

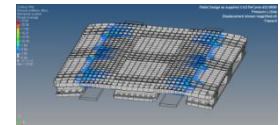
# **The reality and current status of mechanical recycling and critical requirements in order to achieve European recycling targets**

Jean-Marc van Maren

**Plastics Recycling Show Europe**

Amsterdam, March 30, 2017

- Sales of plastic pallets and components
- Design & Technology licenses for plastic pallet production
- Sales of utility pellets and granules made from recycled plastics
- Recycling services and consulting
- Shareholder in:



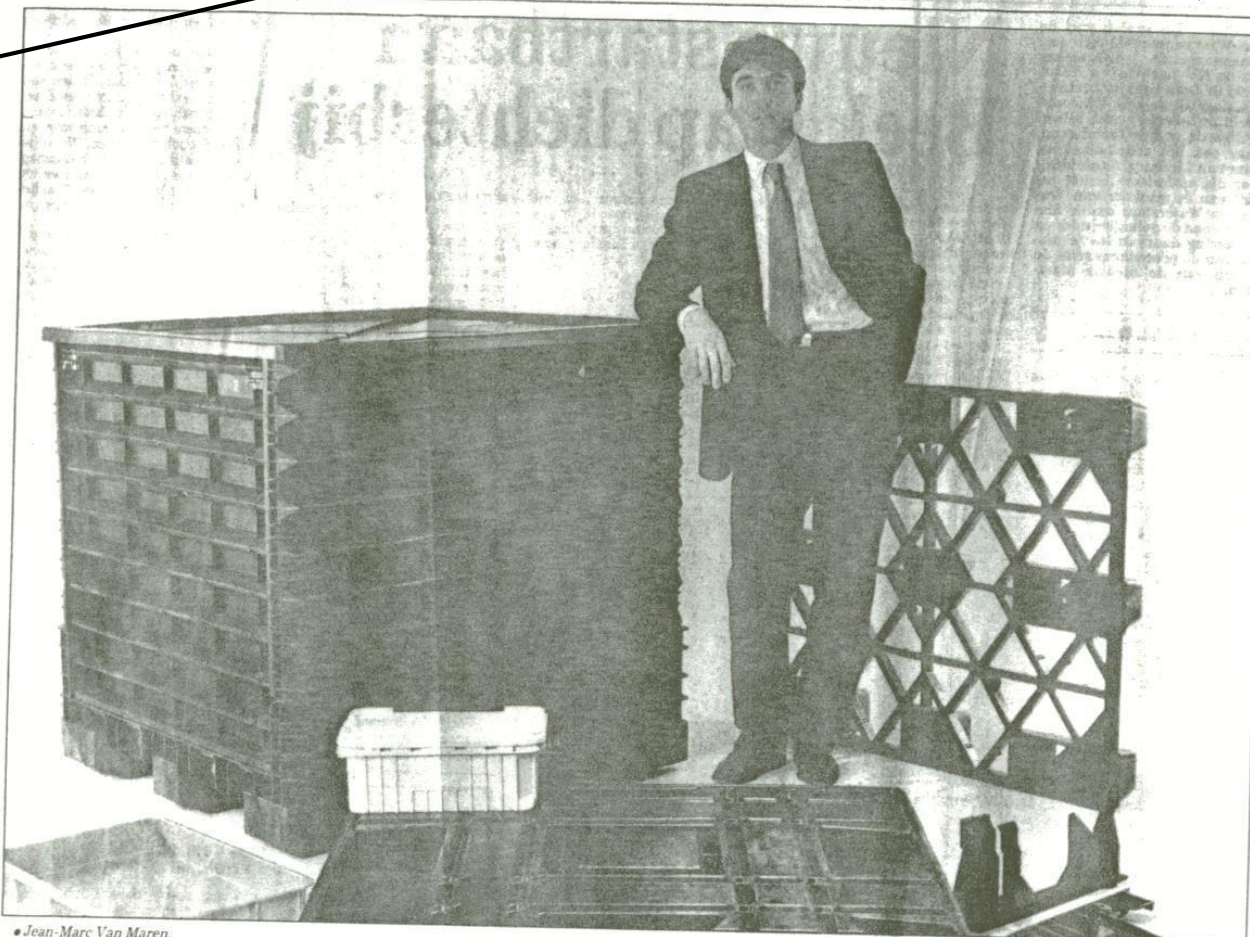
[www.palletplaza.nl](http://www.palletplaza.nl)



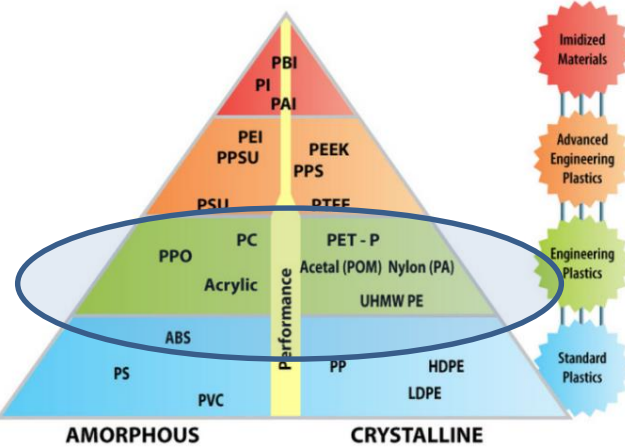
[www.plasticpalletsplaza.com](http://www.plasticpalletsplaza.com)



[www.gnb-systems.com](http://www.gnb-systems.com)



• Jean-Marc Van Maren.



# Kunststoftoepassingen voor materials handling

**BERGEN OP ZOOM -** General Electric Plastics zal op de kunststofbeurs K '89 in Düsseldorf (2 tot en met 9 november) een serie in partnership ontwikkelde produkt dragers van kunststof tonen. Het is voor het eerst dat GE Plastics daarmee in Europa naar buiten treedt. GE Plastics is met de ontwik-

industrie en transport pallets en andere hulpmiddelen voor intern en extern transport als sluitpost werden gezien en vooral goedkoop moesten zijn. Logistieke eisen, just-in-time, automatisering, integrale kwaliteitsbeheersing en dergelijke vragen nieuwe oplossingen voor oude problemen. Kunststoffen hebben een aantal voordelen die in de

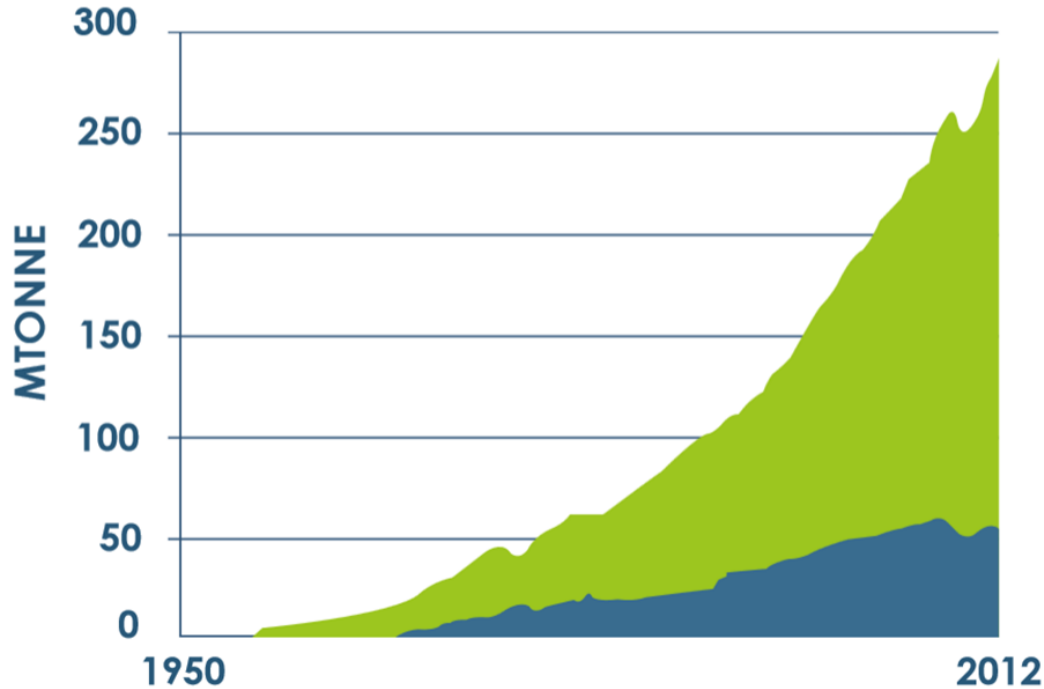
genomen zo'n 50 dollarcent per pound. De materialen van GE Plastics voor materials handling kosten 1,20 tot 1,60 dollar per pound. Edoch, als men de kosten integraal bekijkt is kunststof vaak te prefereren vanwege de grotere flexibiiteit en hogere produktiviteit die kunststoftoepassingen mogelijk maken. Wie goedko-

andere industriële bedrijvigheid waar grote properheid wordt verlangd, voor produktie, intern transport, opslag en vervoer in het algemeen waar hoge kwaliteits-eisen worden gesteld.

