

FLEXIBLE PVC IN OUR DAILY LIFE



FLEXIBLE PVC IN OUR DAILY LIFE

The information in this booklet is based on the findings from the study *Circular Visions for Flexible PVC* by Ramboll Denmark.
The study was commissioned by PVC Information Council Denmark.

FLEXIBLE PVC – A MATERIAL FIT FOR THE GREEN TRANSITION

In this booklet, we showcase the durable, affordable, and often beautiful applications of flexible PVC and explain how many of these applications can contribute to **Europe's green transition**. Flexible PVC is a plastic that provides the building block for a wide range of applications that address societal needs in almost every sector: building and construction, healthcare, transportation, food production, leisure, sports, entertainment, art, and design.

In addition to highlighting where flexible PVC is used in society, we also present the findings of a study by the global consultancy Ramboll. This study, commissioned in 2020 by our colleagues at the PVC Information Council Denmark, delves into the reasons why flexible PVC is utilised in a myriad of products within buildings and other pivotal sectors.

Ramboll's findings are clear-cut. The consultancy determines that flexible PVC is an irreplaceable material in many applications due to its unique functional properties. The study underscores the plastic's durability and weather-resistance, which is unparalleled by other materials. Furthermore, the report emphasises the circularity of flexible PVC.

Given flexible PVC's attributes of being durable, beautiful, and affordable, we believe that Europe's architects, designers, specifiers, cities, regions, and policymakers should take Ramboll's findings into account in their future planning and initiatives.

Brigitte Dero
Managing Director, VinylPlus®
2023







8



12



14



24

TABLE OF CONTENTS

WHAT IS PVC?	8
RAMBOLL: FLEXIBLE PVC IS IRREPLACEABLE IN KEY APPLICATIONS IN SOCIETY	10
VINYLPLUS	12
A Commitment that works	12
A roadmap for 2030	13
CLIMATE	14
Climate-proofing with soft PVC	16
PVC protects against flooding	16
Flexible pvc meets many climate goals and has the potential to meet even more ...	18
Flexible PVC can contribute to climate action	19
Sweden's first fossil-free construction project uses bio-attributed PVC	22
HEALTH	24
Flexible PVC helps curb transmission of infection in the health service	26
PVC has excellent hygienic properties	28
Safe treatment of patients with Flexible PVC	29
PVC recycling in health care	31

CONSTRUCTION AND ARCHITECTURE 32

- Endless potential for creating unique design 34
- Durable and chemical-resistant floors 35
- PVC roofing membranes keep buildings dry for many years 36
- Savings for building owners and the environment 38
- New functions to existing buildings 39
- PVC cables power up our digital lives 40
- SPOTLIGHT** Seven decades of faithful service in Stockholm - Bromma Airport 41

SPORT AND LEISURE 42

- Flexible PVC in sports improves performance 44
- Soft mattresses and shock-absorbent floors 44
- Waterproof waders and soft barriers for ski sports 45
- Using Flexible PVC in stadium construction adds to the sporting experience 47
- Iconic meeting places 48
- Sustainable design practices 49
- Trampolines and bouncy castles improve children's motor skills 50
- SPOTLIGHT** She Runs 52

ART, CULTURE AND DESIGN 54

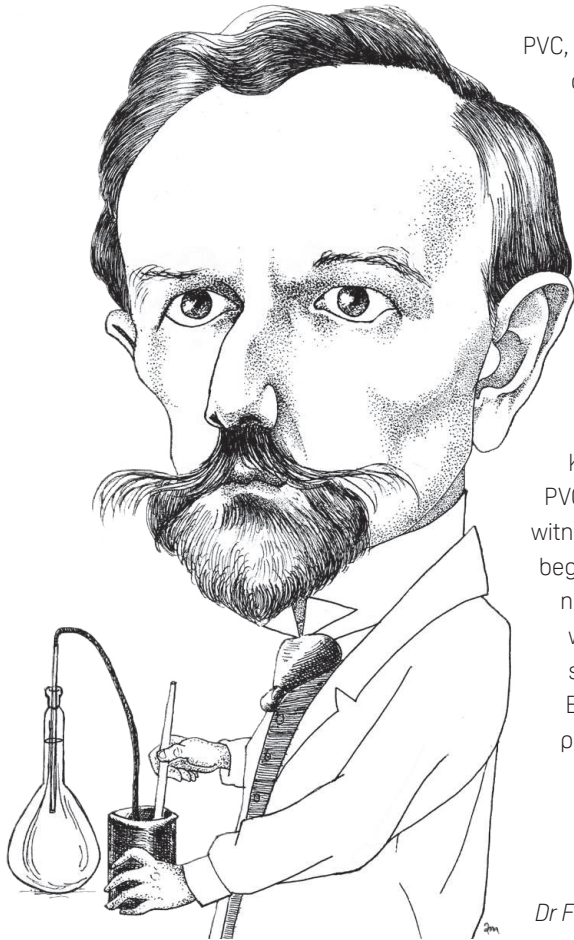
- The icon of famous rock festival is manufactured in flexible PVC 56
- Installation art, sculptures, designer lamps and seating 58
- SPOTLIGHT** An artist's choice of materials is also a challenge 60

INDUSTRY AND TRANSPORT 62

- PVC in industry ensures efficient and safe production 64
- Food and drink 65
- When cargo needs protection 66
- PVC in vehicles 67
- Safety at sea 68
- Allez allez with PVC! 70



WHAT IS PVC?



PVC, also known as vinyl, stands for polyvinyl chloride and is one of the most widely used plastics in the world with a wide range of long-life applications such as window frames, pipes, flooring, cables, sport equipment, and a range of lifesaving medical devices. PVC is the most used polymer in two key sectors in society, namely building and healthcare.

More than 100 years ago, German Dr. Fritz Klatte devised a method for manufacturing PVC industrially, although he never actually witnessed its success himself. At the beginning of the 20th century, it was simply not possible to build chemical installations with the dimensions required by Klatte's solutions. It turned into a triumph. In the EU alone about 5 million tonnes of PVC are produced each year.

Contrary to other types of plastic, PVC is primarily manufactured from salt, an inexhaustible resource. There are two types of PVC: flexible and rigid. Flexible PVC is produced by adding plasticisers, which make the material soft and flexible. This allows for the manufacture of products such as medical equipment, roofing, cables, flooring, tents, tarpaulins, and advertising banners.

The industry has worked hard to make sure that these plasticisers are safe. Over the past 20 years, 6 billions have been invested to replace unsafe plasticisers with safe alternatives.

Rigid PVC is primarily used to manufacture hard, durable products for the construction industry, such as pipes, doors and windows. Depending on the product, PVC has a lifespan of 100+ years. Besides high durability, PVC can be recycled eight to ten times without losing its functional properties. In Europe, more than 8 million tonnes of PVC have been recycled since 2000. The European PVC industry is committed to increase this figure to 900,000 tonnes/year in 2025 and 1,000,000 tonnes/year in 2030.

Dr Fritz Klatte (1880-1934), sketched by Anne Marie Steen Petersen.

