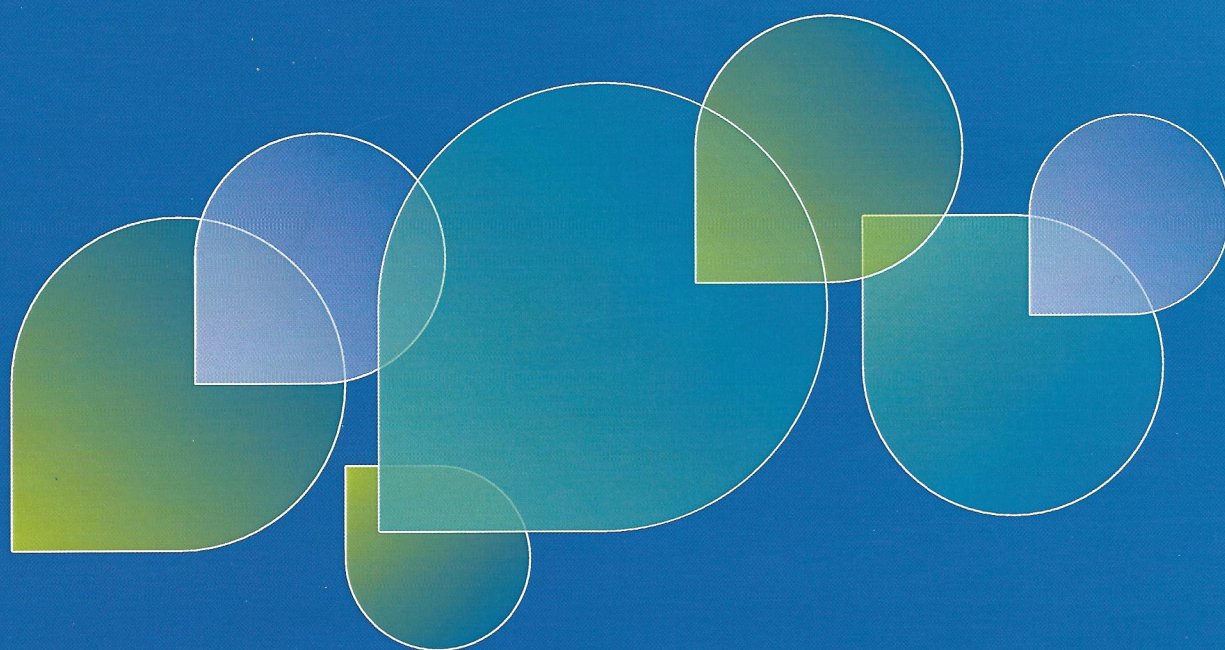


# 7 STUDIES ON PVC



vinyl<sup>plus</sup>  
COMMITTED TO  
SUSTAINABLE DEVELOPMENT



# Introduction

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PVC or polyvinyl chloride, is one of the most widely used polymers in the world. Because it is so versatile, PVC is used extensively in a broad range of industrial, technical and everyday applications.

Additives are necessary to ensure PVC products meet performance requirements. Heat stabilisers are needed to prevent degradation during processing and use. Plasticisers in flexible PVC products provide the required softness.

Some additives which complied with past regulations are now restricted or subject to authorisation, because of proven or suspected harmful effects on human health and the environment. The most relevant examples include heat stabilisers based on cadmium or lead, and low molecular weight additives such as DEHP.

Through innovation, the European PVC industry managed to substitute these heat stabilisers and plasticisers by safer substances. Because PVC is mainly used in long life applications, cadmium and lead-based stabilisers and DEHP are still present in the waste arising today, and will remain so in the years to come.

The PVC industry is convinced that such waste can nevertheless be recycled in ways which minimise the risk to human health and the environment, and which are much better for the environment than alternative disposal routes.

In order to prove that such recycling is safe, VinylPlus®, the Voluntary Commitment to sustainable development of the European PVC industry, has undertaken 7 studies in recent years which show that the exposure of workers and consumers as well as environmental releases are extremely low and that the benefits of recycling far outweigh the impacts. The objectives and key conclusions of these studies are presented in the next pages.

For more detailed information, please contact VinylPlus at [info@vinylplus.eu](mailto:info@vinylplus.eu).

## ABOUT VINYLPLUS

VinylPlus® is the Voluntary Commitment to sustainable development of the European PVC industry. The VinylPlus programme was developed through open dialogue with stakeholders, including industry, NGOs, regulators, civil society representatives and PVC users. The regional scope of the 10-year programme is the EU-28 plus Norway and Switzerland. VinylPlus is registered as a SMART partnership on the UN Partnerships for SDGs Platform. For additional information: [www.vinylplus.eu](http://www.vinylplus.eu).

