



ZOTEFOAMS

# RETHINKING FOAM PRODUCT DEVELOPMENT FOR THE CIRCULAR ECONOMY

## Foam Expo 2024

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# FOAM IS GREAT, RIGHT?



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From initial uses a century ago as insulation or buoyancy aids, its lightweight and durable properties were soon harnessed for the early aviation industry and subsequently a wide range of sectors that could benefit from

- Insulation
- Buoyancy
- Cushioning
- Weight reduction
- Water resistance
- And more



# THE ORIGINAL SUSTAINABLE MATERIAL



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**Materials have moved on too: early applications used rubber but today foams are made from a variety of different polymers to suit different requirements.**

Its use has saved countless tons of carbon over the decades thanks to its lightweight and insulation properties.

Today the emphasis is on

- carbon reduction to protect the environment and
- circularity to preserve resources.

Our customers are looking for both recycled and recyclable lightweight foams to ready themselves for the circular economy.



What's driving  
circularity?





# EU REGULATIONS

## The regulations and targets set to create the circular economy

### Green Deal



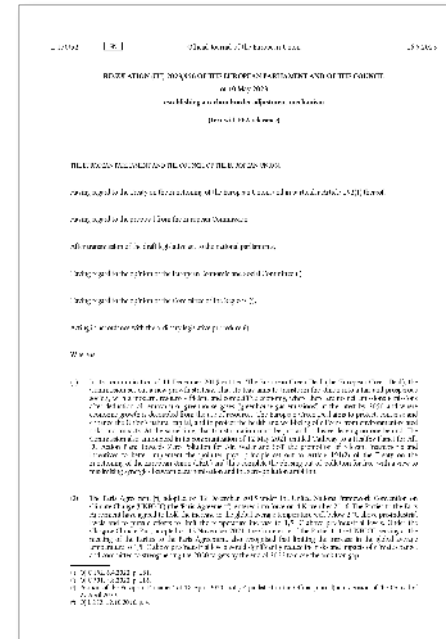
### CBAM

### (Carbon Mechanism Pricing)



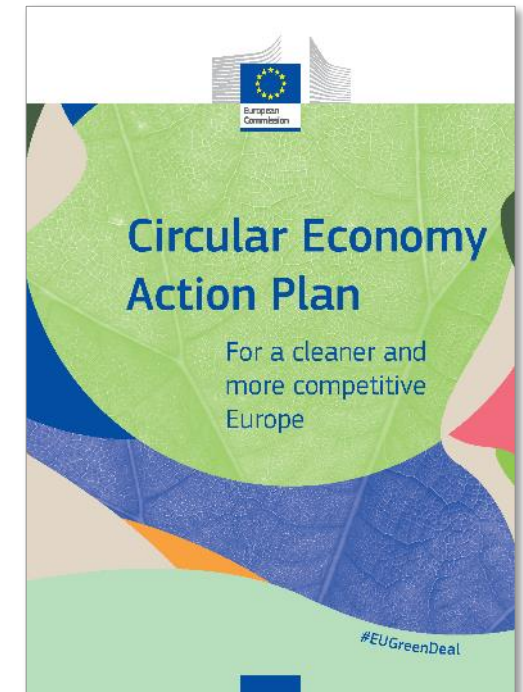
### ESPR

### (Ecodesign for Sustainable Products Regulation)



### CEAP

### (Circular Economy Action Plan)



# EU TARGETS

The regulations and targets set to create the circular economy

**PPWR** (Packaging and Packaging Waste Regulations)

30% recycled content in single-use plastics packaging by 2030

**ELV** (End-of-life-Vehicles Directive)

95% of materials are reusable or recoverable

*with a proposed target of*

25% recycled content for vehicles by 2030

*of which*

25% should be recycled from ELVs





# BARRIERS TO CIRCULARITY





## PRIMARY CONCERN

Right foam, right job.