RAMBOLL: FLEXIBLE PVC IS IRREPLACEABLE IN KEY APPLICATIONS IN SOCIETY

In 2020, PVC Information Council Denmark commissioned Ramboll Denmark to conduct a study on flexible PVC. The aim was to investigate why plastic converters choose flexible PVC and no other plastics for specific products. The study concentrated on floorings, sheeting, tarpaulins, advertising banners and the like for cultural purposes, climate management equipment, bouncy castles, sports and medical equipment.

Ramboll concludes that most of the products have a very long service life and are handled by professionals, which eases collection and recycling. Further, substitution to other plastics is not possible due to technical reasons.

Throughout the booklet you will find several other quotes from the Ramboll study which show the unique properties flexible PVC can provide to products.



The general conclusion of the market analysis is that the flexible PVC in the investigated products is not a material with obvious alternatives or potential for substitution ... There are no materials or products able to live up to the technical functionality of flexible PVC, and the functionality provided by flexible PVC products cannot be supplied by other materials.



The market analysis shows that flexible PVC is used in products with very specific technical specifications, which only flexible PVC can meet. Furthermore, the most important properties of flexible PVC are its durability, long service life, softness, thickness and flexibility, making it virtually impossible to damage.



The market analysis indicates that, due to flexible PVC's reputation amongst the public, the industry has shown a proactive interest in identifying alternatives. However, there are no alternatives for these seven product categories which would give the products the necessary functionality and quality.



The market analysis also shows that the industry wishes to continue to be able to supply high quality products, and that it is frustrated by flexible PVC's poor reputation in the eyes of the public. Furthermore, the industry is very interested in circular solutions for its products, whereby they are returned or collected with a view to recycling and safe waste treatment.



VINYLPLUS – A UNITED EUROPEAN PVC VALUE CHAIN COMMITTED TO IMPROVE PVC PRODUCTS’ SUSTAINABILITY



Sustainable development is not a new challenge for the European PVC industry. For more than two decades, the entire PVC value chain has worked together to make the production, use and waste management of PVC more sustainable. The work is embodied in the VinylPlus programme, the commitment to sustainable development of the European PVC industry that is now entering its third decade.

Ongoing progress is published in an annual report which is independently audited and verified by third parties. VinylPlus activities are overseen by an

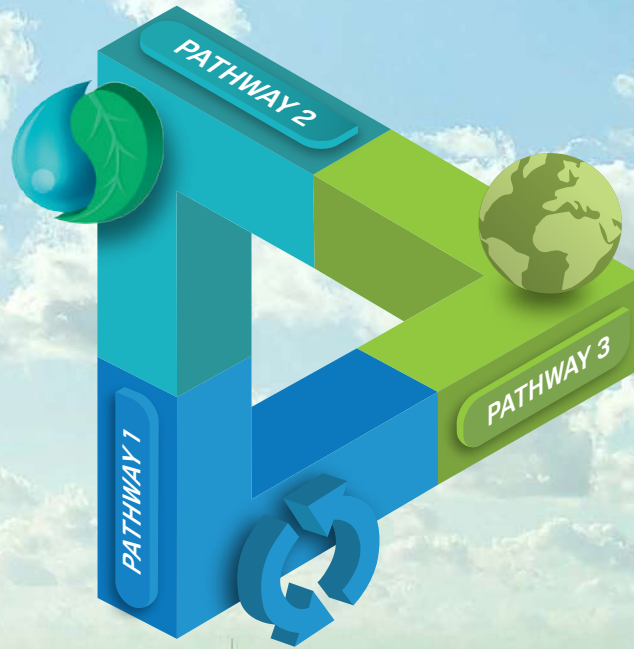
independent Monitoring Committee, consisting of representatives of the European Commission and Parliament, consumer organisations, trade unions, academic institutions and the PVC industry.

A COMMITMENT THAT WORKS

VinylPlus is noted for being an efficient, industrial commitment, and for meeting the targets it sets. Praise for VinylPlus comes from a wide range of stakeholders in the EU. At the VinylPlus Sustainability Forum in 2020 Kirsi Ekroth-Manssila, Head of Unit, DG GROW, at the European Commission, said:

“VinylPlus is a perfect example of how to make the Circular Economy a reality, being the first value chain to take on the challenge of transforming a problem into an opportunity, as early as 2001. In addressing the environmental concerns linked to PVC, VinylPlus and the industry came up with an ambitious and forward-looking approach: to organise, cooperate and communicate with the whole value chain, from the producer to the downstream user and the waste manager.”

VinylPlus 2030 Commitment



A ROADMAP FOR 2030

VinylPlus 2030 is the next 10-year Commitment of the European PVC industry to Sustainable Development. With its renewed Commitment, VinylPlus aims to contribute proactively to addressing the global sustainability challenges and priorities. The VinylPlus 2030 Commitment has been developed bottom-up through industry workshops and with an open pro-

cess of stakeholder consultation. Three 'pathways' and 12 'action areas' have been identified embracing the PVC value chain's circularity, its advancement towards carbon neutrality, minimisation of the environmental footprint of the PVC production and products, and its engagement with stakeholders and global coalitions.

CLIMATE

Flexible PVC is used in the event of climate emergencies such as cloudbursts, storms and other phenomena that cause elevated water levels. Mobile flood barriers protect our buildings and valuables. They are easy to assemble and can be reused again and again.





CLIMATE PROOFING WITH FLEXIBLE PVC



Extreme precipitation, severe deglaciation from mountains and glaciers, and flooding. Sea levels are expected to rise in line with global warming. While we collaborate on solutions to reduce CO₂ emissions, it is vital that we also develop solutions for mitigating the consequences of rising water levels.

“ PVC in flood protection equipment cannot be substituted by other materials, since there are strict requirements for the load the material must be able to bear without breaking. Flexible PVC is the only material that meets the desired functional specifications.

Ramboll Denmark, 2021

PVC PROTECTS AGAINST FLOODING

When water rises, we need to protect our buildings quickly and efficiently. Due to its functional strength and flexibility, flexible PVC is an appropriate material for flood barriers that can be rolled out and used at short notice, without the need for tools or specialist staff, providing a protective barrier and preventing water ingress.

Traditional emergency response to flooding is often costly, time-consuming and difficult to manage. For example, sandbags require transport of substantial quantities of sand to the flooded areas. By the time the sandbags have been

filled, the damage has often already been done.

Today, flexible PVC is widely used in the manufacture of climate management equipment such as mobile flood barriers to protect against cloudbursts, storms and other phenomena that cause elevated water levels – and these mobile PVC flood defences can be packed up and reused as needed. PVC is an obvious choice of material for protection against flooding caused by storm surges, extreme rainfall and rising sea temperatures.

“

Roofing membranes ensure a completely watertight system, and this is an important property for roofing, with implications for the roof's service life. Tests show that PVC roofing membranes have a lifespan of up to 50 years.

Ramboll Denmark, 2021



Green roofs absorb a large proportion of the precipitation that falls on them. Thus, a green roof relieves the pressure on the sewer system. PVC is a material of choice for the membrane that is concealed under the green roof, which protects the building against water ingress.

