



# EUPC – The Future of Plastics Packaging

## 20<sup>th</sup> September 2016

# Agenda



- Food Waste is the Problem
- Packaging is a Green Technology that reduces food waste!
- But is Packaging nonetheless a Problem?
- Tension exists between innovation and recycling. Recycling can become the enemy of Innovation
- LINPAC has solutions for recycling that are innovative,
- These are made with 95% rPET content
- Super-cleaned to guarantee food safety
- Incorporated into LIFE lightweight designs
- That deliver maximum performance at lowest weight
- High barrier
- Minimise discoloration (red meat)
- Rolling out Elite which facilitates recycling of these same trays as if they are bottle material





Food Waste and Food Security are the real real problems!



*fresh thinking!*

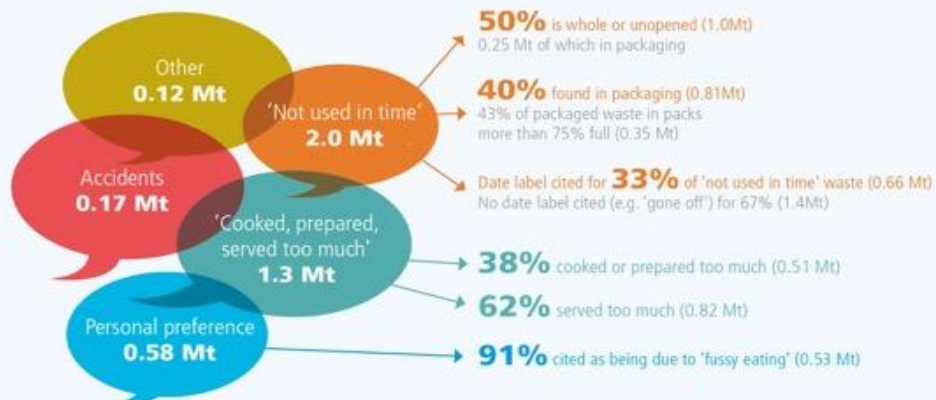


# UK Household Food Waste - WRAP

## Household Food Waste.

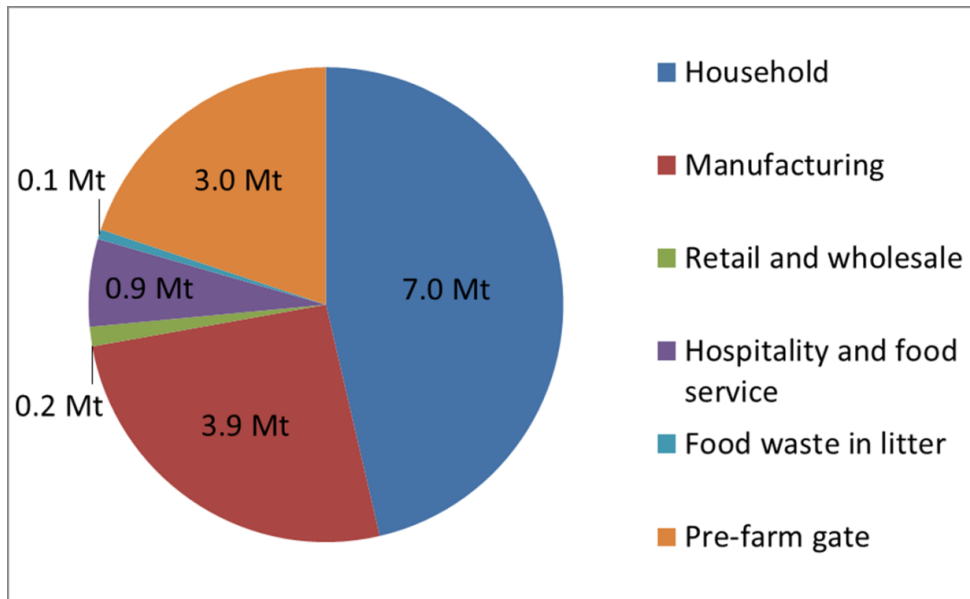


**92%** as amounts more than 50g (3.8 Mt)  
**33%** as amounts more than 400g (1.4 Mt)

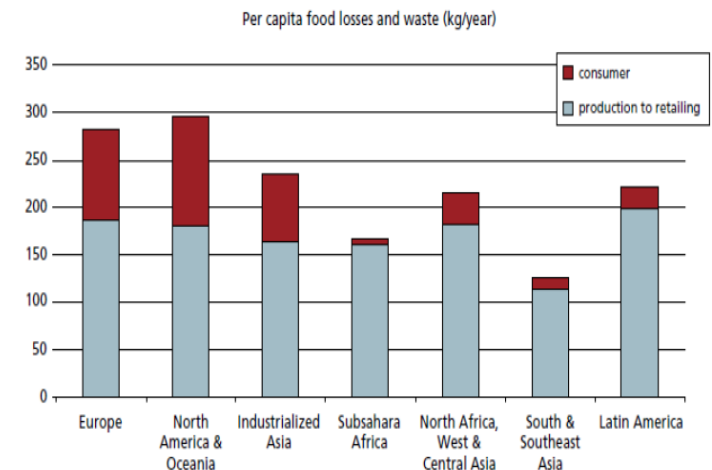


# Introduction: Global situation

## Introduction: Global situation



Amounts of food waste arising in the UK by sector (total = ca. 15 Mt)\*



**Per capita food loss and waste at consumption and pre-consumption stages in different regions.**



# Food Waste is the real, real problem!



## Packaging has a huge role in minimising food waste and maximising food security

- Packaging does not exist in its own right; its there to do a job
- Protection, preservation and Presentation
- Guaranteeing food to the consumer at affordable cost and without health risks
- Extension of shelf life
- Portion control
- Visibility of contents
- Etc etc
- Consumers don't go out to buy packaging. It's not a product; it's a delivery vehicle



## Imagine a world without packaging

- If it were invented today, packaging would be heralded as a “green” technology

**Key Message – Packaging is a good thing (a “Green Technology”) and we should be striving to Innovate and develop it further to bring ever greater benefits in terms of reducing food waste and increasing convenience**

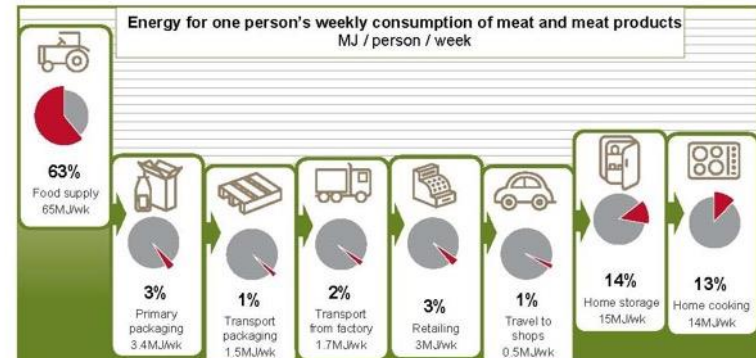


# How much of the energy and resource in the food chain is constituted by packaging?



## Meat and its Packaging

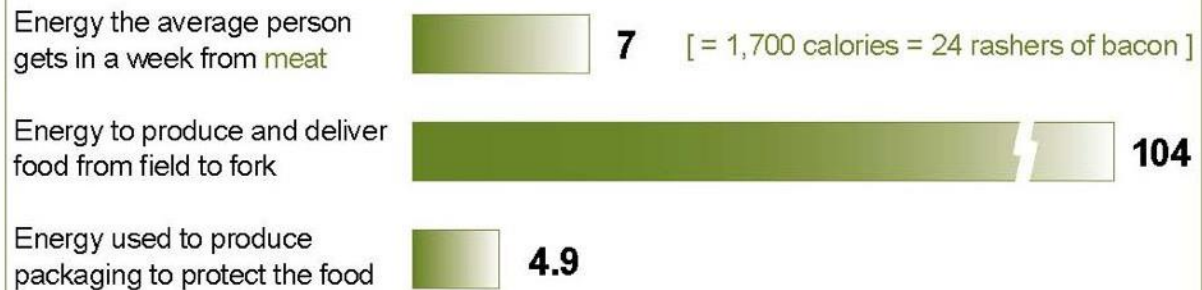
**Meat** (includes meat products)



- Rearing and processing meat accounts for more than half (63%) of the energy in the supply chain
- Storing and cooking food at home uses just under a third
- Packaging is 3%
- Meat provides us with 12% of our calorie intake

### Food Energy

MJ/week



**Key Message – Packaging consumes a relatively small part of the overall resource in the food chain. Producing the food and refrigerating it consume the vast majority. It makes sense to spend a little more resource on the packaging if it can save food waste.**





But Packaging is  
a major problem  
isn't it?

