Active and intelligent packaging solutions

TUT Actinpack Summer School; June 12-16, 2017

Plastics for Packaging and Their Sustainability Aspects

TAMPERE UNIVERSITY OF TECNOLOGY 12.6.2016

Erkki Laiho/EhoPlace Oy

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- Small carbon foot print and the earth will be saved
- Plastic shopping bag- environmental spoiler?
- Why to keep silent? – Plastic vs. paper/paperboard
- Public opinion –driving force
- Recycling -and everything is okay
- My sustainable recycling behaviour
- Conclusion

EhoPlace Oy

Polymers,
Lamination,
Adhesives,
Coatings and
Extrusion

- Established autumn 2012. Private company
- Perustettu syksyllä 2012. Yksityinen osakeyhtiö.
- Toimisto (office): Livornonkatu 8 A 19, 00220 Helsinki
- Nimi (name):

  Erkki Lai**ho (Eho)**

  Place: **P**olymers (polymeerit)
  Lamination (laminointi)
  Adhesives (adhesiivit)
  Coatings (päällystys)
  Extrusion (ekstruusio)

- Motto:"Your problem is my passion"
  " Ongelmasi on intohimomme"

EhoPlace Oy's offers in Plastic and Packaging area

- **Education,** training, seminars and conferences
- **Consulting,** advising ,troubleshooting and standardization
- **Project and waste management** in packaging and plastic industry
- **Packaging** construction design; multilayers
- **Analytical services** and packaging studies
- **Food contact** packaging safety and regulatory compliance services
- **Extrusion- and printing lines; plans and design**
- Technical "**Due diligence**" -service in packaging and plastic area
- Co-operation with **plastic raw-material suppliers**

Introduction

Main packaging plastics and their usage

What is sustainability?

There is no universally agreed definition on what sustainability means. There are many different views on what it is and how it can be achieved. The idea of sustainability stems from the concept of sustainable development which became common language at the World's first Earth Summit in Rio in 1992.

Two examples:

1) Avoidance of the depletion of natural resources in order to maintain an ecological balance

***2)* "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Bruntland Report for the World Commission on Environment and Development (1992)**

5 sustainable packaging trends to watch in 2017

By Kevin Hill, 12-Jan-2017
Last updated on 12-Jan-2017 at 14:45 GMT

Post a comment

Pic: iStock/homewor

1. **Labelling will get clearer**
2. **Lightweight packaging will be embraced**
3. **Increased use of recyclable materials**
4. **Edible packaging**
5. **Packages will slim down**

Note; that basic purposes of packaging like: protection, barrier (tightness), design, open ability etc. cannot be forgotten

Commodity Plastics

(now also PET included)

Polyolefins (Polyolefiinit) Esim.

Polyethylene (PE) (Polyeteeni)

PE-LD (LDPE) (matalatiheyksinen polyeteeni)

PE-LLD (LLDPE)(lineaarinen matalatiheyksinen)

PE-HD (HDPE) (korkeatiheyksinen polyeteeni)

Polypropylene (PP) (Polypropeeni)

homo-PP (homo-polypropeeni)

random co-PP (random-ko-polypropeeni)

block-PP (heterophasic-PP)(blokki-polypropeeni)

raheco-PP(random-heterofaasinen polypropeeni)

Polyvinyl chloride (PVC) (Polyvinylkloridi)

Polystyrene (PS) (Polystyreeni)

Polyester (PET) (Polyesterl)

Recommendation for marking of plastics

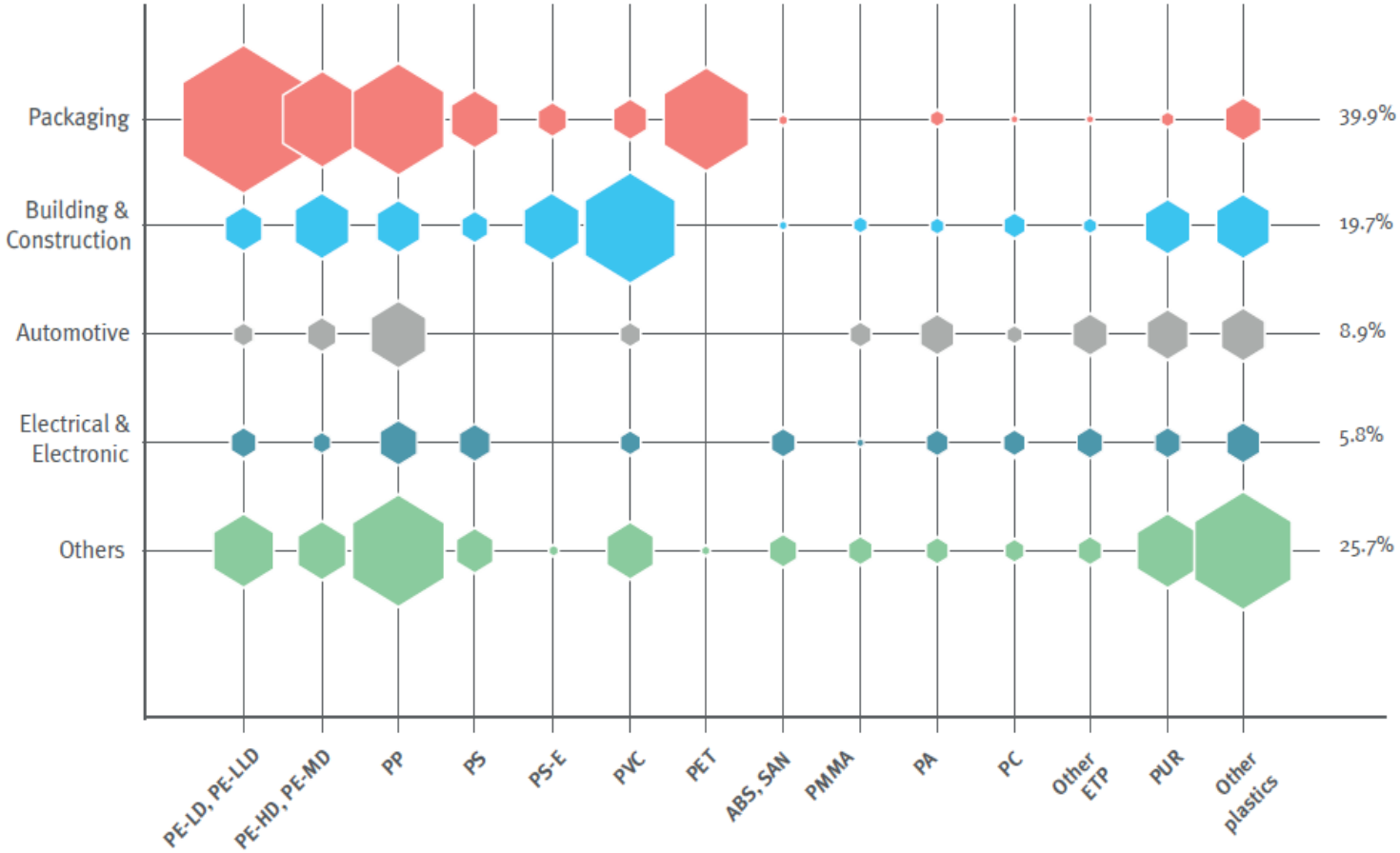
DIN Standard 6120 (Germany) based on SPI (USA) resin identification code

Code	Material	
1	PET	Polyethylene terephtalate **(Polyesteri)**
2	PE-HD	High-Density Polyethylene
3	PVC	Polyvinylchloride
4	PE-LD	Low-Density Polyethylene (PE-LLDmukana)
5	PP	Polypropylene
6	PS	Polystyrene
7	**(Monikerrosrakenteet)**	Other resins and multilayer structures

European Plastics Demand by Segment and Resin Type 2015

Total 49 Mto

(PlasticsEurope)