FLEXIBLE PVC MEETS MANY CLIMATE GOALS AND HAS THE POTENTIAL TO MEET EVEN MORE



Photo: Milène Servelle

EASY INTEGRATION OF SOLAR PANELS

A fast build up of renewable energy is necessary for Europe's green transition to succeed. Solar power already provides an important contribution to the European energy mix, and it is expected that solar has the potential to meet 20% of the EU electricity demand in 2040. PVC roofing membranes offer easy integration of solar panels that can harness the sun's energy for many years.

Besides being successfully used to produce different climate adaptations, flexible PVC can also contribute to climate protection in more general terms. The material's high durability and recyclability alone provide obvious benefits. On the next pages you can see how flexible PVC can help to achieve ambitious climate targets within six areas that materials must meet in the future.

FLEXIBLE PVC CAN CONTRIBUTE TO CLIMATE ACTION





1

LONGER PRODUCT LIFESPAN AND INCREASED REUSE

Lifespan is an important parameter for categorising materials as climate friendly. PVC products for construction are noted for their long lifespans. As mentioned in another section of this publication, there is PVC flooring in the busy Bromma Airport outside Stockholm. The floor was laid 70 years ago and is still fully functional.

Reuse and repair are also important parameters for climate-friendly products. Many flexible PVC products are easy to repair. Both tents and tarpaulins can be patched if they are damaged. A new PVC canvas is simply welded onto the damaged section of the tent. Furthermore, tents can be rented out again and again.



2

INCREASED USE OF RECYCLED MATERIALS

PVC is unique in terms of recycling. It can be recycled eight times without losing its functional properties, and new products can contain large quantities of recycled material. Since 2000, more than 8 million tonnes of PVC were recycled, a large share of which is flexible PVC. In 2019, VinylPlus committed to recycle at least 900,000 tonnes of PVC in new articles per year by 2025, as part of the European Commission's Circular Plastics Alliance.



3

CIRCULAR BUSINESS MODELS

The VinylPlus® Product Label is the sustainability mark for PVC products in building and construction, developed by VinylPlus in collaboration with The Natural Step and the British Building Research Establishment (BRE). To receive certification, the PVC resin must be manufactured in accordance with high European standards, and the products be designed for circularity.

The VinylPlus® Product Label has garnered significant recognition. It's the first plastic building product certification scheme acknowledged in both BREEAM® and Home Quality Mark®. In Belgium, the label has been recognised for green public procurement, equated with renowned ecolabels like the Nordic Swan and Cradle to Cradle. Additionally, it's been integrated into Belgium's sustainable carpentry label and cited as a standard for sustainably sourced plastic building products in Wallonia. By early 2023, the updated label achieved accreditation at the Italian level by Accredia. It also aligned with the Italian GPP CAM's environmental criteria and was evaluated by the Swiss organisation Ecobau for potential integration into their sustainability certification schemes for building products.



4

NON-FOSSIL MATERIALS AND SUSTAINABLE CHEMISTRY

Sustainable chemistry and carbon neutrality are at the heart of a sustainable economy. Non-fossil-based PVC additives and compounds, as well as bio-attributed and circular-attributed certified PVC resins, are increasingly available on the market thanks to innovation by the industry.



5

LESS WASTE

The PVC value chain is constantly seeking ways to minimise waste. This means the waste produced by plastics manufacturers is recycled, either within the factory or by other companies which recycle the waste in new products.

The industry is making concerted efforts to tackle plastic pellet, flake and powder loss granulate waste produced during plastics manufacture. This work is carried out under the auspices of Operation Clean Sweep®.

All member companies of the European Council of Vinyl Manufacturers, and founding member of VinylPlus, signed up to the Operation Clean Sweep® programme and are encouraging their customers to sign up as well.



6

INCREASED AND IMPROVED RECYCLING

Over the past two decades, the PVC industry in Europe has invested massively in collection and recycling. Since 2000, more than 8 million tonnes of PVC have been collected and recycled through VinylPlus in Europe alone. VinylPlus will contribute further to sustainable development by reaching 1 million tonnes of PVC recycled per year by 2030 in Europe. This is in line with the ambitions of the EU Circular Plastics Alliance.

SPOT-LIGHT





SWEDEN'S FIRST FOSSIL-FREE CONSTRUCTION PROJECT USES BIO-ATTRIBUTED PVC

As an element of Gothenburg's goal to end use of fossil fuels by 2030, the city has constructed Sweden's first fossil-free building. As the city writes on its website, the aim of the building, a kindergarten named "Håbet" (Hope), is to "stimulate innovation, develop know-how and create better conditions for fossil-free construction". In order to achieve this goal, they have imposed extensive requirements on the building materials used. For example, materials must be recyclable and be assessed based on their entire life cycle.



TIMBER WASTE REPLACES OIL

The kindergarten opened in 2021, and its pipe system is manufactured from climate-friendly, recyclable bio-attributed PVC. Waste from the timber industry replaces oil as feedstock, yielding a CO₂ reduction of 90% compared to traditional PVC pipes.

The bio-attributed PVC is certified by the The Roundtable on Sustainable Materials, which is an independent, global organisation that drives development of the bio-economy. In principle, since it is the chemical building block ethylene that is produced from the timber waste, it is irrelevant whether rigid or flexible bio-attributed PVC is manufactured. Some PVC manufacturers are already making flooring from bio-attributed PVC today.

HEALTH

Flexible PVC is vital to healthcare. From the way we design our hospitals to how we manufacture medical equipment.





FLEXIBLE PVC HELPS CURB TRANSMISSION OF INFECTIONS IN THE HEALTH SECTOR



The COVID-19 pandemic led to various levels of lockdown, and to minimise transmission of infection, we all had to keep our distance, put our social lives on standby and work from home. To curb the virus, isolation and restriction to our own small bubbles became part of daily life, from one day to the next. Flexible PVC became part of the fight against the pandemic – from medical devices and personal protection to tarpaulins for tents and vaccination centres.

” Tarpaulins can be made from other materials but the result is a thinner product that is more easily damaged and, thus, has a shorter lifespan. They simply do not give the same protection as a flexible PVC tarpaulin.

Ramboll Denmark, 2021



Throughout the COVID-19 pandemic, testing and vaccination centers proved critical. PVC tents were used for many of the temporary constructions. These are highly durable, fire-retardant, resistant to wind, weather and strain, and can be reused again and again.

INDGANG

INDGANG
MED KVARTET APP
HJØRSTADVEIEN 10



PVC HAS EXCELLENT HYGIENIC PROPERTIES

PVC and the health service are an ideal match, when it comes to both organisation of our hospitals and the medical equipment used for treating patients. PVC is used in hospitals, in their clinical environments and in their laboratories.

Due to its combination of functionality, hygiene and durability, PVC is a good choice of material

for surfaces in hospital environments where patient safety is a top priority. PVC floors and walls reduce the risk of transmission of microbes, are easy to clean and retain their hygienic properties throughout their useful life.