### Samenstellingen

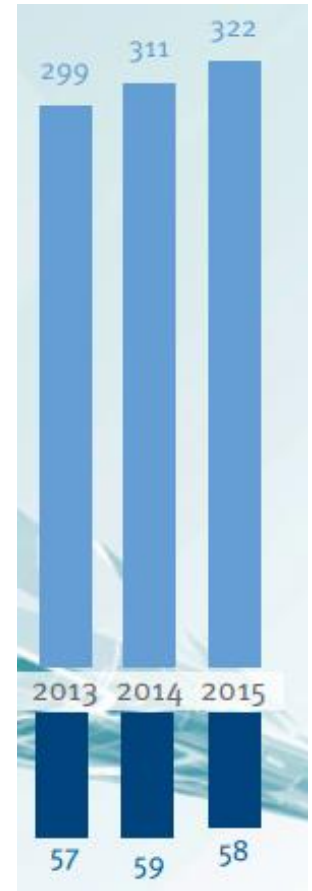
der materiaal is ontwikkeld, dat dozen en andere hulpmiddelen permanent antistatisch houdt. Het is het enige kunststof, aldus Van Maren, dat permanent antistatisch blijft. GE Plastics heeft verder dragers ontwikkeld met een honingraatstructuur, boven en onder afgedekt met

# Plastics Production since 1950



World Plastic Production

European Plastic Production

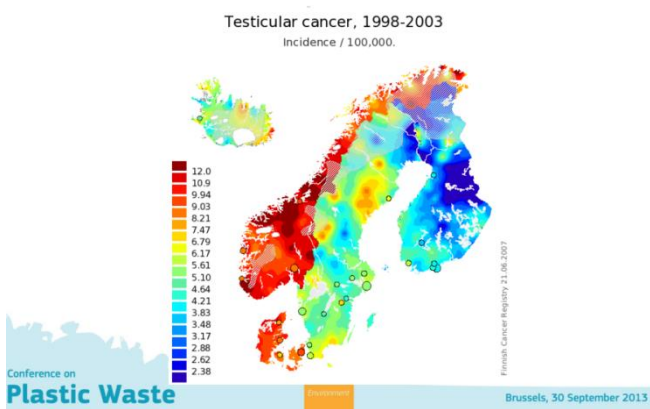
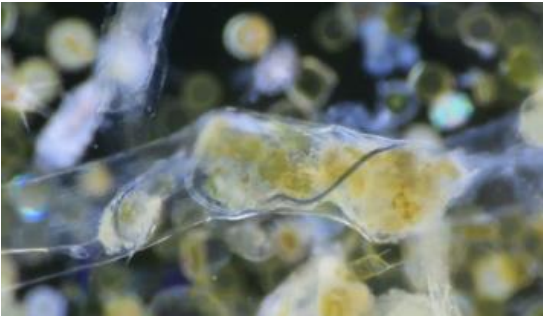


*Plastics enables economic growth and provides many demonstrable benefits including environmental benefits!*





# Plastics has a bad image

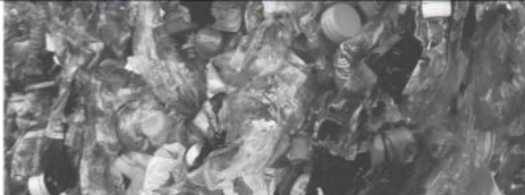


# What is the “true cost” of linear plastics?

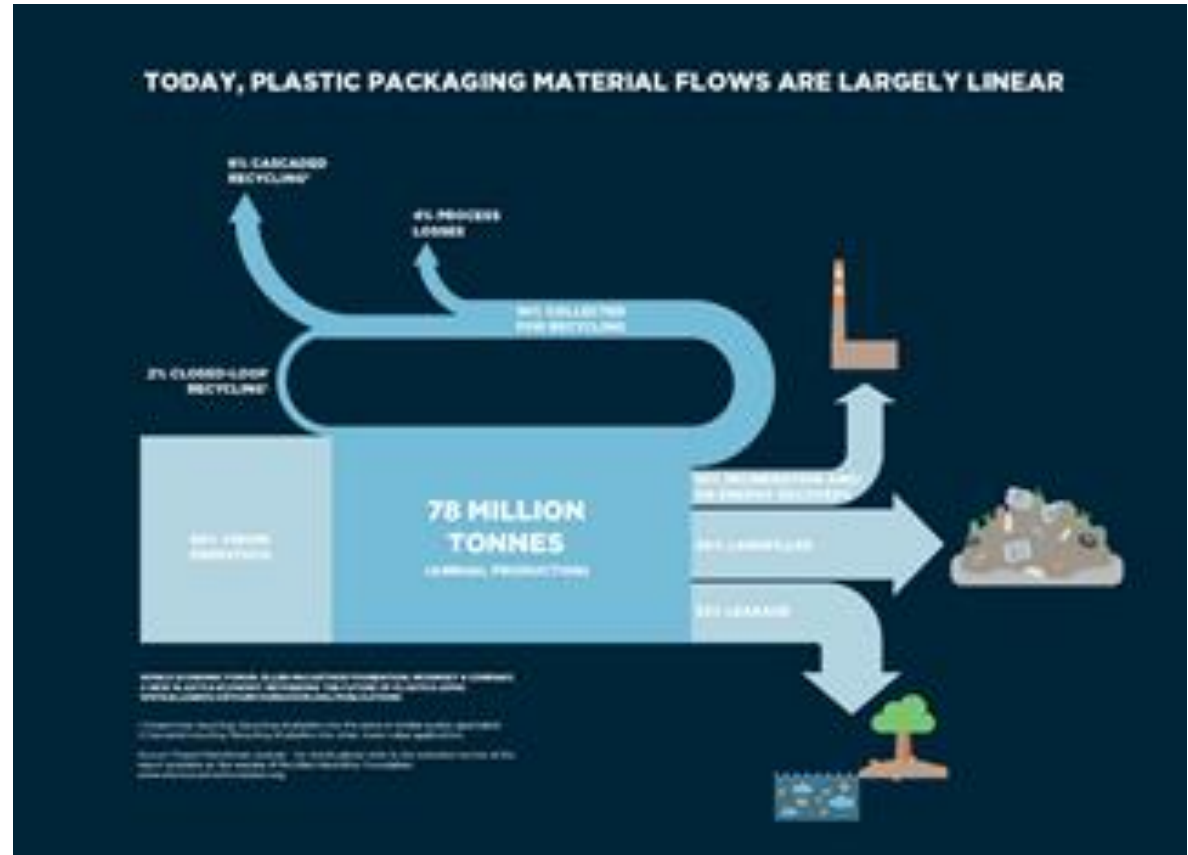


## SCALING SUSTAINABLE PLASTICS

Solutions to drive plastics towards a circular economy



Prepared by Trucost  
APRIL 2016



***Externalities are not yet systematically factored into the price of plastic either of the material itself or the final product.***



# Bio-based plastics the solution?



**THE WORLD IN 2025**  
10 PREDICTIONS OF INNOVATION

## IN 2025

### **PETROLEUM-BASED PACKAGING IS HISTORY; CELLULOSE-DERIVED PACKAGING RULES**

**Bio-nanocomposites based on nanocellulose make 100% fully biodegradable packaging pervasive. Petroleum-based packaging products will be no more.**

Research is emerging today focused on the use of bio-nanocomposites and nanocellulose for packaging. In 2025, these materials will be staples of choice in the packaging industry.