Hierarchy of needs for the application will determine choice of material:

- › weight reduction
- › safety factors
- › aesthetics
- › durability

**In aviation, safety is always the first consideration.**







# INFRASTRUCTURE – BIGGEST BARRIER IS RECYCLING INFRASTRUCTURE



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**How do you recover what's been used and how do you separate it?**

- Infrastructure, logistics and carbon footprint cost associated with that, makes it very difficult
- As a manufacturer, if the global infrastructure isn't there, the monetary and more importantly carbon cost is prohibitive

## COST OF RECYCLING

- Foams often bonded to other materials making end of life recycling difficult.
- Sorting and processing: labour and energy costs around sorting materials, washing, processing down to pellets, resale
- Foam is high volume relative to its weight and is expensive to transport in both carbon and financial terms
- Recycled material can be expensive to purchase and low supply







# CUSTOMER ATTITUDES



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Zotefoams consulted thoroughly with customers on the development of its foams with recycled content and was assured there was demand.

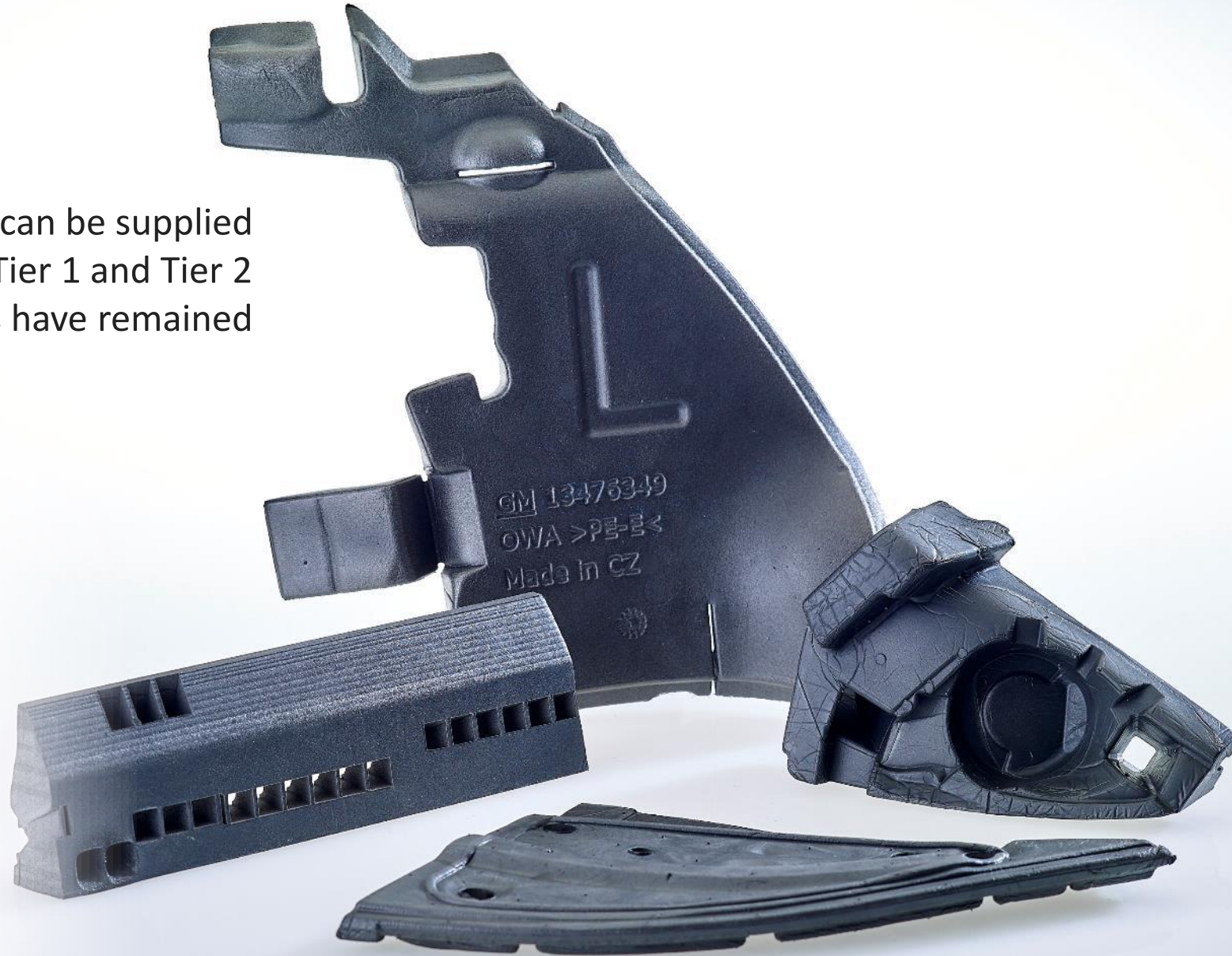
- Performance of recycled foam can be the same as virgin for e.g. transit packaging but there is pushback on aesthetics  
“it doesn’t look perfect like your usual foams”.