Furthermore, studies show that PVC makes good financial sense. A life-cycle cost analysis completed by Västra Nylands Hospital showed

that the Finnish hospital was saving €65,000 a year on cleaning compared to other flooring materials. The hospital chose a high-quality PVC which requires no polishing. Calculated on a 24-year life cycle, total savings run to €1.6 million on cleaning alone. There is also an obvious environmental benefit as, over a period of 24 years, the hospital will save 58,320 litres of water, 17,136 litres of chemicals and 16,944 kWh of electricity.



PVC has a range of properties which are not found in other materials. Thanks to these properties, the material is particularly suitable for use in medical equipment.

Ramboll Denmark, 2021

SAFE TREATMENT OF PATIENTS WITH FLEXIBLE PVC

Around 30% of all disposable products used in hospitals are made of PVC. This is not a coincidence, as PVC is one of the best materials for manufacturing reliable medical equipment that takes the safety of both patients and staff into account. If we compare the functional properties of PVC with those of other materials such as metal, glass or ceramic, it is clear that PVC is the ideal choice for use in the manufacture of medical equipment.



Tubing, urine bags, blood bags, transfusion sets, oxygen masks. The list of PVC-based products used in the health sector is almost endless, and the popularity of PVC within the healthcare industry is due to a long list of factors: thanks to the material's flexibility and versatility, medical products made from PVC combine the functionality, reliability and high safety standards hospitals require. The transparency and unrivalled anti-kinking properties of PVC make it the ideal choice for various types of tubing. Other medical products are manufactured from PVC because of the material's chemical stability, biocompatibility and cost-effectiveness. When price, quality and comfort are important, flexible PVC is a good choice. And the industry's initiatives to identify recycling solutions for PVC-based medical equipment will help the circular economy make inroads into hospitals.

PVC RECYCLING IN HEALTHCARE



COVID-19 highlighted the crucial role played by single-use plastic medical devices in the prevention and control of infection in hospitals. The surge in the need of such disposable items has shed light on the challenges of properly managing and discarding them after use. Properly sorting and recycling the non-infectious plastic waste can both significantly reduce the environmental impact of hospitals and their operational cost.

Market studies show PVC is the most used polymer for single use medical devices and it will retain its position in the years to come. The high volume and PVC's unique recyclability indicate that hospitals should start with PVC in recycling schemes for plastics-based medical devices.

The European PVC industry, through VinylPlus, has invested in recycling of PVC medical devices since 2014 when the RecoMed take back scheme was established in the UK. The scheme was inspired by the successful PVC in hospitals recycling project in Australia and New Zealand, which involves over 250 hospitals.

In 2022, VinylPlus launched a collaborative project called VinylPlus® Med. Aimed at accelerating sustainability in healthcare across Europe through the recycling of discarded single-use PVC medical devices, the project brings together hospitals, adult day care centres, waste management companies, recyclers and the PVC industry in some selected European countries.

The programme only focuses on creating PVC recyclates devoid of harmful substances, suitable for a broad spectrum of high-quality products marketed throughout Europe. Belgium serves as the inaugural country for this initiative, collaborating with Renewi (waste management company) and Raff Plastics (plastic recycler). These recyclates have been successfully integrated into long-lasting wall coverings for hospitals. Expansion plans for similar programmes in other European countries are currently in progress.

Learn more at vinylplus.eu and pvcmed.org.

CONSTRUCTION AND ARCHITECTURE

In the construction industry, flexible PVC is widely used for flooring, wall cladding, roofing, cables and many other products.



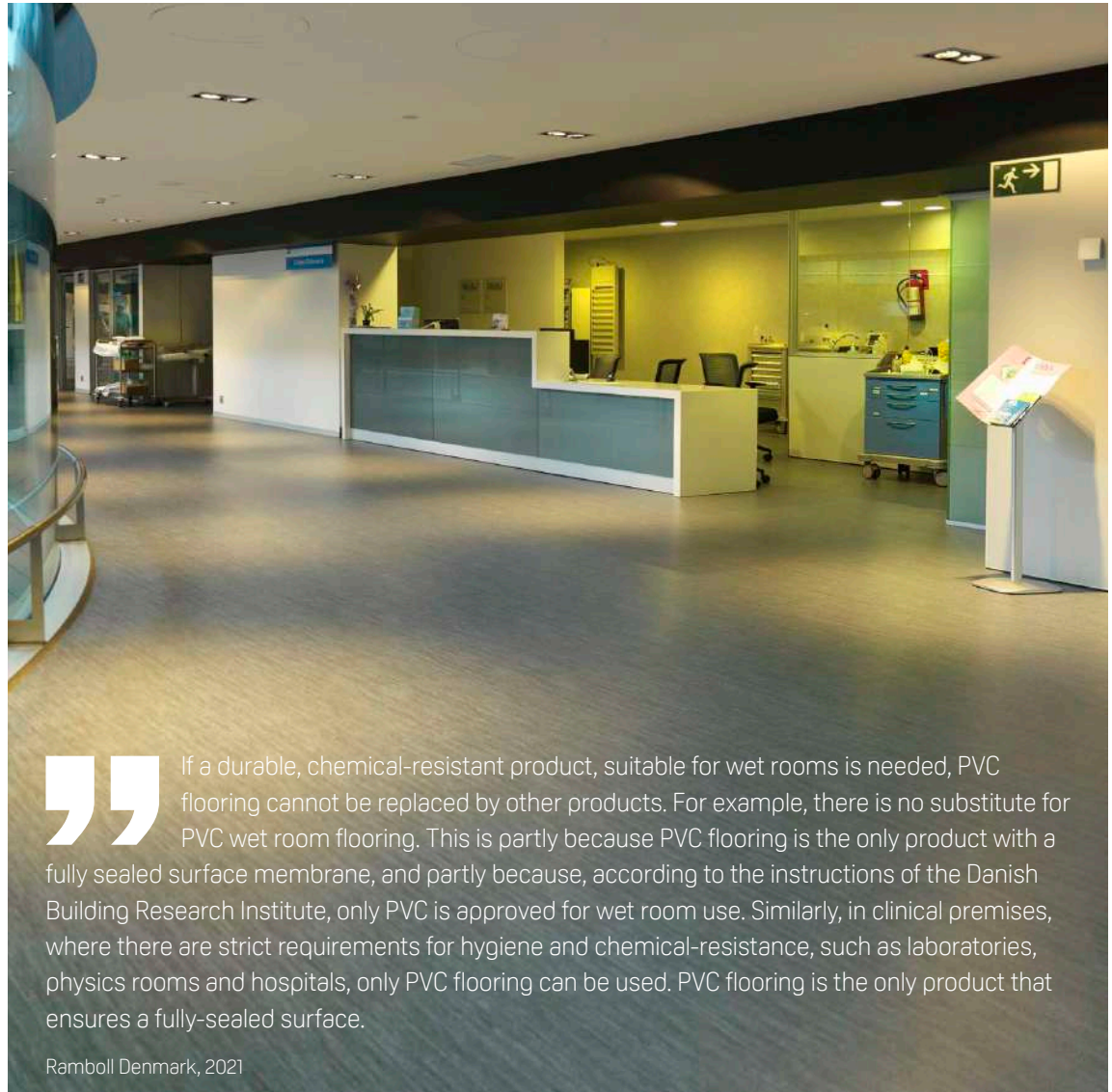
The “Solar Trees” on the German pavilion were the architectural highlight at the Expo 2015 world exhibition in Milan. The trees were fitted with a solar cell installation. During the day, energy was stored in them and then used to illuminate the pavilion at night. The solar trees consist of a steel structure, coated with an extremely thin, flexible PVC membrane.