Nanocellulose is material comprising nano-sized cellulose fibrils with a high length/width ratio. In layman's terms, it is pseudo-plastic. Bio-nanocomposites are derived from bio matter, whether biomass or some other plant matter. Advancements in the use of these elements will, in 2025, provide packaging materials that are fully biodegradable.

Toxic plastic-petroleum packaging that litters cities, fields, beaches and oceans, and which isn't biodegradable, will be nearing extinction in another decade. Thanks to advancements in the technology related to and use of these bio-nano materials, petroleum-based packaging products will be history.

Whether for food, medicine, electronics, textiles or consumer products, all packaging will be made from cellulose-derived products.

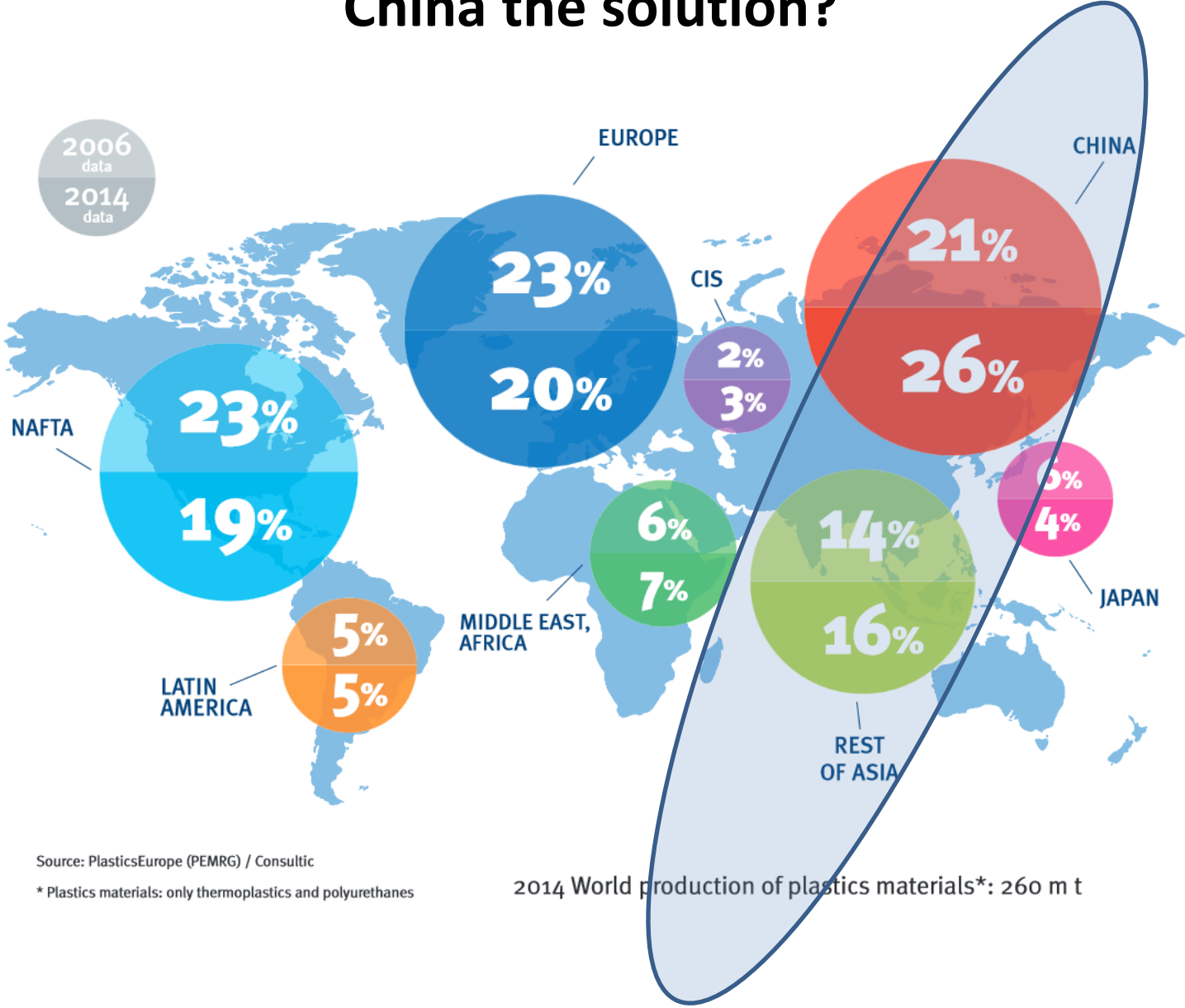


# Energy & Chemical recycling the solution ?





# China the solution?



Source: PlasticsEurope (PEMRG) / Consultic

\* Plastics materials: only thermoplastics and polyurethanes

2014 World production of plastics materials\*: 260 m t

# Global plastics waste market: China dominates!



Global recycling markets:  
plastic waste

A story for one player – China



A report from the ISWA Task Force on Globalisation and  
Waste Management

# Where are we today in Europe?



## Plastics waste treatment in EU28+2

In 2014, 25.8 million tonnes of post-consumer plastics waste ended up in the official waste streams. 69.2% was recovered through recycling and energy recovery processes while 30.8% still went to landfill. Within the different plastic applications, plastic packaging reached the highest recycling rate with 39.5%\* and represented more than 80% of the total recycled quantities.

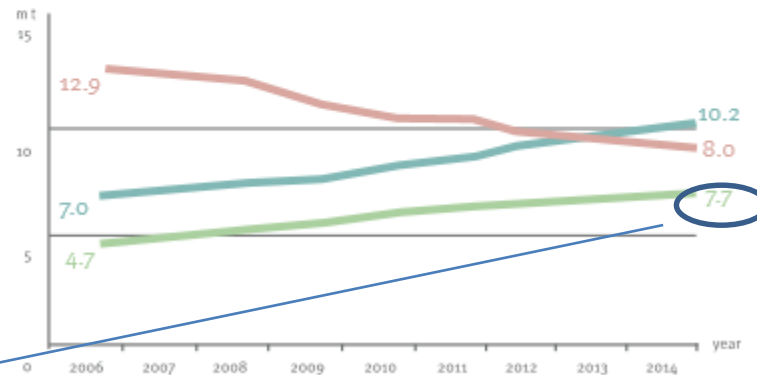
Source: Consultic

Recycling 29.7%

Energy recovery 39.5%

Landfill 30.8%

### 2006-2014 waste treatment evolution:



+ 64 % Recycling

+ 46 % Energy recovery

- 38 % Landfill

The annual average of post-consumer plastics waste generation from 2006 to 2014 is 25 million tonnes

\*Based on in-put quantities into recycling facilities.

Today 29% ~7,7 mio tons "recycled". Estimated 50% ~3,5 mio tons is exported to Asia. So effectively only 15% ~ 3,7 mio tons is recycled within Europe. This is only 6% of market!



# EU strategy on plastics in a circular economy

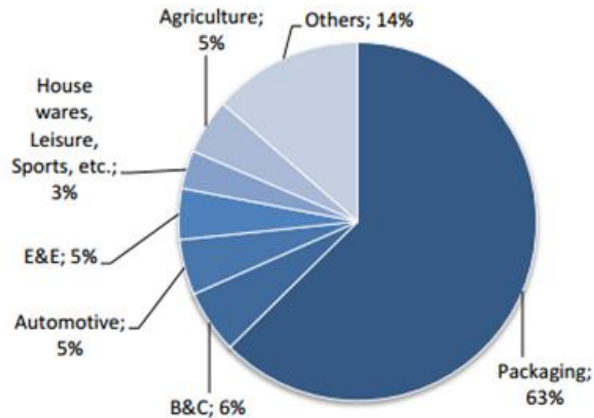


1. decoupling plastics production from virgin fossil feedstock and reducing its life-cycle GHG impacts
2. improving the economics, quality and uptake of plastic recycling and reuse
3. reducing plastic leakage into the environment.

