

— SORTING IT —



PVC-U SUSTAINABILITY – SEPARATING FACT FROM OPINION

CHRIS COXON & JOHNNY DOBBYN

WITH DR. MICHELE EDGE & DR. JASON LEADBITTER

ABOUT THE AUTHORS

CHRIS COXON

IS GROUP HEAD OF MARKETING FOR EUROCELL PLC. HE'S WORKED IN THE PVC-U INDUSTRY FOR OVER 10 YEARS, SO KNOWS A THING OR TWO ABOUT THE SUBJECT

JOHNNY DOBBYN

IS A CONSTRUCTION JOURNALIST WITH OVER 10 YEARS' EXPERIENCE. HE WAS THE GROUP EDITOR OF LOCAL AUTHORITY BUILDING & MAINTENANCE, HOUSING ASSOCIATION BUILDING & MAINTENANCE AND WINDOW FABRICATOR & INSTALLER. HE'S NOW A PARTNER OF FACTA, A CONSTRUCTION AND ENGINEERING SPECIALIST PR AGENCY.

WITH

DR MICHELE EDGE

IS A READER IN POLYMER SCIENCE AT MANCHESTER METROPOLITAN UNIVERSITY. ACKNOWLEDGED AS A LEADING TECHNICAL EXPERT IN PVC-U, SHE HAS WORKED WITH INDUSTRY AND ACADEMIA ON THE SUBJECT FOR OVER 30 YEARS.

DR JASON LEADBITTER

IS SUSTAINABILITY & CORPORATE SOCIAL RESPONSIBILITY MANAGER AT INOVYN. HE HAS A PHD IN POLYMER CHEMISTRY AND HAS WORKED IN THE SUSTAINABILITY AREA OF POLYMERS FOR OVER 30 YEARS.





CONTENTS

I	PVC-U – THE SALT OF THE EARTH	4
II	TIME FOR THE NARRATIVE TO CHANGE?	5
III	CIRCULAR ECONOMY & CLOSED LOOPS	6
IV	ENTER STAGE LEFT: THE WASTE & RESOURCES STRATEGY	7
V	ENTER STAGE RIGHT: TOP NET POSITION ON NET ZERO	8
VI	PLASTIC <i>IS</i> FANTASTIC	9
VII	EVEN BETTER THAN THE FIRST TIME	14
VIII	THE EVOLUTION OF RECYCLING	17
IX	GOING THE EXTRA MILE	19
X	IT'S TIME TO CLEAN UP: TIME FOR A CLEAN SWEEP	21
XI	YOU PAYS YOUR MONEY AND YOU TAKES YOUR CHOICE	24
XII	THE FUTURE OF PVC-U SUSTAINABILITY	27
XIII	THAT'S ALL, FOLKS	31
<hr/>		
	APPENDIX I - CASE STUDIES	32
	APPENDIX II - EUROCELL FACT FILE	35



CHAPTER I

PVC-U – THE SALT OF THE EARTH

Let's start at the beginning. What does PVC-U (the correct terminology) stand for exactly?

Poly**V**inyl**C**hloride-**U**nplasticized

To keep things simple, it's the 'Unplasticized' bit that's important here. Its means rigid - ie the hard, durable version of PVC used in building products - commonly in windows and doors, the primary focus of this eBook.

BUT WHAT IS IT?

Again, lets keep this simple. The chloride (57%) in Polyvinyl chloride comes indirectly from salt (yes, the stuff you put on your chips) one of the most abundant substances on earth. It's 43% Ethylene, a by-product of oil (and Ethylene from oil equates to 0.3% of annual oil consumption).*

'Unplasticized' means that none of the chemical plasticizers needed to make flexible PVC, used for example in cables and flooring, are needed. To make 'unplasticized' PVC strong and tough impact modifiers and fillers are used.

This is the Virgin (industry term for New) material used in PVC-U window and door frames. But the virgin material is only the beginning of the PVC-U sustainability story...



*SOURCE: British Plastics Federation - www.bpf.co.uk

CHAPTER II

TIME FOR THE NARRATIVE TO CHANGE?

EVERYONE HAS AN OPINION

Everyone has an opinion about plastic and the effect it has on our planet. But what are those opinions based on? And how well informed is the average person? To find out, we hit the streets and canvassed public knowledge and opinion on issues around plastic and recycling.*

We also asked if people knew that PVC-U windows and doors could be recycled.

99% OF PEOPLE ASKED DIDN'T KNOW.

On the whole there was a sense of amazement too, when people were informed that the average PVC-U window could be recycled up to ten times with a life cycle of up to 350 years.

So maybe there needs to be more time and effort spent informing the general public objectively about plastics? That's what this eBook aims to help achieve for PVC-U - in its own small way.

*Conducted by Eurocell in Chesterfield town centre, Derbyshire, April 2018. Based on 114 responses

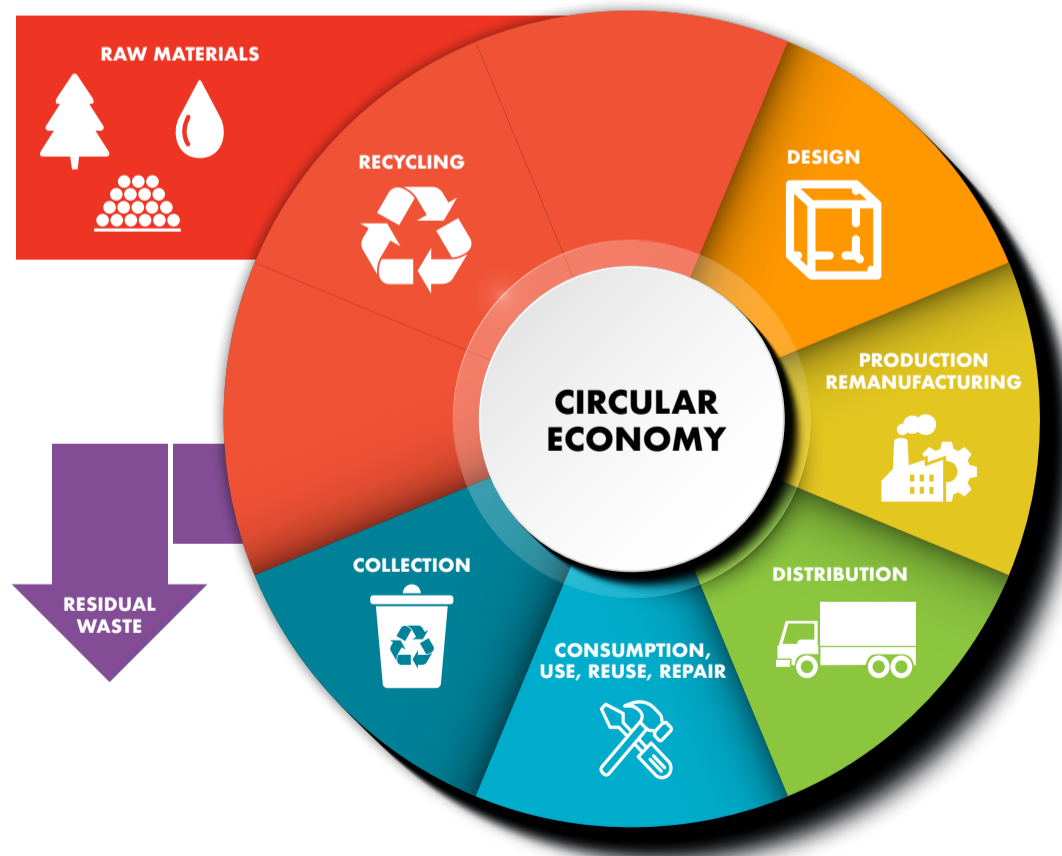
CHAPTER III

CIRCULAR ECONOMY & CLOSED LOOPS

SEPARATED AT BIRTH

The circular economy is everywhere today. In management and construction media, accreditation standards and any sustainability publication worth its salt (pun intended). Even mainstream TV is talking about it. The principle is simple; an 'economic system aimed at minimising waste and making the most of resources' (source: Wikipedia)