Pakkaukset
Packaging

Rakentaminen
Building & Construction

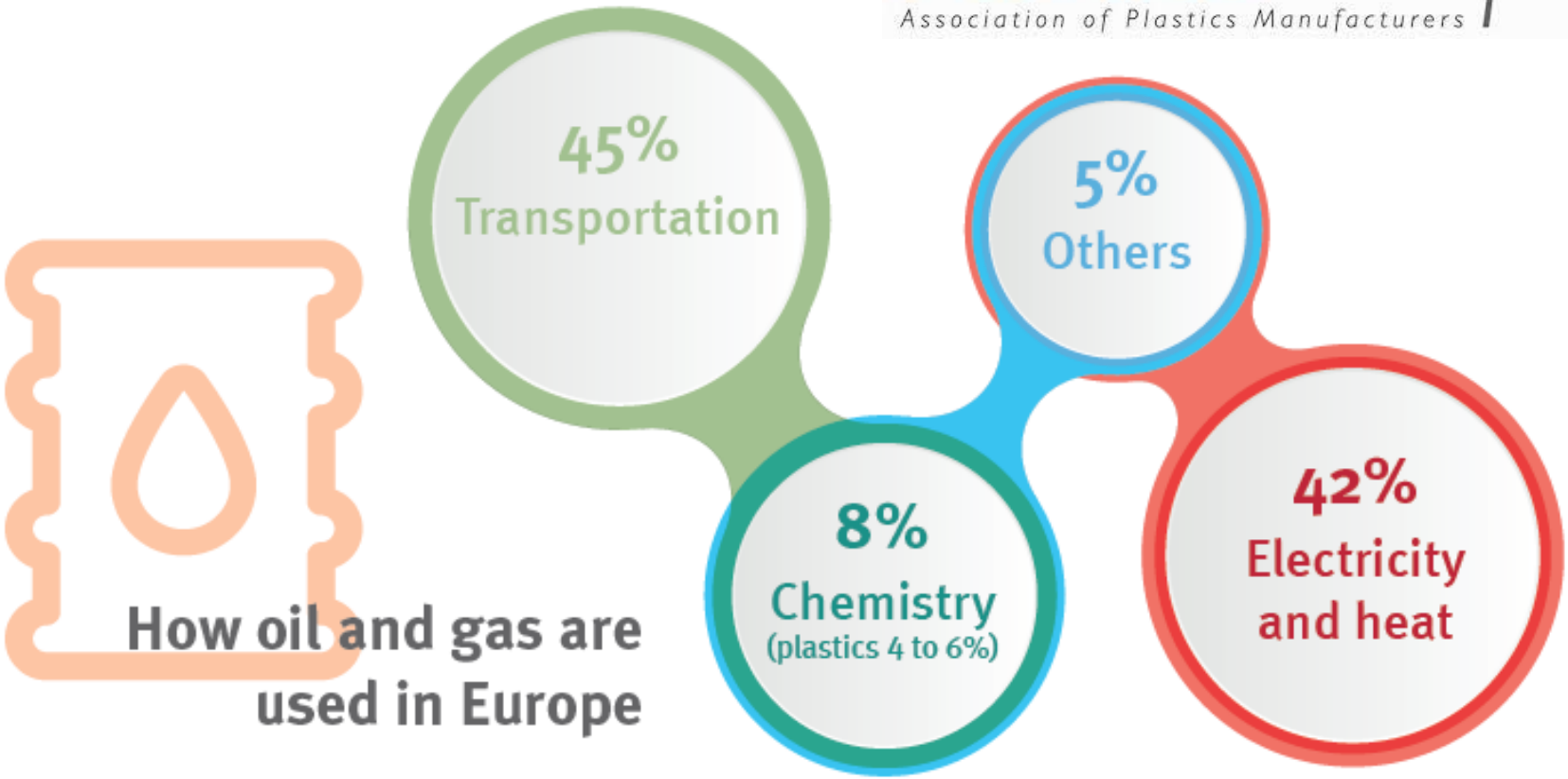
Autot
Automotive

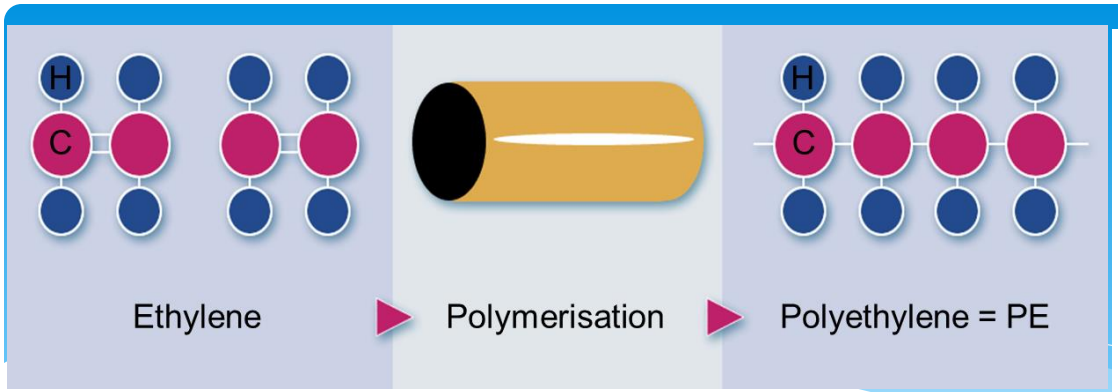
Elektroniikka
Electrical & Electronic

Muut
Others

From oil and gas 4-6% are used for plastics

PlasticsEurope
Association of Plastics Manufacturers





Distillation

Cracking

Polymerisation

LPG

Gasoline

Naphtha

Kerosene

Crude oil

Bitumen

H H
I I
C = C
I I
H H

Ethylene

Propylene

Butadiene

H – C – H
H – C – H
H – C – H
H – C – H
H – C – H

Polyethylene

Bag making process

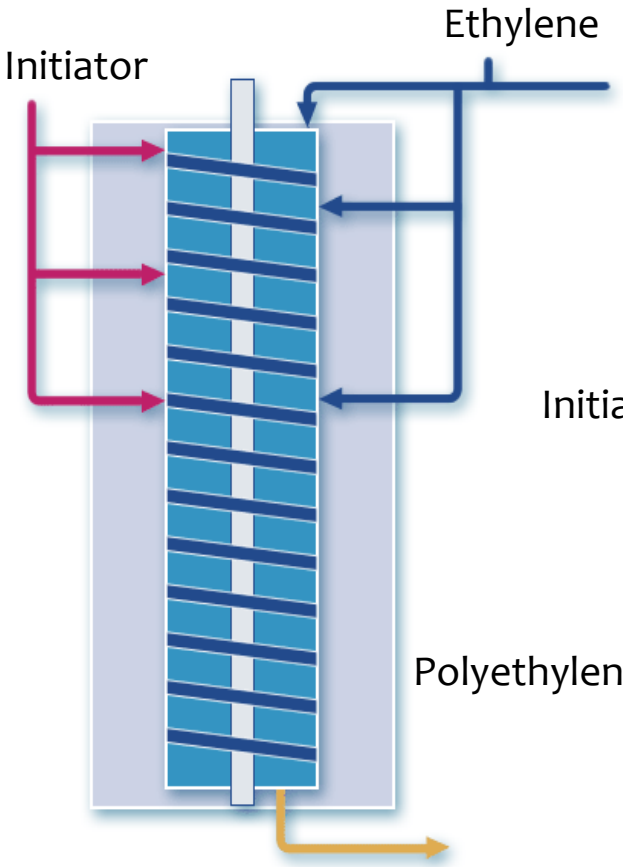
Plastic bag

The birth of a plastic bag

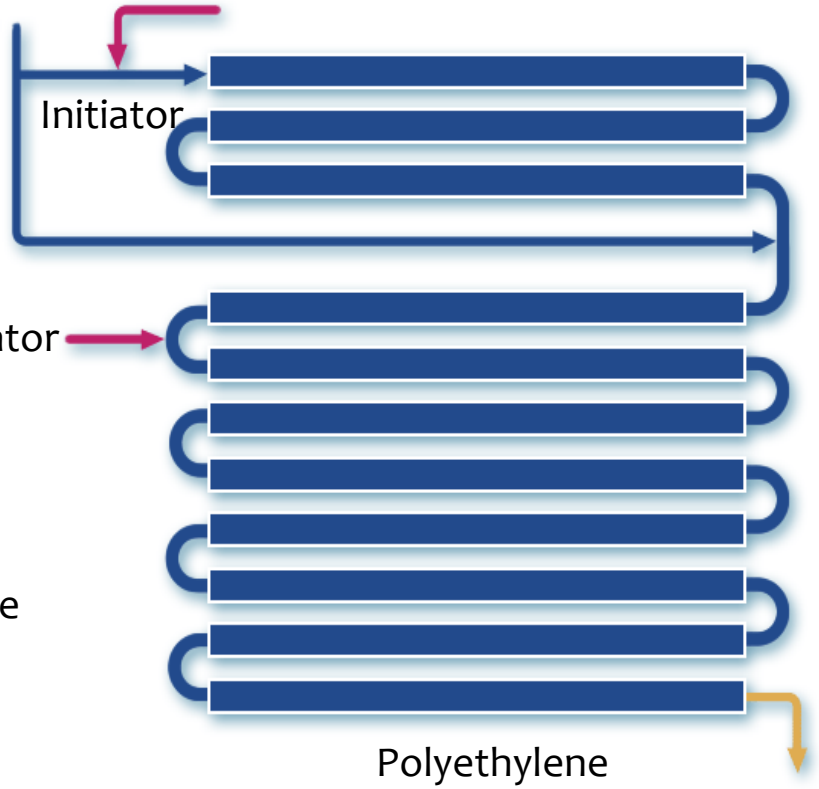
LD-Polyethylene, high pressure reactors

Two reactor types

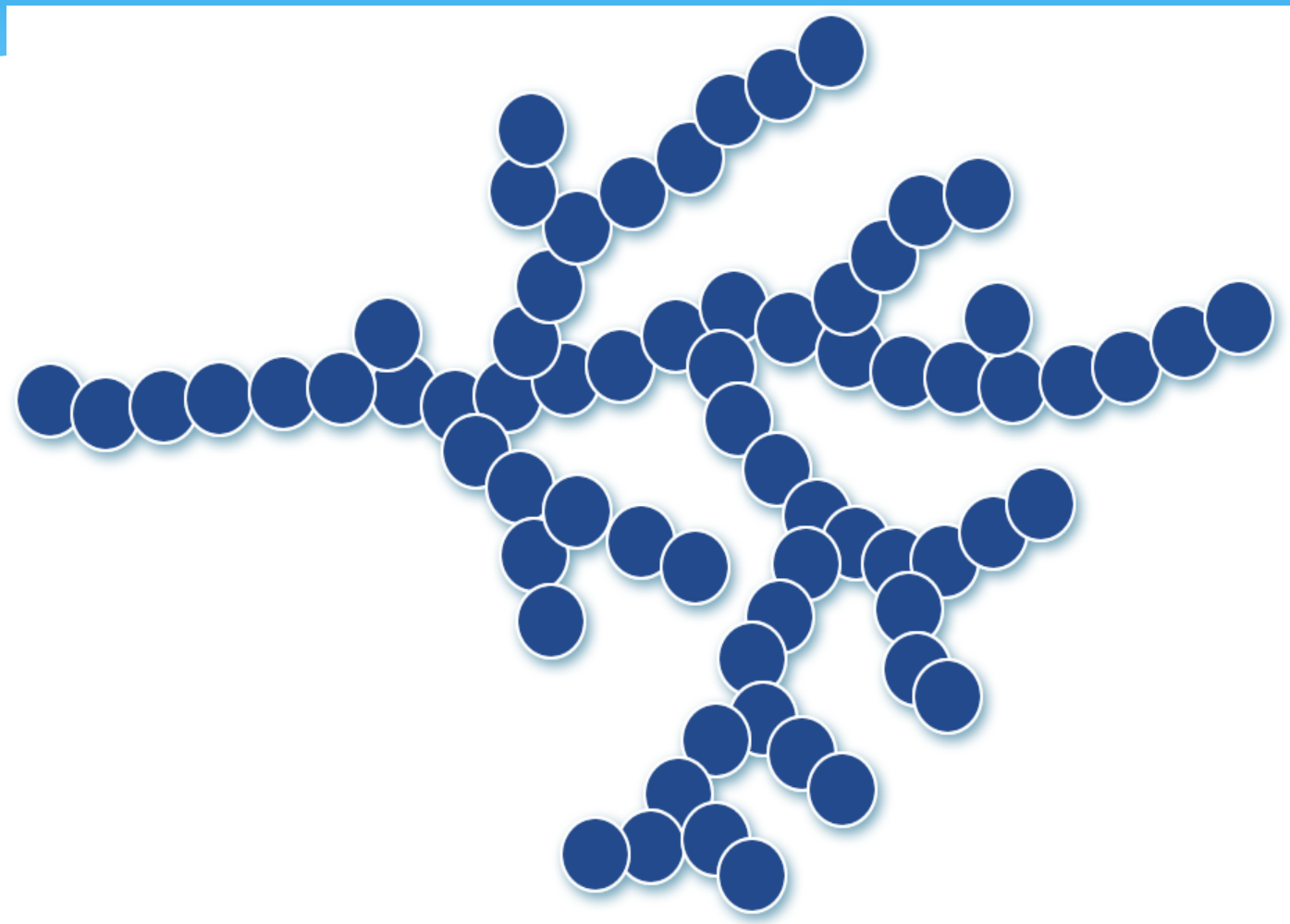
Autoclave process



Tubular process

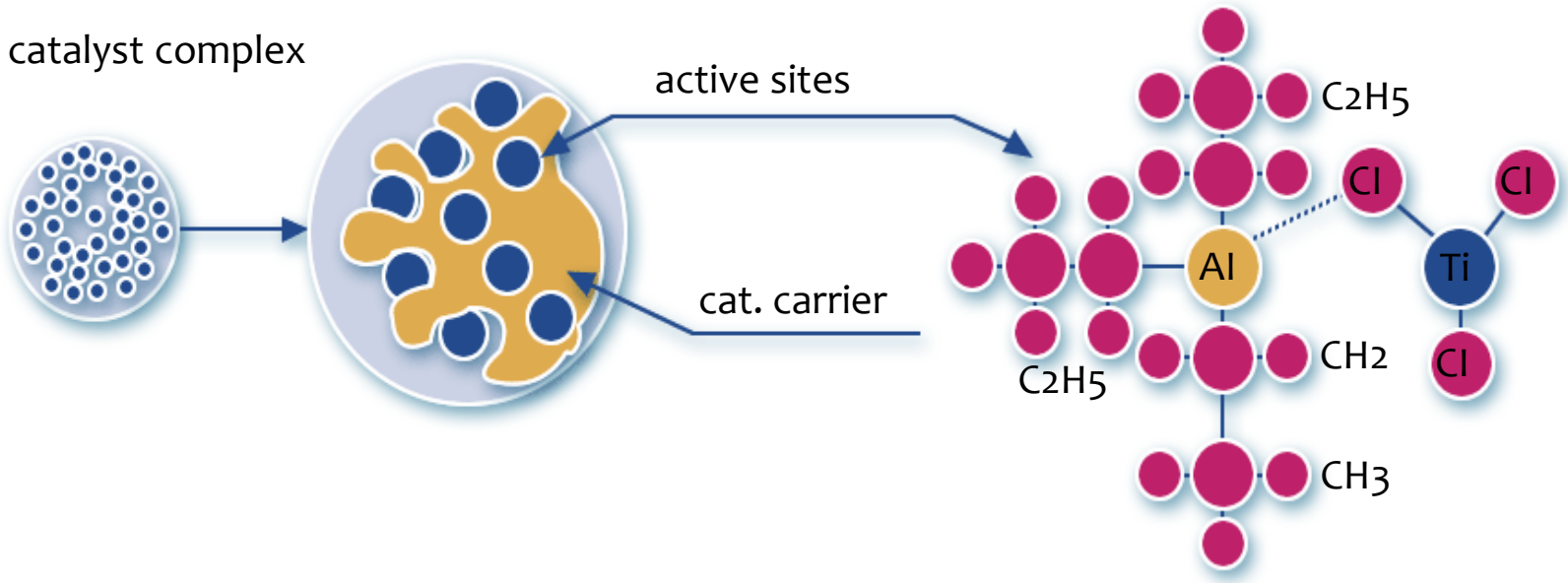


High pressure – LDPE (schematic molecule)

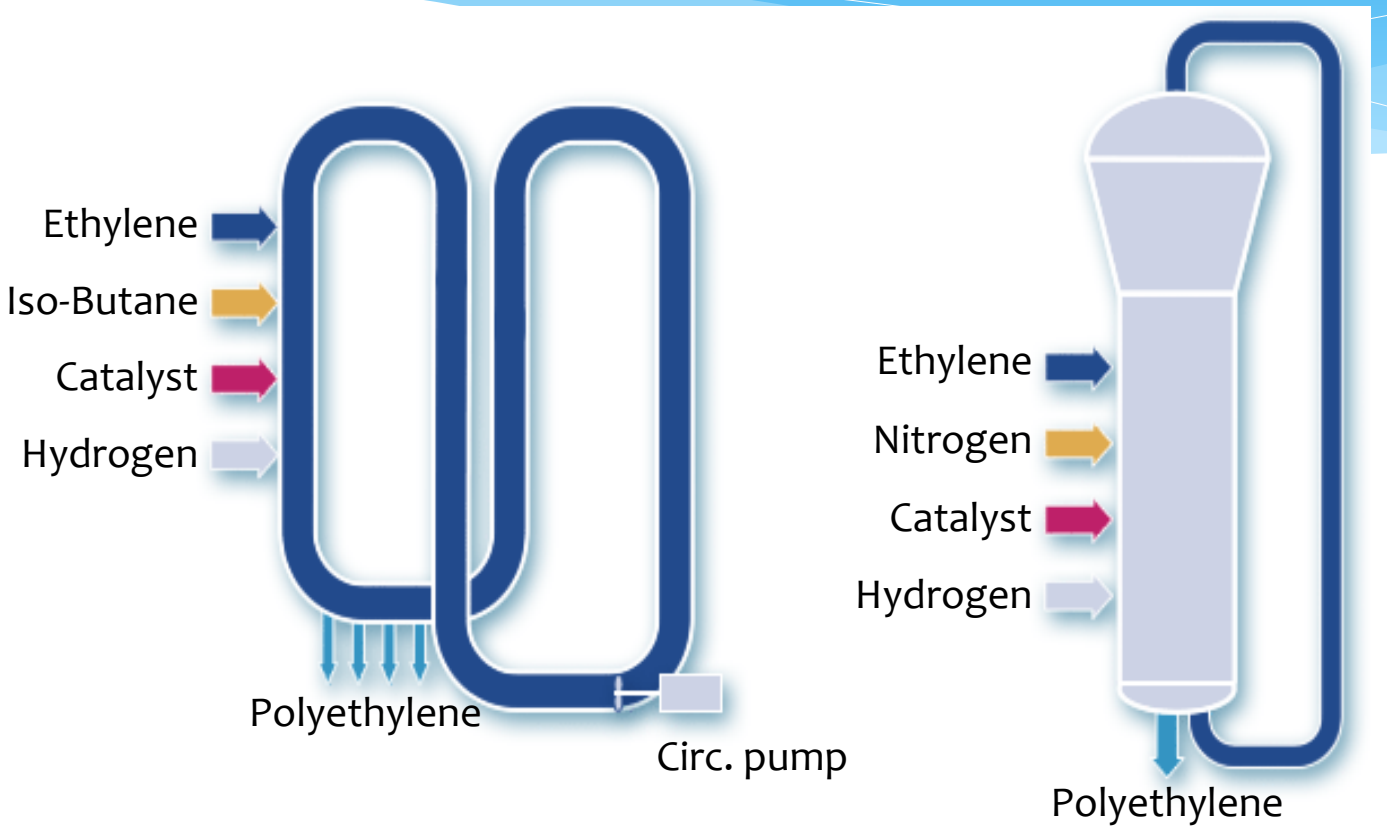


Catalyst

- Catalyst starts the polymerisation reaction to produce **low pressure PEs** like LLD, MD,HDPE
- New generation catalysts ; single site (or metallocenes) produce for instance polyolefin plastomers (POP) and elastomers (POE) or mLLDPE,



Polyethylene, low pressure processes, two reactor types

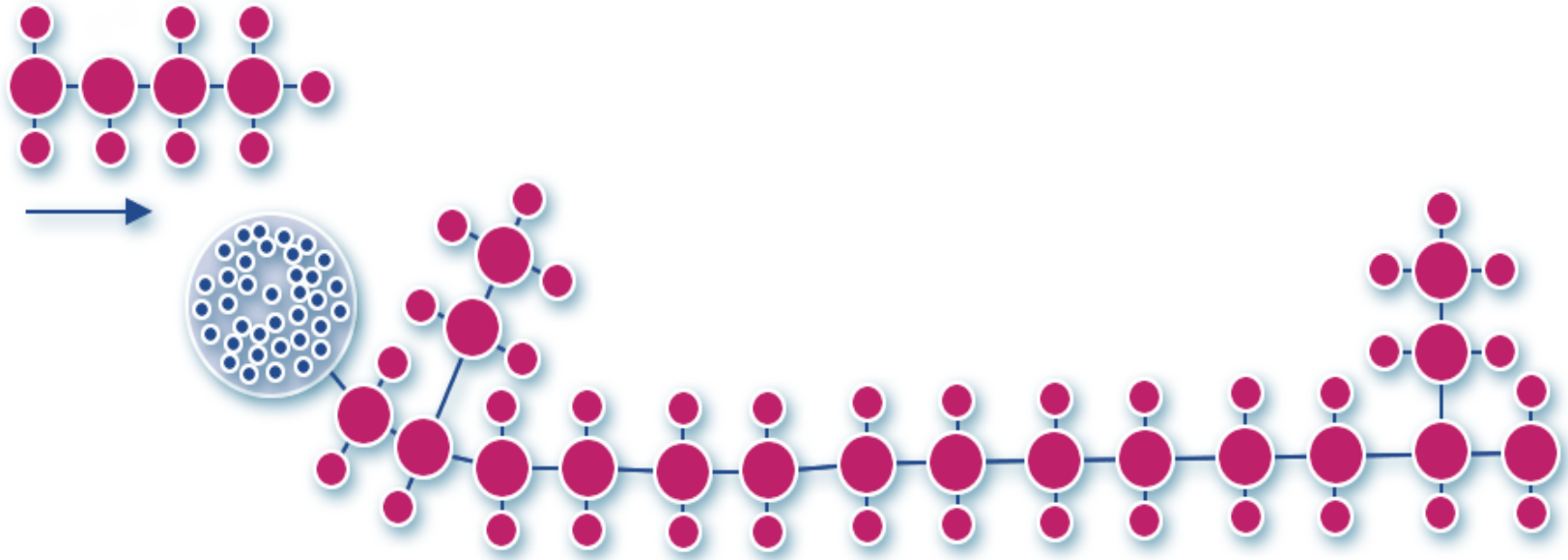


Tubular reactor
("Slurry")

Fluidized bed reactor
("Gas phase")

Side branches

- Co-monomer (1-butene) polymerises with monomer (ethylene) by creating a short branch into polyethylene chain.



Branched polyethylene's

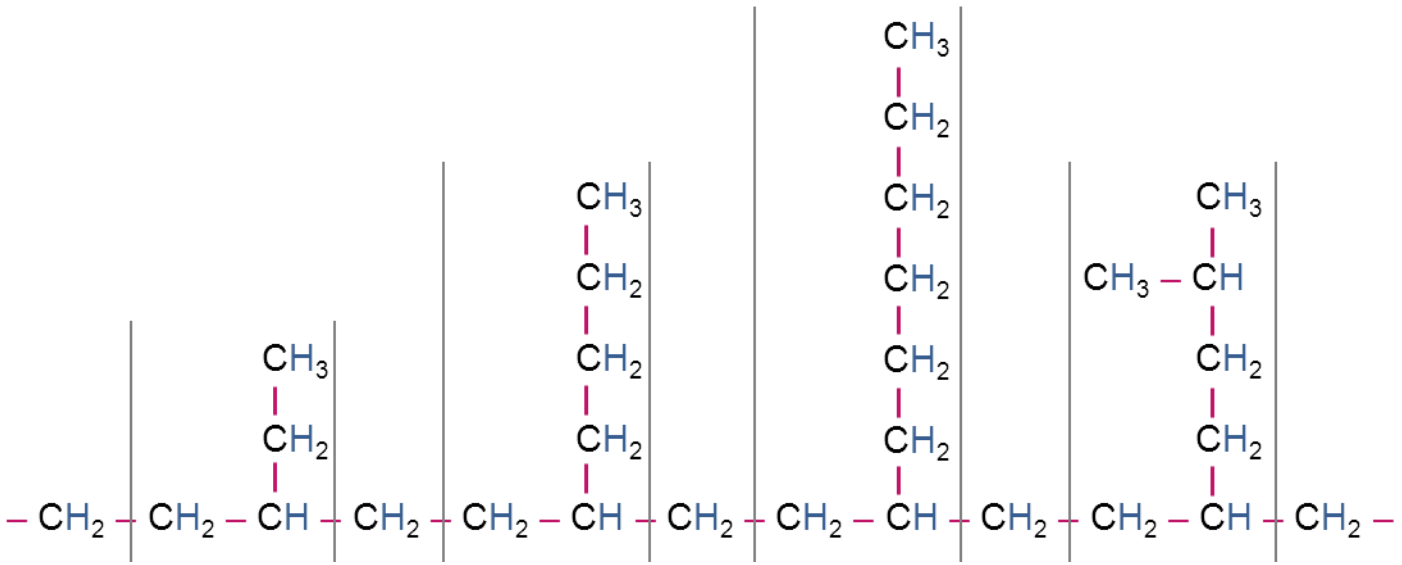
LLDPE (linear low density polyethylene)

Butene $CH_2 = CH - CH_2 - CH_3$

Hexene $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$

Octene $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

4-Methyl 1-Pentene (4MP1) $CH_2 = CH - CH_2 - CH(CH_3) - CH_3$



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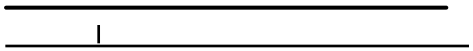
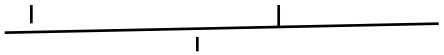
POLYETHYLENE TYPES

From LP processes

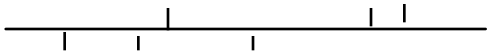
HDPE
- dens. 940 - 970 kg/m^3
- comon. cont. 0 - 2.5 wt-%



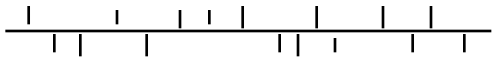
MDPE
- dens. 930 - 940 kg/m^3
- comon. cont. 2.5 - 5 wt-%



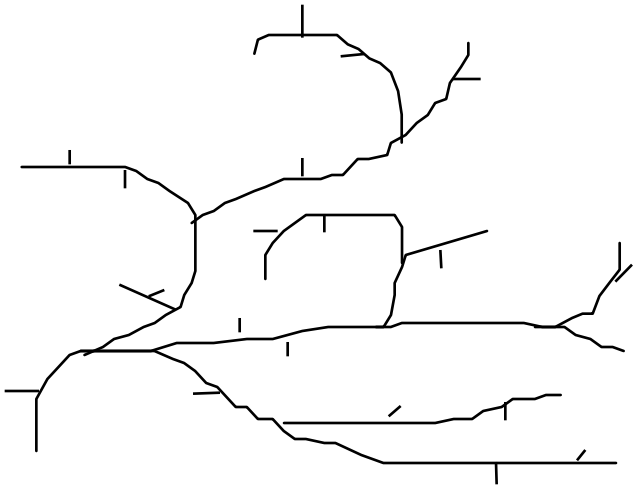
LLDPE/LDLPE
- dens. 915 - 930 kg/m^3
- comon. cont. 5 - 12 wt-%