Really?



*fresh thinking!*





# Let's look at relative impacts

## Driving vs. Packaging



### The Problem .....

- The average European consumes 27 Kg of oil as plastic packaging in a year in all forms -primary packaging, secondary, food, non-food
- 35% of this was recycled in 2015

### On the other hand .....

- The average driver consumes 1620 Kg of oil in his car in the form of diesel or petrol fuel
- As far as I know, none of this was recycled
- **That's 1.7% in packaging and 98.3% in fuel**



### Which one gets the most attention?

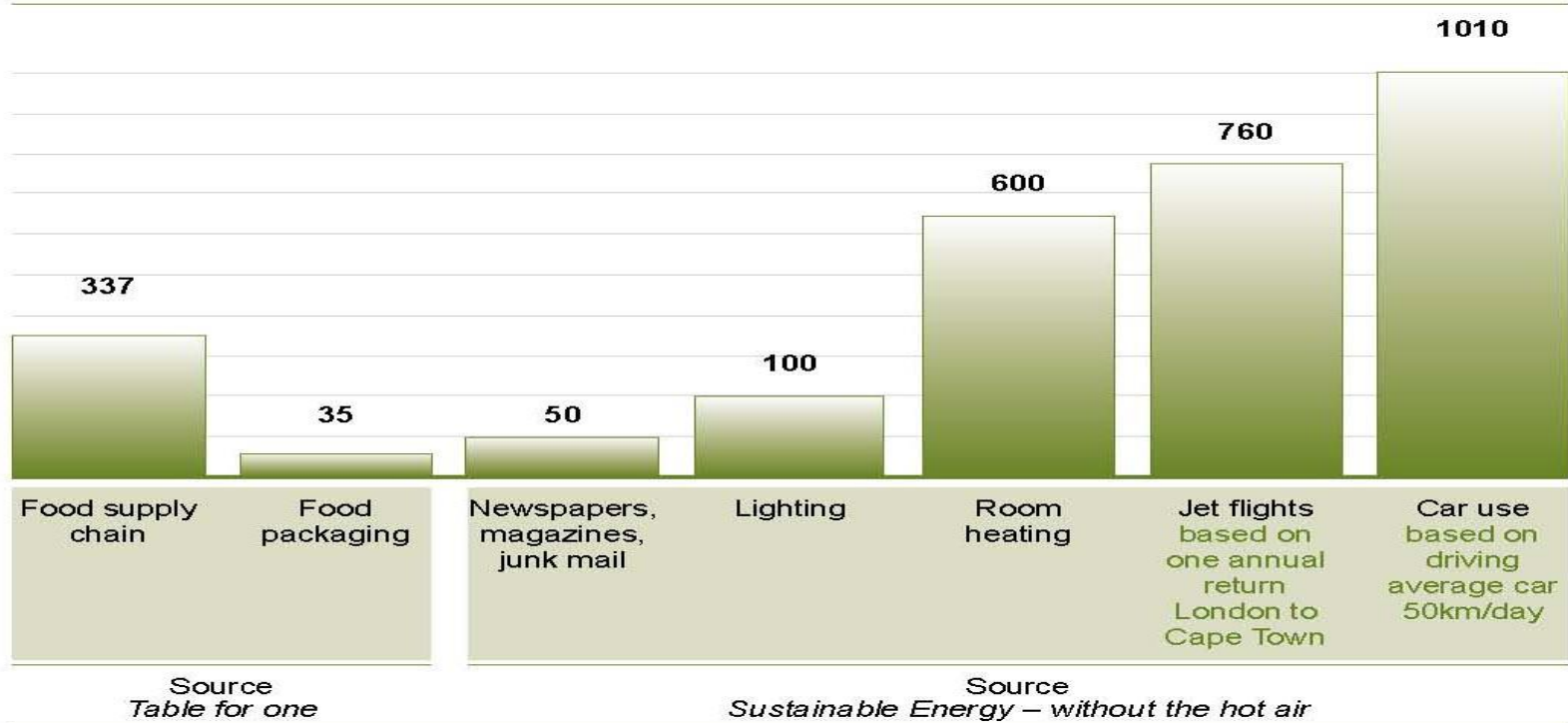
- Drive 1.7% less and forget about packaging!
- Or just 1 km/h slower would save more

**Key Message – Packaging consumes a trivial amount of the fossil fuels extracted today. A substantial proportion is already recycled. And yet it receives a disproportionate negative press.**