So is the circular economy a recent innovation? No. The PVC-U industry has operated its own circular economy for a long time. It's been known as closed-loop recycling, and it provides a system for the cradle-to-grave re-use of PVC-U, which leading industry players developed and championed early. For example, Midlands-based Eurocell recently celebrated its closed-loop recycling 10th anniversary.



CHAPTER IV

ENTER STAGE LEFT

THE GOVERNMENT WASTE & RESOURCE STRATEGY

December 2018 saw the UK Government launch its Waste & Resources Strategy (for England), which aims to advance the circular economy. Although primarily targeted at single-use plastics, one of its centrepieces is the 'Extended Producer Responsibility' (EPR), for manufacturers to take more responsibility for their goods at end-of-life.

Fantastic, we say. We're already out there, actively reclaiming material from customers and collection networks as part of the closed-loop recycling process. So anything which may help make this easier is welcomed.

The strategy also aims to promote UK-based recycling and export less waste to be processed abroad. Where do we sign? No PVC-U should be leaving our islands. We want it all, to put back into great British products. Help us to work towards this goal.



CHAPTER V

ENTER STAGE RIGHT



TOP NET POSITION ON NET ZERO

Hot on the heels of the waste and resource strategy, in June 2019 the government made the UK the first major economy to commit to net zero greenhouse gas emissions by 2050. Impressive stuff.

But again, the industry is one step ahead. Put simply, windows and doors with BFRC (British Fenestration Rating Council) Window/Door Energy Ratings (WERS) of A make a positive net contribution to the energy performance of an average home. So the highest performance A++ rated windows are already going a long way towards achieving net zero greenhouse gas emissions in 2019.

By contrast, the latest Building Regulations only require a C WER rating.

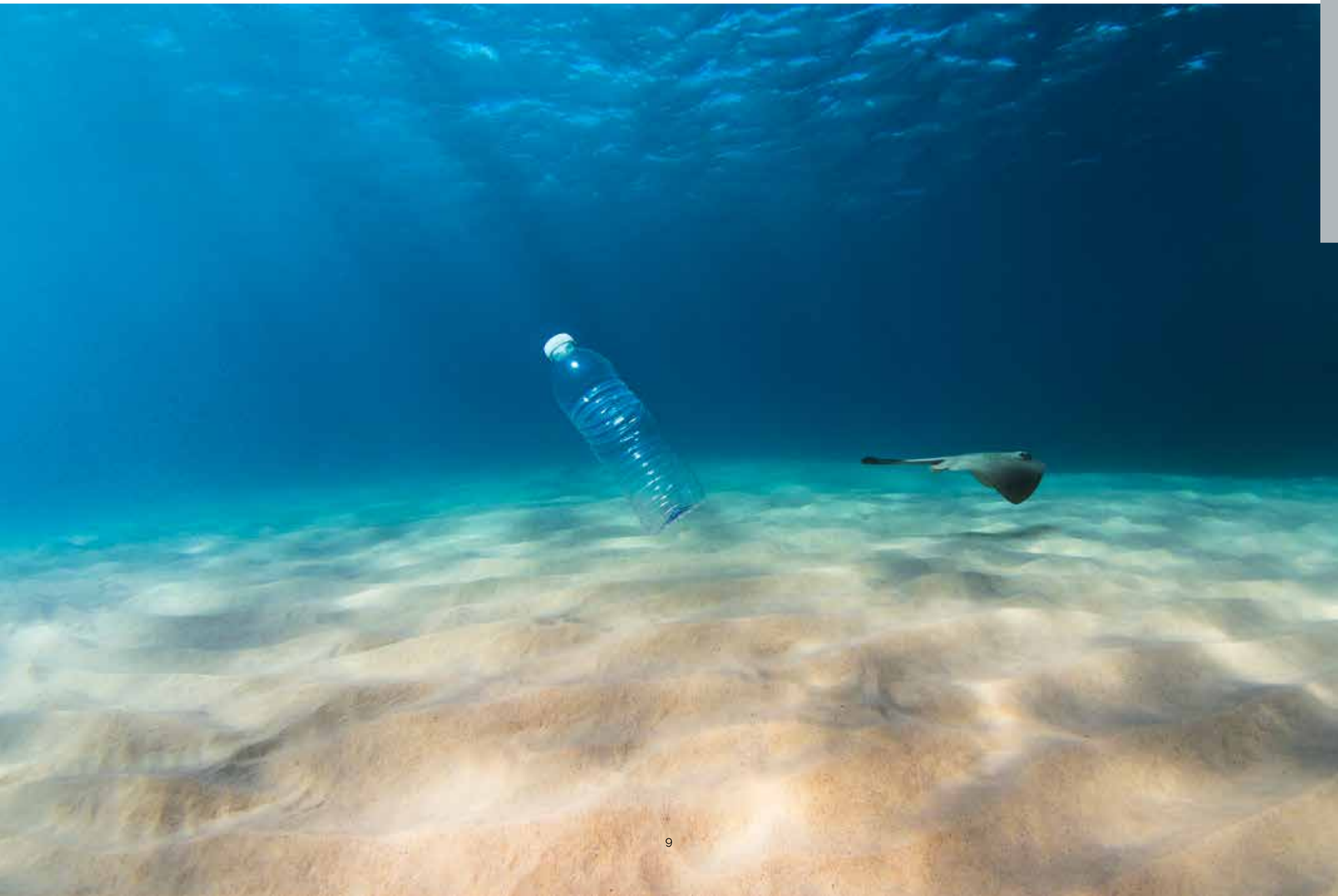
And 95% of A+ registered windows and above are made of PVC-U*. Impressive stuff.