VLDPE/POP/POE
- dens. 860 - 915 kg/m^3
- comon. cont. 10 - 35 wt-%

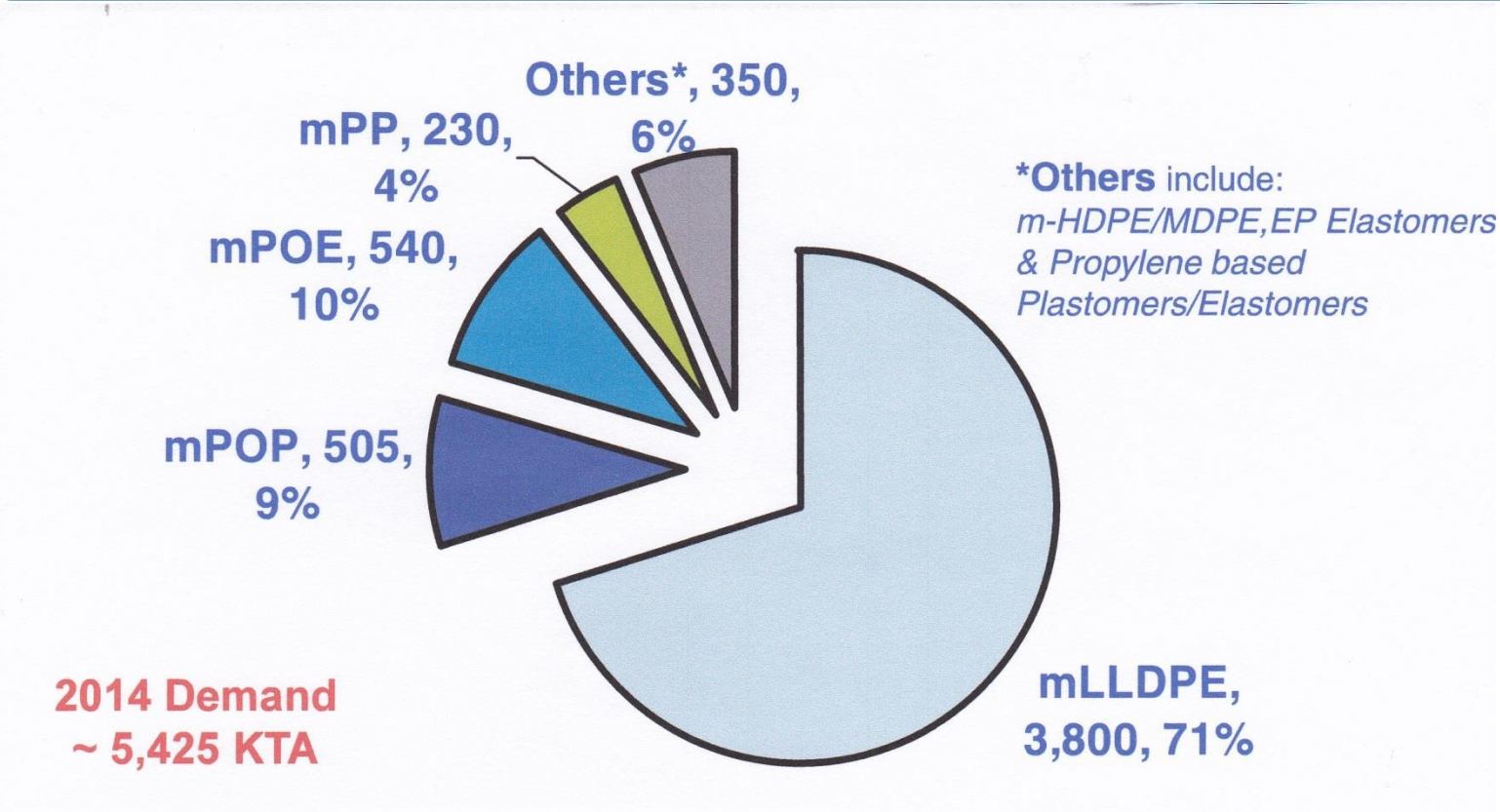


From HP processes



LDPE
- dens. 910 - 935 kg/m^3
- no comonomer

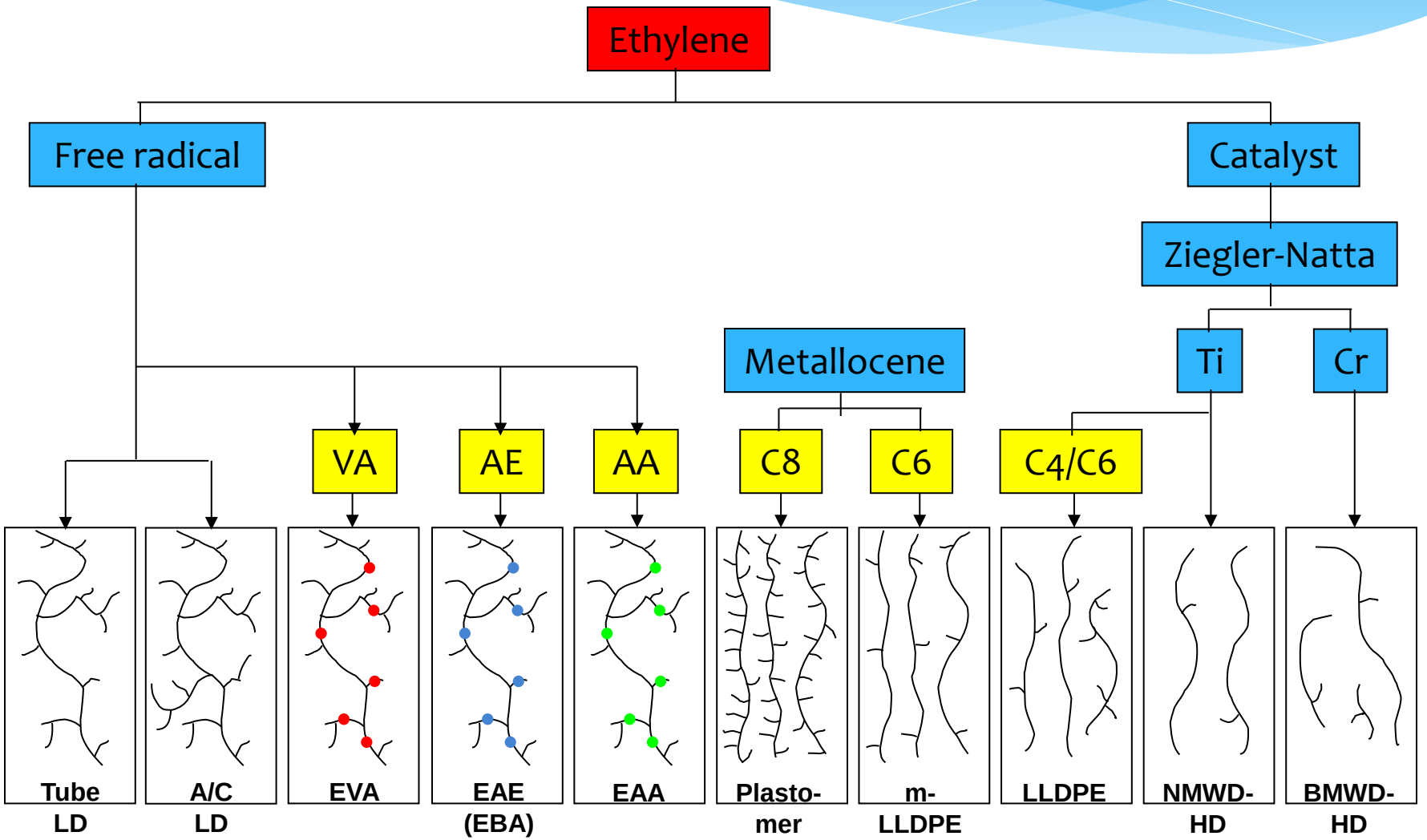
Metallocene Catalyst Markets



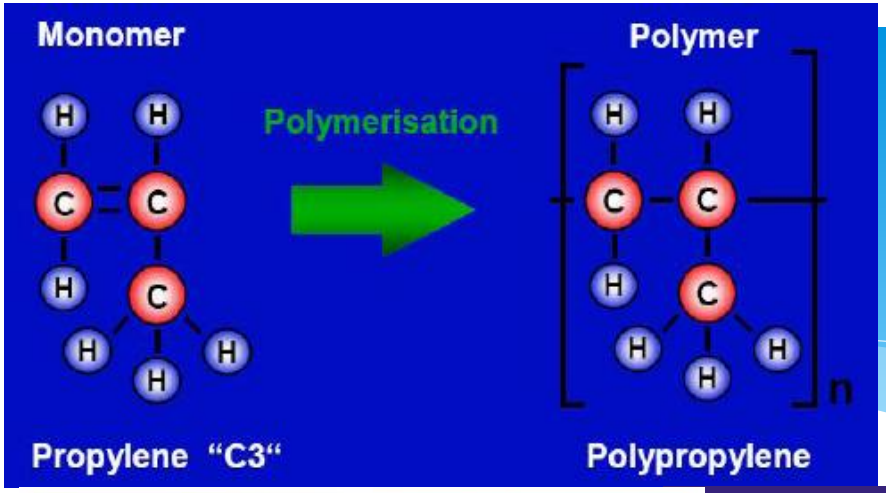
About 3 %of the total POs !

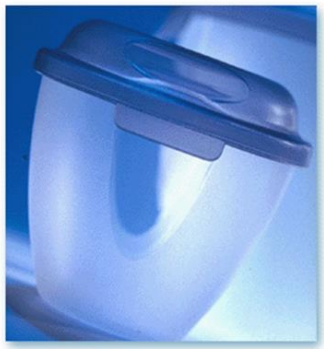
Source: CMR

Ethylene polymers

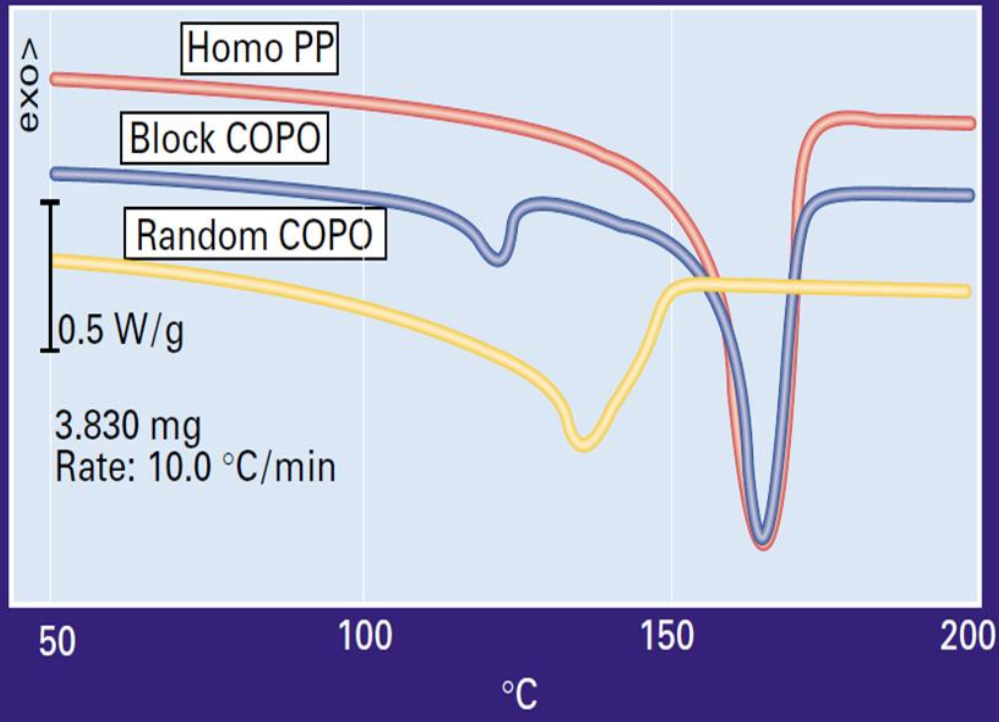


Polypropylene





Melting of polypropylenes



POLYPROPYLENE TYPES

HOMOPOLYMERS (PP-H)

General purpose
Stiff grades

→ **Stereostructure (iPP)**

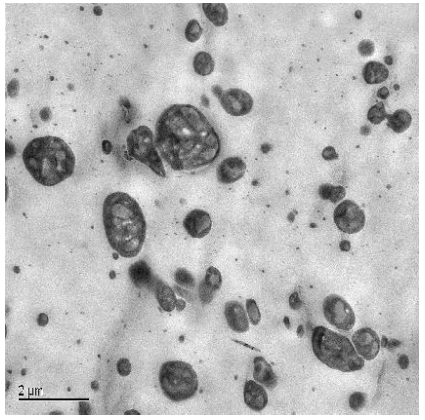
Isotactic 90 - 99%
Syndiotactic 0.5 - 5 %
Atactic 0.5 - 5%

RANDOM COPOLYMERS (PP-R, RACO)

Propylene-ethylene → *Ethylene cont. 1- 8 wt-%*
Propylene-butene → *Butene cont. 1 - 8 wt-%*
Propylene-butene-ethylene → *Butene cont. 1 - 10 wt-%, ethylene cont.1 - 2 wt-%*
One phase system

HETEROPHASIC PP (HECO, Impact PP)

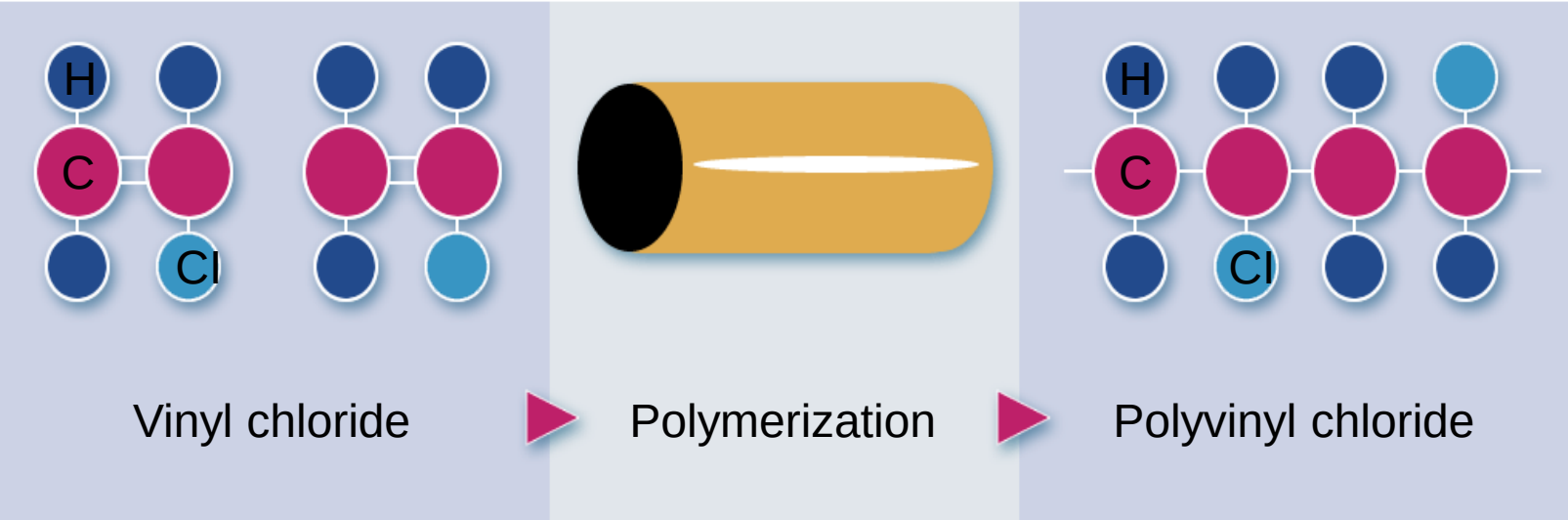
Medium impact grades → *Ductile at - 0 °C*
High impact grades → *Ductile at - 20 °C*
Super high impact grades or r-TPO → *Ductile at - 40 °C or lower*
Ethylene cont. 3 - 30 wt-%
Multiphase system



SOFT PP → *Flex 400 or 200 MPa*

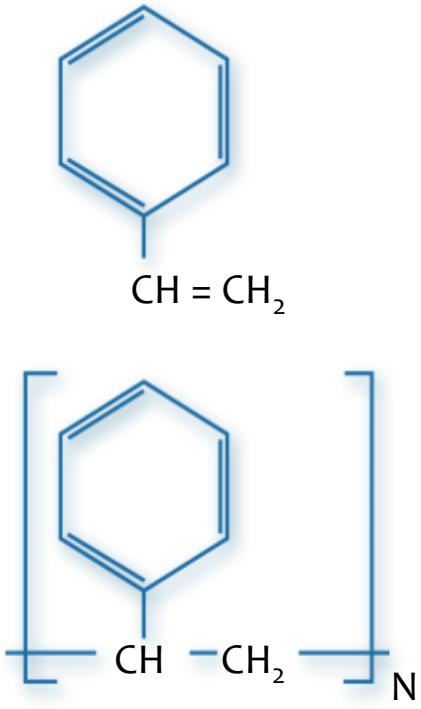
Tailored heterophasic PP with random copo matrix