# How much Energy is saved by how much Packaging?

UK energy consumption  
MJ / person / week

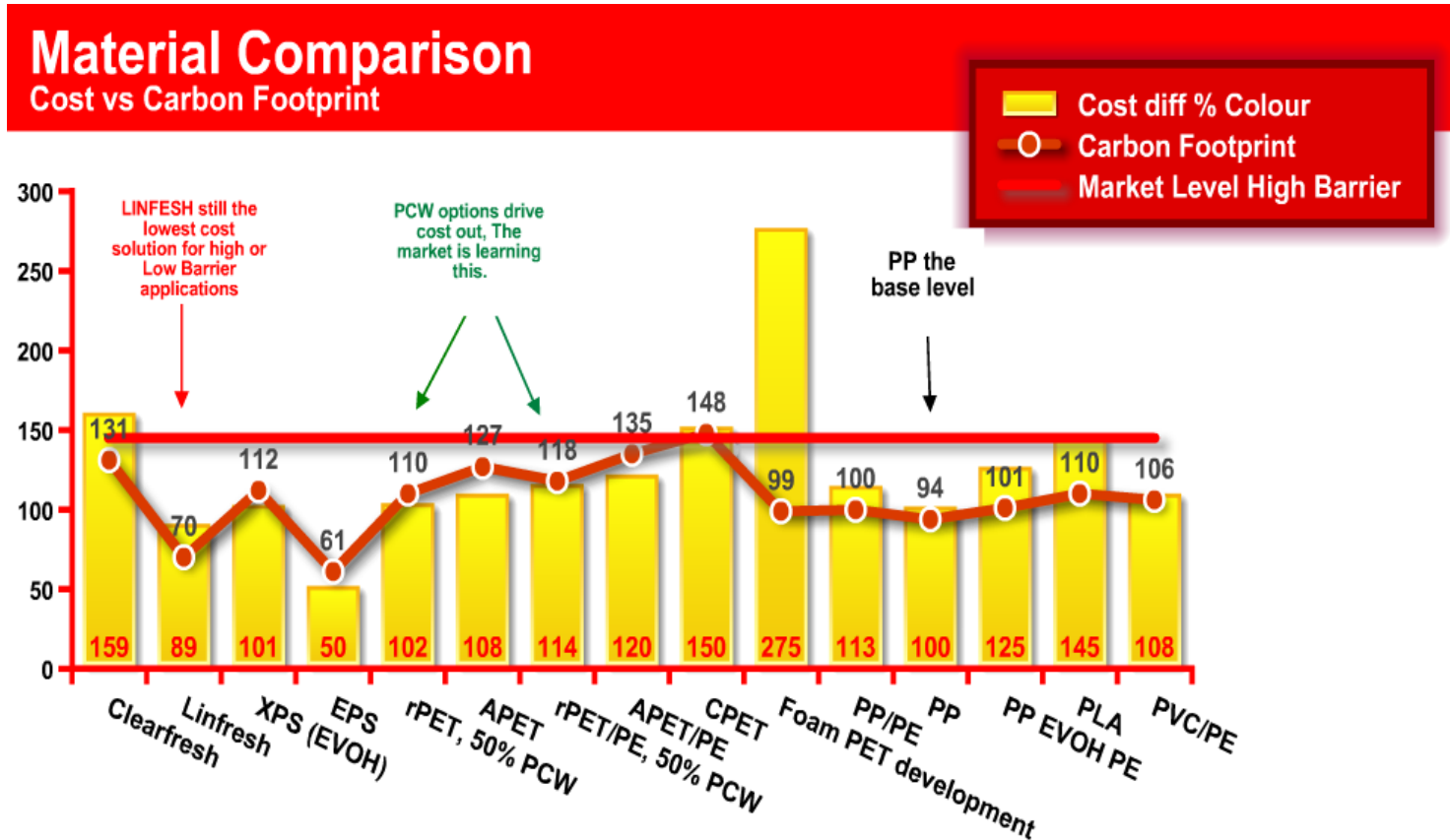


The figures are expressed using a common personal metric (per person) of megajoules per week (MJ/wk). A megajoule is roughly the energy an 'energy saving' lightbulb would use if left on for a whole day (or five hours for the equivalent 'old' style lightbulb)



# Relationship between Cost & Carbon

Comparing a range of different material options for 500g of minced beef



Enables us to understand the strategic implications of a move in format.

**Key Message – When a customer asks about carbon footprint of our products, he almost does not have to ask. If it's the cheaper product, almost certainly it's the lower carbon footprint**





But we have to really  
focus on recycling  
don't we?



*fresh thinking!*



# Recycling vs Innovation

## Innovation

- Foamed Solutions
- Use of mineral Fillers
- Complex Multi-layer structures
- New Materials
- New Formats



## Recycling

- Popular with consumers
- Restricting Material Choice
- Favours Heavier Formats
- Stifles Innovation

**Key Message – Recycling of Packaging is great, where it makes sense.**

**But concentrating on recycling risks two negative outcomes:-**

- 1. Stifles Creativity and Innovation that could make much more impact**
- 2. Ultimately leads to greater use of resource and Energy – a negative environmental outcome**



# Relentless Pursuit of Recycling Targets

- There are always siren calls for increased levels of packaging recycling.
- That may make sense for glass and metals where the resource and carbon investment is already huge.
- But for plastics, it rarely is.
- That being the case, the drive to recycle more risks designing packaging that's easy to recycle but uses more resource to make in the first instance.
- Net Environmental outcome = negative!
- The latest and significant driver is the Circular Economy Package (CEP)
- But where's the environmental cost benefit analysis that demonstrates that these new targets will actually bring benefit.
- Right now, we see Re-processors and others seeking to rationalise plastics in use for packaging; to make it easier to recycle.
- Once again, where's the demonstrated benefit in such rationalisation.
- Its highly likely that the outcome will be strongly negative
- After all, the "system" has spent the last 50 years optimising materials and designs to give maximum benefit for minimum cost.
- And minimum cost equals (usually) minimum Resource/carbon .
- So why do we want to put the train in reverse?



That doesn't mean  
that LINPAC wont  
work to improve the  
recyclability of its key  
product groups



*fresh thinking!*



# Improving Recyclability of our trays



We do that in three ways:-

1. Maximum use of Recycled rPET in our products. Frequently 95-100%
2. Optimising our trays through light-weighting and ..
3. Innovating to facilitate recycling. Eg Elite trays

- *LINPAC has solutions for recycling that are innovative,*
- *These are made with 95% rPET content*
- *Super-cleaned to guarantee food safety*
- *Sourced where possible from local recycled PET*
- *Incorporated into LIFE lightweight designs, that deliver maximum performance at lowest weight*
- *High barrier for optimum shelf life*
- *Minimise discoloration in red meat*
- *Rolling out Elite which facilitates recycling of these same trays as if they are bottle material*





# Choice of Material



## Why PET and.....Why rPET?



- ✓ Good Oxygen barrier
- ✓ High clarity
- ✓ High strength per unit weight
- ✓ Excellent environmental profile
  - ✓ Can be recycled at end of life
  - ✓ Opportunity for high recycled content (up to 100%)
- ✓ Popular with retailers
- ✓ Bottles are widely recycled
- ✓ PET does not absorb large molecules
- ✓ Up to 70% reduction in Carbon compared with virgin PET
- ✓ In line with CSR policies
- ✓ Packaging waste legislation

**Key Message - LINPAC chooses PET so as to drive recycling through use of high levels of recyclate consumption. Driving a Circular Economy. Its also a great packaging material.**





There are 2 common ways to produce rPET pots and trays, both meeting the regulatory requirements for using recycled material.

1. Super-cleaning
2. ABA co-extrusion (recycled material behind a functional barrier)



*fresh thinking!*



# How do we ensure the consumer stays safe ?

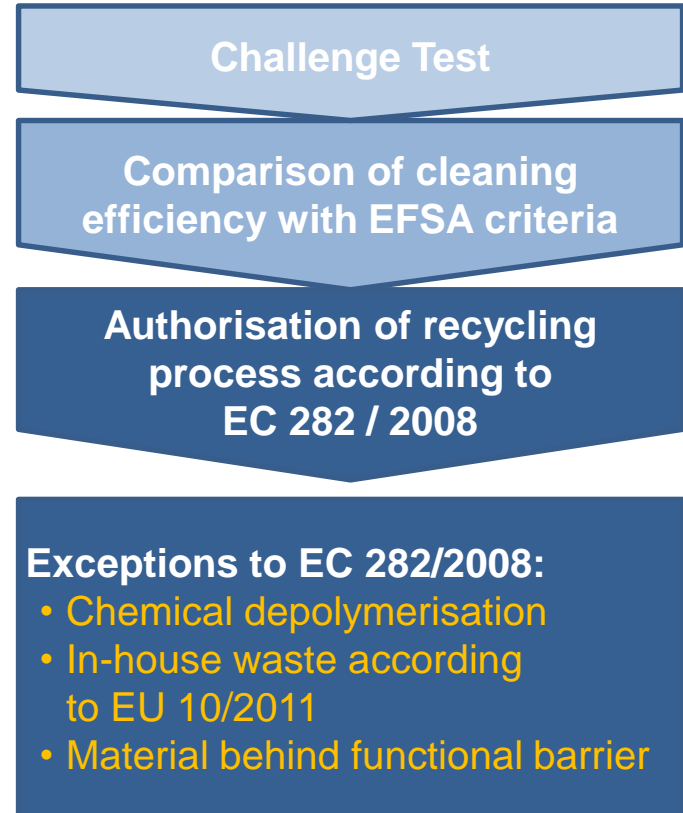
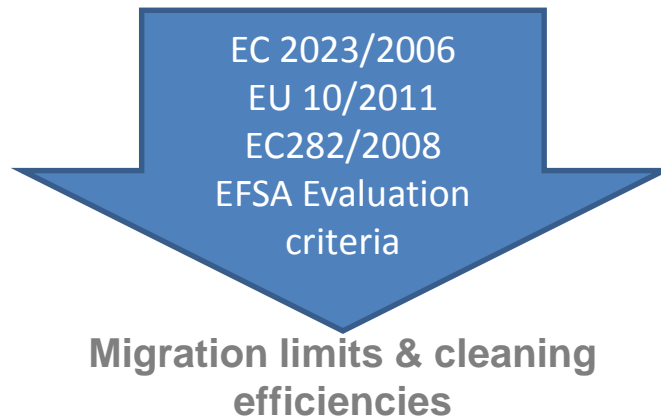