*SOURCE: BFRC



CHAPTER VI

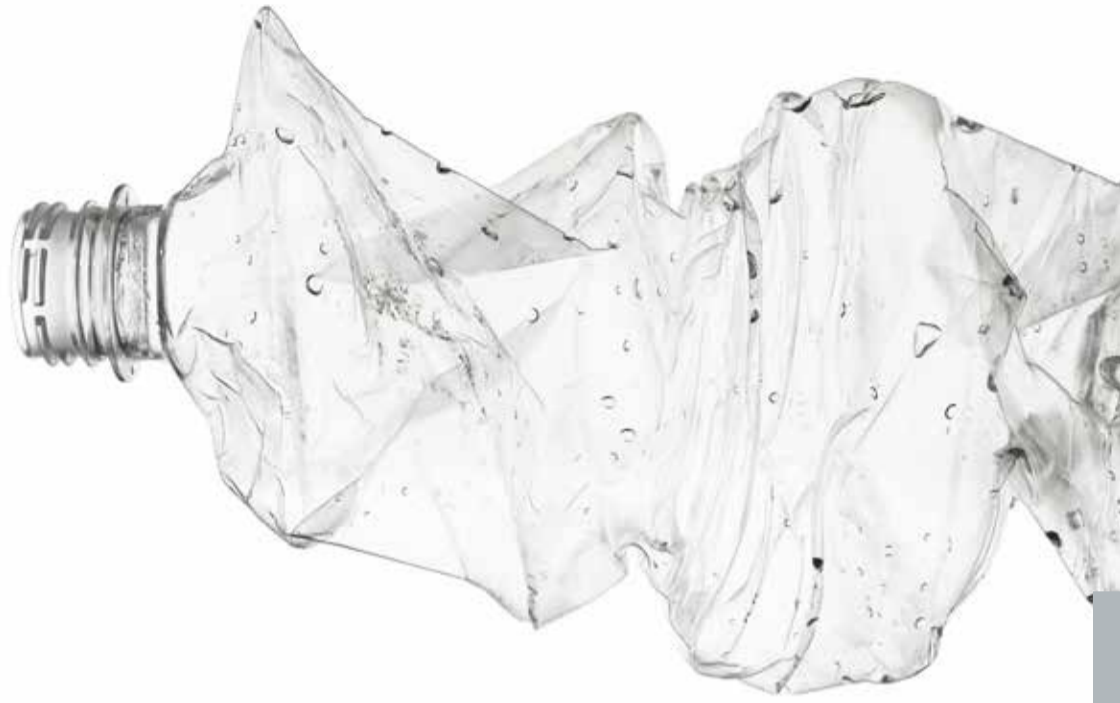
PLASTIC /S FANTASTIC...





**“BUT WE
DON’T WANT IT
IN OUR OCEANS.”**

NOT IN OUR OCEANS



Brought to public attention most dramatically by the BBC's 'Blue Planet II' documentary series, plastic marine pollution is perhaps the biggest environmental issue of our time.

But exactly how did we arrive at this situation? Where does all that plastic in the ocean come from? And as users and producers of plastic, what can companies in the replacement window industry as a whole do to play their part in reversing the 'plastic tide'?

**“WHO HAS SEEN A
WINDOW FRAME FLOATING
IN THE OCEAN?”**



NOT IN OUR OCEANS

MIRACLE MATERIAL OR STUFF OF NIGHTMARES?

Plastic is so much a part of our everyday life, it's difficult to picture a world without it.

It keeps food fresher for longer. It drives down transport costs and emissions by reducing the weight of packaging.

It has inspired advances in the design of everything from medical equipment to clothes, electronics and furniture.

In the building trade, it's given us new applications in insulation, drainage and, of course, doors and windows.

But our reliance on plastic has come at a cost: the sheer volume of plastic waste floating free in our oceans today.

Each year, it's estimated another 8 million tonnes of plastic finds its way into the ocean. The vast majority of it in the form of 'single-use' plastic products like straws, cups, drinks bottles and carrier bags. If you find that hard to visualise, imagine a refuse truck dumping a full load of plastic into the sea, every minute of the day, 365 days of the year.

If pollution continues at that rate for the next seven years, there'll be 1 tonne of plastic in the sea for every 3 tonnes of fish.* If we can't reverse the trend by 2050, there'll actually be more plastic than fish.

And by then, the microplastic granules already found in much of the seafood we eat will be spread throughout the entire food chain.

PEOPLE, NOT PLASTIC, ARE THE PROBLEM

Easy as it is to be overwhelmed by the scale of the problem, we have to remember none of that plastic got there by itself. Without exception, every plastic drinking bottle, straw, carrier bag, stirrer or carton that ends up in the ocean does so because somebody, somewhere didn't dispose of it properly. Littering, basically.

It could be one individual that didn't take their rubbish home with them after a picnic. It could be a business or a local authority that isn't meeting its obligations to recycle waste properly. It could be an entire country that thinks nothing of using the sea as a dumping ground for its waste.

The fact is, plastic marine debris is a direct result of human attitudes and behaviour. Change those attitudes, change that behaviour, and we can change the level of plastic in our ocean for the better.

In recent years, a flurry of new initiatives to do exactly that have been introduced at home in the UK, as well as across the world.

The plastic bag charge has seen the number of bags taken home from UK supermarkets drop by 90% (excluding 'bags for life'); a 25-cent deposit on PET bottles in Germany has meant 98% of all bottles are returned and recycled;** and a ban on toiletries and cosmetics containing plastic microbeads in the USA, UK and several EU states will drastically reduce the number of these damaging particles that are washed into the sea.

Now the race is on to integrate all those measures into a wider circular economy in which much more plastic is recycled and reused and much less of this valuable commodity is lost to the world's oceans.

*SOURCE: www.ellenmacarthurfoundation.org

**SOURCE: www.gov.uk

NOT IN OUR OCEANS

HOW PVC-U IS HELPING

The PVC-U industry is the most advanced of all plastics producers in recycling. It has well developed channels for recovery and recycling, allowing old frames to be recycled and reprocessed into new products up to ten times without any loss of quality.

On the European stage, the Recovinyl initiative works closely with manufacturers, fabricators, installers and recyclers to improve PVC-U recycling rates and increase the efficiency of the recycling process. Its aim is to see 800,000 tonnes of recycled PVC-U in use across the EU by 2020.*