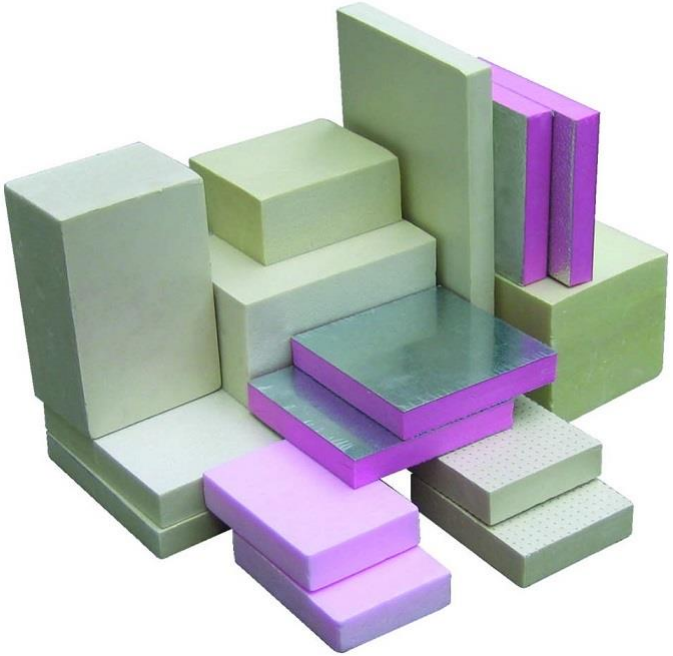
Polyvinyl chloride = PVC



* Shrink films
* Household films (meat, fruits, vegetables, cheese)
* Thermo formable boxes and lids
* Bottles (oil, vinegar)
* Vessels

Styrene & Polystyrene





Polystyrene classes and usage in packaging

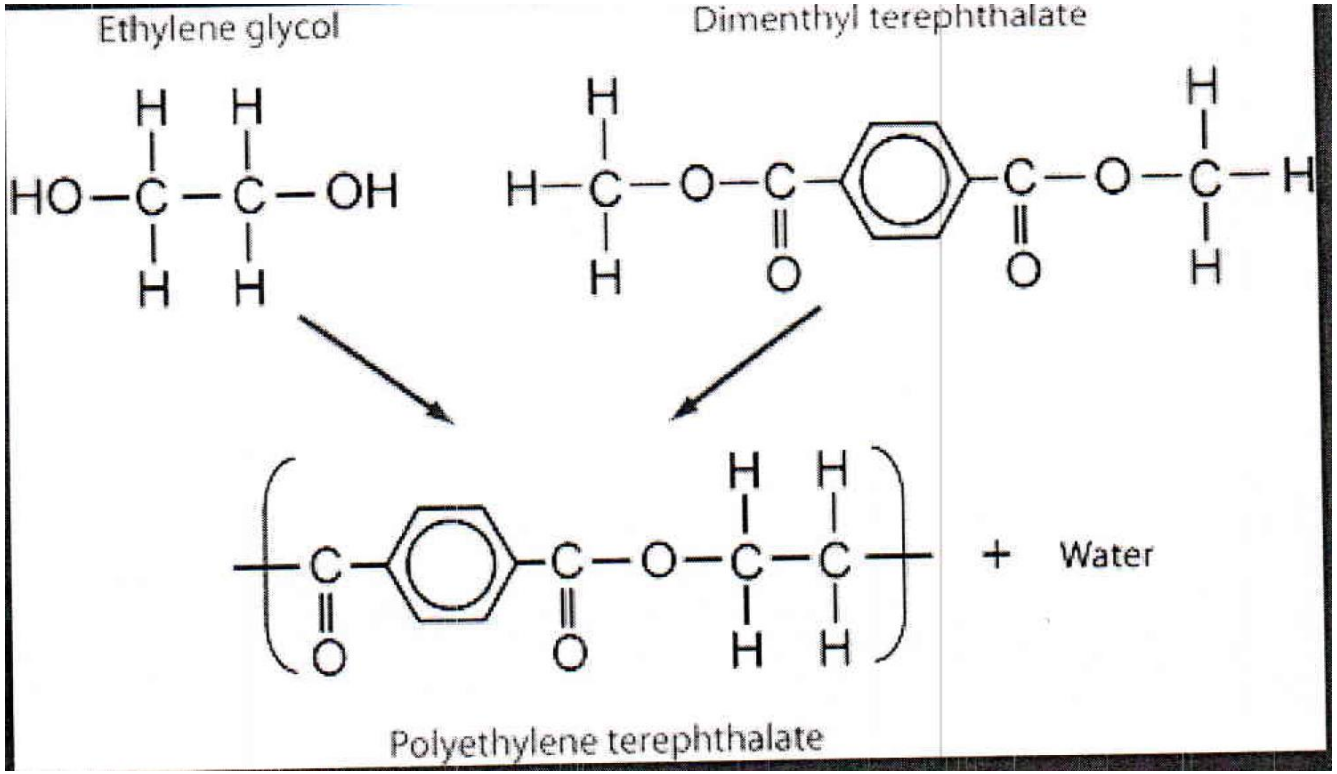
- PS-GP
  (General Purpose PS)
- PS-HI
  (High Impact PS) or SB (styrene-butadiene)
- Expandable polystyrene (EPS)
- ABS, SAN, etc.
  (acrylonitrile-butadiene-styrene, SAN etc.

- Transportation boxes, cases
- Trays
- Thermoformable products (cups, "glass")
- Injection moulded cups, boxes
- Bad and shelters for transportation

PET

❑ **Produced by esterification of ethylene glycol with a dibasic acid**

- Water is by-product
- Esterification is reversible. This means if water exists when melted, PET will degrade into monomers.

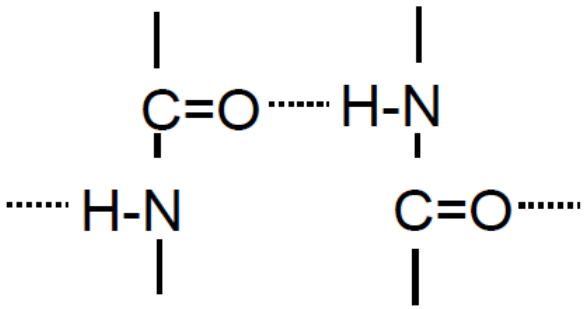


Properties Polyamide

BASF
The Chemical Company

amide-amide interactions provide

- high melting point
- high strength + stiffness
- good abrasion resistance
- high barrier/resistance to gases + chemicals
- good printability

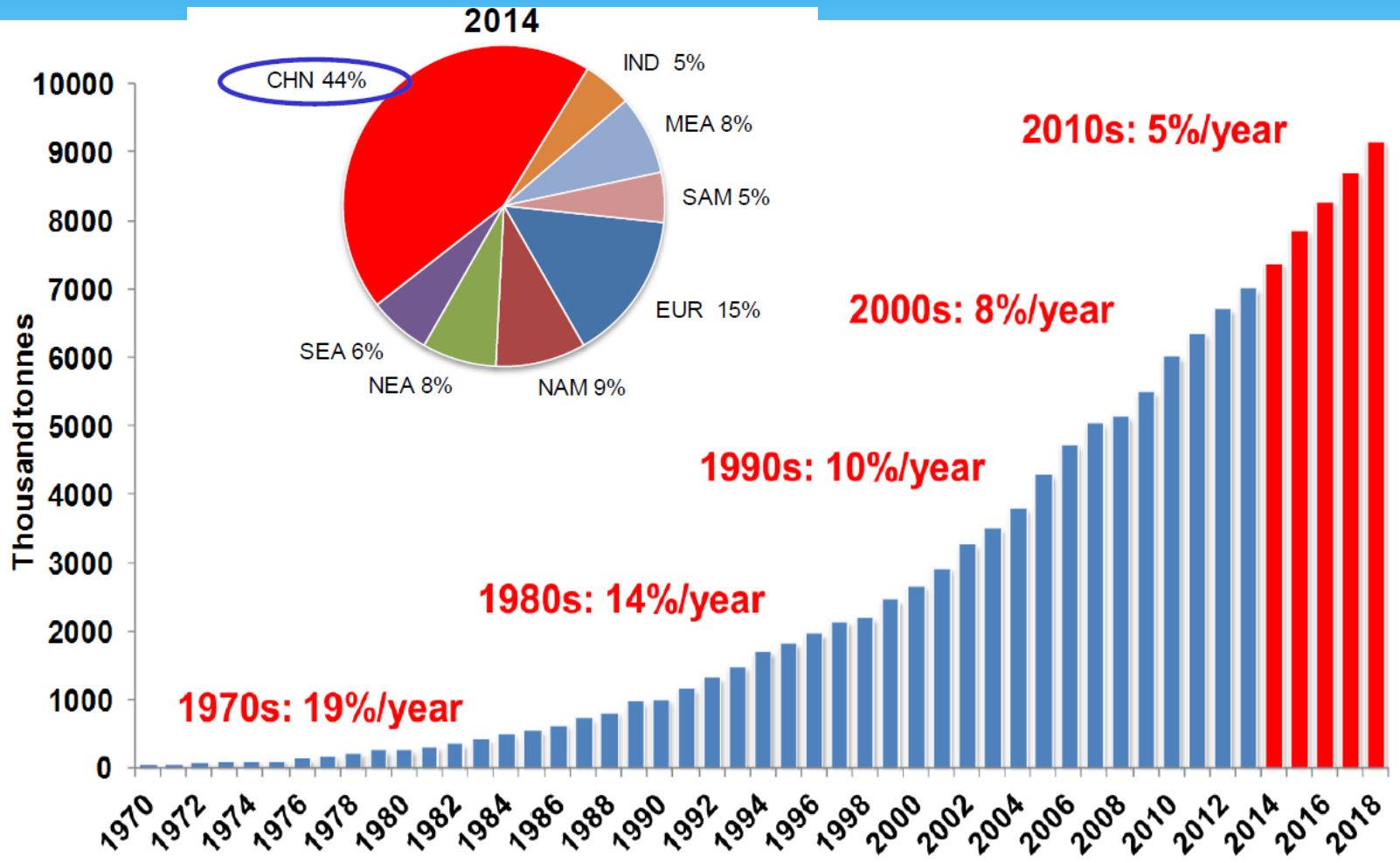


amide-water interactions provide

- toughness and flexibility
- good thermoformability

➔PA achieves many of its advantageous properties only after water absorption

Development of global BOPP film demand



Source: AMI Consulting, 2014

Polyamide Film: Applications

BASF
The Chemical Company

Polyamide widely used for food packaging

- meat, poultry
- cheese
- processed food

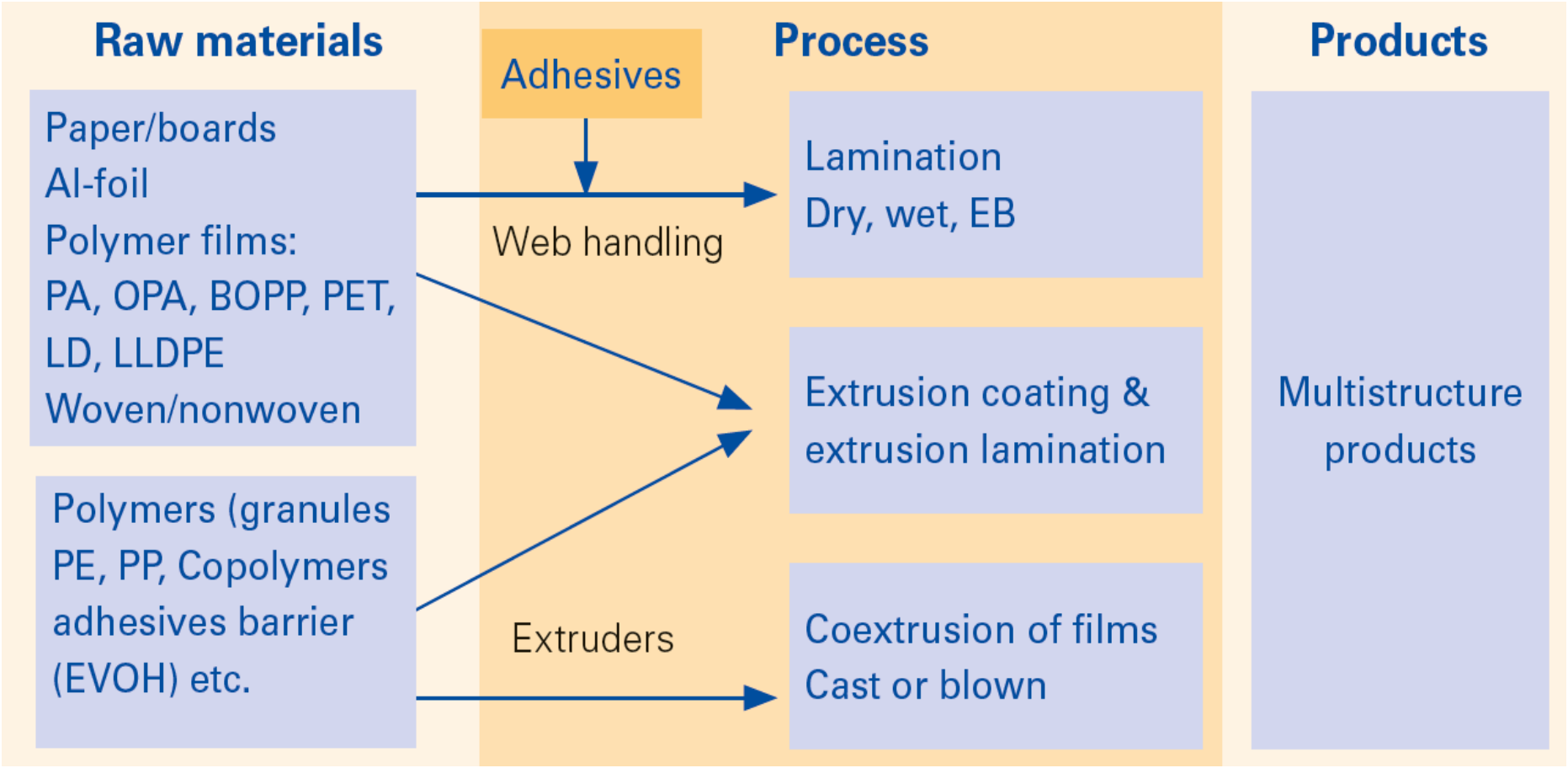
due to its combination of

- oxygen barrier
- flavor and aroma barrier
- good mechanical properties
- high transparency
- thermoformability
- thermal stability

BOPET Film – Product Range

- Packaging Films
- Optically Clear Films
- Electrical Films
- Industrial Films
- Specialty Films
- Metalized Film

Multistructure manufacturing methods



Plastic packaging can be divided for two groups

1) **1) Films and flexible packaging**

Including orientated films

2) Rigid packaging, trays and bottles

Sustainability

Food service and logistics need plastics

Note: Active and intelligent fiber-based packaging very often needs barrier plastic layer !

Case: Barrier packaging

- "Sustainability is a journey not a destination"

FOOD & BIOBASED RESEARCH
WAGENINGEN UR

EAFA European Aluminium Foil Association e.V.

The Debate: Packaging & Sustainability

"WHAT DO YOU MEAN THERE'S NO SUCH THING AS SUSTAINABLE PACKAGING?"

This report demonstrates that, in absolute terms, there is no such thing as 'sustainable packaging'. 'Sustainable packaging' must be considered in context, as it does not exist in its own right; it actually exists only in the context of the product for which it has been conceived. There is very poor understanding of the contribution of smart packaging to sustainable consumption and production in the food chain – particularly regarding packaging's role in reducing food waste.

