

*The new Velodrome designed by Mikkelsen Architects is located in Odense, in a suburban open and green area where trees as well as existing vegetation surround the existing outdoor cycle track and associated buildings.*

The project describes a solution with the enclosure of a 250 metre long cycle track, as well as establishing a new timber cycle track in combination with a 200 m running track and field event facilities in the central area.

The building is located within the existing track's geometry – this will help emphasise the area's landscape character, while at the same time all existing vegetation is arranged in relation to and supports the existing track's geometry.

Thus the new building will, right from the start, be surrounded by plants. The building is located as far south as possible in the existing track's geometry. This location will make the building visible to passersby. Surplus excavated earth will be used as fill in the area to the north of the building. Additionally the open area on the site will benefit greatly as it will appear as a larger combined area.

The biggest challenge with regard to the structural design is the need to design a structure that can span over a large column-free area while being both the lightest and most structurally and economically effective solution. During the first stages of the design process it became clear that the best way to achieve these goals was to use a membrane structure in combination with a supporting structure of

steel. A membrane functions simultaneously as structure and cladding for the roof. This reduces both weight, costs and the environmental impact of the structure.

The roof consists of nine PVC membrane panels supported by eight structural steel trusses. The trusses are unusual since their centre lines are not vertical but are "tilted" off the vertical to match the slope of the roof. This architectural feature, made the design and especially the installation of the trusses more complex. The longer trusses are 85 m in length. The thrust force in the arched trusses is balanced with a Macalloy bar.

**Project:** Velodrome Odense

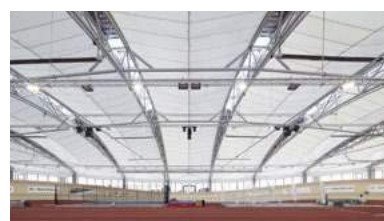
**Location:** Odense, Denmark

**Architects:** Mikkelsen Architects, Copenhagen, Denmark

**Technical info:** PVC roof

**Picture credits:** SÅ, ren Aagaard

**Website:** [www.mikkelsengroup.dk](http://www.mikkelsengroup.dk)







## RCS Media Pavilion

*The pavilion for RCS Media, designed by Italian architect and designer Monica Armani, draws its inspiration on the temporary character of the structure as well as the historical precedent of the expo exhibition*

The architecture of the pavilions is based on a transparent volume made of xlam columns and inflated PVC crystal cushions. 22 transparent two-layer cushions create the facades while two printed tri-layer cushions form the roofs. The roofs can filter sun rays according to the inflation of the two chambers, thanks to random patterns printed on different layers in positive/negative arrangement.

The lightness of the inflated part contrasts with the weight and the mass of the vertical and horizontal wooden structure. This combination ends up in an elegant and sober construction.

Designed with the focus of material reuse and characterised by attention to details of the finishes and materials, it quickly becomes a recognisable building, a building used, shared and enjoyed, a building that tells the story and, at the same time, stresses the relevance of the Corriere della Sera's Group.



**Project:** RCS Media Pavilion  
**Location:** Expo 2015, Milan, Italy  
**Architects:** Monica Armani, Italy  
**Technical info:** PVC mesh  
**Picture credits:** Expo 2015, Monica Armani  
**Website:** [www.monica-armani.com](http://www.monica-armani.com)





## Filo Filo

*All individuals seek their spaces and every space says something about the person who created it, possesses it, lives in it and enjoys it. Lighting contributes to any space to the extent that it affects its appearance, its atmosphere and the feelings it creates.*

Light is one of the primal forces that shaped the world as we know it and its creative power is now used to create an entire world of personalised micro-universes.

New hanging and table lamps Filo Filo are a fusion of architectural and formal essential elements, that grant a perfect lighting together with a timeless elegance.

The lamps, designed by Italian designers Asnago and Minotti for Penta, create a new space to live and models itself according to the different needs. Design therefore, but in the broadest sense, as light, space, movement and sensations.

The main structure is made in anthracite varnished metal with a PVC cable available in different colours. The choice of a material, a mass coloured PVC cable, which is produced industrially by means of an innovative use of filament winding technology, gives this collection an appearance which unites technology with tradition.