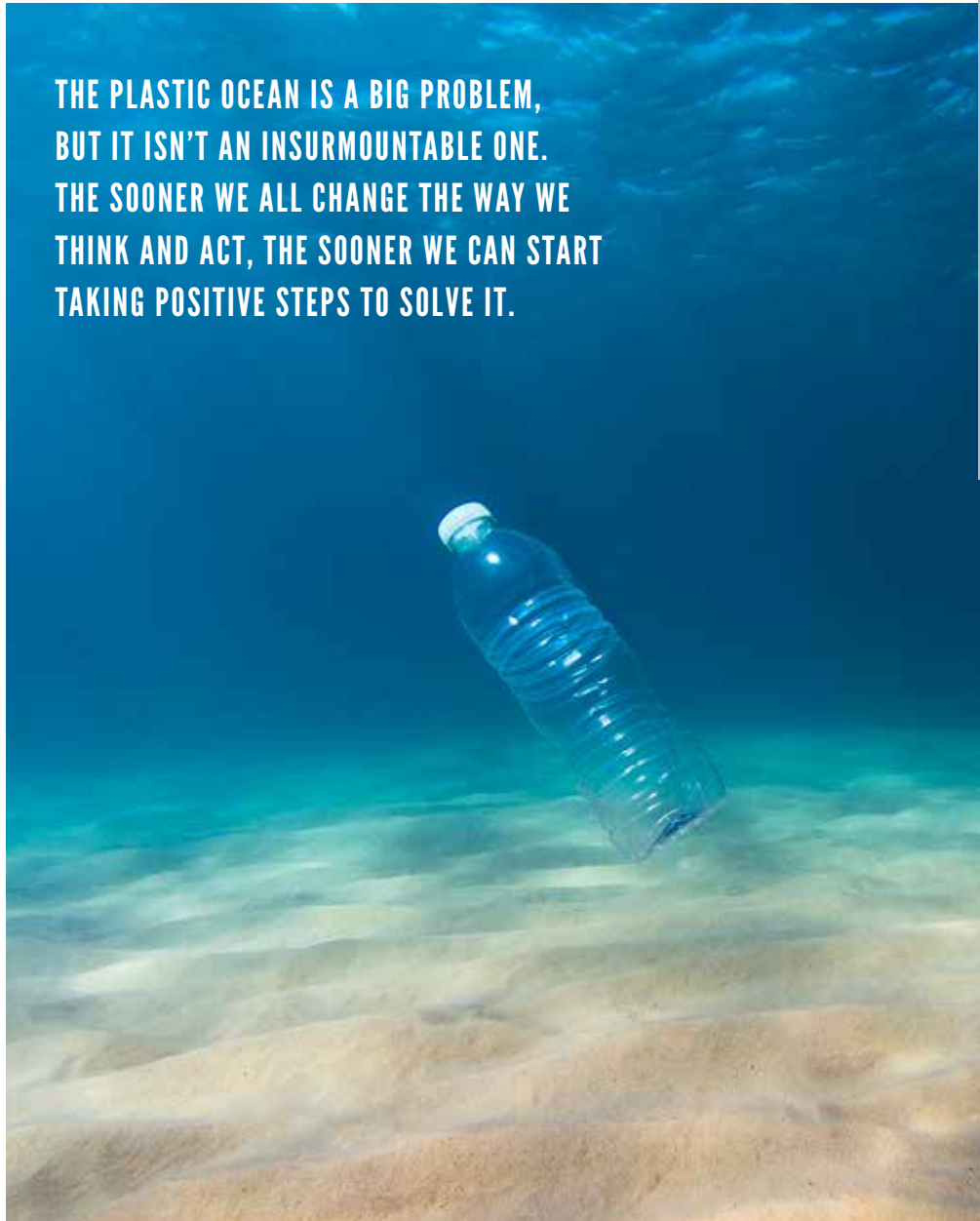
Leading producers have invested in the most advanced recycling facilities of their kind, operating a closed loop system for recovery, recycling and re-manufacture of new PVC-U products from old windows and doors. Altogether, it allows a minimum of 5 million frames to be recycled in the UK every year.**

Even offcuts and waste from the production line are recycled to produce new windows and doors. Nothing goes to waste and, more importantly, nothing is deliberately discarded to find its way into drains, rivers and the ocean.

Of course, no recycling system is 100% efficient. But by researching and trialling new methods and working with fabricators and installers to make it easier to return old frames for recycling, bit by bit we're getting it as close to perfect as it can be.

Repeated across the industry, across the country, across the planet, it's those little changes - almost unnoticeable on their own - that add up to make a big difference to the future of the world we live in.

The plastic ocean is a big problem. But it isn't an insurmountable one, and the sooner we all change the way we think and act, the sooner we can start taking positive steps to solve it.



**THE PLASTIC OCEAN IS A BIG PROBLEM,
BUT IT ISN'T AN INSURMOUNTABLE ONE.
THE SOONER WE ALL CHANGE THE WAY WE
THINK AND ACT, THE SOONER WE CAN START
TAKING POSITIVE STEPS TO SOLVE IT.**

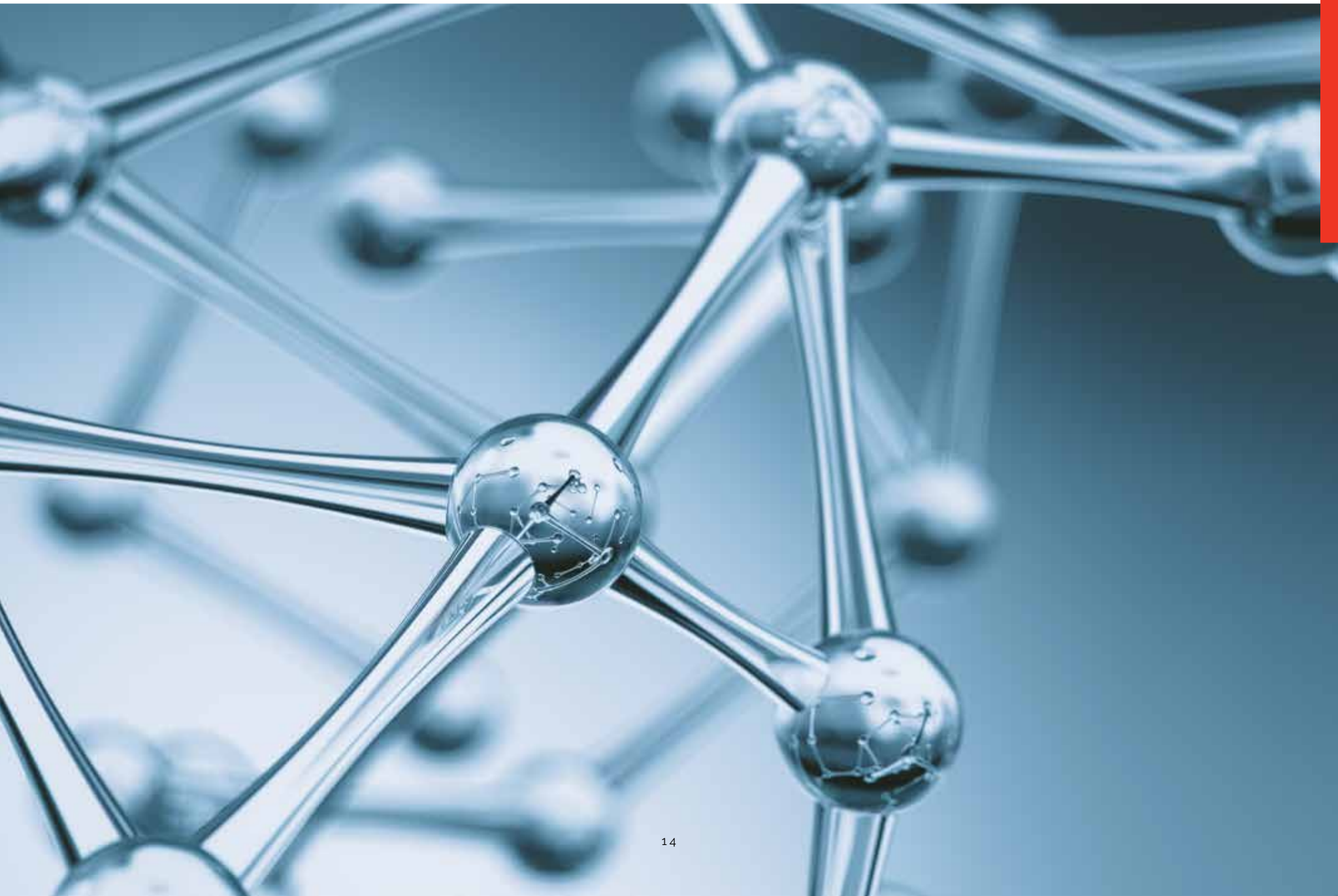
*SOURCE: Recovinyl

**SOURCE: Eurocell

CHAPTER VII

EVEN BETTER THAN THE FIRST TIME

HOW RECYCLING CAN ACTUALLY MAKE PVC-U FRAMES STRONGER



EVEN BETTER THAN THE FIRST TIME

Recycled products, it seems, have an image problem.