# Migration studies

## Migration of substances from recycled polyvinyl chloride, FABES, 2016

### OBJECTIVE OF THE STUDY

*Do lead, cadmium, zinc and DEHP migrate from PVC products when they are in contact with water, sweat or saliva?*



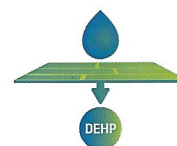
### CONCLUSION

The measurement of two essential parameters (diffusion speed in the polymer matrix and partition between the polymer and water) at various temperatures allowed to model the migration of these substances in various conditions. The modelling shows that the migration of lead, cadmium and zinc is extremely low for rigid PVC. The migration of lead, cadmium and DEHP from flexible PVC is limited by the poor solubility of these additives in water.

## Investigation of the migration behaviour of PVC flooring, FABES, 2016

### OBJECTIVE OF THE STUDY

*Does DEHP migrate out from vinyl flooring made from recycled PVC when in contact with water?*



### CONCLUSION

The measurement of diffusion speed in the polymer matrix and partition between the polymer and water at various temperatures allowed to model the migration of DEHP in various conditions. The modelling shows that the DEHP migration from vinyl flooring made from recycled PVC is very low, being limited by the poor solubility of DEHP in water.

## Modelling migration of lead compounds from unplasticised polyvinyl chloride sewer pipes connecting houses with the public sewer system, FABES, 2017

### OBJECTIVE OF THE STUDY

*Does lead migrate from PVC sewage pipes when in contact with waste water?*



### CONCLUSION

A specific modelling and risk assessment study was required for this (single layer) kind of products because it is the only case where recycled material is in direct contact with waste water. The environmental risk assessment of potential leaching of lead during the service life of such pipes clearly shows that the risk for the environment and for indirect exposure of humans via the environment is negligible.

# Risk assessments

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## Risk assessment of lead migration during use of recycled PVC, Arche Consulting, 2016

### OBJECTIVE OF THE STUDY

*Are there any risks associated with lead migrating out of products made from PVC recycle?*



### CONCLUSION

Migration of lead was modelled and risk-assessed for various applications into which PVC is recycled. Migration of lead is so negligible that there are hardly any risks via dermal or oral exposure to lead migrating out of products made from PVC recycle. Furthermore, the environmental exposure from all combined uses of recycled PVC products is negligible compared to lead background concentrations in water, sediment and soil. Consequently, the environmental risk assessment of potential lead leaching from PVC during the service life of products containing recycled PVC clearly shows negligible risks for the environment and for indirect exposure of humans via the environment.

## Risk assessment of lead migration during storage of PVC waste, Arche Consulting, 2016

### OBJECTIVE OF THE STUDY

*Does storage of PVC waste in the open pose a risk to humans and environment due to lead migration?*



### CONCLUSION

PVC waste (rigid or flexible) stored in the open can be subject to rain and/or extreme weathering conditions. During contact with water, lead could be released from the surface of the PVC scrap and contaminate local waste water, sediment and soil. The potential amount of lead released was modelled and the derived lead concentrations in the leachate were used to perform an environmental exposure and risk assessment. The local contributions due to lead leaching in such conditions are negligible compared to the regional lead background concentrations. Consequently, the environmental risk assessment of potential lead leaching from PVC stored at recycling facilities shows that the risks for the environment are negligible.



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## Health risks of occupational lead exposure in conventional PVC recycling and converting, CATS, 2016

### OBJECTIVE OF THE STUDY

*Does exposure to lead-containing PVC waste result in increased lead levels in blood?*



### CONCLUSION

Biomonitoring of workers in the PVC recycling and converting chain showed that average lead levels in blood were generally within the range of reference values from non-occupationally exposed population reported in literature. This does not indicate a relevant health risk.

## Socio-economic impact study

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### Cost-benefit analysis of recycling PVC applications containing lead, RDC ENVIRONMENT, 2018

#### OBJECTIVE OF THE STUDY

*Assess the societal impact of applying lead restrictions in specific PVC applications made from recycled PVC. Analyse and compare the cost of avoided lead emissions with the cost of restrictions applied to a range of other substances.*



#### CONCLUSION

Recycling PVC waste is much better for society than incineration or landfilling. For the analysed recycled PVC applications, the societal benefit of recycling is several hundreds of millions of € per year compared to incineration and to landfill. The human health cost is small compared to the environmental, economic and job creation benefits.





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