**70 Percent Waste Recycling target by 2030!**



# Packaging is the most important waste generator!



EU Plastics recycling waste directive targets for 2025 is **60 %**

## Re-use and Recycling!

EU definitions:

**Re-use:** Products or components used again for the same purpose for which they were conceived

**Recycling:** Material recovery, excluding energy recovery and reprocessing into materials which are to be used as fuel.



# Reality for Re-use and Recycling targets ?

| <b>EUROPE</b>  | 2016 Plastic recycling |      | <b>7.700.000</b>      |
|----------------|------------------------|------|-----------------------|
| EU28+2         |                        |      |                       |
| <b>Type</b>    | <b>Quality</b>         |      | <b>7.700.000 tons</b> |
| PET            | 328-1                  | 7%   | 539.000               |
| PE             | 329                    | 8%   | 616.000               |
| PP             | 324                    | 10%  | 770.000               |
| F310           | 310                    | 21%  | 1.617.000             |
| <b>MK350</b>   | 350                    | 39%  | 3.003.000             |
| Metals         | 340                    | -    |                       |
| Sorting residu |                        | 15%  | 1.155.000             |
|                |                        |      |                       |
|                | total                  | 100% | <b>7.700.000</b>      |



Estimations about the European quantities applying German/Dutch specifications



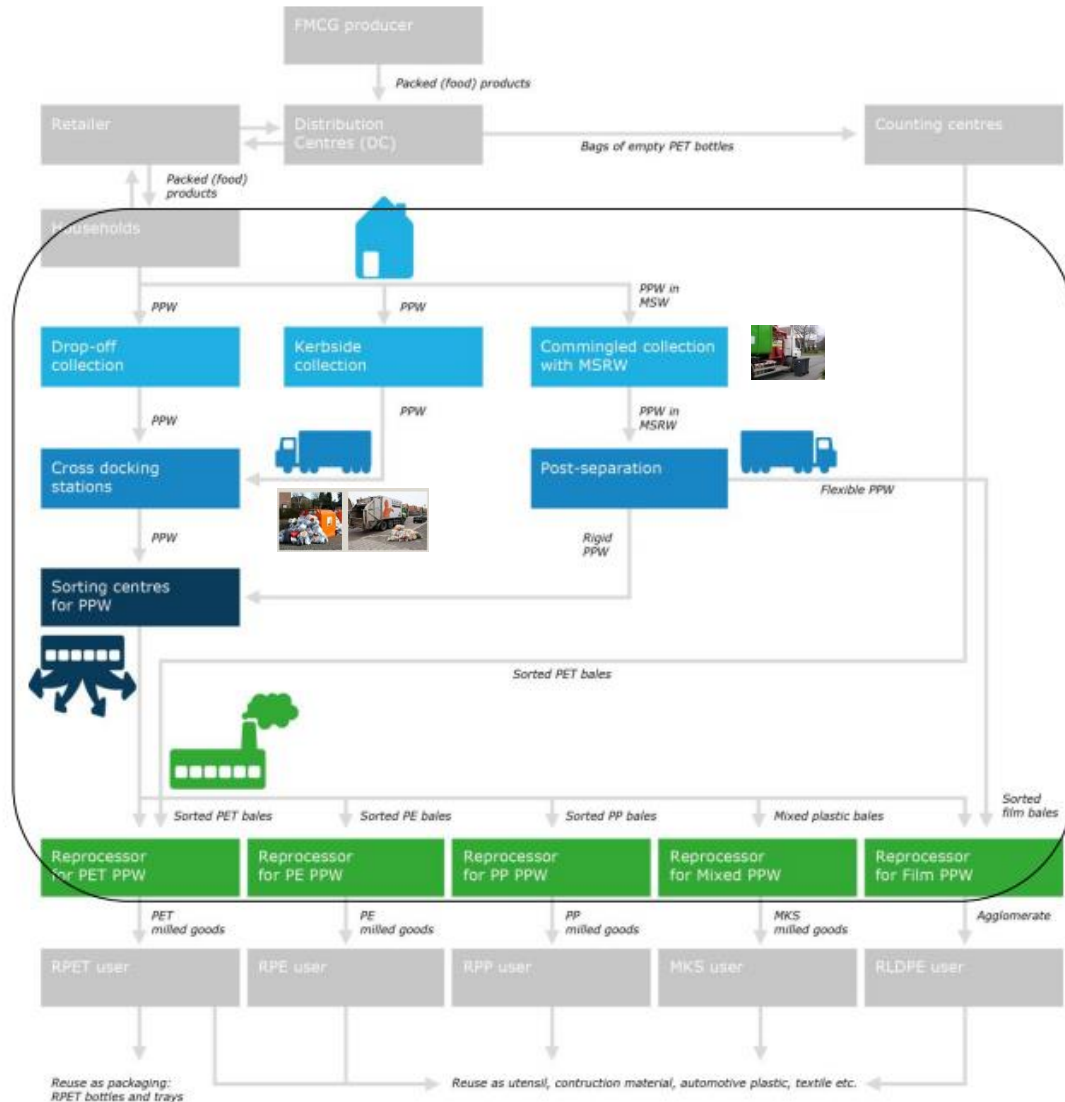
# Reality for Re-use and Recycling targets ?

| EUROPE         | 2025 Plastic recycling |      | 15.000.000        |
|----------------|------------------------|------|-------------------|
| EU28+2         |                        |      |                   |
| Type           | Quality                |      | 15.000.000 tons   |
| PET            | 328-1                  | 7%   | 1.050.000         |
| PE             | 329                    | 8%   | 1.200.000         |
| PP             | 324                    | 10%  | 1.500.000         |
| F310           | 310                    | 21%  | 3.150.000         |
| <b>MK350</b>   | 350                    | 39%  | 5.850.000         |
|                |                        |      |                   |
| Metals         | 340                    | -    |                   |
| Sorting residu |                        | 15%  | 2.250.000         |
|                |                        |      |                   |
|                | total                  | 100% | <b>15.000.000</b> |



Estimations about the European quantities applying German/Dutch specifications

# Mechanical recycling economics & quality is relying on collection and sorting systems



# Mechanical recycling reality in Germany

UBA Texte Entwicklung von Instrumenten und Maßnahmen zur Steigerung des Einsatzes von Sekundärrohstoffen

Table 5: Disposal methods of the considered plastic types for the year 2011

| Plastic type  | Mechanical re-<br>cycling | Feedstock re-<br>cycling | Energetic<br>recovery | Landfill        | Total<br>product<br>waste |
|---------------|---------------------------|--------------------------|-----------------------|-----------------|---------------------------|
|               |                           |                          |                       |                 |                           |
| PE-LD         | 199.6                     | 16.7                     | 561.1                 | 5.9             | 783.3                     |
| PE-HD         | 95.9                      | 7.3                      | 269.5                 | 4.0             | 376.7                     |
| PP            | 162.3                     | 10.8                     | 498.8                 | 8.9             | 680.8                     |
| PS            | 52.2                      | 3.6                      | 175.5                 | 2.9             | 234.2                     |
| PS-E          | 21.6                      | 0.8                      | 58.5                  | 2.1             | 83.0                      |
| PVC           | 112.3                     | 4.3                      | 338.2                 | 11.1            | 465.9                     |
| ABS, ASA, SAN | 12.0                      | 0.1                      | 56.9                  | 1.9             | 70.9                      |
| PA            | 12.2                      | 0.5                      | 43.0                  | 1.3             | 57.0                      |
| <b>Summe</b>  | <b>668.1</b>              | <b>44.1</b>              | <b>2,001.5</b>        | <b>38.1</b>     | <b>2,751.8</b>            |
|               | <b>24.3 v.-%</b>          | <b>1.6 v.-%</b>          | <b>72.7 v.-%</b>      | <b>1.4 v.-%</b> |                           |