ENDLESS POTENTIAL FOR CREATING UNIQUE DESIGNS

In recent years, architects have focused more than ever before on uniting a strong aesthetic design expression with users' needs. Architects have become more skilled in developing spaces with respect for the human scale and users' specific requirements. Practical experience from different construction projects must now be carried forward to ensure the quality of hospital projects in future years.

Architects are consistently developing buildings that push the boundaries of what materials can deliver in the way of artistic and functional objectives. When working with flexible PVC, the design options are almost infinite. In hospital projects, flexible PVC gives architects free rein to create – without constraints related to functionality, specifications for use, aesthetics or costs.



”

If a durable, chemical-resistant product, suitable for wet rooms is needed, PVC flooring cannot be replaced by other products. For example, there is no substitute for PVC wet room flooring. This is partly because PVC flooring is the only product with a fully sealed surface membrane, and partly because, according to the instructions of the Danish Building Research Institute, only PVC is approved for wet room use. Similarly, in clinical premises, where there are strict requirements for hygiene and chemical-resistance, such as laboratories, physics rooms and hospitals, only PVC flooring can be used. PVC flooring is the only product that ensures a fully-sealed surface.

Ramboll Denmark, 2021



DURABLE AND CHEMICAL-RESISTANT FLOORS

PVC floors are durable and can be used for many years without deteriorating in quality. Flexible PVC is therefore typically used as flooring in buildings requiring a combination of functionality, durability and aesthetics. This applies, for instance, to hospitals, laboratories, care homes, industrial buildings, offices, schools, shops and other buildings with heavy traffic.

Floors in the health sector and care homes are used 24 hours a day, all year round. At the same time, the hygiene requirements are extremely strict and the architecture is expected to have a positive impact on the staff's working environment and to contribute to good treatment and care. Since comfort and safety for patients and residents are paramount, PVC flooring is ideal due to its durable, shock-absorbent and non-skid properties. Furthermore, since PVC is resistant to chemicals and very easy to clean, it is the obvious

choice for flooring in the health and social care sector.

Floors in manufacturing industries are subject to heavy machines and a constant flow of forklift trucks. Manufacturing companies therefore require durable and chemical-resistant floors, and that is why flexible PVC covering is widely used in industrial buildings.



PVC ROOFING MEMBRANES KEEP BUILDINGS DRY FOR MANY YEARS

Flexible PVC is also widely used in all types of roofing required to be waterproof. PVC roofing membranes have been used in the construction industry for half a century, and it is a good choice because it is functional, cost-effective and aesthetic. They also have benefits for the climate thanks to their low weight, easy installation, long service life, cooling properties and recyclability.

PVC roofing membranes are easy to install; they are simply welded together on the roof structure with use of hot air, which eliminates the risk of fire. The welds create an extremely watertight roof membrane, eliminating the need for tape and other types of joints which increase the risk of leaks. PVC roofing membranes are also wind-resistant. This means that they are resistant to extreme weather conditions, which are gradually becoming a more common occurrence all year round.



Using soft PVC in building projects offers a wide range of design options, combining functionality, aesthetics, cost-effectiveness and sustainability.



SAVINGS FOR BUILDING OWNERS AND THE ENVIRONMENT

Time is money, and there is considerable focus within the construction industry on reducing costs in all phases. One roll of PVC roofing replaces up to six rolls of traditional roofing materials, which also need to be laid in several layers, increasing installation time significantly. Thanks to the properties of PVC, PVC roof

membranes are extremely durable. Furthermore, due to their high UV resistance, they efficiently reflect the sun, so that less energy is required for cooling or heating the building. Both have a positive impact on the building's operating expenses and the environment.



Roland Garros. Photo: Maffeis

NEW FUNCTIONS TO EXISTING BUILDINGS

Previously, PVC roofing membranes were primarily used on flat roofs. However, today, it is not uncommon to see PVC roofing membranes on all roof types – even the ones with more untraditional architectural design. Welding gives the roof a coherent aesthetic look,

suitable for new builds and renovation projects alike. One well-known example of using PVC roofing membranes to modernise existing buildings can be seen at Roland-Garros in Paris. Here, a flexible PVC sliding roof has recently been installed. This means that there is no longer any risk of the French Open tennis tournament being postponed due to rain.

PVC CABLES

POWER UP OUR DIGITAL LIVES



PVC cables are a frequently used solution for electrical installations. PVC cables are fire-retardant, waterproof and resistant to chemicals and UV radiation. Furthermore, PVC cables can be modified to withstand temperatures of -40 to 150 degrees Celsius and can be adapted to a variety of building types in many different ways.



PVC cables are not only suitable for transporting electricity. Fibre optic PVC cables provide high-speed internet, and cables and wires for electrical appliances in the home, such as TVs, computers and lighting, are typically made from PVC. Flexible PVC's many applications and excellent functional properties make it the preferred choice for cables in Europe, giving it a market share of around 40%. PVC cables are recyclable, and 100,000 tonnes of these cables are recycled in Europe every year.

Learn more at pvc4cables.org.

SPOT-LIGHT

SEVEN DECADES OF FAITHFUL SERVICE IN STOCKHOLM – BROMMA AIRPORT



Stockholm-Bromma Airport, is Sweden's third busiest airport in terms of numbers of passengers and landings. It is not difficult to imagine how much wear and tear an airport floor has to cope with over the years. Nonetheless, the PVC floor in the arrivals hall at Bromma is the very flooring that was laid in 1952. Therefore, it has been making sure that people safely reach their destinations for seven decades.

Photos: LFV photo archive/Peter Phillips

SPORT AND LEISURE

Durability, resistance to wear and functionality make flexible PVC a popular material in the sporting world. Flexible PVC is used for everything from sports clothing and training equipment to sports facilities.





FLEXIBLE PVC IN SPORTS

IMPROVES PERFORMANCE

It is difficult to imagine a sporting world without PVC. The material's hard-wearing properties and long lifespan, as well as the fact that it can be used in all types of weather, are the main reasons why PVC is popular in the world of sports. In addition, thanks to flexible PVC's versatility, designers have endless potential for creating designs that are stylish yet functional. And this applies to clothing, equipment and facilities alike.

SOFT MATTRESSES AND SHOCK-ABSORBENT FLOORS

Flexible PVC is an important component of clothing for both professional and recreational athletes. Furthermore, many sports are completely dependent on flexible PVC. For example, a high jumper lands on a mat with a PVC surface. It is soft to land on, easy to clean and can cope with standing outdoors. In the world of



water sports, there are kayaks made of inflatable, watertight PVC. This ensures water resistance and speed on the water. In sports such as athletics, table tennis and badminton, it is crucial that the floor is made from a material that ensures athletes a soft landing, to avoid unnecessary injury.