People

Planet

Profit

EhoF

Packaging a partner to reduce food waste

One third of all food produced is **wasted** every year

yet **870 million** people are **starving**

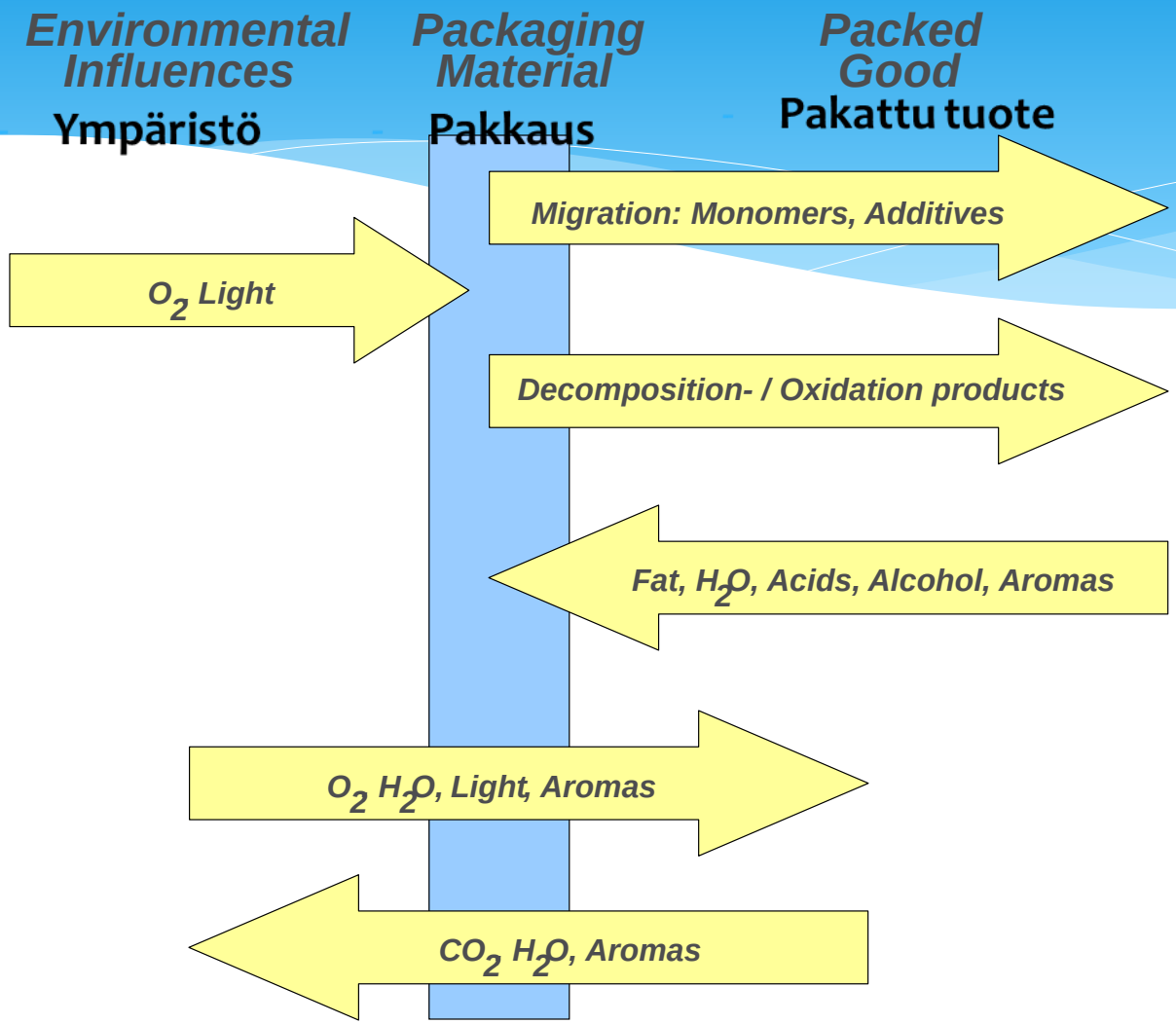
Food waste a major global issue

- 25% of developed world food purchased is wasted
- 30% of developing world food produced is wasted
- Food packaging a major driver to prevent waste

Source: FAO/Save Food

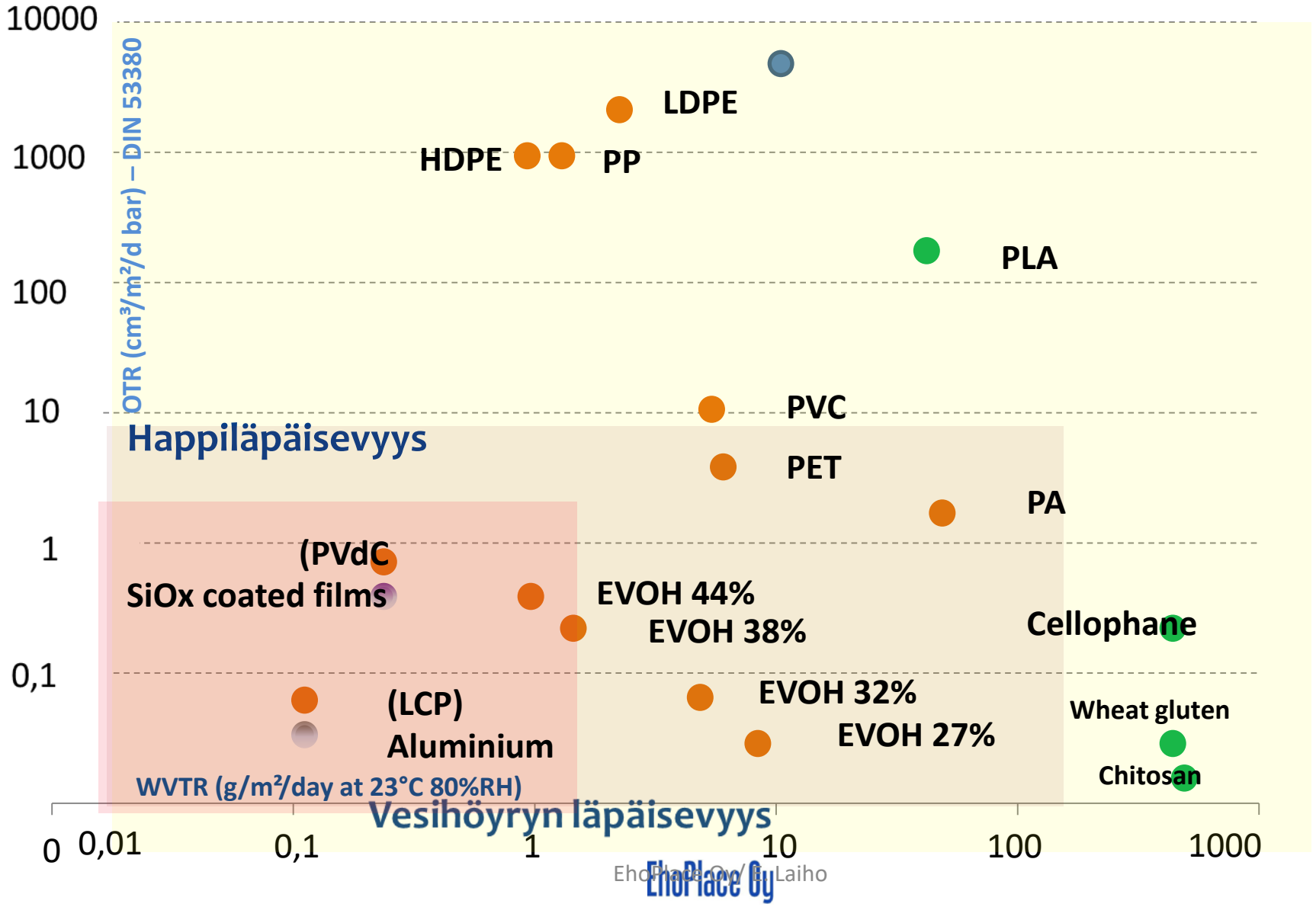
Foodwaste is our biggest environmental problem

Mahdolliset siirtymät pakkauksissa (Why Packaging? Interactions)



Muovien barrier ominaisuudet (Barrier properites)

Source: Pira



Structure / EVOH

NIPPON GOHSEI Baritec

High gas-barrier resin SoarnoL™

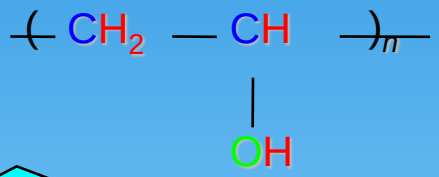
* Erikois barrier-muovi EVOH

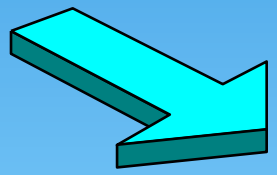
Poly Ethylene (PE)

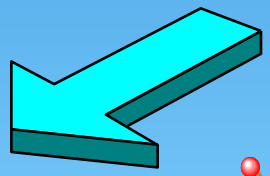
Extrudability

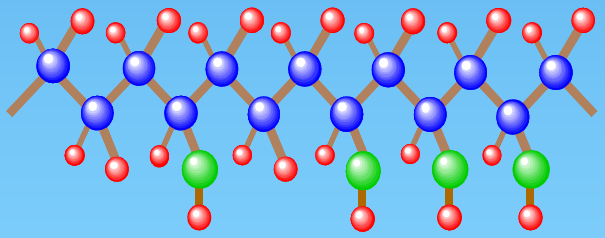
Poly Vinyl Alcohol (PVA)

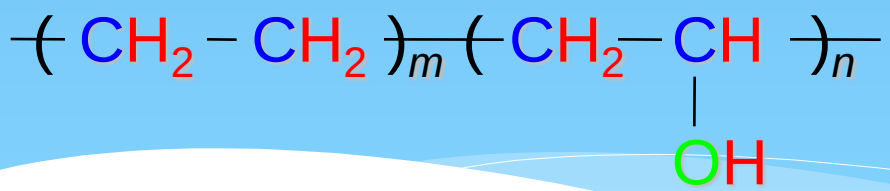
Gas Barrier

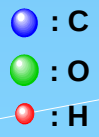












Ethylene Vinyl Alcohol Copolymer (EVOH)

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Shelf life simulation

Example PE bottle vs. EVOH multi layer bottle

Ex.) Tomato puree, M.O.I.P.=4 [ppm]

S: 3.1×10^{-3} [ml/g]

W: 500 [g], T: 600 [um], A: 0.03 [m^2], D:0.21 [atm]

PE monolayer bottle

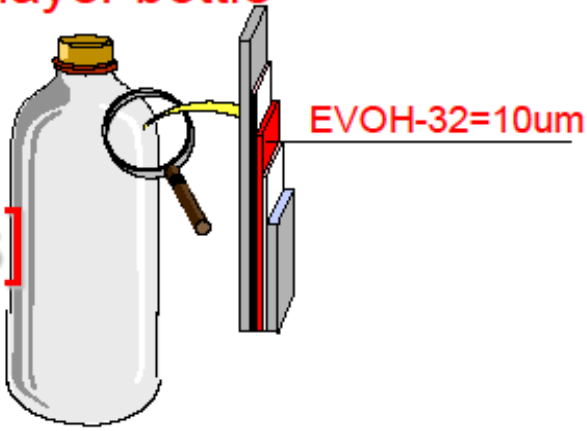
3 [days]

P:2300

[ml.20um/m^2.day.atm]

PE/EVOH multilayer bottle

170 [days]



P:0.7

[ml.20um/m^2.day.atm]

Only 10μm thickness EVOH is put in a layer, about 57 times longer shelf life!!!

(OTR @20C-outside50%RH, inside100%RH)

EhoPlace Oy

Plastic packaging are safe to use

Case: Öljymigraatio (Oil migration)

Plastics in packaging are controlled carefully

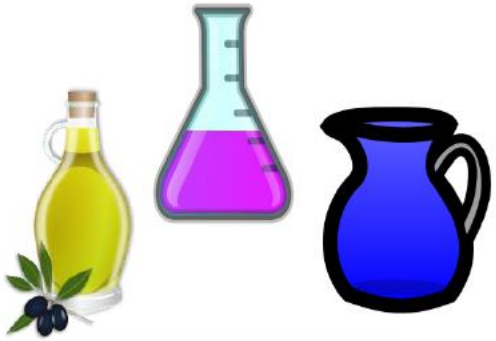
- **Muovien yleisvaatimus (Plastics Regulation (EU) No 10/2011)**

  - This regulation applies to mono-layers, multi-layers and multimaterial of which *at least one layer is a plastic*

- **Overall migration limit (OML)**
- **Specific migration limits (SML)**

Medical packaging:

Eu.P. monograph 3.1.3 and 3.1.4 Class IV



Food Type

Simulant

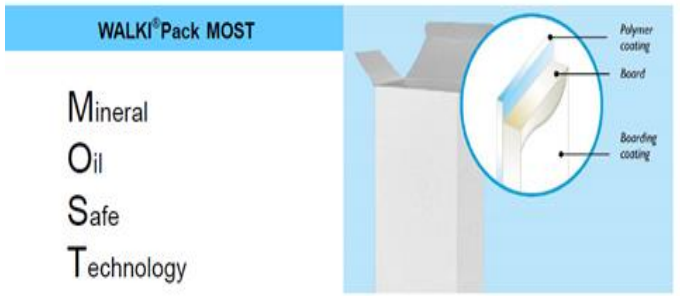
Toxicological evaluation of MOSH/MOAH confirms demand of efficient barriers

- **Mineral Oil** (used in printing inks) contains
  - **MOSH = M**ineral **O**il **S**aturated **H**ydrocarbons
  - **MOAH = M**ineral **O**il **A**romatic **H**ydrocarbons
  - chain length of **C12 – C24** are of migration relevance

- Generated from printing ink of cardboard packages and/or of newspapers vis paper recycling

Solutions for oil migration (1)

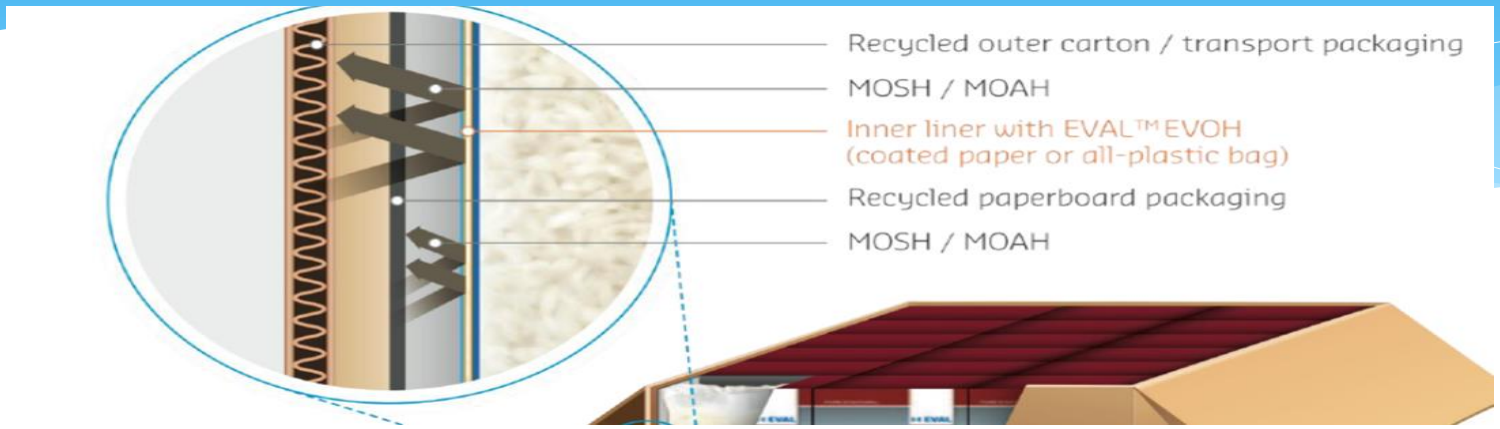
1)Walki; barrier extrusion coating or “bag in box”



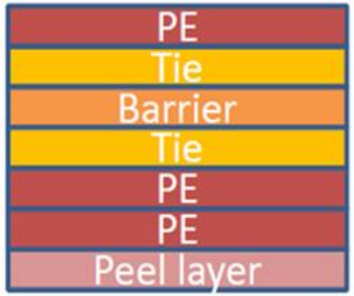
2) BASF; Polyamide (PA) inside bag or extrusion coating

Solution for oil migration (2)

3) EVOH-kerrokset; Nippon Goshei tai Kurraray



4) Barrierfilms ; for example Wentus, Innovia,Xylophane ja VTT



Patent filed 3.2.2016.
PCT/FI2016/5075
Bio-based mineral oil barrier coatings and films

VTT

Innovia Films **BOPP film Propafilm**

- **New barrier film for dry foods**

Xylophane

The renewable barrier against oxygen, grease and mineral oils

“Bio” amazing word that saves everything?

(“ Bio” ihmesana, joka pelastaa kaiken?)

Very soon we have a new magician: ***“Net positive ”***

“Nettopositiivisuus” = business that creates overall more social, economic and environmental benefits than disadvantages.

21.3.2017 Piia Elonen HS

Nyt tulee firmoihin taas uusi ilmiö – nettopositiivisuus: Betonifirmalle se tarkoitti lammikoiden rakentamista viitasammakoille

(To the concrete company this notated that they constructed pools for moor frogs.)

Is "Bio" suffered inflation?

First new generation

Bioproduct factory to Äänekoski

Chemical pulp business is now **Biomaterials.** Paperboard and packaging is now **Renewable materials.**

The Biofore Company

UPM will build up the world's firt wood based bio diesel factory (1.12.2012)

We came up with a solution to make a biopolymer that is identical to the polymer from fossils

North European BioTech Oy (NEB), a sister company of NEOT, is developing advanced ethanol production plants in Pietarsaari and Kajaani.

Emoyhtiön NEOT Oy:n omistavat SOK ja St1 Nordic Oy.