Source: own research

*Entwicklung von Instrumenten und Maßnahmen zur Steigerung des Einsatzes von Sekundärrohstoffen – mit Schwerpunkt Sekundärkunststoffe*  
von

*Henning Wilts, Nadja von Gries Wuppertal Institut, Wuppertal Iswing Dehne, Rüdiger Oetjen-Dehne, Nadine Buschow Oetjen-Dehne & Partner Umwelt- und Energieconsult GmbH, Berlin Prof. Dr. Dr. Joachim Sanden, Lüneburg*

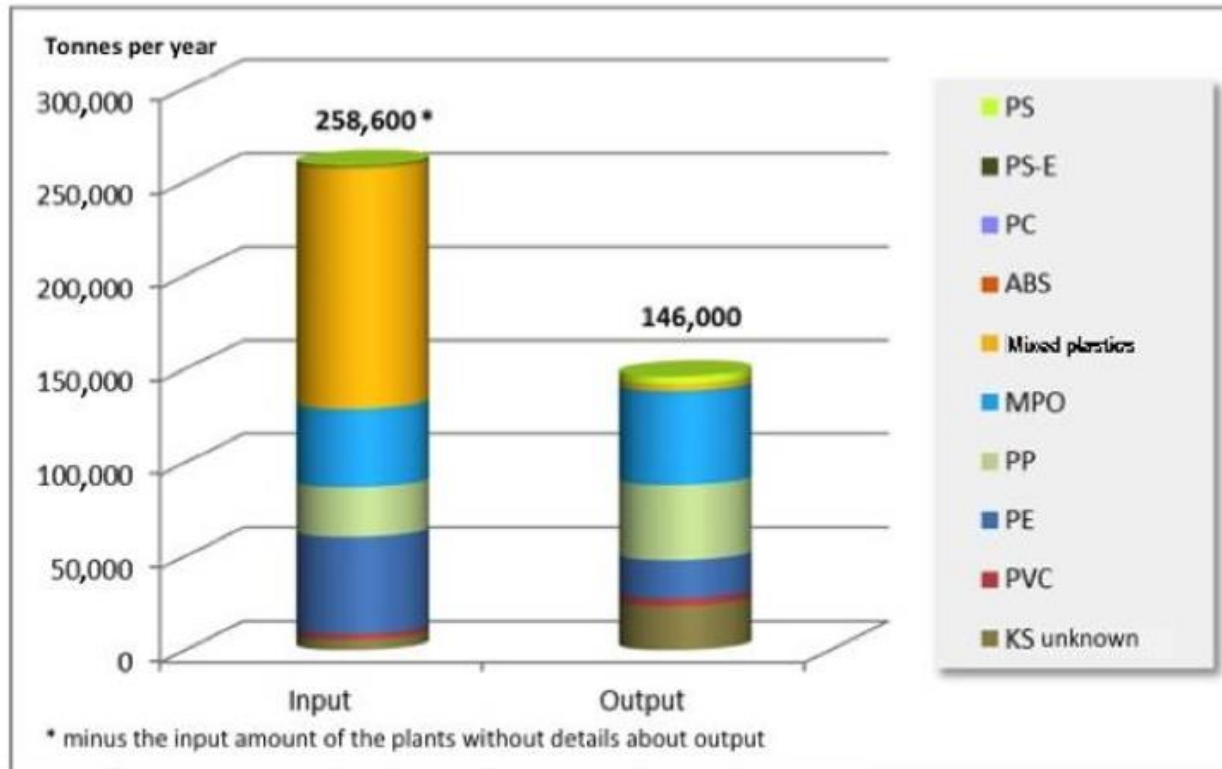
*Im Auftrag des Umweltbundesamtes*



# Input and output of mechanical recycling

UBA Texte Entwicklung von Instrumenten und Maßnahmen zur Steigerung des Einsatzes von Sekundärrohstoffen

Figure 6: Input and output of mechanical recycling



Source: own research, created on the basis of the questionnaire survey

*Entwicklung von Instrumenten und Maßnahmen zur Steigerung des Einsatzes von Sekundärrohstoffen – mit Schwerpunkt Sekundärkunststoffe*  
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Im Auftrag des Umweltbundesamtes

# Mechanical recycling reality



- **Agglomerates compete** with traditional “low cost” materials like wood, metal and concrete



- **Granulates replaces virgin polymer**  
but rarely in original application  
but rarely one-for-one with virgin  
= “**utility**” material



- **Economic value**
  - Price is linked to volatile virgin plastics price movement
  - Cost = collection + sorting + cleaning + blending + processing
  - Most utility granulates PP, PO, PE at 75 % of virgin pricing



# Mechanical recycled plastics reality

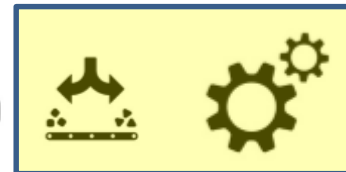


- **Mechanical recycling industry is vulnerable**

- Smaller sized companies
- Fragmented and not very collaborative
- Only a few players forward integrated
- Knowledge level virgin producers vs recyclers is very dissimilar



- **Need for continuous improvement and innovation**



- **New product development for recycled plastic product takes 2-3 years.**



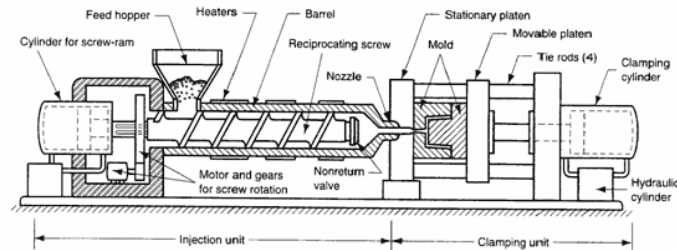
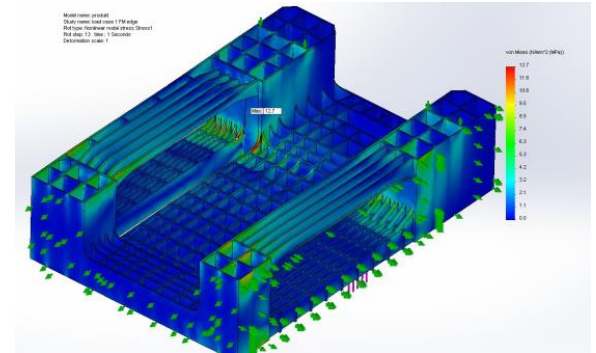
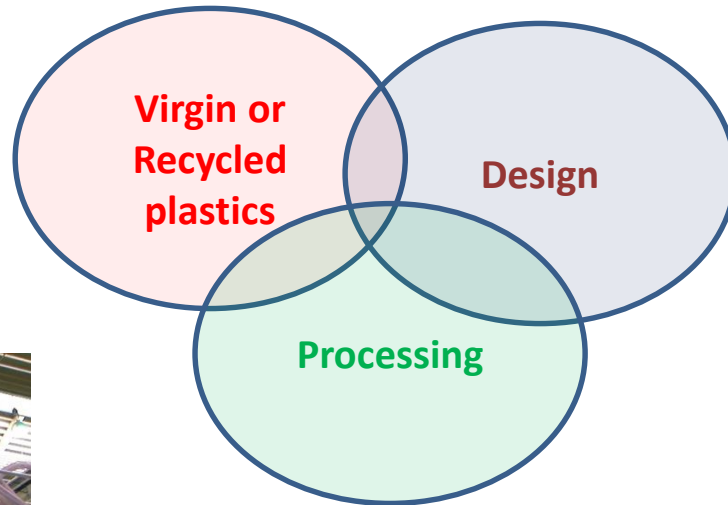
# New product development is complex