**Expectations need to be adjusted.**

- Choose the right foam for the job by identifying the hierarchy of requirements per application.

# SPECIFICATIONS

- Lighter parts with more recycled content can be supplied but if these aren't in the OEM spec then Tier 1 and Tier 2 suppliers can't use it. Some specifications have remained unchanged for decades and simply don't allow for recycled content.
- In the aviation and automotive industries in particular, control of the process is key. There is a widespread perception that recycled content is not controlled and this will impact configuration control. This can be managed via the specification





# FOAM MANUFACTURING PROCESS

- Crosslinked v non crosslinked?  
A balance between durability and marginally easier recycling.
- In effect, all foams can be recycled, using pyrolysis if necessary but this **may not be the Right Thing to do**, economically or environmentally





# ECONOMIC AND CARBON COSTS

Does it make more sense from a carbon and cost perspective to use virgin material?

Plastics and foams are relatively new, so the recycling infrastructure is not established in the same way as e.g. aluminium.



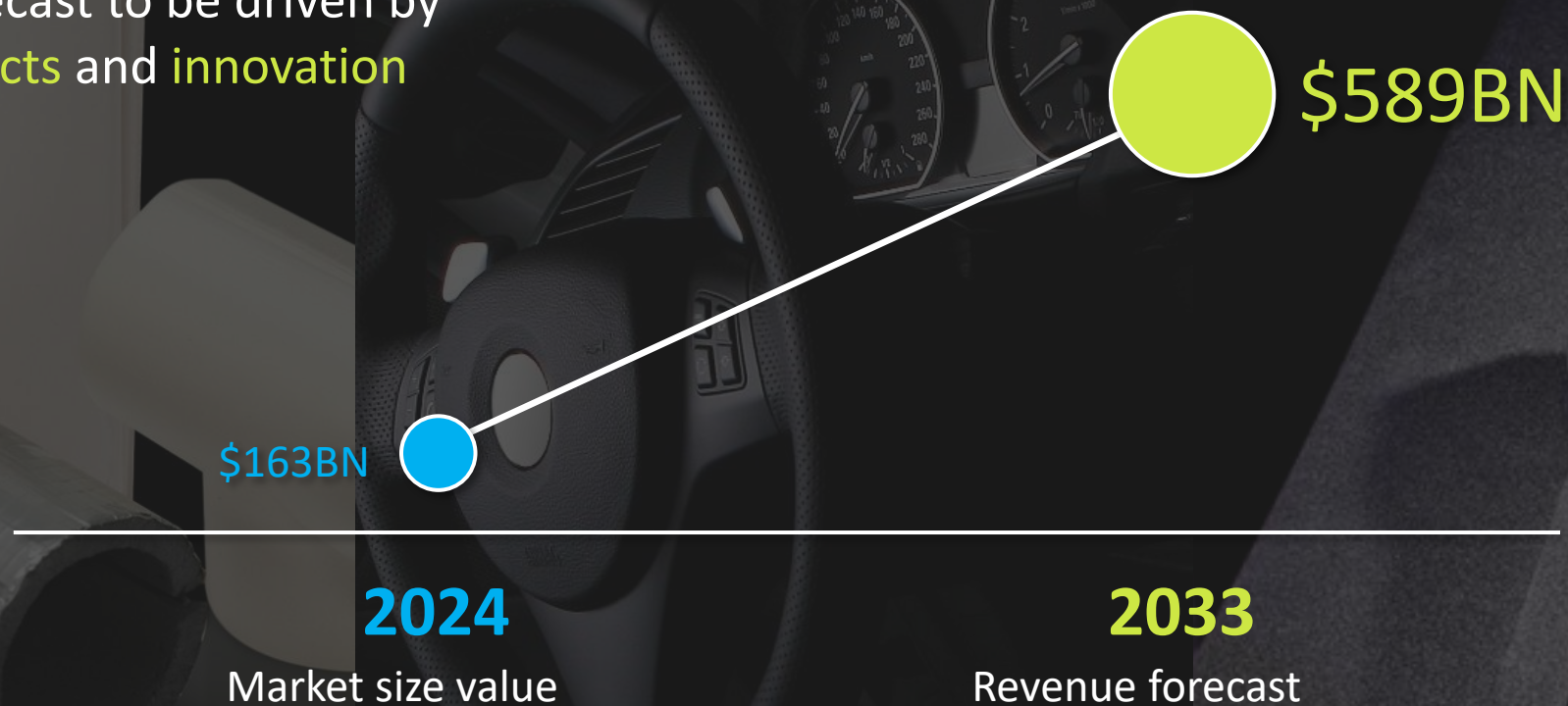


# THE OPPORTUNITY



# PROJECTED GROWTH

The growth is forecast to be driven by sustainable products and innovation



The global foam market is forecast to grow from \$162.90 billion (€155 billion) this year (2024) to \$588.99 billion (€558 billion) in 2030



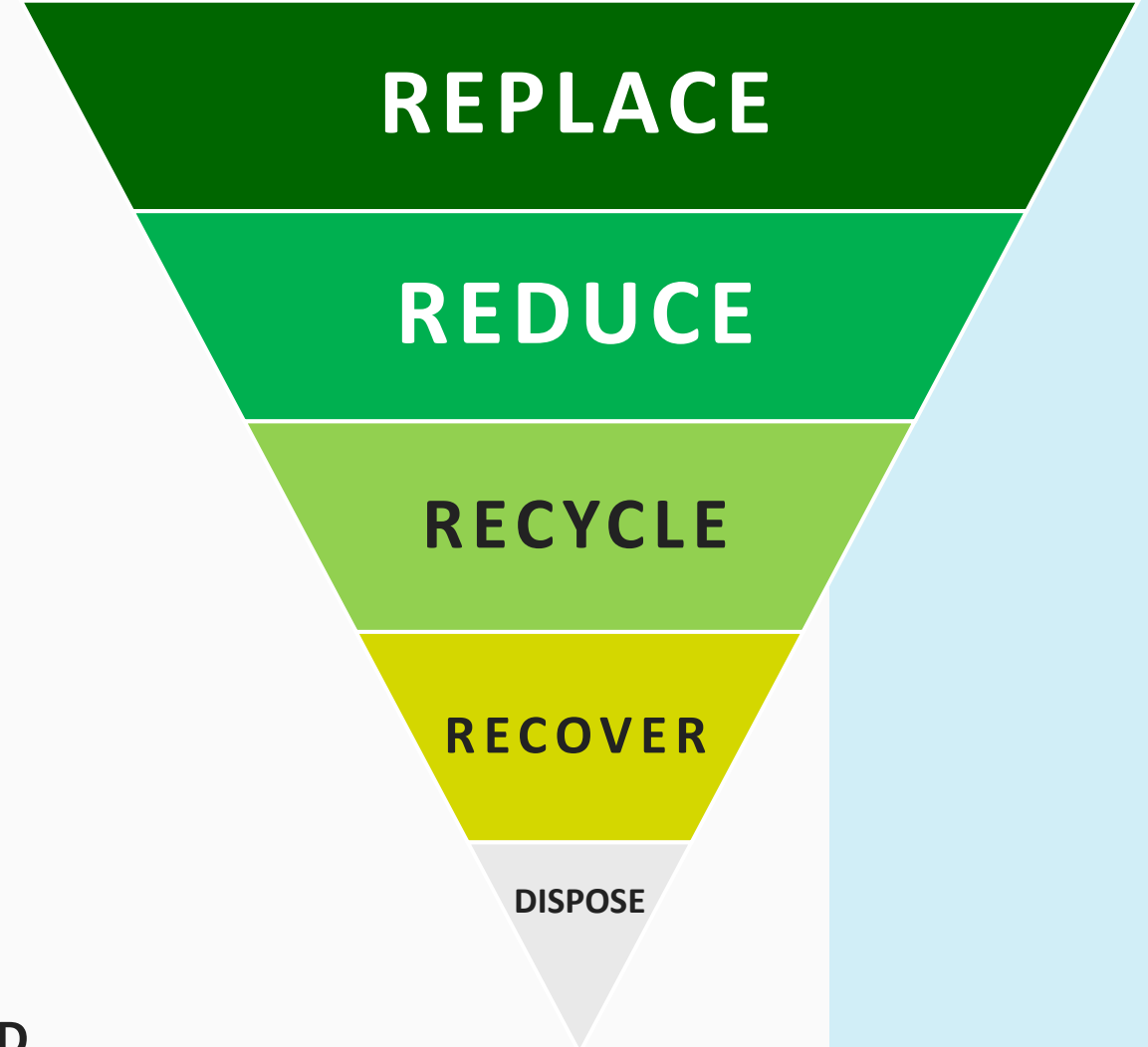
# THE HIERARCHY OF WASTE: REDUCE, REUSE, RECYCLE