Even though more and more of us understand the importance of recycling for the environment, there's still a feeling among the construction industry and general public that anything made from recycled material is somehow 'second best'. Fine for utility items like toilet paper or bin liners. Less so for expensive purchases we expect to last for years, like replacement doors and windows.

But is that strictly true? Scientific studies have shown recycling PVC-U can actually make it stronger, so we put the question to Dr. Michele Edge, a leading figure in polymer science research at Manchester Metropolitan University, to see if things really can be better the second time around.

DR EDGE, IS IT TRUE THAT RECYCLED PVC-U CAN BE HARDER WEARING THAN VIRGIN PLASTIC?

Absolutely. It sounds odd because we're used to thinking of materials like wood or paper losing quality when they're recycled.

But PVC-U that's been recycled from old windows and doors and made into new ones can be even tougher than it was before. That's not the case with all plastics – in fact, we've only found it to be true of PVC-U.

SO WHAT'S DIFFERENT ABOUT PVC-U THAT MAKES IT BEHAVE THIS WAY?

It's all to do with the molecular structure of the plastic itself, and how it mixes with other ingredients that make up the finished product. If you look at a piece of PVC-U under a powerful microscope, you'll see it's made of long spaghetti-like strands called polymers. These strands twist around each other during manufacture, and that's what gives PVC-U its strength.

But we also add other ingredients called impact modifiers that bind the strands together even more tightly so your window frames have extra resistance to bumps and knocks.

We know that Polymer chains tend to break down when the plastic is melted and reformed, but this can be prevented by including additives. That's why recycled frames are just as strong as the originals. What we hadn't realised was that some kinds of impact modifier change their structure and link the strands together in more places than they did before, making a sort of latticework that adds even more strength to the recycled product.

EVEN BETTER THAN THE FIRST TIME

WHEN WAS THIS DISCOVERY MADE?

It was back in 1997, during a research project into recycled plastic conducted by Dr. Jason Leadbitter and Jonathan Bradley*. After the first few experiments, the research team began to notice the recycled plastic was consistently stronger than the original sample.

When something seems too good to be true, your first response as a scientist is to ask, "Why?" Sure enough, when we conducted more detailed tests, we discovered this tendency for impact modifiers to bond more readily to the polymer strands and strengthen the plastic itself.

We can safely say PVC-U is up to 6% stronger when it's recycled the first time. The next four or five times its recycled after that, it will still get stronger but by a smaller amount each time.

HOW MUCH STRONGER ARE THE RECYCLED FRAMES? CAN YOU PUT A NUMBER ON IT?

When you think windows and doors can last up to 35 years before they're replaced, that means they could potentially be getting stronger and stronger for over 300 years!

It opens up all sorts of possibilities. There's already a fair number of products out there with some recycled PVC-U content, but once people realise 'recycled' doesn't mean inferior – it actually means even better – then that reluctance to specify or buy windows and doors made from recycled PVC-U should start to disappear. In fact, we're already seeing this.

And of course, the more recycled PVC-U there is in circulation, the less we need to rely on oil as a raw material and the less plastic there is going to landfill or incineration.

WHAT DOES IT MEAN FOR THE PVC-U WINDOW AND DOOR INDUSTRY?

Ultimately, it's as much about changing attitudes as it is about the science of recycling. Forward-looking companies know that if they control the quality of the recycling waste stream, they control the quality, performance and value of their recycled products.

And consumers who are becoming more aware of the world's environmental problems, especially plastic waste, are starting to see recycled PVC-U as a better choice, not just on an ethical level, but because it gives them stronger, longer lasting window and door frames too.

* SOURCE: From 'Closed loop recycling opportunities for PVC' published by J.Leadbitter and J.Bradley at the IPTME Symposium, Loughborough University, 3-4 November 1997.

CHAPTER VIII

THE EVOLUTION OF PVC-U RECYCLING

WE'VE COME SO FAR IN 25 YEARS



1992

Little PVC-U recycling



2000

Production waste recycling



2008

Old frames or 'post-consumer' recycling



2017

Over 1 million frames recycled by Eurocell



2019

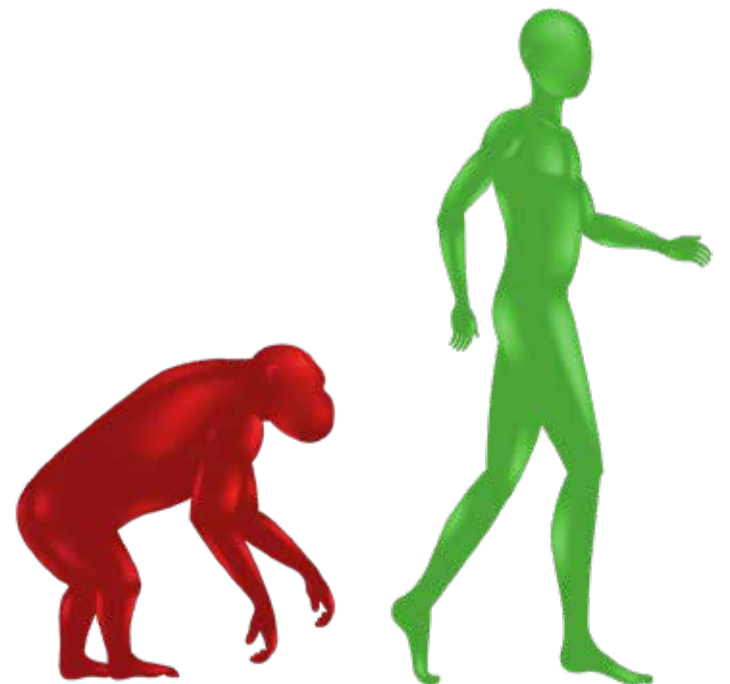
3.6 million+ frames recycled by Eurocell

WE'VE COME SO FAR IN 25 YEARS

It's hard to remember a time when there was no PVC-U recycling within the glazing industry, but you only have to look back as far as 1992 to remember a darker and less sustainable past.

Given the incredible advancements within just the last 25 years, especially with regards to the closed loop recycling process, it is difficult to imagine just where we could be in another 20 years time.

However, we must not rest on our laurels. Could we all work together to make sure that zero windows go into landfill?



CHAPTER IX

GOING THE EXTRA MILE

A. THE CLOSED-LOOP RECYCLING PROCESS



GOING THE EXTRA MILE

B. INDUSTRY PARTICIPATION

We are urging more industry players to take advantage of the PVC-U trade waste and post-consumer waste collection services on offer. These customers could be fabricators handling their own waste or, for example, builders returning old frames to a local recycling centre or branch.