## Overview of the plastics recycling chain



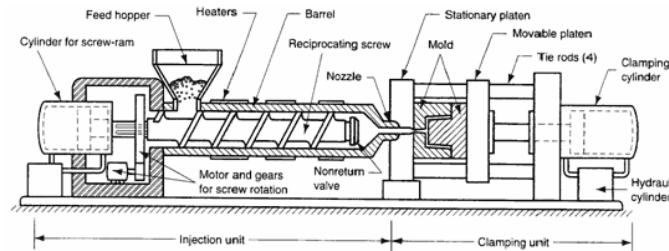
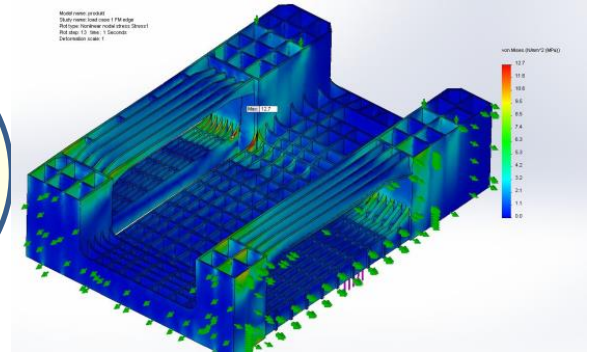
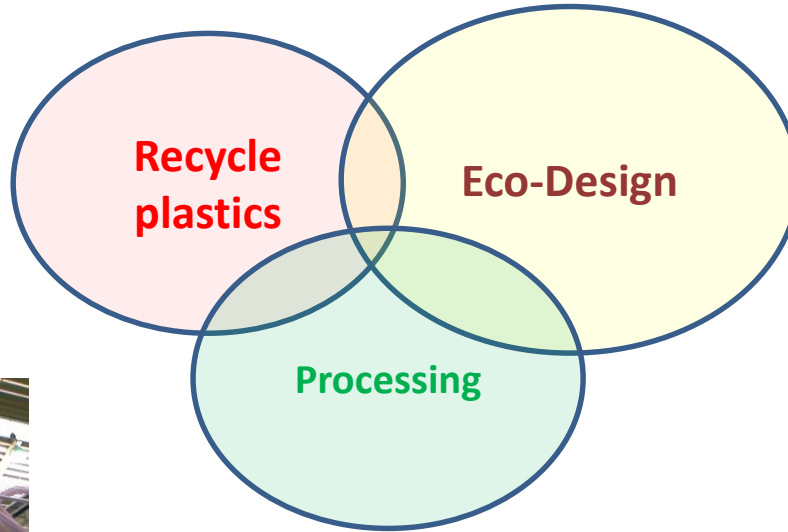


# New Product Development for recycled plastics is identical to virgin plastics!



***It requires an integrated system approach of materials, design and processing !***

# New Product Development for recycled plastics is identical to virgin plastics!



***It requires an integrated system approach of materials, design and processing !***

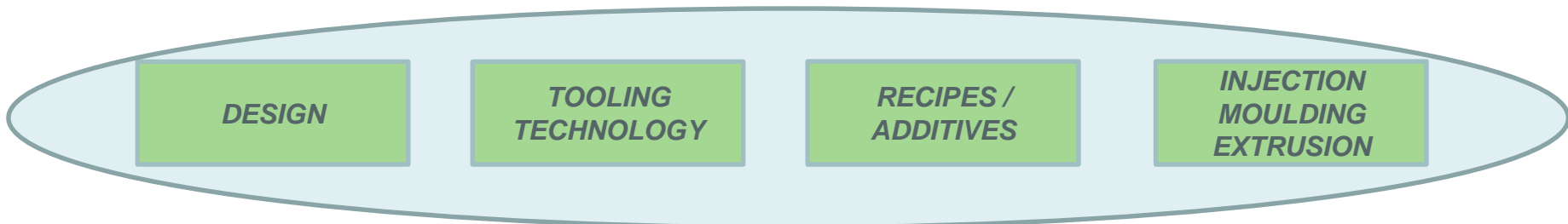
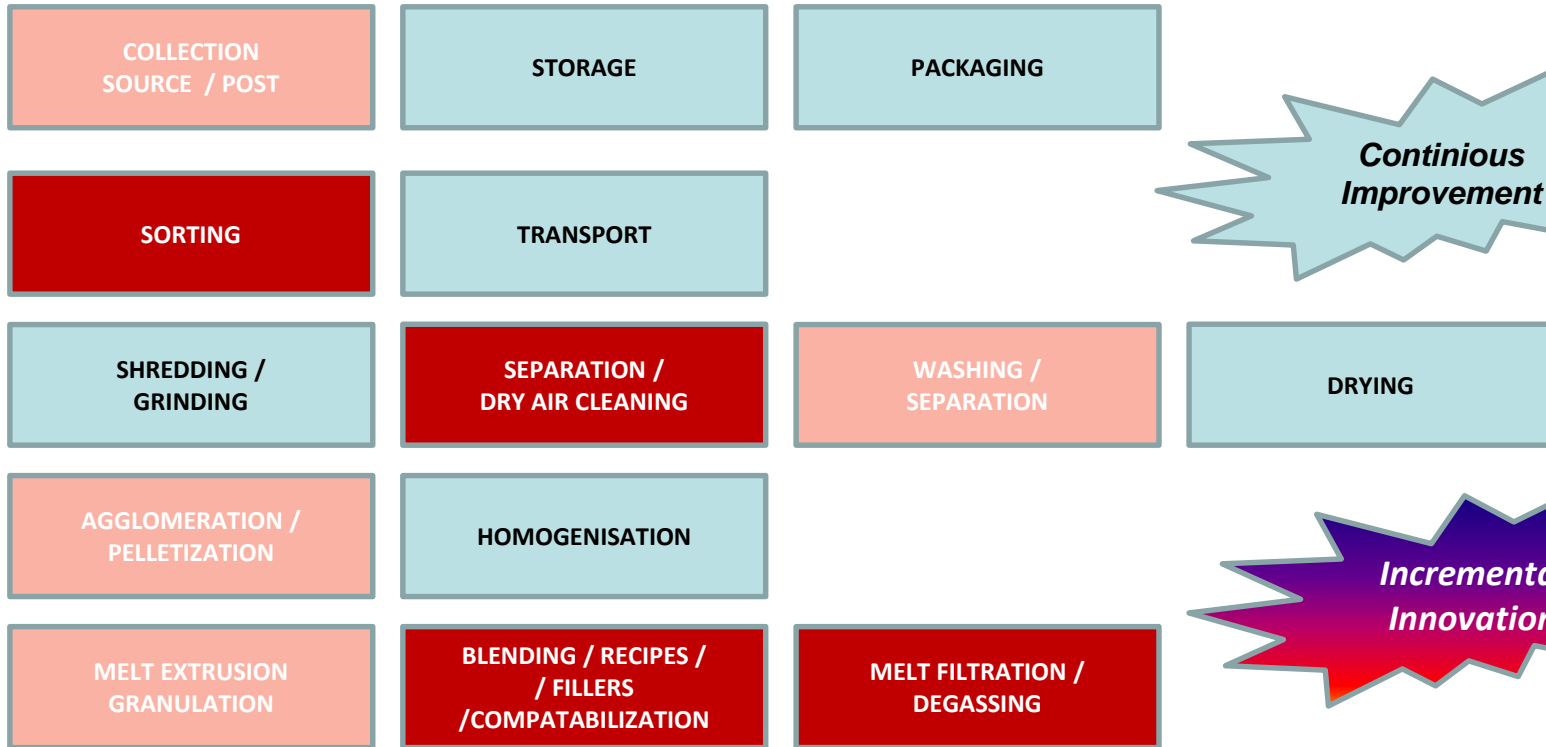
**DESIGN**

**TOOLING  
TECHNOLOGY**

**RECIPES / ADDITIVES**

**INJECTION  
MOULDING  
EXTRUSION**

# Continuous improvement and innovation



# Mechanical recycled plastics reality



Understanding the recycling quota of 60 % by 2025



...50 additional large scale plastic packaging sorting plants with 80 kt/ y capacity \*