Both the carbon cost and the financial cost of building a circular economy for foams are currently high.

- Reduce: Minimise the amount of material entering the supply chain by only using what is strictly necessary for the task at hand
- Reuse: Keep materials in circulation for as long as possible
- Recycle: At the end of its useful life, and where the option is available, recycle the product rather than sending it to landfill so that it can come back as something else

**MOST  
PREFERRED**

**LEAST  
PREFERRED**



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# PERFORMANCE AND SPECIFICATIONS

## Focus on performance

- Use the least amount of material to do the job.  
18 kg foam that performs the same as 30 kg foam

## Lightweighting

- Displace traditional materials to reduce weight and emissions





# OPTIMAL MATERIAL USAGE



**Minimise the use of virgin material,**  
not maximise the use of recycled content.

Avoid unintended consequences, such as selecting a higher density foam with some recycled content it may use more virgin polymer and have a high lifetime carbon impact.

NB: Many users have made commitments to reduce scope 3 emissions.

# PRODUCT DESIGN

## Initial design critical in managing circularity

At this stage foam manufacturer has most input.

Eliminate multi-material components with processes: laminate instead of glue,  
mould components such as hooks instead of applying a different material.  
Mono-material waste stream, doesn't have to be separated.





# LIFECYCLE ANALYSIS

Ensure foams are durable to eradicate need to  
recycle frequently

The degree of crosslinking impacts recyclability:  
select a level that can increase performance but  
not prevent recycling.





# INFRASTRUCTURE LOCAL VS GLOBAL



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**Are there opportunities for local/ regional/ national closed loop schemes?**

Where can you recover material cost effectively? Monetarily and carbon cost effectively. Skins, trims and skeletons.





# GREENER SOURCES



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## **Raw material from non-fossil fuel base**

(biobased, recyclate, ocean plastics – but take care that there are no other impacts e.g. food security: the world could not support a wholesale switch to biobased).

## **Recycled content (30% LDR and PER)**

Fully recyclable foams (TPU and PP closed cell, non-crosslinked). Technology developments to improve the ability to recycle. Such as microcellular, closed cell foams, manufactured without the need to crosslink.



# ZOTEFOAMS APPROACH



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Plastic / foam, when used appropriately,  
**can be the optimal solution** both functionally and environmentally.

This is centred on two principles:

1. Minimising the use of natural resources through a series of internal measures
2. Preferably operating in markets where Zotefoams' products offer unique sustainable advantages which benefit society





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In 2022, 85% of our sales were designated as Green Revenue Criteria being, products which, during manufacture or use, provide a substantial increase in efficiency of resources used.

As the recyclable foams market expands, the key to innovation in polymer will be the alignment of manufacturer, market and end-user on the specifications, performance and aesthetics.