”

The main reasons for using flexible PVC are its hard-wearing properties and long service life.

Ramboll Denmark, 2021



WATERPROOF WADERS AND SOFT BARRIERS FOR SKI SPORTS

Thanks to its water- and weatherproof properties, PVC is widely used in angling, both for sport and recreation. Long waders, for instance, are manufactured from flexible PVC. In ski sports, the barriers skiers bump into are made of PVC – obviously, the flexible kind. But it is not only the athletes who benefit from the properties of PVC. Spectators in many stadiums across the world are protected from rain and baking sun by PVC canopies.



Since PVC fully complied with the London Olympic committee's high environmental standards, more than 90,000 square metres of PVC were used in the water polo arena, the cycling centre, the swimming arena, the shooting range and the basketball hall. Much of the PVC was subsequently either recycled or reused in schools and at the 2014 World Cup in Brazil.

The watertight, long-life membranes for swimming pools are made of PVC.

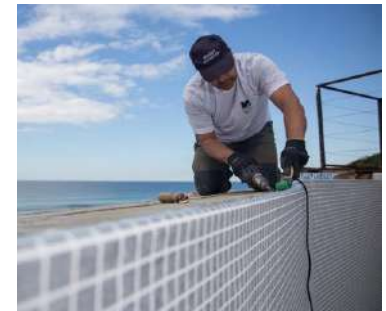


Photo: Renolit.

USING FLEXIBLE PVC IN STADIUM CONSTRUCTION ADDS TO THE SPORTING EXPERIENCE

At the Salif Keita football stadium outside Paris, an orange PVC membrane protects spectators from sun and rain. The membrane also gives a pleasant, soft light.

Photo: B+C Architects. Photo courtesy of the European Council of Vinyl Manufacturers.



At the Mercedes-Benz Arena in Stuttgart, 34,000 square metres of PVC roofing membrane protect supporters against all weathers during football matches.

Hard-wearing, flexible and cost-effective – there are many good reasons for using PVC in the construction of really big stadiums. PVC is therefore used in many of the world's largest stadiums for everything from underground water pipes, comfortable spectator seating, flexible roofing, covering for shock-absorbent floors and live cables for sophisticated irrigation systems.

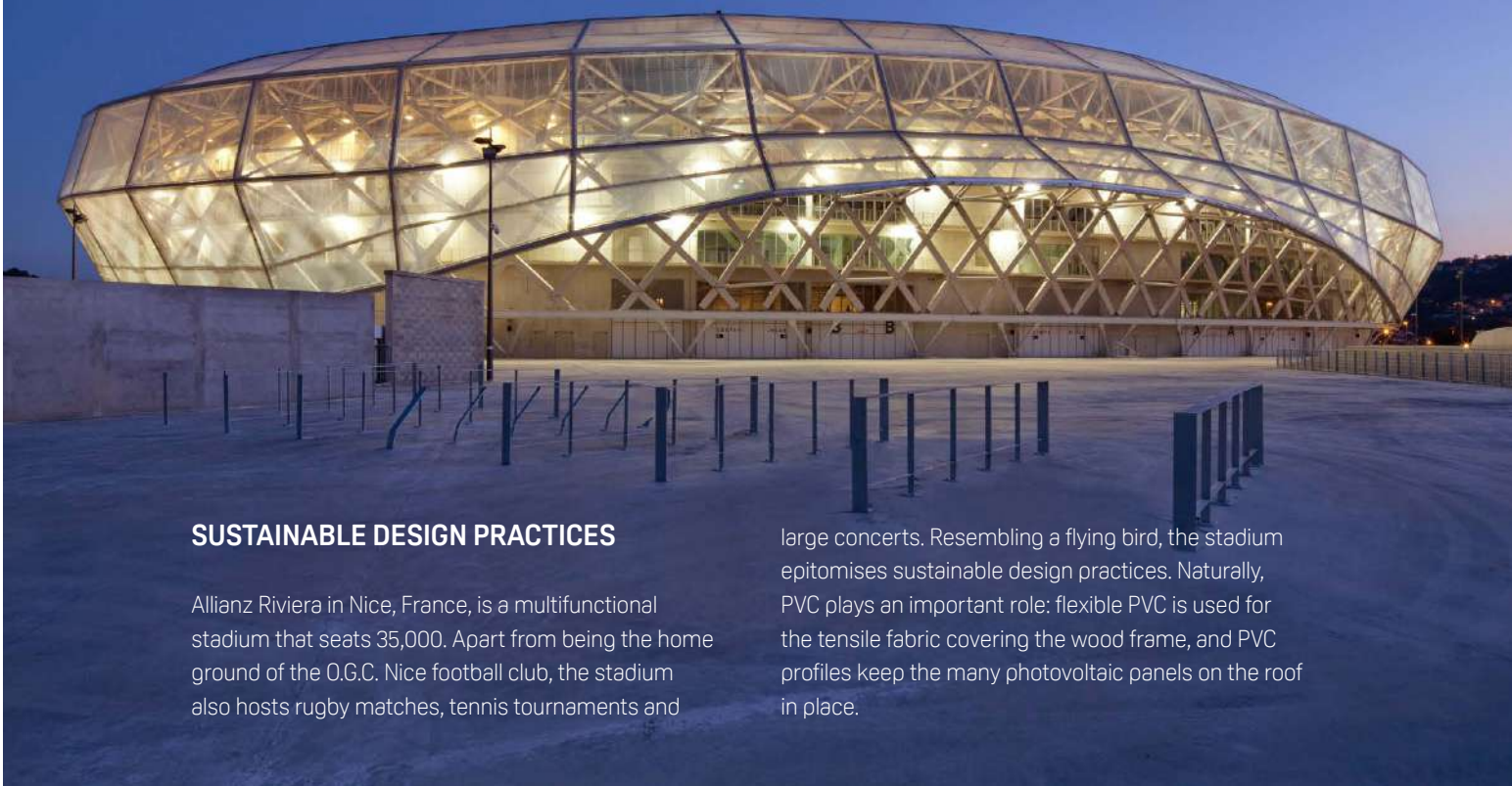
ICONIC MEETING PLACES

People of all ages gather at today's stadiums, which in addition to being sporting venues are often architectural icons that contribute to the marketing of football teams, cities, regions, and even nations, wishing to display their ambitions to the world. Magnificent stadiums are being built all over the globe, each one more spectacular than the next, and PVC is often an integral part of the construction.



For us, PVC was a natural choice. First of all because it allowed us to design a fifth-generation stadium that is well-functioning and hopefully aesthetically pleasing. For instance, we used a transparent PVC tensile fabric membrane for the façade, which lets daylight pass through and make the building appear open and inviting.

Marco Puntzi, architect at Wilmotte & Associés, who designed the stadium.