...142 additional plastic recycling plants with 25 kt/y input capacity \*

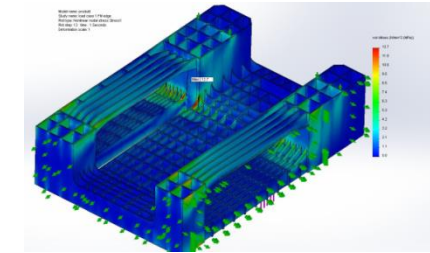
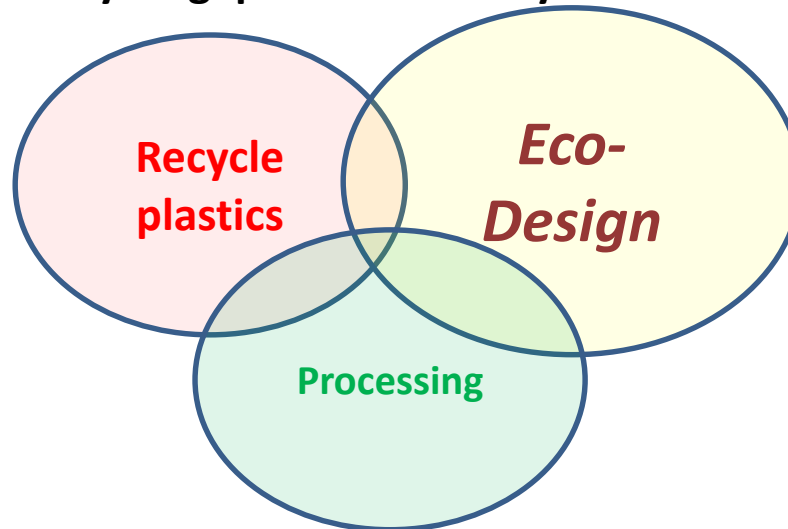
...50 new applications for recycled plastics with a demand of 50 kt/y \*



# Mechanical recycled plastics reality

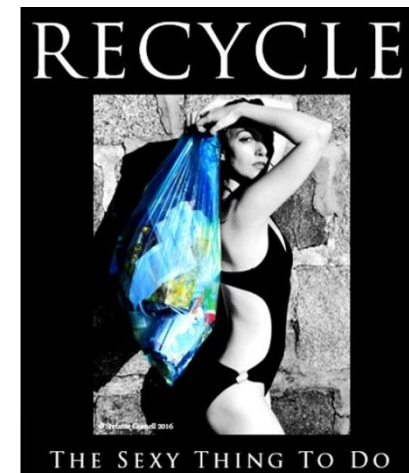


Understanding the recycling quota of 60 % by 2025

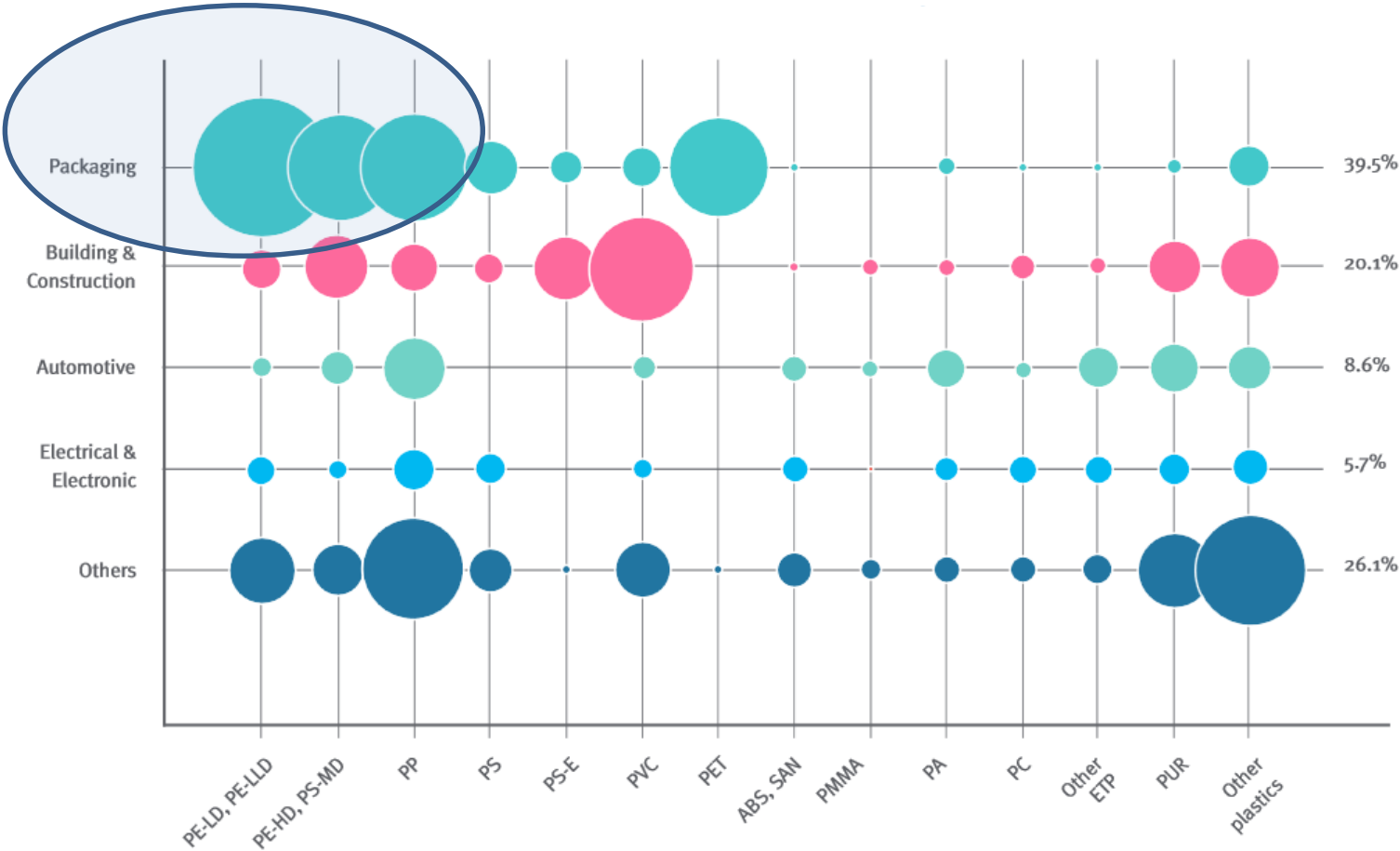


**New Products Development requires :**

- + ***Collaborative development***
- + 5.000 product innovation projects
- + 50.000 recycled material testing projects
- + 100.000 3D printed prototypes
- + 200.000 product testing projects
- + 10.000 tooling projects
- + 100 new plastic processing facilities
- + ***New bright R & Design talent***



# Markets for recycled plastics



European plastics demand\* by segment and polymer type 2014

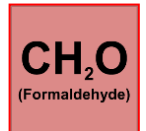
Source: PlasticsEurope (PEMRG) / Consultic / myCeppi