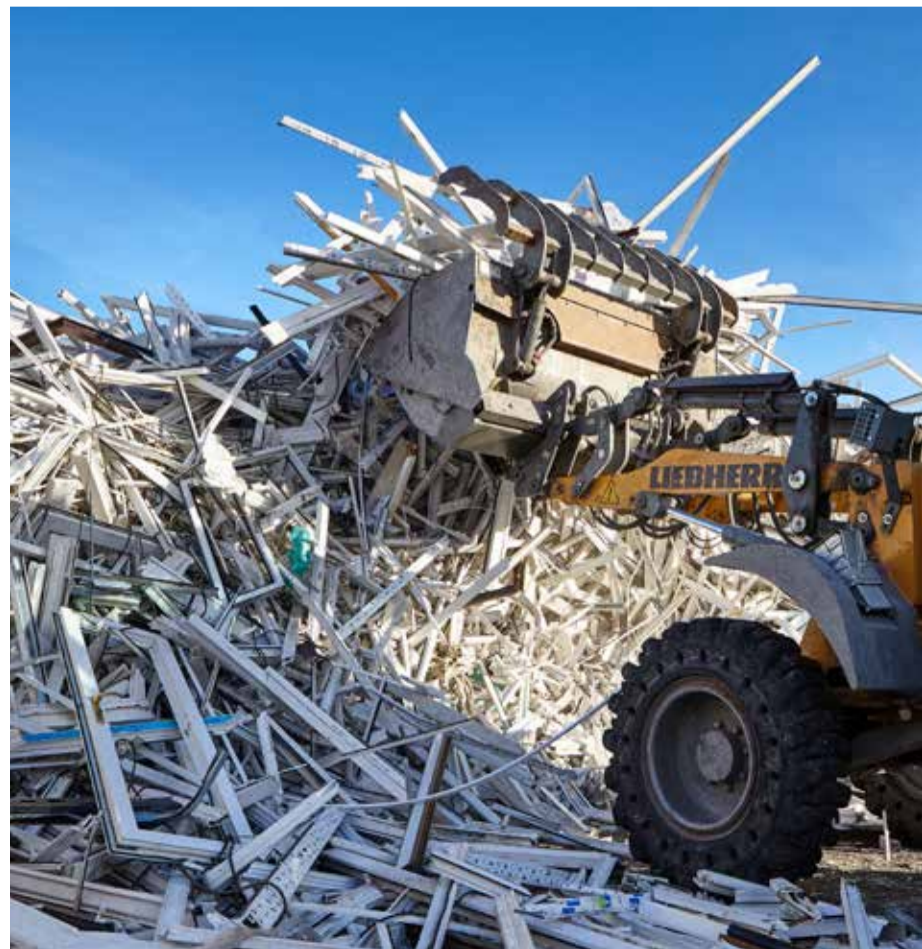
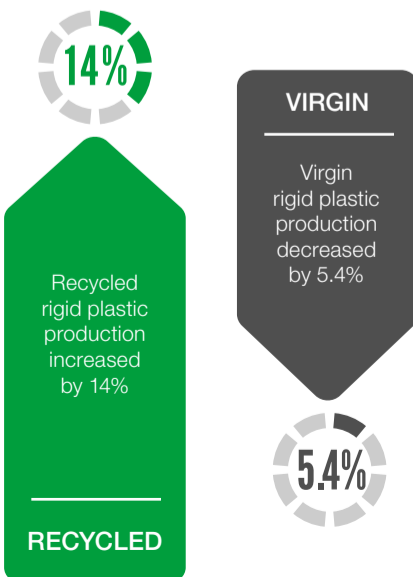
There are no downsides to the free services, and they represent a considerable benefit to all partakers – not to mention the green upside of putting waste plastic to good use, and reducing the amount going to landfill.

The services are simplicity itself: in the case of fabricators, a skip is left with the customer who fills it with old frames (suitably deglazed) and/or fabrication waste, such as offcuts and damaged profiles. Once the skip is full, it's collected and the PVC-U is consigned to recycling plants around the UK.

LESS IS MORE

Eurocell is now producing less virgin plastic and more recycled plastic for windows and doors

2017 - 2018



CHAPTER X

TIME FOR A CLEAN SWEEP



PVC-U INDUSTRY SIGNS UP TO OPERATION CLEAN SWEEP





PVC-U INDUSTRY SIGNS UP TO OPERATION CLEAN SWEEP

The PVC-U industry is going further in improving its environmental impact. Operation Clean Sweep® is a global initiative to reduce plastic pellet loss to the environment, led by the British Plastics Federation in the UK. The aim is to ensure that the plastic pellets, flakes and powders that pass through UK manufacturing facilities don't end up in our rivers or seas.

By signing up to Operation Clean Sweep®, companies are committed to best practice and to implement systems that prevent plastic pellet loss — and that we will play our part in protecting the aquatic environment. What that means is reducing – if not removing – the risk of 'microbead' type material finding its way into rivers and streams.

THE CULPRITS?

The largest culprits until recently – when microbeads were banned – were consumer products like body scrubs and toothpastes. But the PVC-U industry is not complacent and is now taking formal steps to reinforce what has always been a rigorous internal approach to waste control.

“We're always looking to improve and Operation Clean Sweep gives us the opportunity to ensure the effectiveness of the systems we have in place for pellet storage and handling. Our goal is to achieve zero pellet loss and, while this may seem an ambitious target, we believe it is possible through containment and the implementation of good housekeeping practices”, commented Ian Kernaghan, Head of Product Design & Development at Eurocell.

“By signing up to Operation Clean Sweep, we're taking the first step in ensuring that the plastic materials that pass through our facilities are handled carefully and don't end up in the streams, waterways and seas around the UK.”
Helen Jordan, Sustainability Issues Executive at the BPF

COMMITTED TO REDUCING PLASTIC PELLET LOSSES

comments: “The plastic industry is committed to reducing plastic pellet losses to the Environment and Operation Clean Sweep® provides the practical tools companies need to do this. Many in the industry already have Environmental Management Systems in place but Operation Clean Sweep® provides an additional emphasis for the companies on plastic pellet containment”.

The Operation Clean Sweep® Plastic Pellet Loss Prevention Manual contains best practice for the whole of the plastics industry on how to contain plastic pellets, flakes and powders. The manual provides information on conducting site audits, setting up training programmes, worksite setup and procedures to contain and clean up pellets.



PVC-U INDUSTRY SIGNS UP TO OPERATION CLEAN SWEEP

RECOVINYL

Recovynyl is an initiative by the European PVC value-chain aimed at facilitating PVC waste collection and recycling under the Voluntary Commitments of Vinyl 2010 and now VinylPlus®.

The Recovynyl target is to stimulate and certify the recycling of 800,000 tonnes of PVC waste by 2020, as one of the challenges set in the VinylPlus Voluntary Commitment. VinylPlus has also recently committed to recycle and certify the use of at least 900,000 tonnes of PVC per year into new products by 2025, securing PVC's place at the heart of the circular economy.

Today, Recovynyl does more than ensuring that the volumes of PVC being recycled each year increase:

- Recovynyl's mission extends to optimising the resource efficiency of the PVC-U industry by mediating between recyclers and converters to establish a trustworthy relationship and material flow.
- Recovynyl ensures quality and safety by providing a system of traceability of the material through its recycling path.
- Cooperation with EU authorities to addressing the issue of legacy additives (substances that are no longer used in new PVC products, but that can be present in recycled PVC).



CHAPTER XI

YOU PAYS YOUR MONEY AND YOU TAKES YOUR CHOICE

NO FENESTRATION MATERIAL IS PERFECT

DIFFERENT MATERIALS, DIFFERENT ENDINGS

PVC-U is a very easy material to recycle and re-use, and we've established that recycling rates are high.