## What the regulations say about rPET use



Super-cleaning Recycling processes must remove chemical substances to a point where:  
(EC 1935/2004, Art.3)

- ✓ Human health is not endangered
- ✓ No unacceptable change in the composition of food occurs
- ✓ No deterioration in smell or taste of food appears

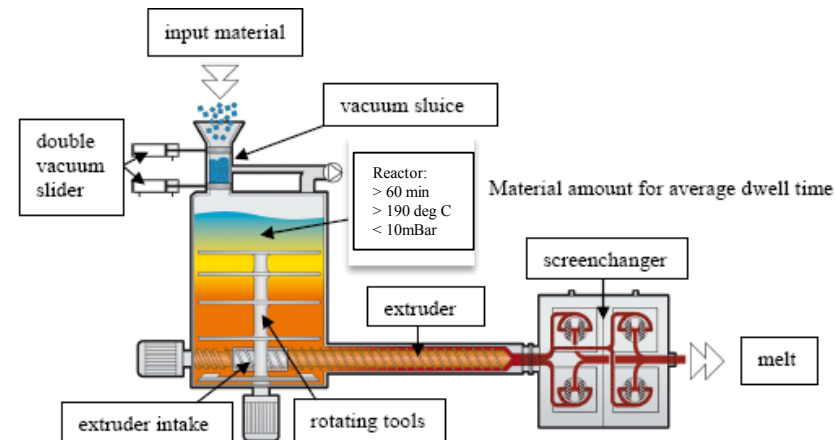


# The Processes we use to guarantee food safety under all circumstances



## Working directly in front of extruder:

1. rPET washed bottle flakes purchased to help drive recycling infrastructure
2. Hot washed flakes are loaded into reactor
3. Flakes are held in reactor for controlled residence time
4. Decontamination occurs in the reactor vessel at high temperature under vacuum conditions
5. Decontaminated PET flakes are fed directly into the extruder for sheet production
6. **Quality Assurance System guarantees food contact compliance**
  - Decontamination efficiency tested at all stages of process - Volatile screening HS-GC-MS
    - Semi-volatile extraction GC-MS
  - Also compliant with FDA CFR 21 part 177-1630



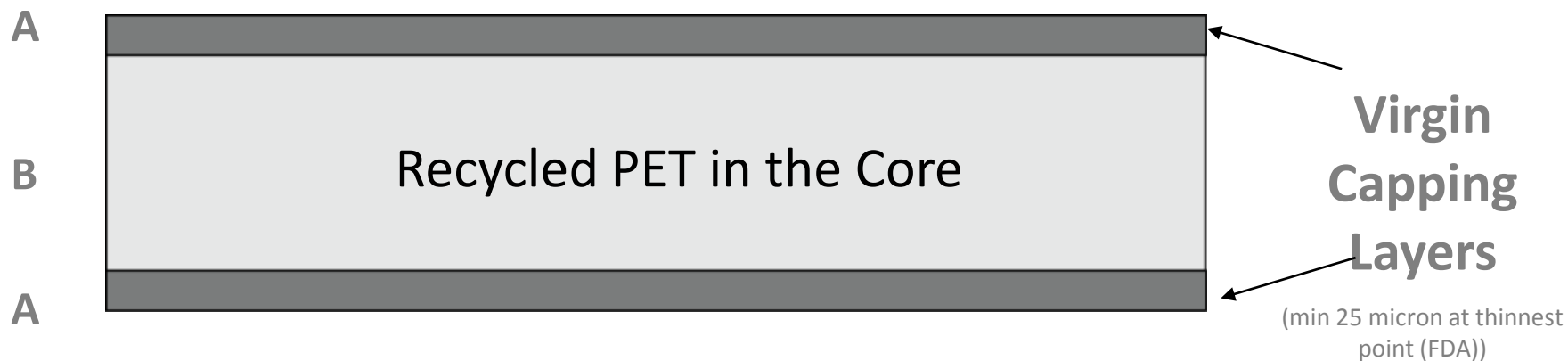
Still waiting for EC to accredit after 7 years



# Recycled PET behind a Functional Barrier

- Recyclates behind Functional Barriers are not covered by the Recycling Regulation 282/2008.
- For recycled PET behind Functional Barriers no EFSA petition has to be submitted.
- Regulation 10/2011
  - "Behind a functional barrier, non-authorized substances may be used, provided they fulfil certain criteria and their migration remains below a given detection limit."
  - Maximum migration level: 10 µg/l
- The performance of the Functional Barrier must be demonstrated.