SUSTAINABLE DESIGN PRACTICES

Allianz Riviera in Nice, France, is a multifunctional stadium that seats 35,000. Apart from being the home ground of the O.G.C. Nice football club, the stadium also hosts rugby matches, tennis tournaments and

large concerts. Resembling a flying bird, the stadium epitomises sustainable design practices. Naturally, PVC plays an important role: flexible PVC is used for the tensile fabric covering the wood frame, and PVC profiles keep the many photovoltaic panels on the roof in place.

TRAMPOLINES AND BOUNCY CASTLES IMPROVE CHILDREN'S MOTOR SKILLS



Trampolines improve children's motor skills and are an easy way of fitting physical activity into children's busy lives. Trampolines need to be protected against wind and weather. Safety is also a priority. PVC safety mats are laid on top of the trampolines' springs to protect bouncing children from falling on them. PVC trampoline covers protect against the elements, significantly increasing its lifespan.

And if we scale up, many bouncy castles are made of PVC, because it meets safety, functionality and durability requirements. Bouncy castles are made of several sections of fabric, welded together to be able to withstand massive pressure. Bouncy castle manufacturers and hire firms cannot compromise on safety in their products, and both tests and development projects indicate that there are no alternatives to PVC here.



”

In the case of jumping pillows, there are no alternatives with properties that can substitute flexible PVC. There are strict requirements for the level of pressure the fabric must be able to withstand without cracking, and flexible PVC is the only material that can meet these requirements. The safety aspect is crucial when it comes to jumping pillows, and manufacturers and dealers stress that safety is not something on which they can compromise.

Ramboll Denmark, 2021

**SHE
RUN2**
ÉDITION SPÉCIALE
La Lycéenne
MAIF RUN



FN'S VERDENSMÅL
for bærekraftig utvikling

ACTIVE GIRL
MAIF
SHE RUN2
LAIF RUN
SHE RUN2

**SPOT-
LIGHT**



VINYLPLUS MAKES SPORTING EVENTS MORE SUSTAINABLE THROUGH PARTNERSHIPS



In 2019, She Runs – Active Girls’ Lead in Paris united 2,500 girls from 35 countries, spotlighting sports, leadership, and sustainability. Prior to the event, an Environmental Action was signed, marking a partnership between the organisers, the International School Sport Federation (ISF), and VinylPlus. This action emphasised the sustainable management of PVC products. The event showcased the versatility, reusability, and recyclability of flexible PVC in tents, the VinylPlus booth, yoga mats, space hoppers, and a sports floor partially made from recycled PVC.


Fast forward to 2022, She Runs in Brussels continued this legacy with over 300 international participants and 2,000 local Brussels girls. Again supported by VinylPlus, the 2022 edition championed the principle of reuse, featuring PVC flooring from the 2019 European Week of Sports, PVC yoga mats from the 2021 Belgian Yoga Day and pouches crafted from repurposed advertising banners.

ART, CULTURE AND DESIGN

*Festival stages, artwork, designer furniture,
cinema screens – flexible PVC enriches cultural life.*







THE ICON OF FAMOUS ROCK FESTIVAL IS MANUFACTURED IN FLEXIBLE PVC



Photo: Mathias Lovgreen Bojesen/Ritzau Scanpix

Culture is an integral part of our lives – whether we are sitting in the darkness at the cinema, visiting a museum or letting music slip under our skin. However, there are probably not many of us who think about the setting while we are enjoying our cultural experiences. For example, many of our major concerts would be radically different without flexible PVC.

Take the Orange Stage at Roskilde Festival – the icon of one of Europe’s largest music festivals. The 1,900-square-metre, 3.5-tonne orange tent canvas is made of PVC. This PVC canvas ensures that the festival’s biggest stage can be used again and again, year after year, when the music lures hundreds of thousands of music-lovers to the festival site.

The tent covering the Orange Stage needs to be durable and hard-wearing, since it is put up and taken down again many times. Furthermore, the canvas must be able to withstand the heavy rain showers and high winds that are often part of the festival package. The unique, geometric shape requires a fabric that is both flexible and strong – and colour-fastness is essential on a stage that takes its name from a colour and has become symbolic of Roskilde Festival.



INSTALLATION ART, SCULPTURES, DESIGNER LAMPS AND SEATING

Artists and designers often use PVC to create their works and products due to the material's flexibility, moulding potential and durability.

The Brazilian Campana brothers' world-famous design was inspired by, and is a homage to, the ingenuity of the Brazilian slums – the so-called favelas. The Anemone chair, which can be seen to the left, reflects the brothers' desire to reuse PVC tubes in an original way, similar to the way the residents of the favelas reuse the materials they have at hand. The chair has been exhibited at the Museum of Modern Art in New York.



Examples of modern design in flexible PVC. The photos are from a photo session at the National Gallery of Denmark where Italian designer Riccardo Giovanetti had erected a range of design icons in inflated PVC bubbles. Behind the chair and the footstool with lions' feet, designed by Danish designers Erich Weitzling and Kaare Sølvsten, there are two different versions of Phillippe Stark's world-famous gnome.

AN ARTIST'S CHOICE OF MATERIALS IS ALSO CHALLENGING

Artists have endless potential for colouring and shaping PVC to suit their artistic visions. This makes PVC an excellent alternative to more traditional materials such as clay, metal and glass. All-embracing installation art, thought-provoking visual art, outrageous sculptures, outdoor canvases with artistic messages in words and images – the potential is endless. PVC is used in the world of design in everything from lamps and indoor and outdoor seating to inflatable furniture.

A PAINTING THAT BREATHES

When the internationally renowned Danish artist Søren Dahlgaard decides which materials to use in his artworks, his choices are typically based on lengthy, rigorous research. Take, for example, his curious work *Breathing Painting* from 2010 – literally, a painting that breathes. The painting consists of a frame covered with a white canvas made from flexible PVC, and a pump controls the “breathing”.

SPOT-LIGHT



Søren Dahlgaard's Hedge to the left and Breathing Painting to the right.

With his *Breathing Painting*, Søren Dahlgaard delves backwards into art history, to the classical portrait and monochrome paintings. Thus, *Breathing Painting* is in line with the artist's most remarkable works, which he has exhibited in museums all over the world, namely his famous dough portraits. To draw the observer's attention away from what they usually notice when they look at a portrait – the face – Dahlgaard covers the person's face with a large lump of dough.

Breathing Painting is conceptual art. This means that the idea behind the work is more important than the artist's traditional aesthetic ability. In reality, the execution of the work can almost be considered mechanical. In principle, it can be created by anyone who follows the artist's written instructions. For this reason, choice of materials is of paramount importance.

When Dahlgård got the idea for Breathing Painting, he therefore concentrated on finding the most suitable material. Most importantly, the material had to be stretchable when the air was blown into the canvas and sucked out again. He tried several different materials. Some were unsuitable because they yellowed over time. Other materials were difficult to work with. Sail cloth was tried, but it produced a brittle, jarring sound when the painting "breathed". Latex, silicone and rubber were tested before he ultimately selected a PVC canvas typically used for cinema screens. Søren Dahlgård ended up with the ideal material by process of elimination.

When artists use plastic in their works, they use it in a manner for which it was not originally intended. The way they use the materials is termed extreme use.