In contrast, recycling rates for timber window frames are much lower, and it's easy to see why. Each time PVC-U is recycled, the proportion of additives such as impact modifiers in the mixture can be adjusted to ensure it keeps its strength. Indeed, as we've learned, PVC-U actually gets stronger the first few times it's recycled. Which means it can be re-processed and used to make the same products it came from, or for high-value 'upstream' recycling. The fibres in wood break down immediately when it's recycled, meaning it can only be used to manufacture chipboard and other low-grade timber products or 'downstream' recycling. Alternatively, it can be converted into biomass fuel and burned to produce green energy.

SPEAKING OF TIMBER

Deforestation is a recognised global sustainability crisis. Worse, the highest timber consumption is in Western Europe, to provide furniture, flooring and windows and doors.

It is estimated that up to 50% of the timber windows removed from refurbishment projects in the UK end up as landfill.* This is partly because the timber frame manufacturers have nothing like the advanced pathways for returning and recycling old frames that the PVC-U industry has, and partly because the paint, stains and preservatives in treated wood make it much harder to recycle - not mention more toxic to the environment when it begins to break down in landfill.



*SOURCE: www.bre.co.uk

NO FENESTRATION MATERIAL IS PERFECT

Let's not forget energy efficiency. We all know from school physics classes that plastic is an insulator – meaning that it's inherently energy efficient. That's why like-for-like PVC-U windows and doors are more energy efficient than aluminum or timber. Wood is porous, hence the preservatives required to maintain its integrity and technical performance. Holes are not conducive to exceptional energy efficiency either, hence why timber windows and doors trail PVC-U in thermal performance.



AND ALUMINIUM?

Indeed. How do aluminium window frames fare when they reach the end of their life? Like PVC-U, recycling rates for aluminium are impressive, reaching 90% across Europe for the construction and vehicle industries. And, like PVC-U, aluminium can be recycled and used to make new window and door frames many times over. The difference lies in the amount of energy consumed - and therefore emissions produced - to recycle each one. PVC-U is reprocessed at a modest 160-220 degrees centigrade, compared to the 700-750 degrees centigrade or more required to melt down and recycle aluminium. While aluminium companies will maintain recycling their product uses a fraction of the energy required to make it in the first place, everything is relative; aluminium production is an extremely energy hungry process, requiring huge amounts of power to extract the metal from its ore. So even the small proportion used in recycling still adds up to a hefty fossil fuel footprint. For energy efficiency, back to our school physics lessons... metals are conductors. So not only does that make energy performance inferior to insulators, but metals are prone to thermal bridging issues, the root cause of condensation. Condensation and windows and doors doesn't usually end well.

NO FENESTRATION MATERIAL IS PERFECT

IN CONCLUSION... YOU PAYS YOUR MONEY AND YOU TAKES YOUR CHOICE

Of course, advances in manufacturing, materials technology and recycling techniques will continue to change the relative merits of 'the big three'. And who's to say what other miracle material will come along to challenge them in the next few decades?

One thing is certain though: PVC-U is not the poor relation regarding sustainability and recycling that it's sometimes portrayed to be. When it comes to PVC-U, wood or aluminium, end of life will never be the end of the argument.



CHAPTER XII

THE FUTURE OF PVC-U SUSTAINABILITY





THE FUTURE OF PVC-U SUSTAINABILITY

Increased consciousness and desire to be environmentally sustainable means PVC-U sustainability is likely to develop faster in the next twenty years than it has in the past twenty-five. But what will this look like? Dr. Jason Leadbitter, Sustainability & Corporate Social Responsibility Manager at Inovyn, is one of the leading authorities on plastics and their impact on the environment.

Here he discusses the processes involved in recycling PVC-U frames, and how the latest recycling technology could offer a long-term solution to the worldwide problem of plastic waste:

NEW WINDOWS FOR OLD

The first 100% recycled PVC-U doors and windows were a proof of concept novelty that showed what could be achieved with mechanical recycling technology.

Today, in more environmentally aware times, recycled PVC-U is a common ingredient in many new PVC-U window and door lines.

So, what does the future hold for what the industry refers to as 'post-consumer' PVC-U? And what technologies are around the corner to help it recover, recycle and reuse even more of this valuable resource?

RETHINKING THE RECYCLING PROCESS

Mechanical recycling has been the standard technique for turning old PVC-U frames into new products for many years. It's a relatively simple process: Old frames are broken up, cleaned, converted into tiny pellets and then melted to be reformed into new window and door profiles or other products.

THE FUTURE OF PVC-U SUSTAINABILITY

Sometimes extra pigments may be added or a 'skin' of virgin PVC-U included to make sure the recycled frames are the same brilliant white colour. But apart from that, everything that's in the old frames goes into making the new ones.

It works because PVC-U is made up of millions of intertwined, spaghetti-like strands, or 'polymer-chains' that give it rigidity and strength. (They also help prevent molten drops of plastic forming during fires, something PVC-U windows have been erroneously accused of in the past).

When the plastic is heated to melting point during recycling, these strands loosen but, crucially, they don't break down as other polymers can in some other forms of plastic.

That means, when the melted plastic is reformed into new window frames, the polymer-chains can intertwine again.

The only drawback with manufacturing PVC-U frames in this way is that it needs to be free from all other types of plastics. That's fine when the raw material comes direct from replacement window projects or factory offcuts.

But mixed waste loads, which contain many different types of plastic from all sorts of sources, are simply too costly to sort and separate and often end up in landfill instead.

That's an awful lot of plastic going to waste every year. So now, the focus for the future is on a newly emerging technology: chemical, or feedstock recycling.





THE FUTURE OF PVC-U SUSTAINABILITY

THE NEXT TWENTY YEARS

Everyone knows that it's impossible to predict the future, but we can give a few pointers from work that Eurocell and Eurocell Recycle are doing now:

RECYCLING

Taking Jason Leadbitter's point, the process will be refined to be more efficient in energy consumption, feedstock process and yields

ENERGY CONSUMPTION

Ways will be found to reduce the amount of energy consumed during new PVC-U products manufacture

CARBON FOOTPRINT

Emissions will continue to be managed and reduced, for a smaller overall footprint. Significant progress is already being made in this area.*

PEOPLE

Will be better informed about plastics sustainability. Industry companies will train and educate colleagues and customers, as well as invest in young people to continually provide future careers in PVC-U.

PRODUCT DESIGN

Innovation will continue, so that sustainability is built-in at design stage and maximum use of recycled materials will continue to minimise environmental impact.

Ultimately the goal is to use more recycled PVC-U material will be used in future windows and doors than virgin PVC-U, significantly contributing to the preservation of natural resources.

*SOURCE: Life cycle assessment of PVC and of competing materials.
European commission publication

CHAPTER XIII

THAT'S ALL, FOLKS

SEPARATING FACT FROM OPINION

The plastics debate will continue throughout the next twenty years. That's a good thing, because it will drive further innovation and continuous improvement for the benefit of everyone. But we also need to remain objective, continually inform all of our stakeholders, of developments in plastics and retain the ability to separate fact from opinion.