# A common Form of Functional Barrier



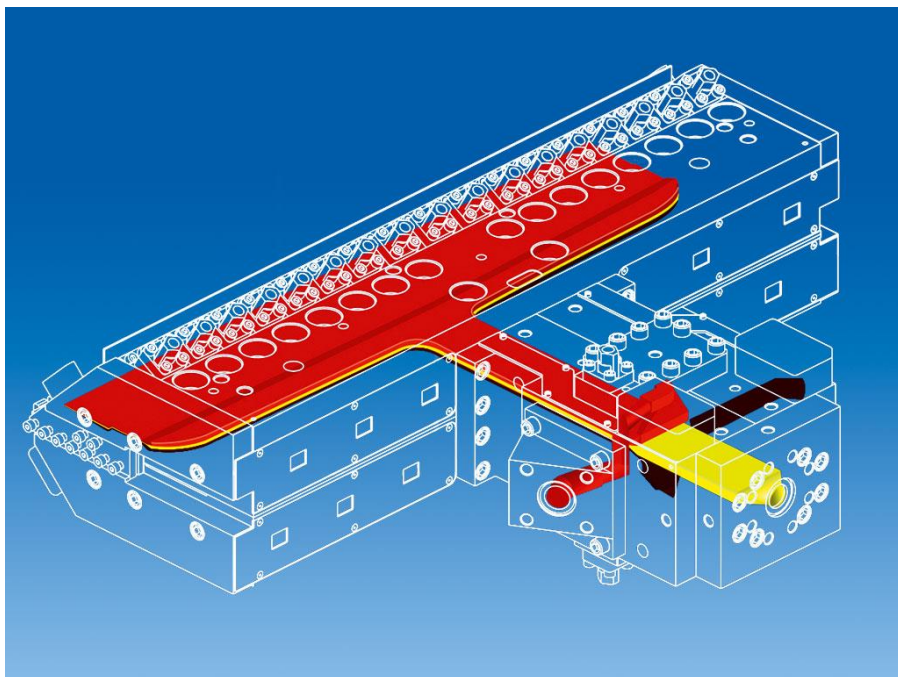


## Exceptions to EC 282/2008

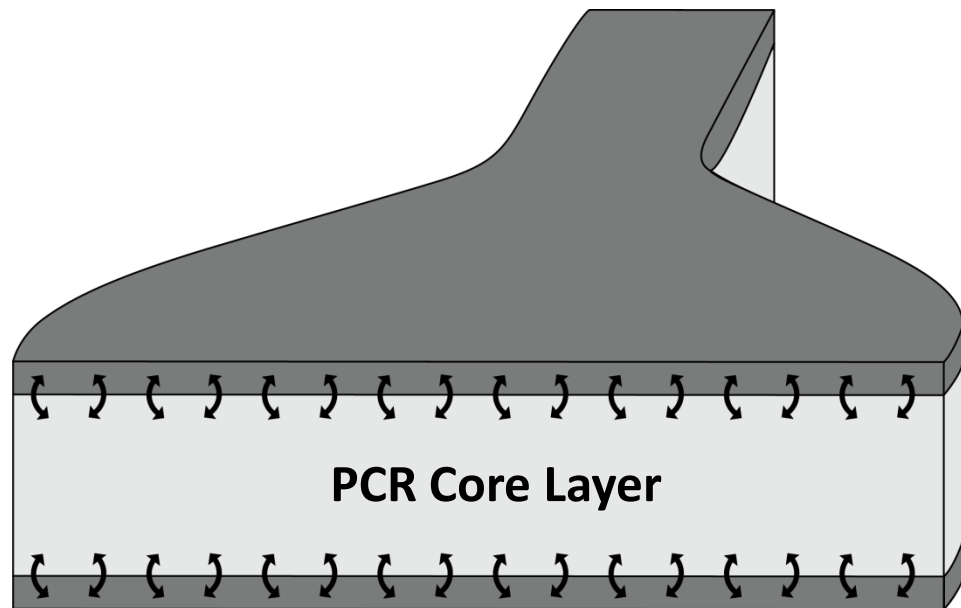
### 3. Material behind a functional barrier

## Risk #1 Melt migration

Recently published data from Germany's Fraunhofer Institute indicates the barrier almost disappears



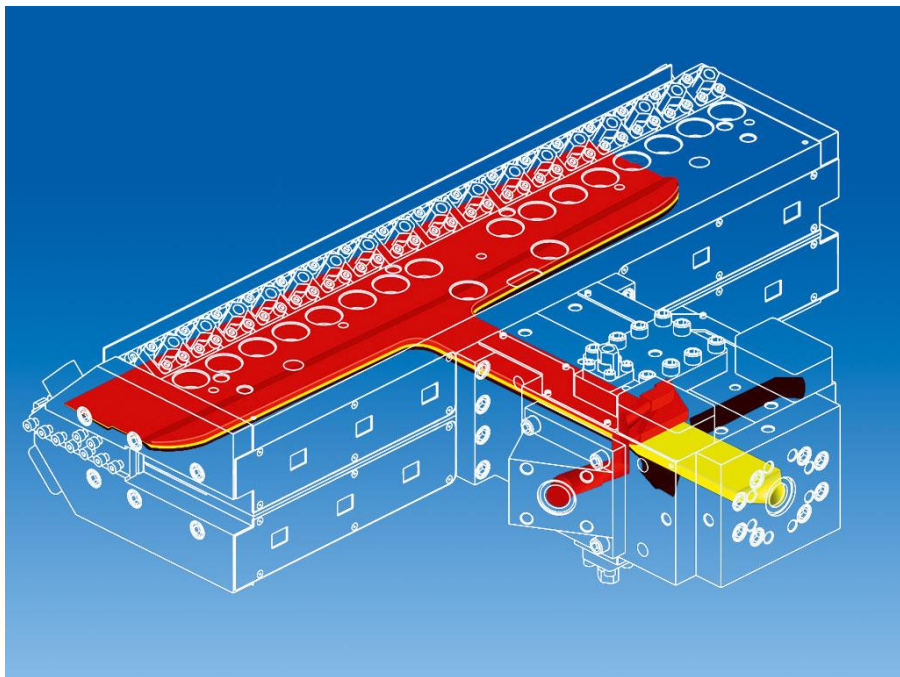
**Virgin  
Capping  
Layers**





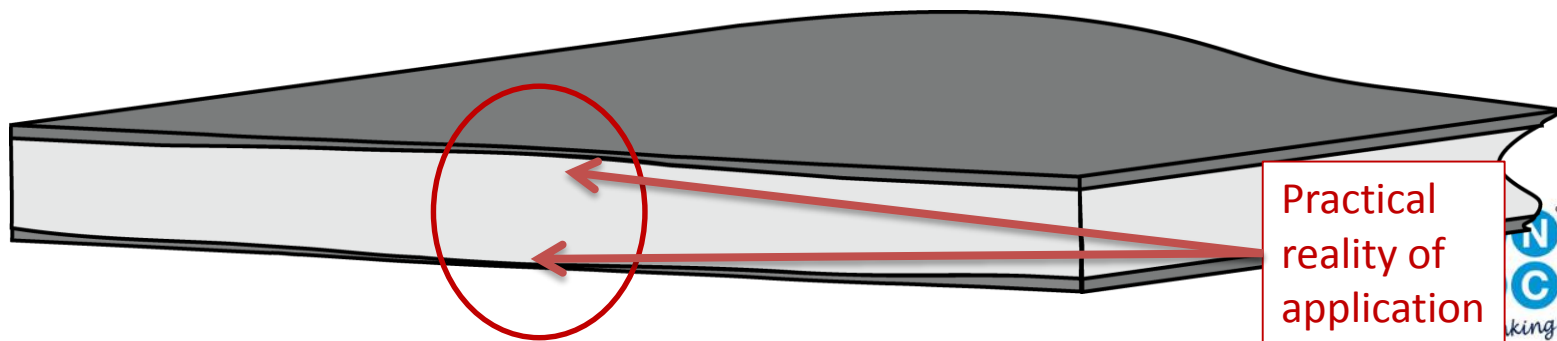
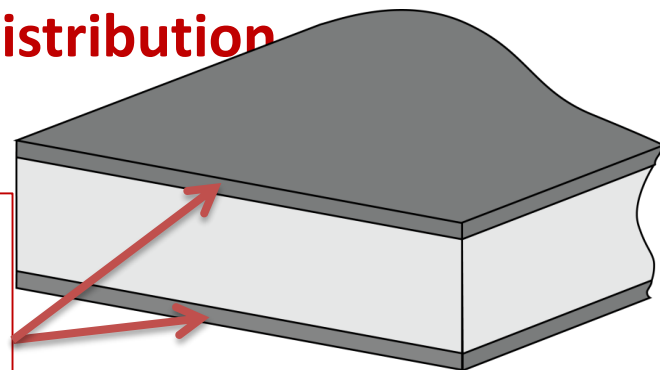
## Exceptions to EC 282/2008