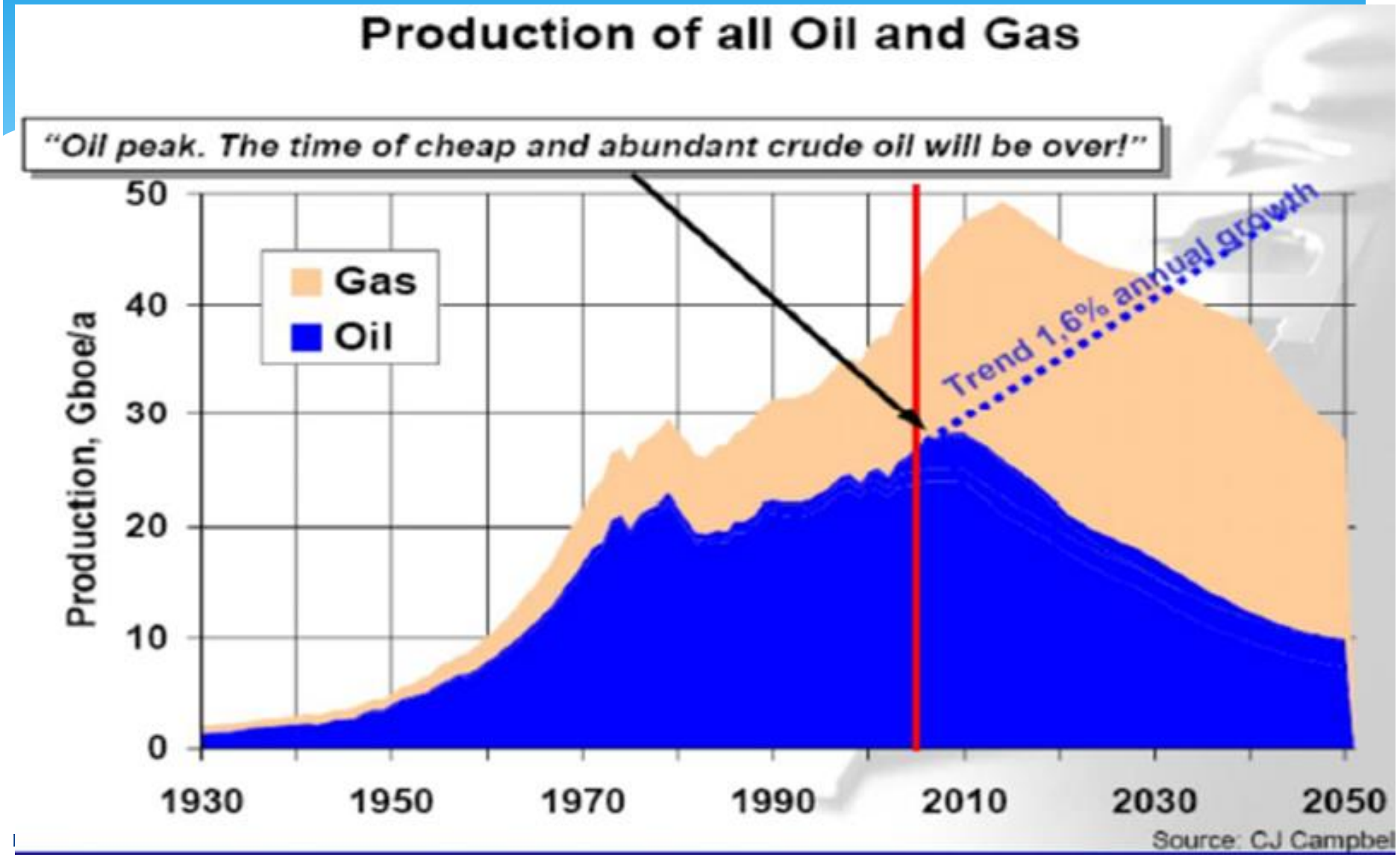
The way in which the bioplastics industry is communicating its messages may be creating more confusion than confirmation

reports Des King "Plastics in Packaging" , April 2017

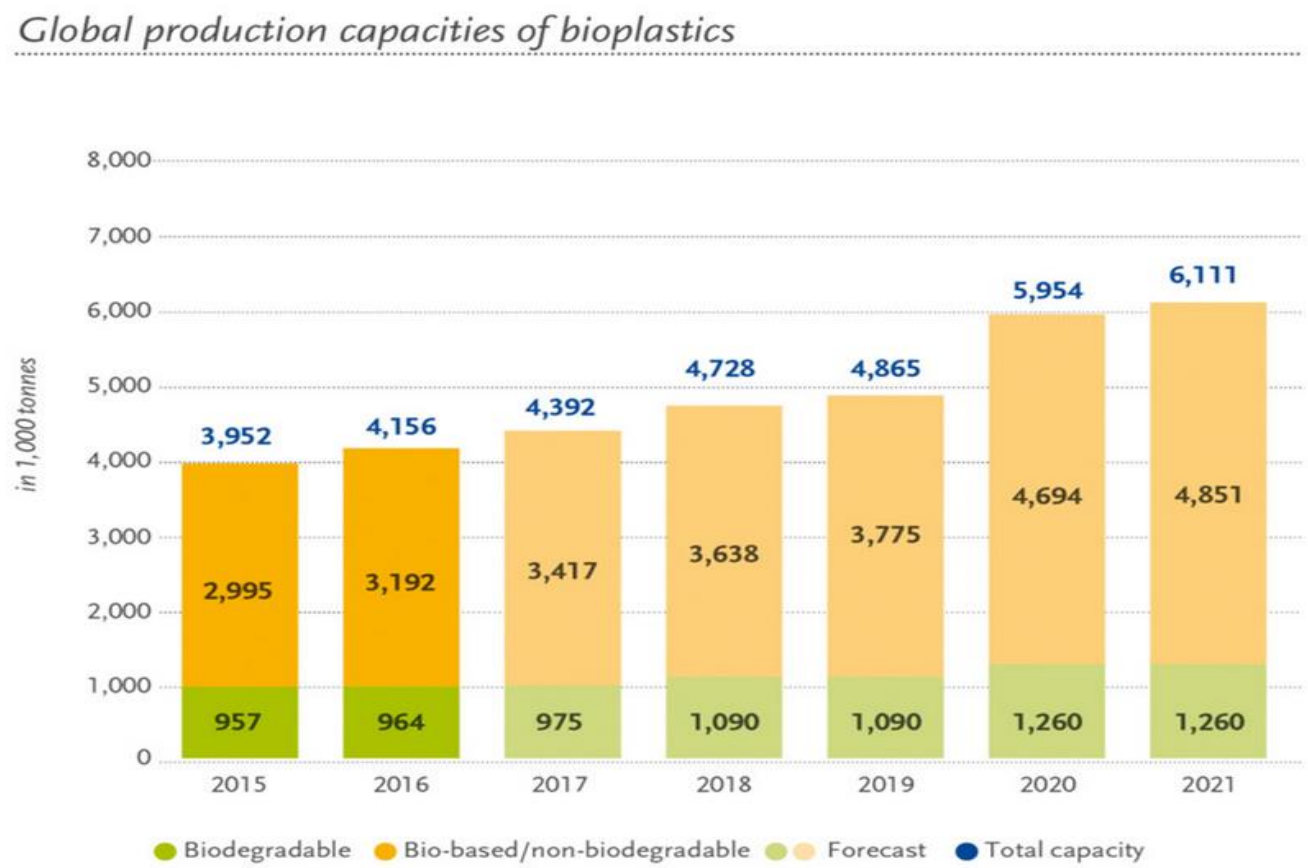
	Öljypohjainen (Oil-based)	Biopohjainen (Bio-based)
Hajoava (Degradable)	**Hajoavat muovit** Degradable Plastics Incl. **PBS,bioPET**	**Biohajoavat muovit** Biodegradable Plastics **PLA,PHA,..... Blends**
Ei-hajoava (Non-degradable)	**Synteettiset muovit** Synthetic(Petroleum based) Plastics	**Uusiutuvista raaka-aineista ”Vihreä PO”** Biogenic Plant-based Green PO

Source:VTT

How much oil we have still?



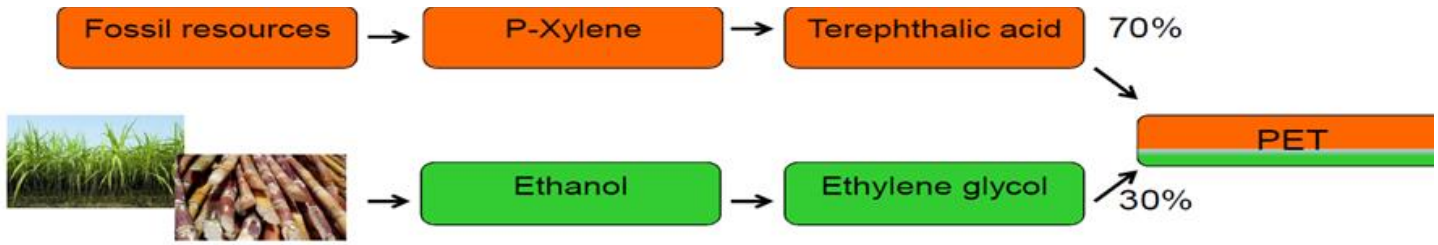
Note; Bio based vs. biodegradable



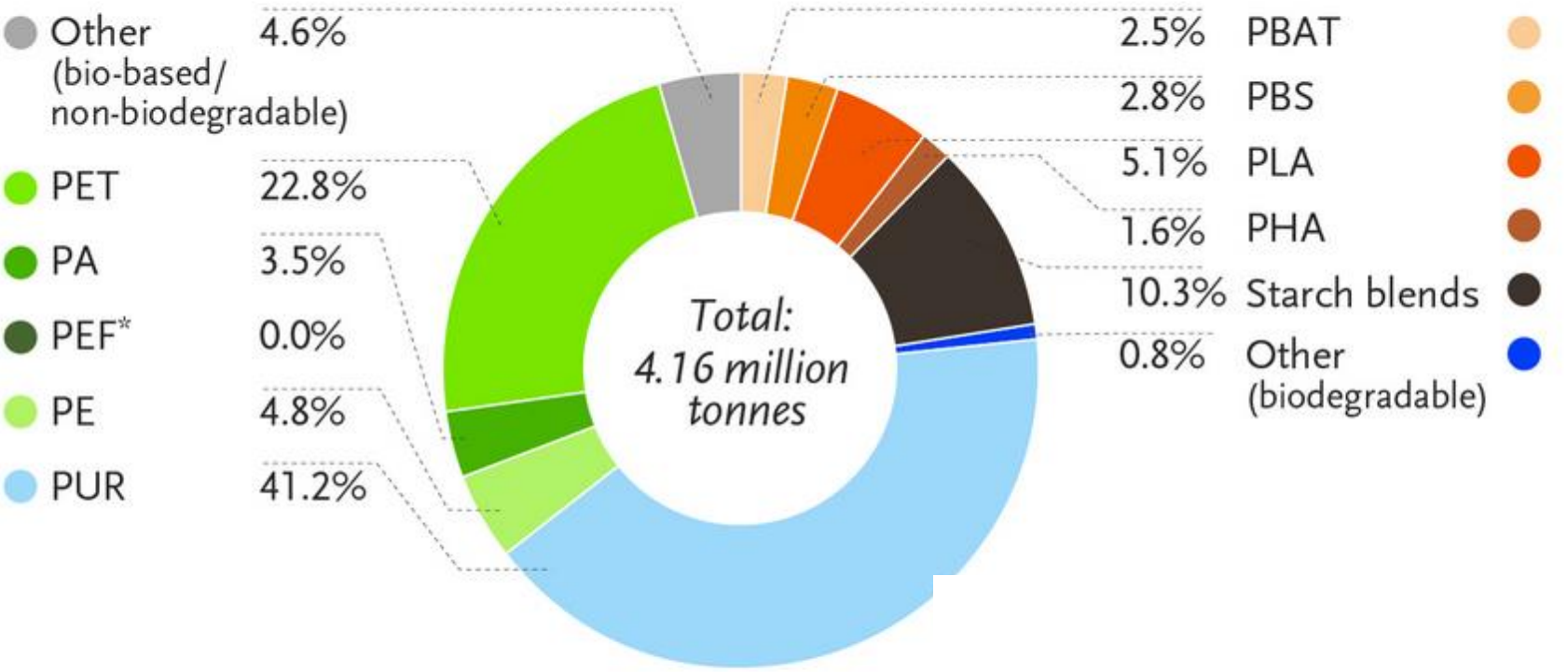
european bioplastics

plantbottle™
up to 30% plant-based
100% recyclable bottle
redesigned plastic, recyclable as ever.

Bio-based PET



Global production capacities of bioplastics 2016 (by material type)



european bioplastics

Bio-based/non-biodegradable 76.8%

Biodegradable 23.2%

polyethylene furanoate (PEF).

*PEF is currently in development and predicted to be available in commercial scale in 2020.

Green PE from Brasil (Braskem)

Valio is the first company to sell Tetra Pak's 100% renewable carton

(foodproduction daily 14.1.2015)


Pakkaus 1/2016

Amergrip on sokeriruoko-valmisteinen Minigrip

FINALLY ORGANIC!

"Green PE"

Petcurean, a family-owned Canadian company that creates premium-quality food recipes for dogs and cats is launching GATHER, a new line of pet food crafted from certified, organic, non-GMO, and sustainably sourced ingredients that will be packaged in flexible packaging made from **sugarcane-based polyethylene**. The project is a partnership between Petcurean, **Braskem,** and **Peel Plastics.**

After many years of intense product development and increasing consumer demand, the Swedish juice company Brämhults is proud to announce the launch of their freshly squeezed high quality organic juices. All juices are shipped to customers in bottles made from Braskem's Green PE, supplied by FKuR, and produced by Scandinavian Packaging. This provides a complete solution for consumers who appreciate organic freshness and environmental responsibility.

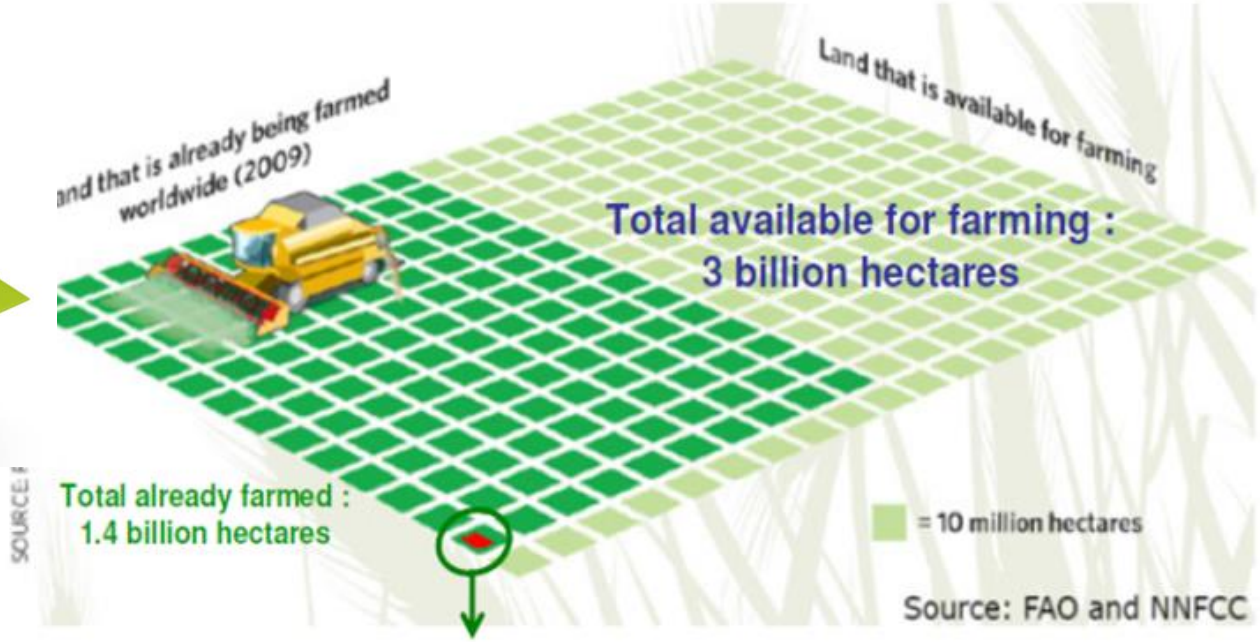
Brämhults is located in Borås, just outside of Gothenburg, and in its facilities juice is squeezed 5 days a week, based upon customer orders. All juices are shipped to customers within 24 hours from being squeezed. In other words, there is no inventory of already produced products! Because at Brämhults, we simply believe fresh juice has the best taste!

Plant-based bioplastics do not take food from us!

Ennuste 2020:

➡ **Projection 2020 :** 3.5 Million ton worlwide

1 Million hectares (0.07% of the land already farmed)



In 2020 : about 1/10th of this surface needed for plant-based plastics

Tests and marks are big business!
Most terrble is: ”marine degradable”

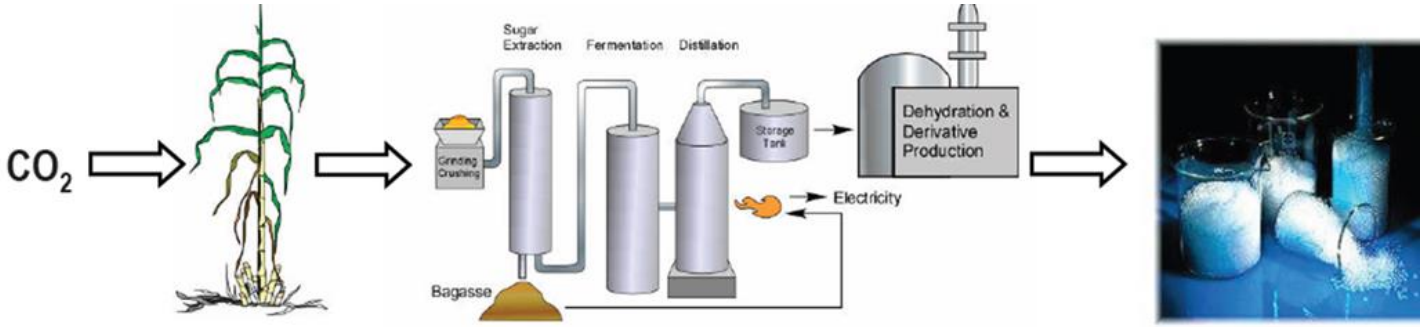
8C084/8C085

8C083

No.299/No.300

Vinçotte OK compost EN 13432: 2000

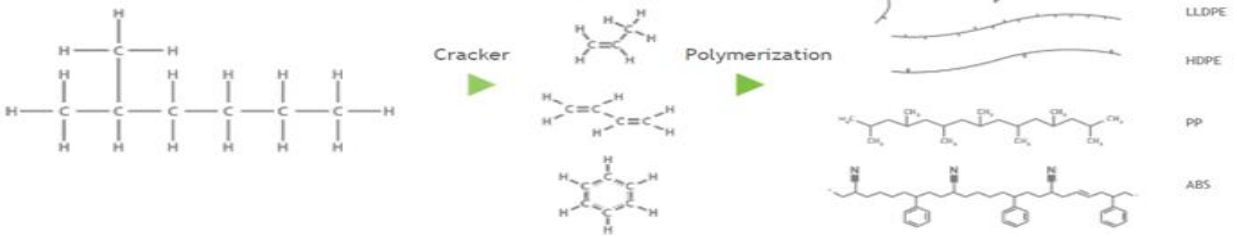
There are many ways to produce plastic from renewable raw materials



$$\text{“}CH_2O\text{”} \xrightarrow{\text{fermentation}} CH_3CH_2OH + CO_2 \xrightarrow[\text{dehydration}]{\text{catalytic}} CH_2{=}CH_2 + H_2O \longrightarrow \text{Derivatives}$$

Hydrotreated Vegetable Oil NESTE

NESTE
waste fats



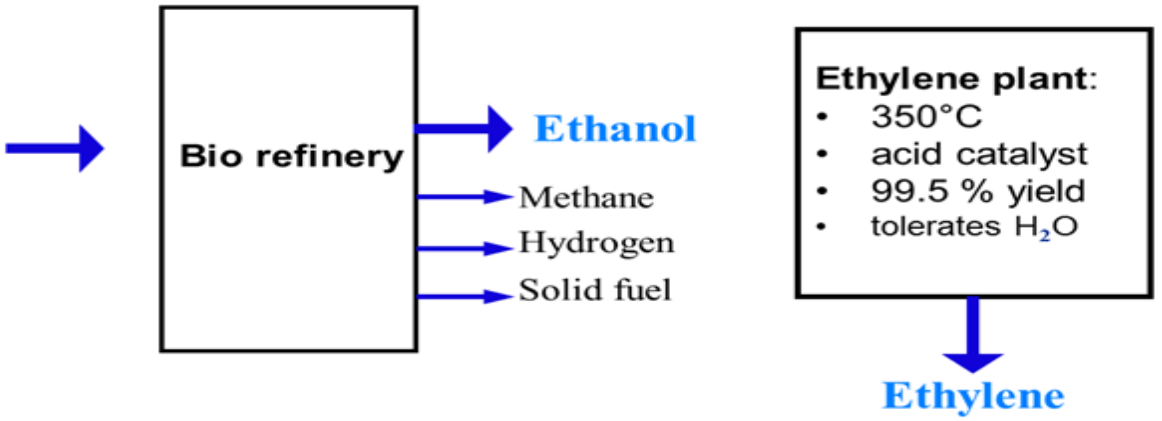
Wheat
Corn

Agro waste

Paper waste

Wood Residues

Forest residues



Greenwashing: Misuse of EU composting standard EN 13432

(***EI TYKKÄÄ NÄISTÄ)***

European Bioplastics (EUBP) has noticed increasing malpractice by producers of fragmentation additives for conventional plastics referring to the European standard for industrial composting, EN 13432, when marketing their products.