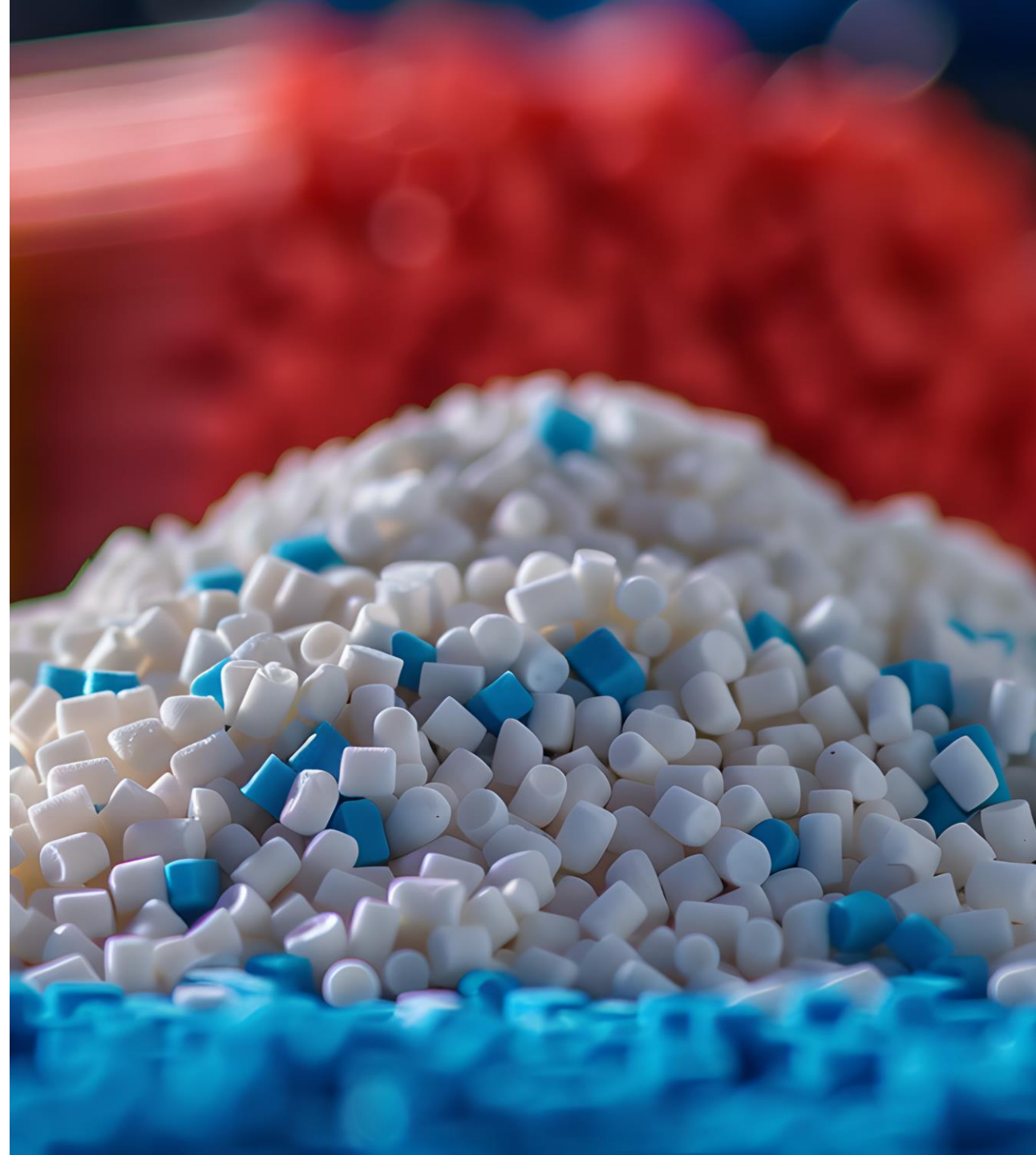
# KEY TAKEAWAYS

## 1. Optimal use of materials

It's about the right product for the right application that minimises the carbon footprint over its life cycle and maximises its durability and its ability to be recycled. Through good selection and good design.

## 2. The market will come, as it has for other materials.

We are at forefront of that.







# THANK YOU

## Q&A