### 3. Material behind a functional barrier



## Risk #2 Layer Distribution

Ideal uniform extrusion & theoretical barrier to migration



Practical reality of application

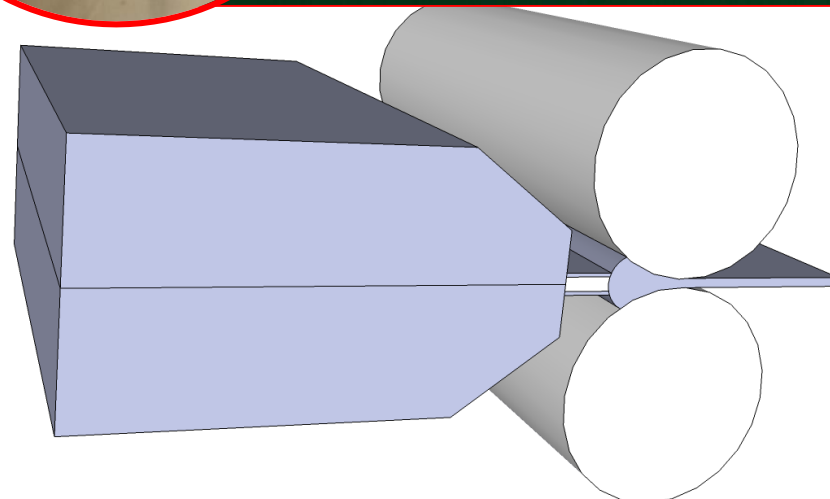
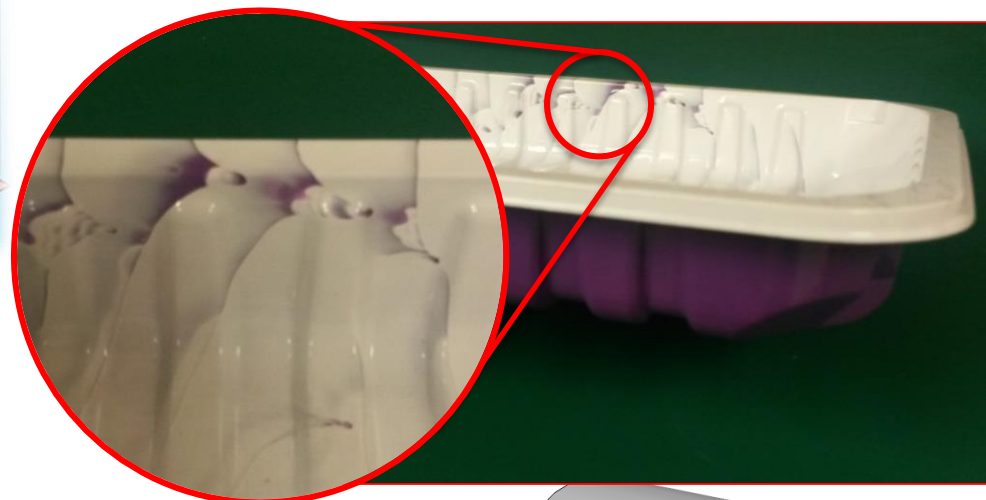
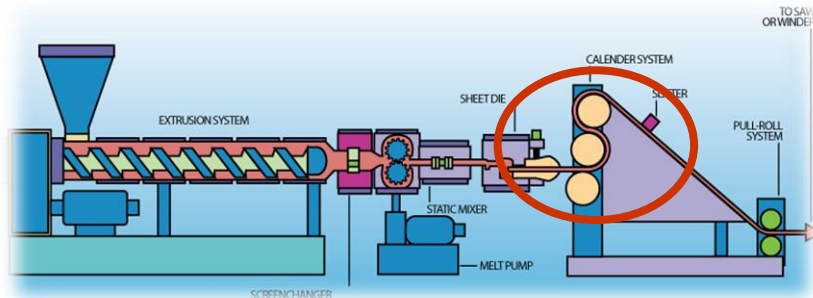




## Exceptions to EC 282/2008

### 3. Material behind a functional barrier

## Risk #3 Rolling Bank





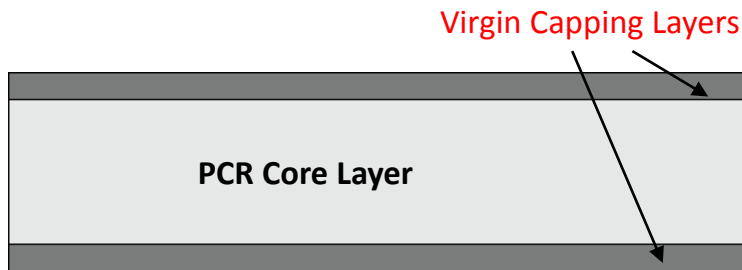
PET

## Exceptions to EC 282/2008

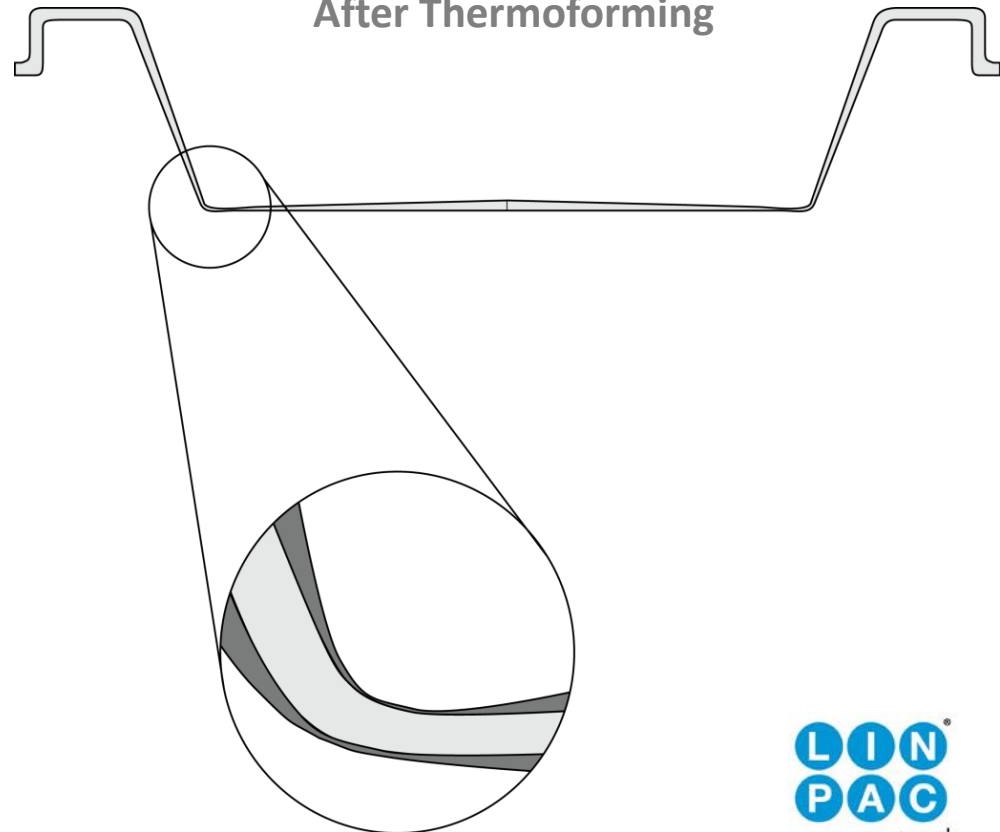
### 3. Material behind a functional barrier