APPENDIX I

CASE STUDIES



CASE STUDIES

THE SMART HOME - BRE & BRITISH GAS EXEMPLAR PROJECT (2013)

The Smart Home is an Exemplar project between the Building Research Establishment (BRE) and British Gas, based on the BRE's Innovation Park in Garston, Watford.

Eurocell windows, composite doors and bi-fold doors were specified for the refurbishment, as they provide high levels of thermal efficiency, sustainability and value for money.

The refurbished former 'Integer House' showcases latest products and technologies with the aim of helping households to reduce energy consumption through sustainable refurbishment.

Calculations indicated that the replacement windows and doors would provide greater air tightness than the existing timber windows as well as improving U values. The refurbishment aimed to improve the three-bedroom home's energy efficiency from an EPC (Energy Performance Certificate) rating of 'E' to a 'B' or an 'A'. Smart Home, formerly the Integer House (which stands for Intelligent and Green), was used as a reference point by many housing associations, local authorities and architects.

The building has already informed a generation of house designers as far as China, and will inspire the next generation of housing experts.

The original timber casement windows were replaced with casement and tilt & turn versions. All new windows incorporate the Eurocell PVC-U Thermal Inserts to improve the frames thermal performance and, being made from 100% post-consumer recycled PVC-U, provide a sustainable method of dealing with end-of-life PVC-U frames from refurbishment projects.

Volunteers were invited to live in Integer House for up to two weeks at a time to provide feedback on its energy efficiency, running costs and overall comfort.

Other sustainable technologies incorporated into the refurbishment included extra insulation, air source heat pump, integrated solar photovoltaics and smart lighting and heating controls. The BRE worked with British Gas, a partner on the project, to use the data from Smart Home to better understand how to apply technology into other homes to make them more efficient and lower cost to run. John O'Brien, Principal Consultant, BRE, said: "With the changes to the Building Regulations over the last 15 years, improved air tightness for windows and doors has been assisted by advances in frame and glazing technology.

The Smart Home will highlight how refurbishing existing buildings can be an affordable and a highly effective way of reducing energy bills and improving comfort for residents."

The Integer House featured on the BBC's House of the Future when it was originally built in 1998. Refurbishment of the property was completed in September 2013.

CASE STUDIES

NOTTINGHAM CITY HOMES SCORES AN 'A' FOR RECYCLING (2010)

Eurocell Recycle Midlands (formerly known as Merritt Plastics), together with partners from parent company Eurocell, secured a £13 million contract with Nottingham City Homes to supply 'A'-rated windows to 15,300 properties, using advanced PVC-U window profiles. A cost-effective British Fenestration Rating Council (BFRC) 'A'-rated windows solution was developed for the project, which exceeded the client brief requirements and gave residents all the thermal efficiency benefits of the highest possible Window Energy Rating (WER)*.

To deliver maximum sustainability for this contract, the 100,000 old window frames were recycled at the Eurocell Recycle recycling plant in Ilkeston. The material was then reground to make PVC-U Thermal Inserts for the new 'A'-rated windows, fitted to the same properties. More than 90% of all waste material from site was recycled – a fantastic achievement considering the scale of the project.

Mark Johnson, Director of Property Services, Nottingham City Homes, commented:

“Our Secure Warm Modern project is helping us to improve thousands of council homes across the city. Eurocell and Nationwide Windows are contractors that are helping us to make this happen, providing high quality service and materials. The innovative use of 'A' rated windows means that our residents are receiving the best low carbon technologies available.”

Fitting the new windows and doors reduced current carbon emissions across the City of Nottingham by around three million kilograms each year and helped residents save an average of £80-100 per household on annual fuel bills. Plus, respiratory illnesses dropped from fewer cases of damp and burglaries from windows as the point of entry also reduced.


*The highest rating achievable today is A++





APPENDIX II


EUROCELL FACT FILE


TOP 10 FACTS


- 


Is the UK's leading manufacturer, distributor and recycler of PVC-U profiles (by market share - Source: D&G 2018)
- 


Operates Eurocell Recycle, the UK's largest recycler of PVC-U window and door profiles (by tonnes processed).
- 


Is a member of VinylPlus, Recovynyl, British Plastics Federation (BPF) and Operation Clean Sweep – an industry-wide voluntary commitment to develop more ecologically responsible ways to produce, use and recycle PVC.
- 


Since 2014, the Eurocell Group has reduced its total emissions by 22%. In the same period it has increased its number of sites by 78 (56%). (Source: Eurocell Greenhouse Gas Report, Inenco Group, February 2019)
- 

Eurocell Recycle prevented over 3.6 million frames from ending up in landfill in 2018
- 

Between 2017 and 2018 virgin rigid plastic production decreased by 5.4%. Recycled rigid plastic production increased by 14%.
- 

c50% of material contained in Eurocell Logik and Modus profile systems is post-consumer recycled PVC-U
- 

98% of waste from Eurocell branches is recycled. 1,485 tonnes in 2018. (Source: BIFFA)
- 

87% of waste from Head Office sites is recycled. 3,337 tonnes. Materials recovered for recycling include cardboard, wood, brick / concrete, polythenes, ferrous metals, non-ferrous metals, glass. (Source: WARD Recycling)
- 

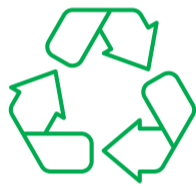
Won the Future Manufacturing Awards - Sustainability 2018 and the MRW Recycling Awards - Manufacturer of the Year 2018



EUROCELL FACT FILE

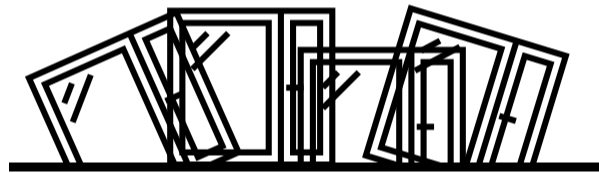
SUSTAINABILITY IN ACTION

3.6 MILLION+



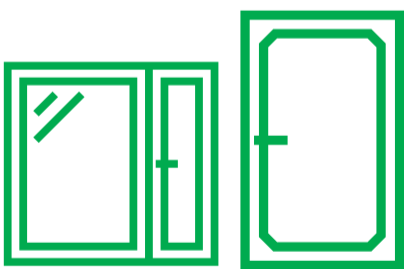
Over 3.6 million end-of-first life frames recycled in 2018 (and more in 2019)

566,320



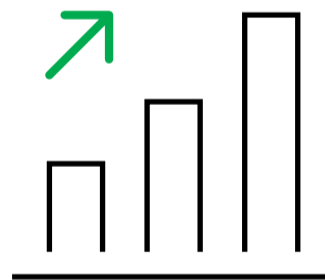
Q1 2019 record set with 40,445 post consumer frames processed a week during the period, that's **566,320 window frames saved from landfill in just 3 months**

EIGHT



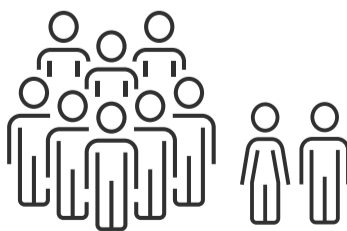
Manufactured product ranges from recycled PVC-U
– this continues to expand

23%



Increased turnover by 23 per cent (2016-2018)

110+2



Provided recycling jobs to 110 people in the local area, including two apprentices

**THANK YOU
FOR READING**