PVC ARTWORKS MUST BE PRESERVED

Many of the artworks created in PVC and other plastics since the sixties are now exhibited in museums all over the world. Many have now begun to decompose. There is therefore ever-increasing focus on how to ensure that they are preserved for posterity.

In contribution to these efforts, the PVC Information Council Denmark participated in a project together with conservators from the National Gallery of Denmark, the National Museum of Denmark and researchers from the Technical University of Denmark. The Council's role was to facilitate contact with experts in the PVC industry abroad. Prominent Danish artists and designers who work with PVC also took part. In addition to Søren Dahlgård, mentioned above, these included painter Claus Carstensen, sculptor Bjørn Poulsen, and designers Christian Flindt and Bodil Jerichau.

To commemorate the project, the National Gallery published a book with contributions by the various artists. The book is entitled *Plastics Research and Innovation for Museum and Industry (PRIMI)* and has the subtitle *Extreme user innovation. A research project by artists, industrial plastic developers, polymer scientists, and art conservators, 2011-13.*



Painter Claus Carstensen contributed a work printed on flexible PVC to the PRIMI book. This PVC is typically used in the manufacture of urine bags.

INDUSTRY AND TRANSPORT

Flexible PVC plays a vital role, in both industry and the transport sector. Robust conveyor belts, highly durable tarpaulins and safe hoses for foodstuffs are just a few of flexible PVC's many applications.





PVC IN INDUSTRY ENSURES EFFICIENT AND SAFE PRODUCTION

Thanks to the suppleness and adaptability of the material, PVC conveyor belts are basically suitable for any production machinery or industry. Pharmaceuticals, agriculture and food manufacture are just a few of the industries that use PVC conveyor belts in their production machinery. Hygiene and reliability are vital in these particular industries.



PVC conveyor belts are available in a wide range of colours, stiffnesses and surface structures, making it efficient and easy to optimise production. PVC is commonly used in conveyor belts due to the material's resistance to chemicals and UV radiation, both of which are used to clean conveyor belts.



FOOD AND DRINK

PVC hoses for foodstuffs ensure safe, effective and hygienic conveyance of food and drink around factories, to the containers that end up in shops and, finally, with the consumer. Thanks to PVC's strength, PVC hoses for foodstuffs are a reliable solution that meets all requirements imposed on food manufacture.



WHEN CARGO NEEDS PROTECTION

PVC tarpaulins for heavy goods vehicles protect cargo against wind, rain and sunlight. Thanks to the flexibility of PVC, tarpaulins can be adapted to any type of heavy goods vehicle and thermal properties can be added so that goods can be kept cold, dry and undamaged during transport. Due to PVC's many design options,

graphic elements can be added to heavy goods vehicle tarpaulins so that they act as rolling advertising for the goods under transport. After many years on the road, the tarpaulins can be upcycled into fashionable and weather-proof bags that can be spotted in Europe's metropolises.



Flexible PVC is used in the manufacture of tarpaulins due to the material's long-term durability and resistance to wind, weather, stretching and kinking. Furthermore, flexible PVC is a heavy material, which is an advantage in the construction industry because it minimises the need to tie the tarpaulin down. It is heavy enough to lie on the materials to be protected without any risk of it blowing away. Tarpaulins of flexible PVC also cling to the products they cover, affording a high degree of protection. In the transport sector, flexible PVC tarpaulins are a necessity because they do not break or tear in traffic accidents. These are the only types of tarpaulin that meet this requirement.

Ramboll Denmark, 2021

PVC IN VEHICLES

PVC has many different uses in vehicles, including undercarriage coatings, floor modules, dashboards, door panels, partitions between seats, protective strips, and window seals. PVC cables provide your electric car with power.

PVC also helps extend the service life of the car because PVC components protect against the weather and ensure less wear and tear on interior parts. Thanks to the fire retardant properties of PVC and its softness, the material increases road safety; many airbags are sealed with a layer of fire retardant PVC.



SAFETY AT SEA

Safety is vital when you are at sea. You need to look after yourself, your vessel and other sea-going craft. This requires highly durable, reliable equipment you can trust in any situation. Whether the vessel is a small

dinghy, an extravagant yacht, a large navy vessel, a fishing trawler or a huge container ship, PVC is the logical choice for fenders and buoys.

Buoys serve a range of purposes but, in all cases, act as markers in the water. Ocean buoys are used to demarcate zones; for example, when fishing boats are catching fish, or ships are performing jobs at sea. In addition, buoys are used to demarcate seaways, define a range of safety zones or to specify where it is safe to swim. Ocean buoys are available in all sizes, from small two-kilo buoys to huge, heavy buoys that can weigh up to several thousand kilograms. PVC also ensures our personal safety, since many life jackets are made of waterproof PVC. Safety at sea is therefore inextricably linked to PVC.



Fenders are a ship's equivalent of a car bumper. They protect vessels from bumping into the quay edge and into each other. Previously, fenders were made of rope-work or cork. However, modern fenders are typically manufactured from PVC filled with air or foam. PVC is waterproof and strong and able to withstand the many bumps fenders continually receive.



ALLEZ ALLEZ
WITH PVC!



Cycling is more than just a sport – it's a lifestyle. It champions health, is environmentally friendly, and appeals to everyone, from professionals to novices, the young and the old. Bicycles provide dependable transport for daily commuters, while cargo bikes adeptly ferry goods and children across European cities, all without a hint of pollution. High-end road bikes, favoured by elite racers and keen amateurs, glide through varied terrains, while mountain and gravel bikes transform muddy and rugged paths into exhilarating adventures.

Flexible PVC plays a pivotal role in the cycling realm. Beyond the sponsorship of major teams by firms within the European PVC value chain, this adaptable plastic is a fundamental component in numerous bicycle parts and products seen on TV, such as brake and gear cables, saddles, handlebar grips, and inflatable arches.



CYCLING FOR A CLIMATE NEUTRAL EUROPE

Cycling is renowned for often being the quickest mode of transport in urban settings. Especially in the Netherlands and Denmark, cycling stands as a predominant means of transport. Opting for a bike over a car not only champions the environment but also promotes health and can significantly reduce congestion and pollution.

This is precisely why the European Commission has embedded cycling within its Urban Mobility Framework. This framework is a cornerstone of the EU Green Deal, which aspires for a climate-neutral Europe by 2050.



About VinylPlus®

VinylPlus is the European PVC industry's commitment to sustainable development. Through VinylPlus, the European PVC industry is creating a long-term sustainability framework for the entire PVC value chain, improving PVC products' sustainability and circularity and their contribution to a sustainable society. It covers the EU-27, the UK, Norway and Switzerland. VinylPlus represents over 200 companies of PVC resin and additives producers and converters and coordinates a network of around 150 recyclers. VinylPlus has invested over 125 million euros in sustainability in Europe since 2000. Building upon a track record of 20+ years of progress and achievements, VinylPlus recently launched VinylPlus 2030, its next 10-year Commitment to Sustainable Development. With its renewed Commitment, VinylPlus aims to contribute proactively to addressing the global sustainability challenges and priorities.