## Risk #4 Thinning during thermoforming

Before Thermoforming



After Thermoforming



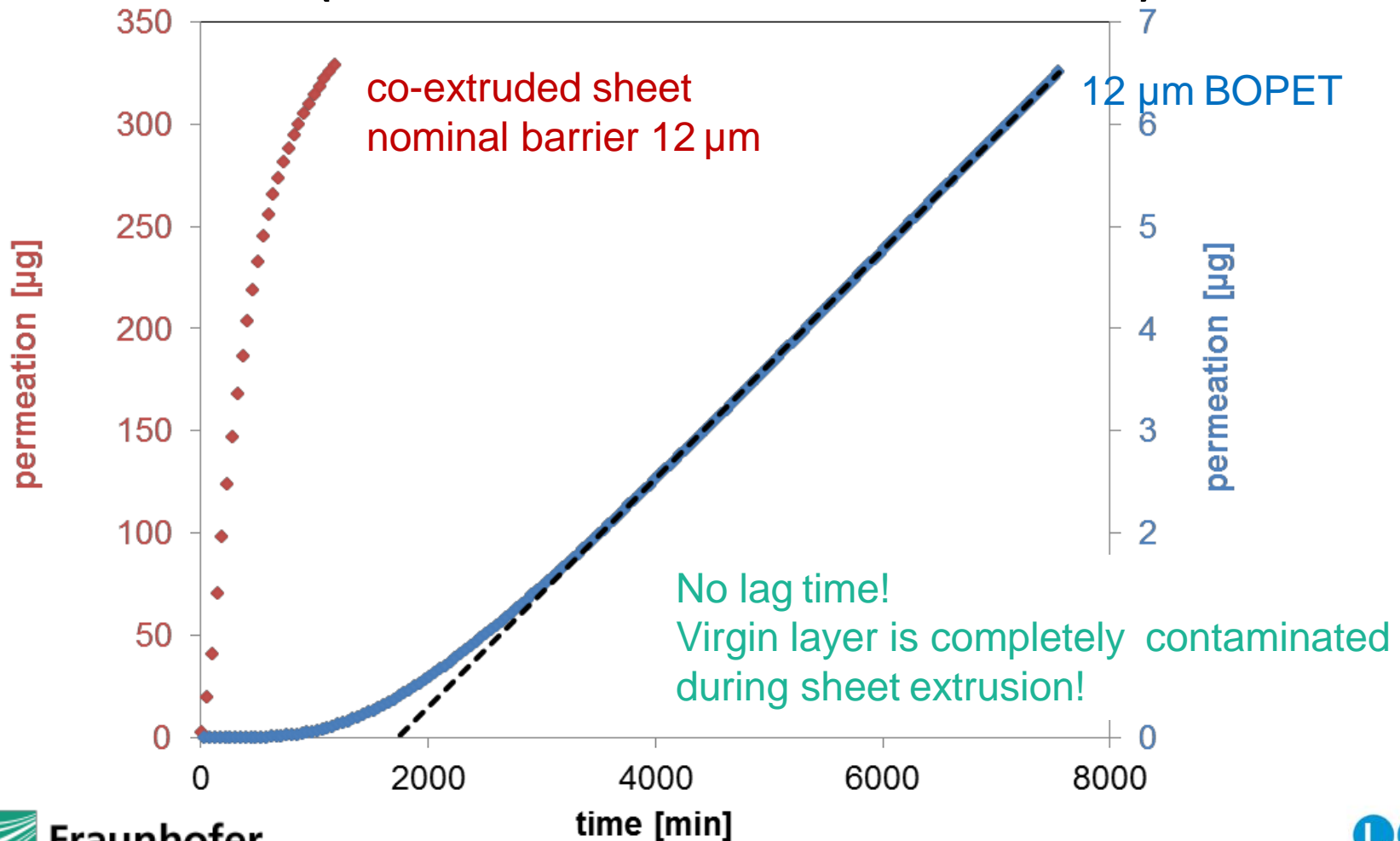
# Co-extruded PET Sheet

## Virgin Layer as Functional Barrier?

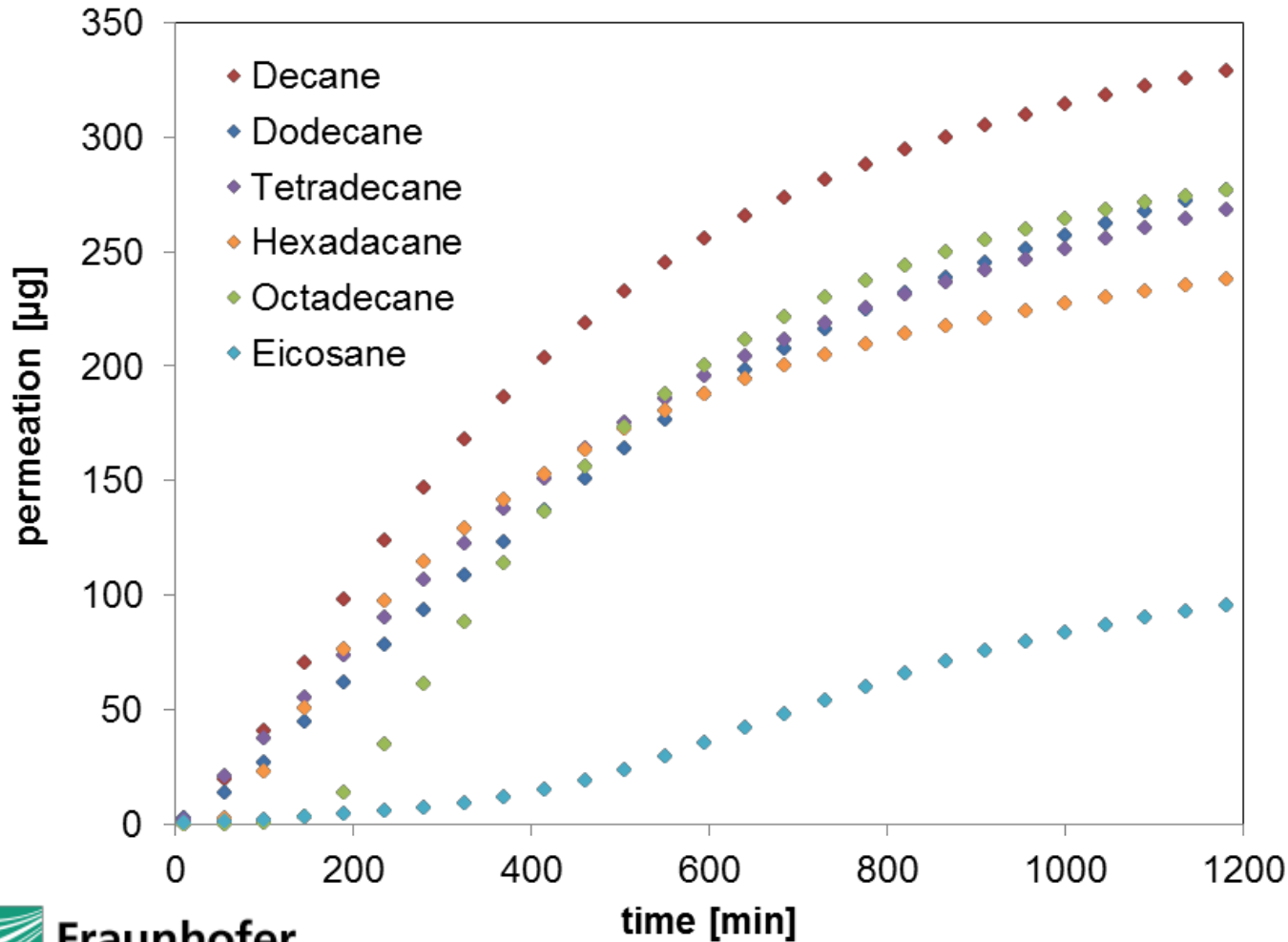
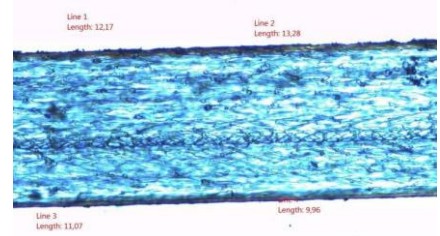
### Tests Carried out by Fraunhofer Institute

- PET sheet was contaminated in the core layer of the ABA structure
- ABA Sheet production on a commercial line (total thickness 500 μm)
  - Main extruder: 800 kg/h, twin-screw 75 mm, vacuum degassing
  - Co-extruder: 150 kg/h, twin-screw 55 mm, vacuum degassing
- Virgin layer with nominal thicknesses of 12 μm and 30 μm
- Permeation test (lag time experiment)
  - n-Alkanes as non-polar substances
  - Testing temperature (100 ° C)

