

# THE ENVIRONMENTAL IMPACT OF USING POST-CONSUMER PVC-U WASTE TO CREATE TODAY'S WINDOWS AND DOORS

A RESEARCH PAPER FROM EUROCELL



## INTRODUCTION AND CONTEXT

As the world comes together to meet the challenges of the climate emergency, responsible companies are setting out plans and taking decisive steps to mitigate and reduce their environmental impact locally, nationally and internationally.

Eurocell is the UK's leading manufacturer, distributor and recycler of PVC-U profiles and is aware of the need to ensure our daily operations are sustainably responsible and transparent, so we can make a positive contribution to reverse the harm caused by carbon emissions.

Eurocell is keen to further optimise all our operations to deliver even more CO<sub>2</sub> savings and cement our position as a front runner within the industry when it comes to everyday greener manufacturing and driving a sustainable future. We have made significant investment to establish and operate the Eurocell Recycle service. It is designed to both prevent discarded plastic window frame waste ending up in landfill, as well as be a source of new PVC-U extruded materials to support our manufacturing operations. We are proud to say that Eurocell Recycle is the largest UK recycler of PVC-U window and door profiles by tonnes processed.

As a company that produces enough window and door extruded profiles to fabricate around 1.25 million windows and doors annually, it is vital that the environmental effect of such volume manufacturing is visible and clearly understood.

We have therefore commissioned academics who have used a lifecycle assessment model to accurately validate the impact of the recycling methods we employ to produce PVC-U extruded products.

Eurocell is already highly committed to a recycling ethos and is a primary consumer of post-industrial and post-consumer window frames which are recycled as a significant part of our manufacturing operations. But it is important to determine the actual environmental success of this commitment and to independently ascertain the levels of carbon savings delivered by using waste materials in our processes and preventing them ending up in landfill.

This, in turn, allows us to reliably provide our customers, housebuilders and homeowners, with an accurate and verified carbon saving statistic associated with the use of waste window frames as the central element of Eurocell's recycling operation.

We asked experts within the Faculty of Science and Engineering at Manchester Metropolitan University to review and verify an array of data sets and modelling emanating from peer-reviewed publications. This helped to establish a lifecycle assessment of the use of recycled PVC-U window frames in our manufacturing operations.

Eurocell commissioned the interrogation of the set estimates for overall CO<sub>2</sub> savings that can be achieved from the use of post-consumer and post-industrial waste PVC-U, and for an accurate statistic to prove the environmental benefit of using waste PVC-U within the company's recycling operations to be determined.

## METHODOLOGY

All the data, calculations and formulas verified by Manchester Metropolitan University were taken directly from a primary source and peer-reviewed document “Life Cycle Assessment of Recycling PVC Window Frames” by Heinz Sticchnothe, lead at the School of Chemical Engineering and Analytical Science at The University of Manchester.

The goal of the study was to estimate the environmental impacts of recycled PVC from post-industrial and post-consumer window frames with the functional unit defined as ‘production of 1 tonne of recycled PVC from waste window frames’.

Post-industrial waste comprises off-cuts and rejects from the manufacturing process, whilst post-consumer waste represents used frames recovered at the end of their useful lifetime and destined for landfill.

Lifecycle assessment has been used as a tool to estimate the environmental impacts of window frame recycling following the ISO 14040/44 methodology and the system boundary is from ‘cradle to gate’. This comprises elements such as the collection and transport of waste to the recycling facility and processing of waste frames to produce PVC chips.

The results include assessment of transport distances and truck payload factors. For the transport of waste PVC-U to the recycling facility, an average distance of 100 miles by a 22t truck with a payload factor of 0.33 was assumed.

All waste from the recycling process is assumed to be landfilled except for the metals recovered from the post-consumer waste which are recycled. A distance of 12 miles is assumed for the transport of process waste to a landfill.

The study is based on a recycling facility situated in the UK, with a capacity to process 50,000 tonnes of waste PVC-U frames per year.

## KEY FINDINGS

- ▶ The results suggest that significant savings on environmental impacts can be achieved by using recycled waste materials instead of virgin PVC-U for window frames.
- ▶ Recycling post-consumer waste leads to higher carbon savings than post-industrial waste due to credits for metals recycling, with calculations using the average aluminium mix of 75% secondary and 25% primary (virgin) aluminium.
- ▶ Because of the metal credits, the savings are much greater for post-consumer waste when compared with the post-industrial waste as all the impacts become negative. For example, the GWP (Global Warming Potential) is reduced from 1910kg to -146kg CO<sub>2</sub> eq./t PVC, thus saving in total 2056kg of CO<sub>2</sub> eq. per tonne of PVC-U.
- ▶ The study concluded that by using one tonne of post-consumer PVC-U as part of recycling efforts, it will save 2.056 tonne CO<sub>2</sub> equivalent against the use of virgin PVC-U.

## EUROCELL'S POSITIVE CONTRIBUTION

Eurocell extruded 12,398 tonnes of post-consumer waste in 2020. Based on the study's conclusions independently verified by Manchester Metropolitan University, it can be stated that because of this, the company saved 25,490 tonnes of CO<sub>2</sub> equivalent by replacing virgin PVC-U with recycled post-consumer PVC-U across its manufacturing operations. In addition, around 50% of the material contained in Eurocell's popular Logik and Modus profile systems is now from post-consumer waste window frame recycled PVC-U.

### **Housebuilders and homeowners: The environmental benefit of specifying newly extruded PVC-U profiles using recycled post-consumer waste window frames**

Thanks to the validated scrutiny undertaken by the Faculty of Science and Engineering, Eurocell is confident in sharing important data and conclusions that can better inform and underpin the sustainability objectives of both housebuilders and homeowners.

For example, a typical semi-detached house comprising seven windows and a pair of French doors will see an average weight of post-consumer PVC-U within the eight products plus cavity closure of 122kg. Therefore, a housebuilder constructing, on average, 2500 units of semi-detached houses will save around 627 tonnes of CO<sub>2</sub> equivalent per year by specifying recycled Eurocell windows and cavity closures over full virgin PVC-U windows.

Homeowners have access to high performing, thermally efficient, secure, and aesthetically pleasing products. But they also now have the verified knowledge that the choice of Eurocell's window and door solutions is proven to reduce CO<sub>2</sub> emissions and drive efforts to tackle the current climate emergency.

Eurocell remains committed to finding and utilising innovative and sustainable material solutions that help to create a better and greener world for all.

For more information on Eurocell's products and services, visit [www.eurocell.co.uk](http://www.eurocell.co.uk)