\* EU-28+NO/CH



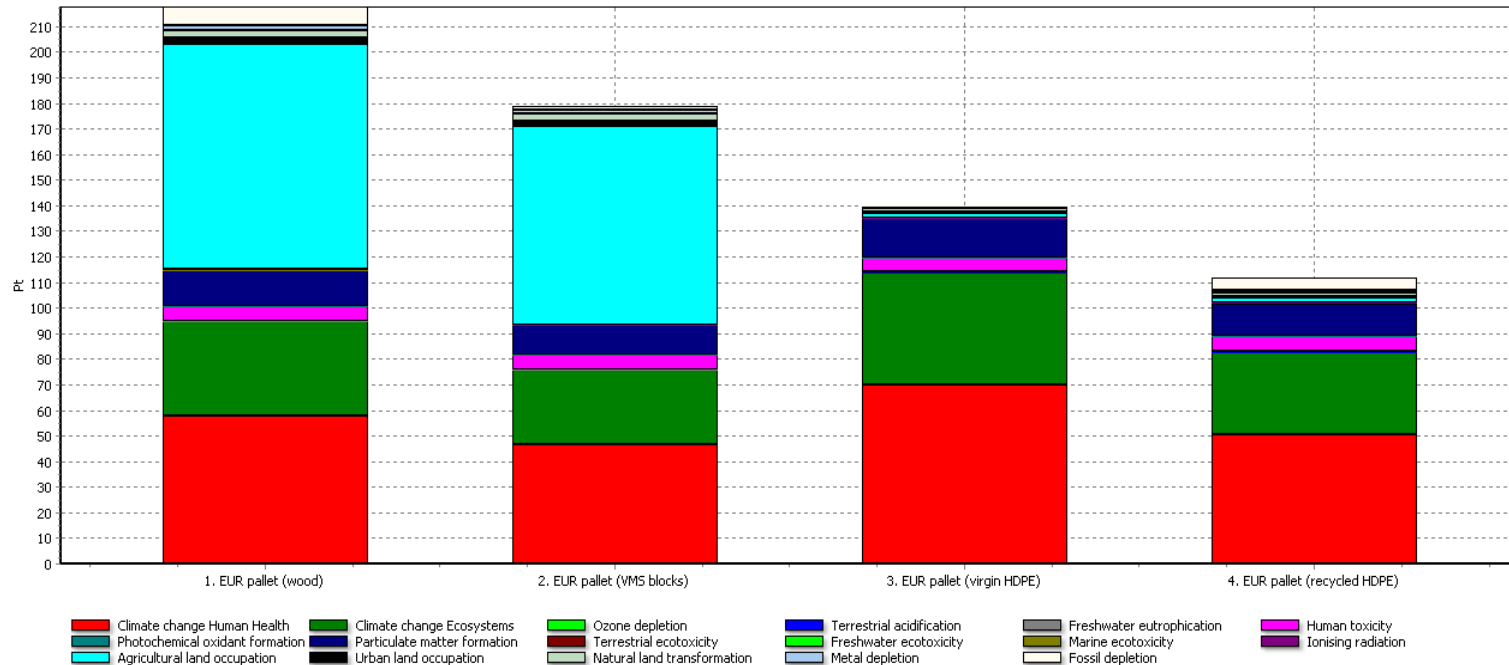
# Industrial packaging is big opportunity for recycled plastics

- Large pallet market in Europe : 450 mio wood pallets per year
- Usage of formaldehyde in blocks
- Wood pallet life is short and has negative residual value
- Plastic pallets today have only 6 % marketshare  
= ~ 225.000 tons plastics in Europe



# Opportunity for recycled plastics: Pallets

Comparative Life Cycle Analysis of plastic pallet systems vs wood pallet systems



Comparing 1 p '1. EUR pallet (wood)', 1 p '2. EUR pallet (VMS blocks)', 1 p '3. EUR pallet (virgin HDPE)' and 1 p '4. EUR pallet (recycled HDPE)';  
 Method: Recipe Endpoint (H) V1.07 / Europe ReCiPe H/A / Single score



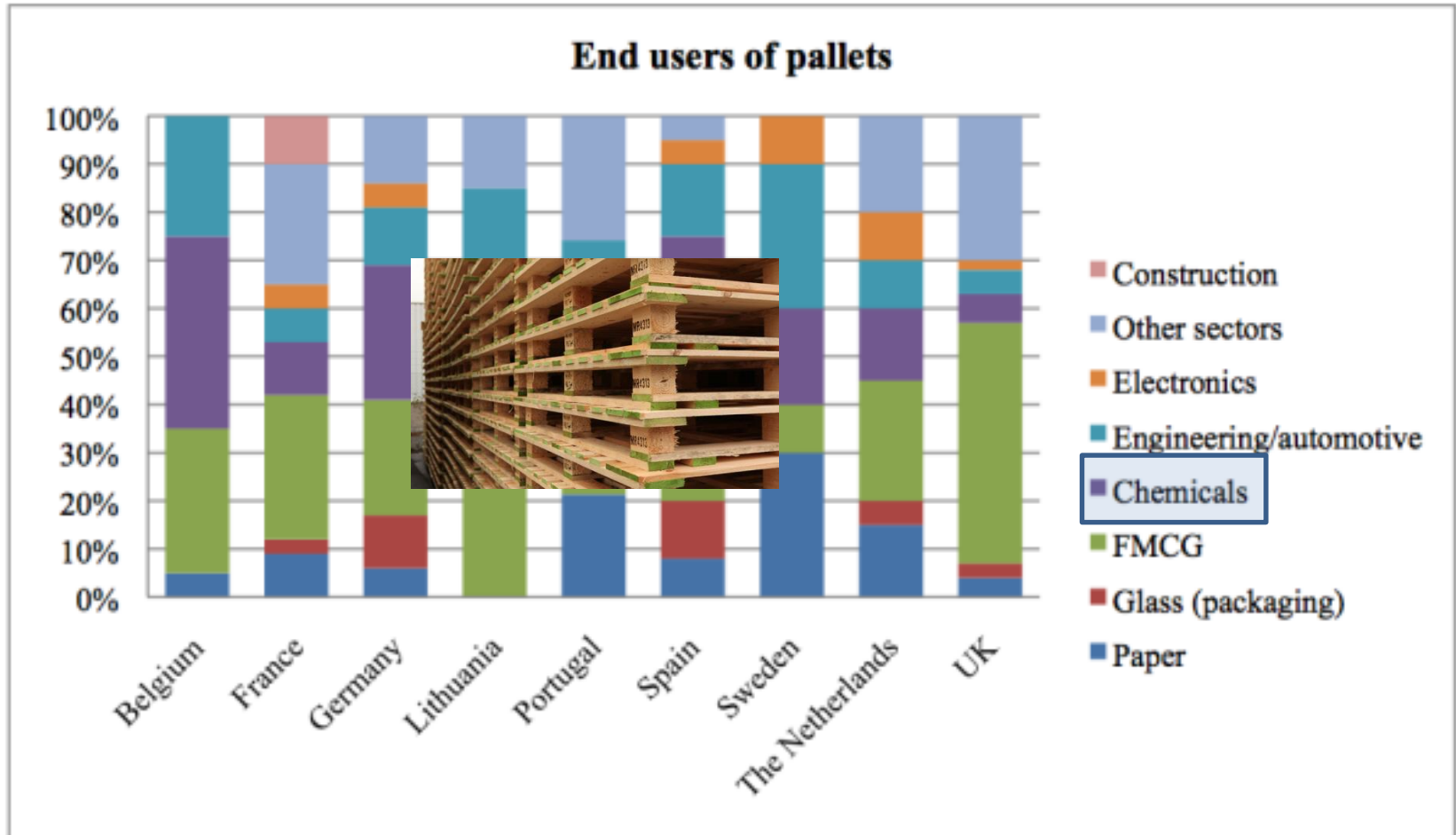
**eco-innovation**  
WHEN BUSINESS MEETS THE ENVIRONMENT





# Plastic industry is large enduser of pallets

Annually 35 million new CP wood pallets are produced in EU



Source: FCEC survey

# Mechanical recycled plastics reality

- **Transparent calculation methodology for recycling**
- **Investments in collection & sorting systems**
- **Harmonized regulations on waste collection and sorting specifications**
- **Voluntary or mandatory recycle content for virgin plastic producers?**
- **Mechanical recycling market development is changing**
  - Waste service providers become material suppliers: VEOLIA & SUEZ
  - Virgin suppliers enter the market: BOREALIS & TOTAL
  - Brandowner commits to 100% recyclable plastic packaging: UNILEVER
  - Large brand owner acquires stake in recycler: IKEA





## Eco-nomics

It is our challenge to make economic growth happen and protect the environment at the same time. We want to show people how to look at the environment from a business point of view.

## About us

We innovate to lower the operational costs of our customers. It is our ambition to achieve the lowest ecological footprint possible for the plastic recycling and re-using process. Van Maren Systems helps customers to

## Products

### Pallet Systems

Better  
Lighter  
Cheaper

### Materials

In the era of soaring raw material prices, we offer a cost-saving alternative to virgin plastic