Yet such products do not fulfil the requirements of the EU norm for industrial composting of plastic products.

Consequently, European Bioplastics considers this a severe case of greenwashing.

impact of oxo-degradable plastics on the environment?

Polyethylene, polypropylene and polystyrene that contain **Poly-Bi®** as biodegradable, in line with **ISO 14855** for aerobic biodegradability, **ISO 15985** for anaerobic biodegradability,**ISO 14853** for biodegradability in an aqueous system, and **ASTM D6691-09** for the biodegradability in marine environment.

= ei oxo-additive vaan lisäys tekee muovista **"enzyme-mediated palstic**". Todetaan massan häviämisenä ei CO2- konversiona

Small carbon foot print and the world will be saved

(Pieni tai negatiivinen hiilijalanjälki ja“ Maailma pelastuu”)

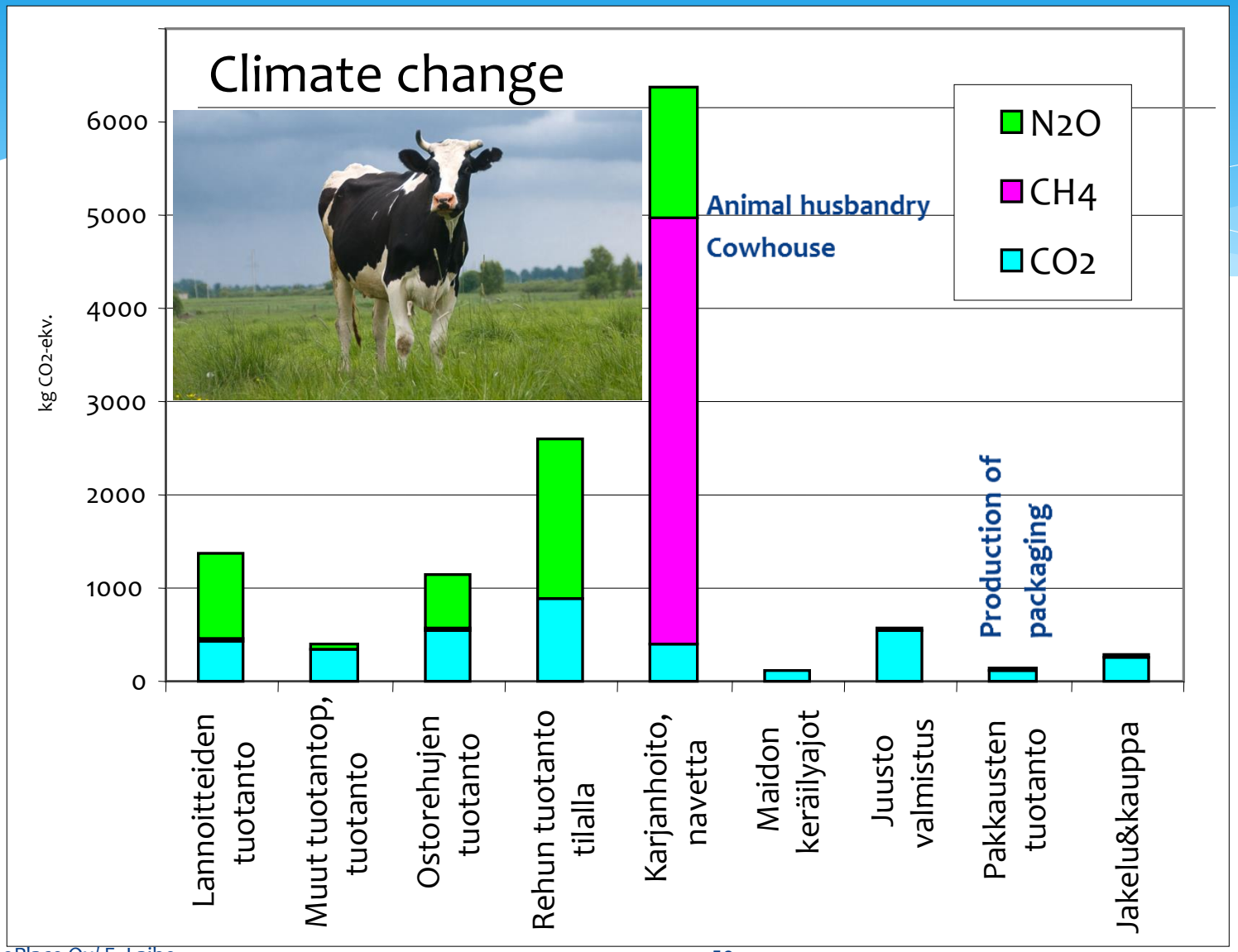
- **Food waste is the single largest contributor to GHG emission****

*** Study from the Stockholm Environmental Institute*

© The Coca-Cola Company

Emmental Sinileima cheese 1 000 kg sold packages (a' 350 g)

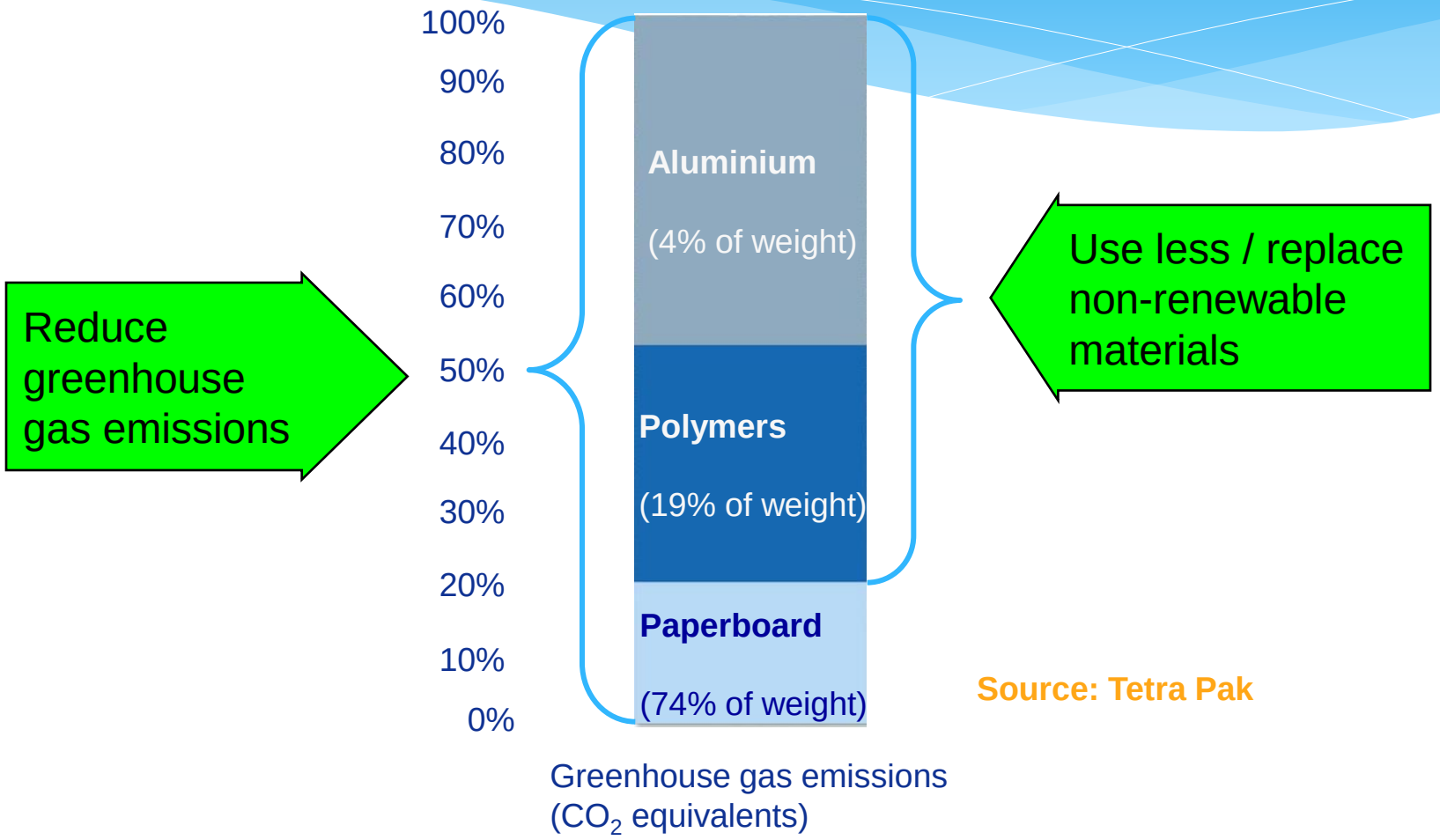
(source : Juha-Matti Katajajuuri et al, MTT, Foodchain tutkimus)



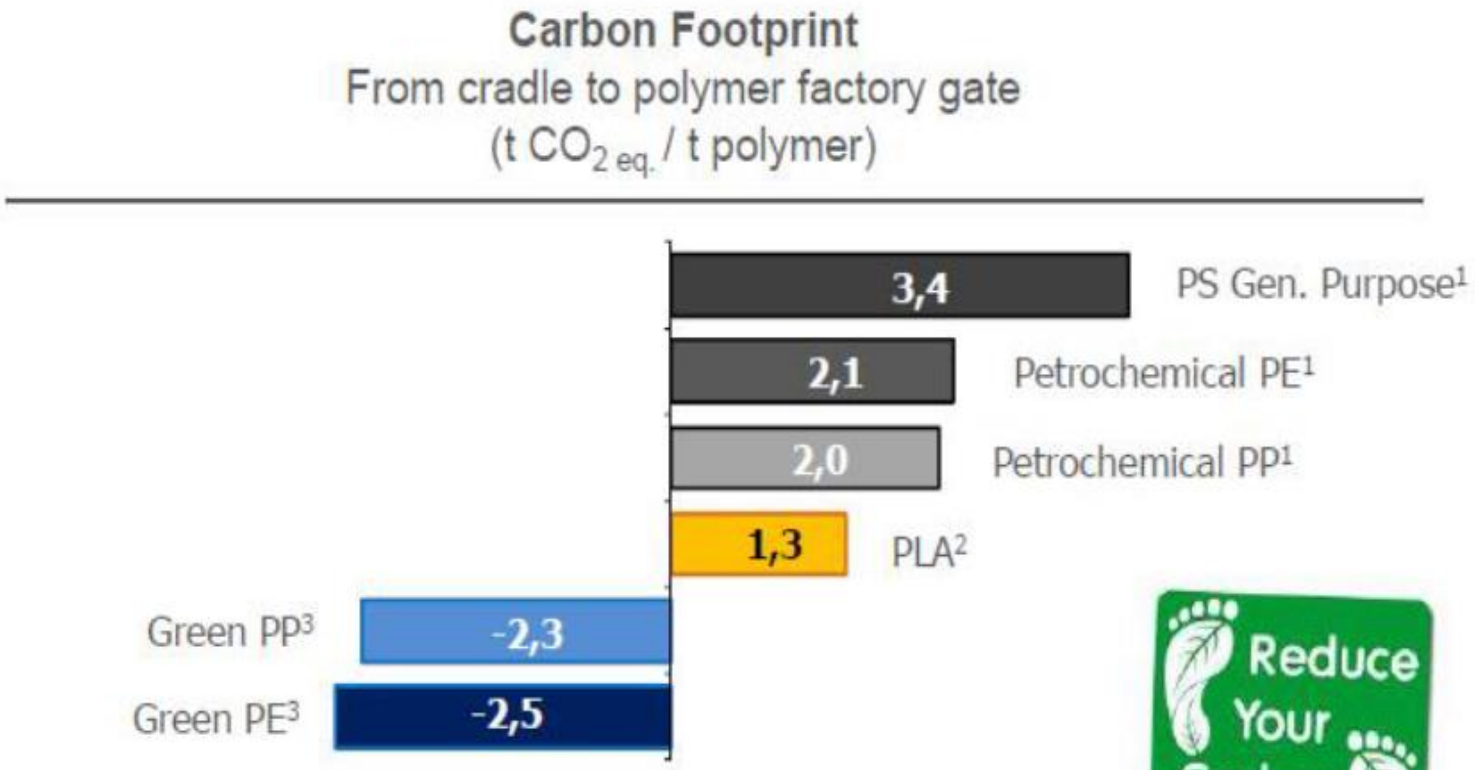
→ 1 kg cheese – 60 km car driving CO_2

Greenhouse gas emissions (CO_2 equivalents)

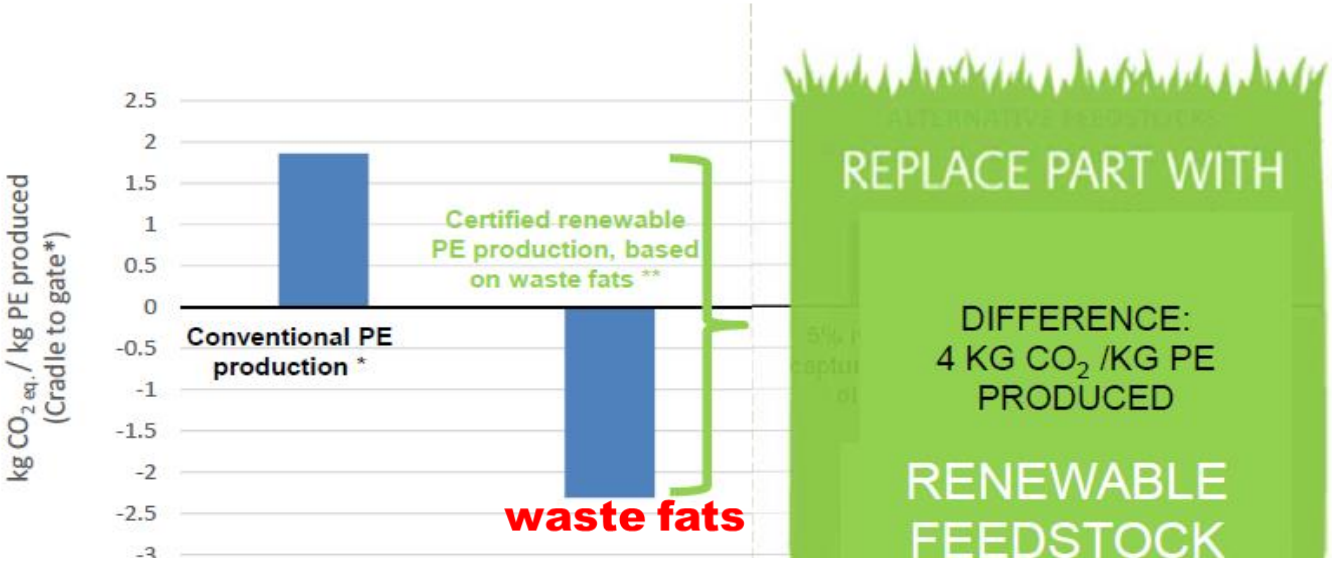
Base materials produced for Tetra Pak



Green PE/PP have negative carbon footprints



Carbon footprint /renewable PE



SUMMARY

- Industry is busy finding sustainable alternatives to reduce fossil usage
- Use of Certified renewable PE and PP:
  - Gives reduction in fossil depletion potential by up to 84%
  - Gives 4kg CO_2 saving for each kg of used renewable PE product in the market
  - Is not in competition to the food chain
  - Does not require modification in production processes downstream
- The concept of mass balance is verified by ISCC+

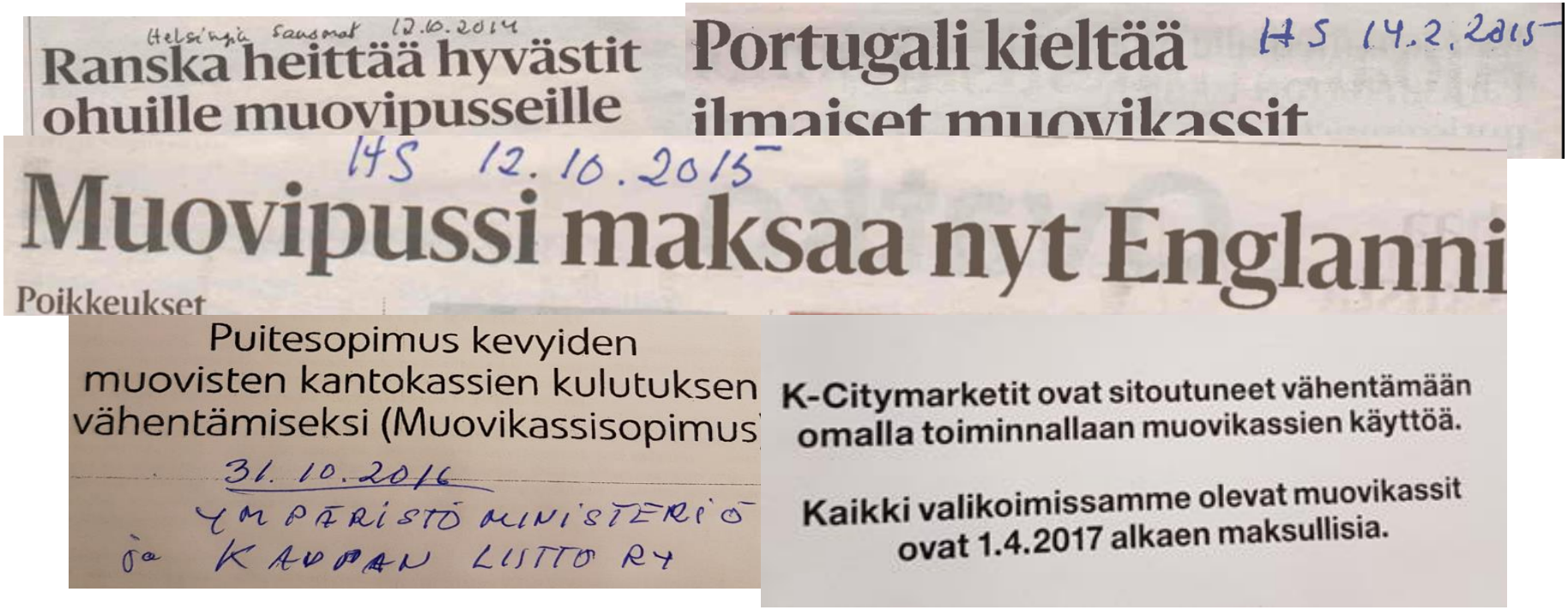
Innovative food packaging extends shelf life, reduces footprint ,August 18, 2016 Food Packaging Daily

Plastic shopping bag- environmental spoiler?