**Project:** Filo Filo

**Designer:** Umberto Asnago, Carola Minotti, Como, Italy

**Producer:** Penta Light, Como, Italy

**Technical info:** PVC cables

**Picture credits:** Penta

**Website:** [www.penta.it](http://www.penta.it)





# Mercado de Paloquemao

*During the Milan Design Week 2015, fashion brand Marni created a colourful installation inspired by the vibrant markets of Bogota, Colombia.*

The Marni Mercado de Paloquemao links well to the theme of the Expo Milano 2015 which explores the relationship between food and the arts – showcasing limited edition woven furniture, tableware and a sculptural banquet of fruit pieces in an array of colours in PVC and metal.

The exhibition gives the chance for visitors to be transported into Marni's tropical world, given a taster visually, and literally, of their take on the dynamic South American country.

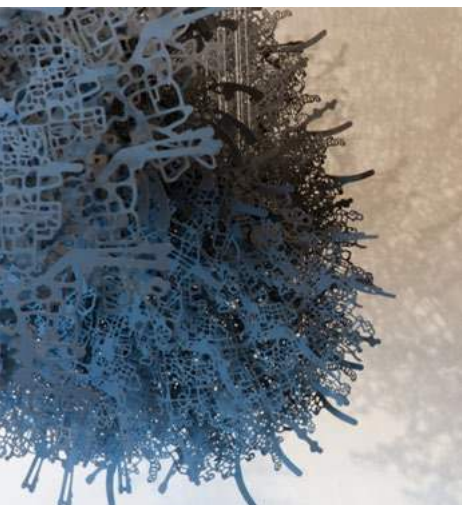
The set-up of the installation invites conviviality. The large table, enriched by the shapes of exotic fruits, is setup with tin plates hand decorated with Marni's archive motifs. Around the table, you can see the new Marni chairs made of metal and bright PVC weavings, whereas stools of various shapes, colours and woven patterns complete the collection.

Marni expresses certain freedom in her compositions, where each combination is unique and unexpected and allows the viewer to expand its concept of design to incorporate Latin components.

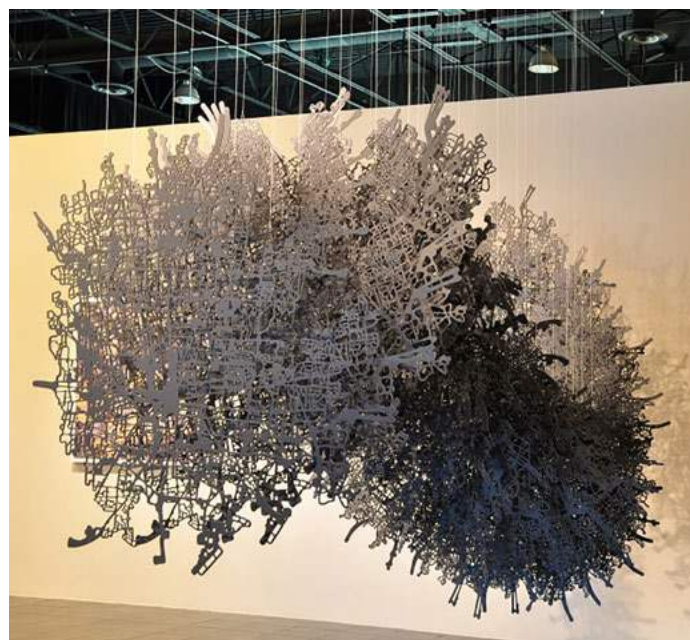


**Project:** Mercado de Paloquemao  
**Location:** Marni Showroom, Milano, Italy  
**Architects:** Marni, Milano, Italy  
**Technical info:** PVC and metal  
**Picture credits:** Marni  
**Website:** [www.marni.com](http://www.marni.com)





**Project:** Chiaroscuro  
**Location:** Grand Rapids Art Museum, Grand Rapids, MI, USA  
**Designer:** Virginia Kistler, Columbus, Ohio, USA  
**Technical info:** Laser-cut PVC sheet  
**Picture credits:** Virginia Kistler  
**Website:** [www.virginiakistler.com](http://www.virginiakistler.com)



# Chiaroscuro

*Virginia Kistler is an interdisciplinary artist focusing on sculpture and with a background in design.*

Virginia Kistler's art practice consists of large interior and exterior sculptures, while her design background includes designing exhibits for children's museums and science centres, both nationally and internationally. Much of her work explores the growth of urban spaces and the consequences of this growth on the human psyche.