# Co-extruded PET Sheet (n-decane tested at 100 ° C)



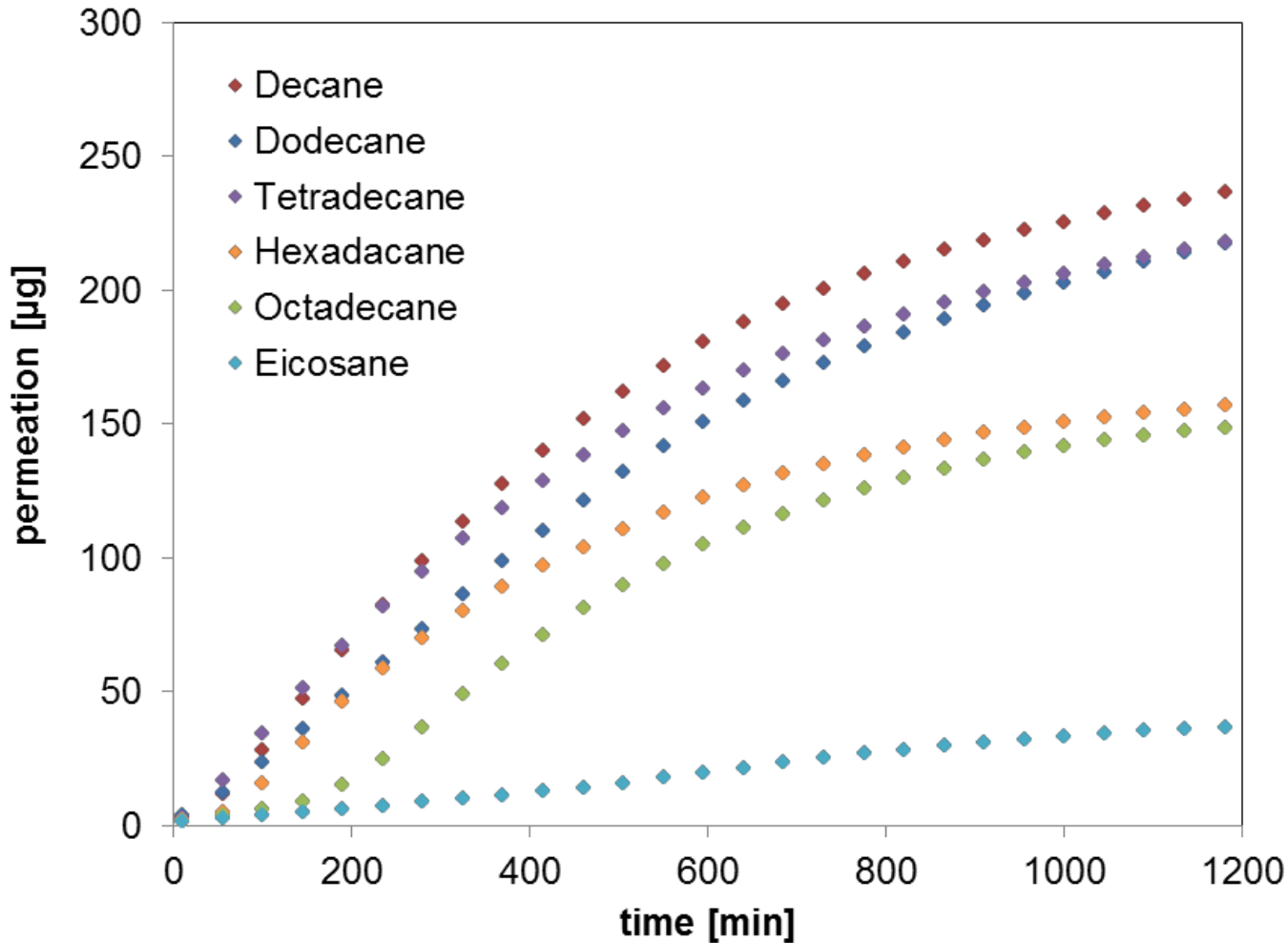
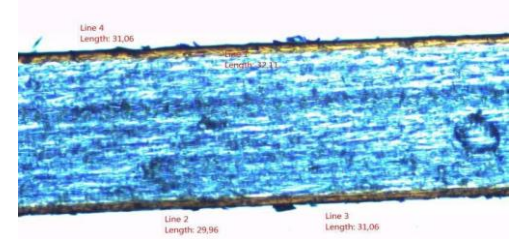
# Co-extruded PET Sheet (nominal thickness 12 $\mu\text{m}$ )



Experimental  
data at 100  
 $^{\circ}\text{C}$

No Functional  
Barrier!

# Co-extruded PET Sheet (nominal thickness 30 $\mu\text{m}$ )



Experimental  
data at 100  
° C

No Functional  
Barrier!

# Conclusions

- PET recyclates in direct food contact have to comply with Recycling Regulation 282/2008. EFSA Petition!
- PET recyclates behind Functional Barriers have to comply with Regulation 10/2011. No EFSA Petition!
- The performance of the Functional Barrier must be demonstrated.
- Co-extruded PET sheets with recyclate in the core layer of ABA structures show no Functional Barrier.
- The virgin layer is contaminated during sheet production.
- Such co-extruded PET sheets should be handled as sheets with PET recyclates in direct food contact. EFSA Petition!



Lets make the lightest  
trays possible!



*fresh thinking!*





# We make the lightest trays possible!

## Super lightweight rPET packs



- Rigorous programme of benchmarking, CAD design and testing on real packing lines
- Up to 25% reduction in material usage vs earlier designs
- Maintenance of pack strength and performance for application
- Optimal pack design for protection of contents
- Competitive with F.F.S (Form, Fill, Seal)





# The Elite Revolution!



*fresh thinking!*



# The Rfresh® Elite Revolution!



Historically, the best way to seal a PET tray for demanding MAP applications has been to use a laminated PE layer

- ✓ PE laminate provides effective sealing through contamination, moisture etc.

But...

- ✗ Only 19% is used during sealing
- ✗ Skeletal waste is now contaminated with PE
- ✗ Trays are more difficult to recycle



# What is Rfresh Elite?



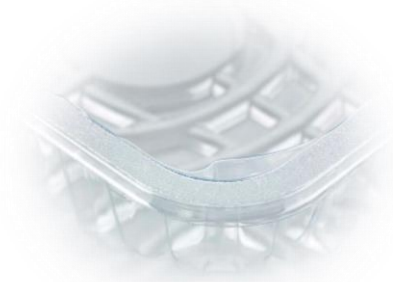
Patented sealing system developed by LINPAC  
Sealing compound applied to tray upper flange to permit sealing to lidding films

- ✓ Effective sealing in challenging conditions
- ✓ No contaminated skeletal waste
- ✓ Trays are easier to recycle
- ✓ Increased opportunity for light-weighting of trays

**Key Message - LINPAC has developed Elite to improve recyclability of thermo-formed rPET containers. Performance increased, weight reduced, recyclability improved**



# Value Chain Analysis



LINPAC

- ✓ Market leading product
- ✓ Reduction of PET/PE flake
- ✓ Increased ability to light-weight

Packer Processor

- ✓ Reduction in leaking packs – less rework and fewer returns
- ✓ Improved sealing through contamination
- ✓ Increased seal strength
- ✓ Reduced seal time and temperature
- ✓ Visual quality checks
- ✓ Reduced risk of tray distortion

Retailer

- ✓ High clarity pack
- ✓ Improved recyclability
- ✓ Reduction in leaking packs
- ✓ Reduced product spoilage
- ✓ Reduced Carbon Footprint

Consumer

- ✓ Improved product visibility
- ✓ Reduction in leaking packs
- ✓ Reduced product spoilage



# Conclusions

1. Food Waste is the problem
2. Packaging is a Green Technology
  - In that it uses far less, than it protects
3. Packaging is the Solution ....and not the problem
4. We must ensure that Innovation is not sacrificed on the altar of Recycling
5. There are solutions that aid Recycling AND Innovation driven options
  - i. rPET Raw materials, allied to....
  - ii. Super-cleaning to guarantee food safety
  - iii. Lightweight “LIFE” designed trays
  - iv. Elite sealing system



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Thank you from



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