Virginia Kistler investigates the ubiquity of urban landscapes and the absence of biodiverse spaces in our lives. She seeks to record the impressions created by urban spaces, flora, and fauna as a way of understanding this changing landscape and

to investigate the intersection of the two. Inspired by satellite photos of contemporary cities taken at night, she creates light maps or light impressions of urban spaces.

Using these light impressions, Virginia projects the darkened maps and cuts away what remains to create hanging sculptural forms and two-dimensional work which consist of laser-cut PVC elements suspended with steel cables. The darkened light maps symbolise the fluctuating presence and absence of urban and natural spaces.





# Cubic Prism

*Cubic Prism is a three-dimensional cube-based structure made out of three different colours of polyester/PVC textile. It consists of 153 pieces of 1.4 cubic metres, and the dimension of the tube is 4.2m x 4.2m x 23.8m.*

Textile designer Akane Moriyama exhibited this at the Curtains exhibition as one of the finalists at the Curtains competition hosted by the Center for American Architecture & Design in Austin, Texas.

When rigid cubes are replaced by semi-transparent textiles, the geometry loses its shape in relation to environmental factors. The lines are moved by the wind and weight of rain drops. The transparency changes by light and the colours are mixed in space.

The Cubic Prism is a transient experience of shifting form, light and colours, creating a dynamic and spatial experience for the senses.

The installation's opacity changes according to the way natural light is filtered through it, mixing the different colors – the transient prism continuously shifts its visual appearance. Hanging naturally between the surrounding buildings, the structure dramatically influences the nature of the square below.



**Project:** Cubic Prism

**Location:** Goldsmith Hall, Texas, Austin

**Design:** Akane Moriyama, Stockholm, Sweden

**Technical info:** PVC, polyester and metal

**Picture credits:** Akane Moriyama, Alison Steele/SOA VRC

**Website:** [www.akanemoriyama.com](http://www.akanemoriyama.com)







**Project:** Contra Dictions  
**Design:** Martijn van Strien, Rotterdam, Netherlands  
**Producer:** MPHVS, Rotterdam, Netherlands  
**Technical info:** PVC laser-cut sheets  
**Picture credits:** Olya Oleinic  
**Website:** [www.martijnvanstrien.com](http://www.martijnvanstrien.com)



# Contra Dictions

*Contra Dictions is a new fashion line recently shown at Dutch Design Week, designed by Rotterdam-based designer Martijn van Strien using laser-cut PVC to create dazzling, futuristic patterns that look like a graphic designer's alien dream.*

The mood of the collection is inspired by a man traveling the edges of his existence. It's about staying on the move, visiting different places, looking for the unknown in search of yourself. It's about being confused, and lost, and liking it, about perpetual change. About the contrast between real and unreal, between organic and geometric, alive and dead, material and non-material.

Made using high-tech equipment to turn unconventional materials such as PVC into wearable pieces, this collection is an exploration into the future of fashion. Taking a parallel path to the opportunities 3d-printing brings to product design, this technique makes one-of-a-kind, custom garments possible to exactly fit the "consumer's" size and demands. A 21st century approach to haute couture.

The material came from long research into the possibilities of making heavy industrial materials lighter, flexible and more wearable. The goal was to add different qualities to one piece of material to eliminate the need to use different materials in one garment. All holes and outlines are cut into the PVC by using a laser cutter which makes it easy to adapt a garment to specific sizes, prints or other requirements. Each garment can be unique, there is no need to mass-produce large amounts of the same garment.

The shapes are inspired by architecture. They're kept simple and square because the main focus is on the material. It's a 'unisex' collection because van Strien doesn't believe in the difference between men and women. Physically there doesn't have to be much difference, so also what they wear can be similar.