Muovinen ostoskassi- ympäristön pilaaja ?

Representatives of European Union (EU) member states hammered out a deal last Friday to reduce consumption of lightweight plastic bags to 40 bags a year by 2025.

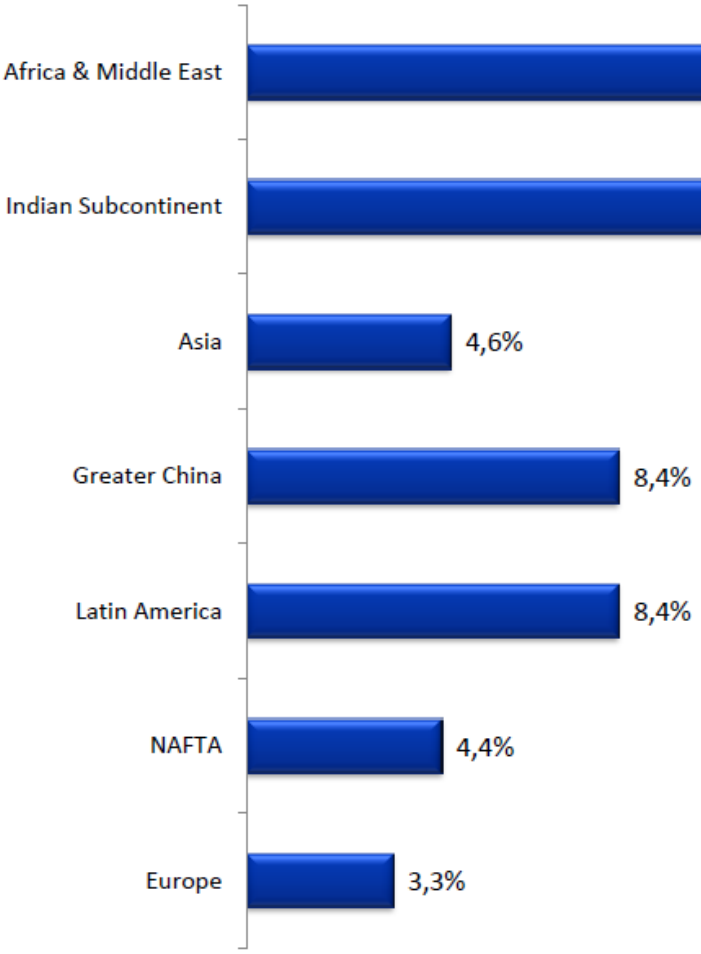
National governments will have to either reduce average lightweight plastic bags consumption to 90 bags per person per year by 2019 and 40 by 2025 or ensure that, by 2018, all bags are charged for. A second unanimous vote was needed because the original agreement had been opposed by the European Commission, the EU's executive.



Dilemma: Market growth is there where has less waste management !

Market Trend

Barrier films growth over the last 5 years



Source: AMI Consulting

Packaging technology in Asia

Unfortunately plastic packaging can be seen like this

What are microplastics?

--Cosmetics Europe: They are synthetic non-biodegradable and durable plastic particles size under five mm (5 mm). Microplastics come to sea for instance from **cosmetics and plastic fibers from clothes**

--**Microplastics from peel palm and toothpaste** finally end up to water systems causing problems to people and animals. ” **How to avoid microplastics”?**

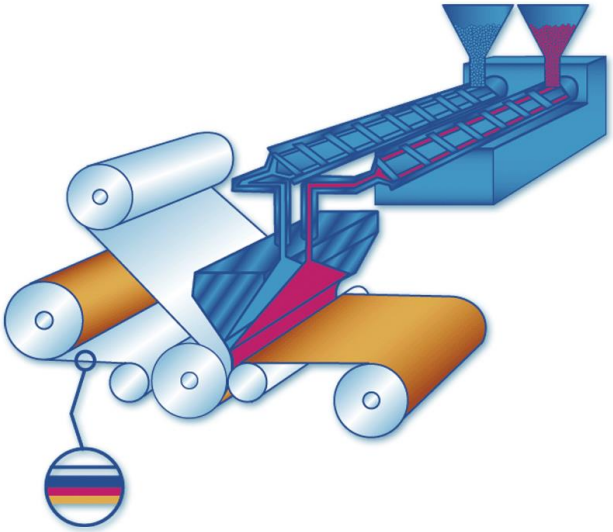
--**The study from Norway: The motoring is greatest origin for microplastics.**

Thousand tons of microplastics **from cars’ wheels and from asphalt surfaces** are released and finally go to sea

the truth... About Plastic Bags

Despite the facts, plastic bags have gotten a bad rap. Here's the truth about your plastic bags and why they are the right choice for the environment, your wallet and your community.

Plastic opposition causes that packaging try to hidden necessary plastics? – Plastic vs. paper/paperboard



Liquid packaging contains min. 14% of PE-coating

No mentioned : But "Recyclable, renewable wood fibres, small carbon footprint " has been printed

Purpose? :Consumer believes that " no plastic"

“Vuoden 2010 muoviteko”-palkinto

“Soon plastic packaging disappear--
sauces in the future in paperboard packages”

Coating of PET 40 g/m² needed

Hyvästi
muovipakkauksille

entistä ympäristöystävällisemmin. Eikä ole
haitaksi, jos pakkaukset ovat vielä muka-
van näköisiäkin. Uskalla kokeilla
jotain erilaista!

Muovi jäämässä syrjään - makkaratkin tulevaisuudessa kartonkipakkauksissa

Ei mainintaa, että kartongissa on 40g/m2 päällystetty PET

Finnish company making a scientific breakthrough-solution for the world wide take away-cups' waste problem (without plastic coating ?)

Suomalainen yritys tekemässä tieteellisen läpimurron – ratkaisee take away -mukien maailmanlaajuisen ongelman

Kotkamillsin kehittämän kertakäyttöisen kahvikupin idea on siinä, ettei kartonkia tarvitse päällystää muovilla. 19.10.2016 (Yle uutiset)

With our high-performance barrier papers, we offer an environmentally friendly alternative to plastic packaging.

ESITELMÄ: "Ympäristöystävälliset **barrierdispersiopäällystetyt** kuitupohjaiset pakkausmateriaalit": DI Harri Mutanen,Paperex Colombier Oy

"Dispersion coating"

Totally wrong arguments to have the funding and a strange application

Kauppalehti

An article 3.4.2017

- **Suomalainen pakkausinnovaatio keräsi miljoonarahoituksen. (Sulapac)**
- **(Finnish packaging innovation collected million funding. Also TEKES with)**
- Suvi Haimin ja Laura Kyllösen **Sulapac** haluaa vapauttaa maailman pakkausmuovin ongelmasta.
- **(Sulapac likes to release the world from plastic packaging waste problems)**

"Wood composite made by "Woodcast-gypsum material is competing in the same market than its comparable contaminant; plastic":
say the innovators.
The first test application is cosmetic cream.
(Is cosmetic packaging causing marine problems?)
(Best cosmetic can is PET, most likely bio-PET ?)

No matter, what is packaging material!
One spoiled slice of ham and all environmental packaging aspects have disappeared!

My Opinion !

The public, consumers, media and the commerce

give directions for plastic raw materials and plastic usage and development in packaging

more than facts.

And the result is: "Plastic opposition and plastic shame"

Next some public columns and publications:

Column in main Finnish news paper

Muovitettu maailma

HS 22.6.2015

Muovi tappaa massoittain merieläimiä ja lintuja. Muovijäte sisältää vaarallisia ympäristömyrkkyjä. Arktisista jäistä on mitattu jopa merivesiä korkeampia pitoisuuksia mikrokoon muovia.

Ravintoketju tuo muovin takaisin omaan elimistöömme: sitä löytyy jopa hunajasta.

Miten tähän vastaa elintarviketeollisuus? Pakkaamalla valmis-

Johanna Sinisalo

MUOVISEN virvoitusjuomapullon voi palauttaa kauppaan ja saada siitä pantin. Einespakkausta, jossa on vähintään yhtä paljon muoviraaka-ainetta, ei voi.

Suomessa 60 prosenttia muovijätteestä on erilaisia pakkauksia. Vain harvalla paikkakunnalla niitä voi kierrättää energianlähteeksi tai raaka-aineeksi.

Ehkä tähän muovin pakkosyöttöön tulee muutos ensi

The message from the column is:

Sustainable packaging is; **NO PLASTIC**

- Toxic plastic waste in sea **kills fishes and birds**
- **Even juices** are packaged into **plastic bottles**
- **Too strong packaging** for instance to chicken, meat , meatballs etc.
- In Finland from **plastic waste 60 % comes from packaging.**

(The Research in Pirkanmaa (2016) showed that from all mix waste 16,5% is plastic and from packaging waste , 50% is plastic packaging)

- **We are forced to use plastic packaging without need.**
- 2009 Finnish Metsähallitus (Forest organization) made a research and the result was: **two from three selected for yogurt packaging paperboard not plastic**
- Coffee, ice-cream and drinks **are sold easily in papercups**
- Paper is based on renewable raw materials
- Plastics only if it is necessary!

PÄÄKIRJOITUS

HS 29. huhtikuuta 2017

LASSE RANTANEN

9

Muovista tulee helposti ikuista jätettä.

VASTAAVA PÄÄTOIMITTAJA
KAIUS NIEMI
PÄÄTOIMITTAJA
ANTERO MUKKA
TOIMITUSPÄÄLLIKÖT
ARI KINNARI
KIMMO PIETINEN

Meri ei saa olla kaatopaikka

B 12 HELSINGIN SANOMAT TORSTAINA 4.5.2017

MIELIPIDE

Yhteystiedot: PL 71, 00089 Sanoma
hs.mielipide@hs.fi
+358 9 1221 ma-pe 12.00–12.30

Jäte: Tarvitaanko hedelmä- ja vihannesosastoilla lainkaan muovipusseja?

Muovittomista valinnoista on tehtävä helppoja

Plastic becomes easily everlasting waste

Sea cannot be dump

No plastic alternatives should be easier to have

Recycling -and everything is okay

Recycling is one of the most accessible and easily understood ***aspects of sustainability,*** and most consumers have experience with the process, but have little connection to where their recycled items go; storied plastics provide the opportunity for brands to be that connection.

Plastics waste treatment in EU28+2

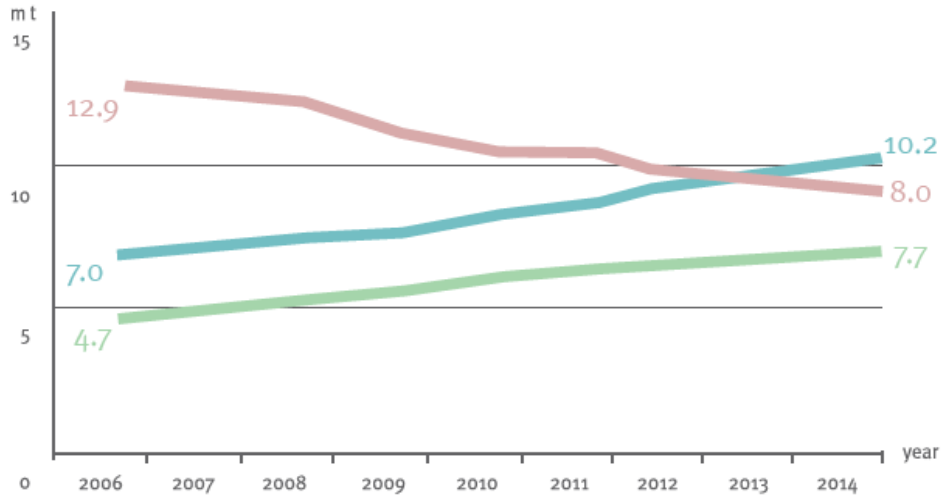
Recycling + energy recovery 69,2 %

Recycling 29.7%

Energy recovery 39.5%

Landfill 30.8%

2006-2014 waste treatment evolution:



2006-2014 waste treatment evolution:

+ 64 % Recycling

+ 46 % Energy recovery

- 38 % Landfill

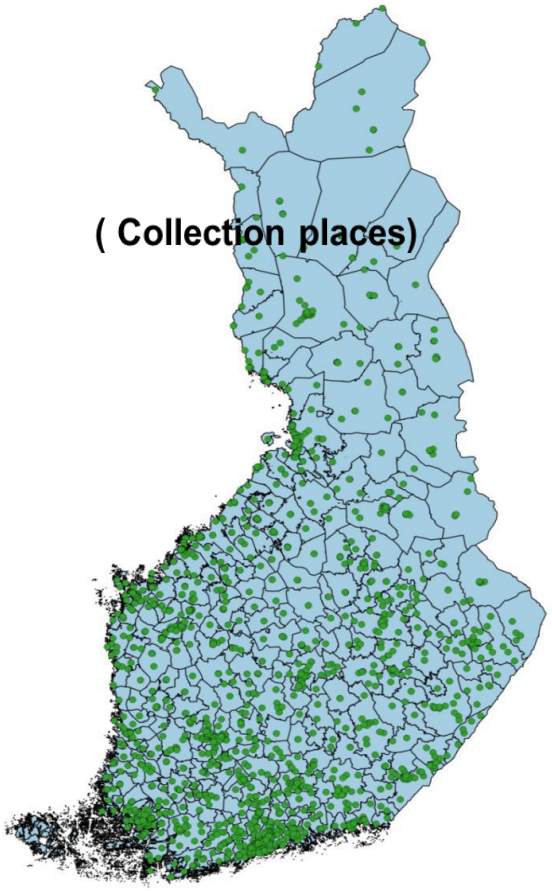
The annual average of post-consumer plastics waste generation from 2006 to 2014 is 25 million tonnes

*Based on in-put quantities into recycling facilities.

In Finland consumer packaging's' recycling responsibility lies on the producer organizations of different packaging types .

Pakkaustyyppi (Type)	Keruupisteet Jan-2017 (Collection places)	Minimiaatimus (Min.request)
Kartonkipakkaus(Carton)	***1 876***	***1 850***
Lasipakkaus (Glass)	1 902	1 850
Metallipakkaus (Metal)	1 902	1 850
Muovipakkaus (Plastic packaging)	***535***	***500***

- Plastic packaging still mainly incineration
- Wrapping plastics from industry and commerce ar recycled well
- Post Consumer recycling (PCR) started 2016
- 535 collection points (Reguest 500)
- Fortum's (Ekokem) plastic factory in Riihimäki ref recycled PE.PP and PET granulates.
- First shiopping bags available (Essi- bag)
- Liquid paperboard packaging was first recycling organisation in Finlanf 1994.
- Today Carton takes care of that.



EhoPlace Oy

PRAMIA GRINDING AND WASHING

1 000 000 bottles/ day

PET bottle grinding and washing line

77 %
Goes to flake production

66 %
Pramia rPET
Clear FL

11 %
Pramia rPET
Mixed color FL

Pramia PO FL 8%
(crushed caps)

Rotation moulding
Injection moulding

Pramia rPET fine 5%
(fine PET)

Fiber industry

Pramia rPET 2%
Mixed color with alu

Fiber industry

EVERYTHING WE DO IS 100% RECYCLED PET

Plastic bottles recycling are well organized in Finalnd

My sustainable recycling behaviour

I need , I like and I use plastic or plastic coated packaging

Stand-up pouches

Retortable bags

Vacuum packaging

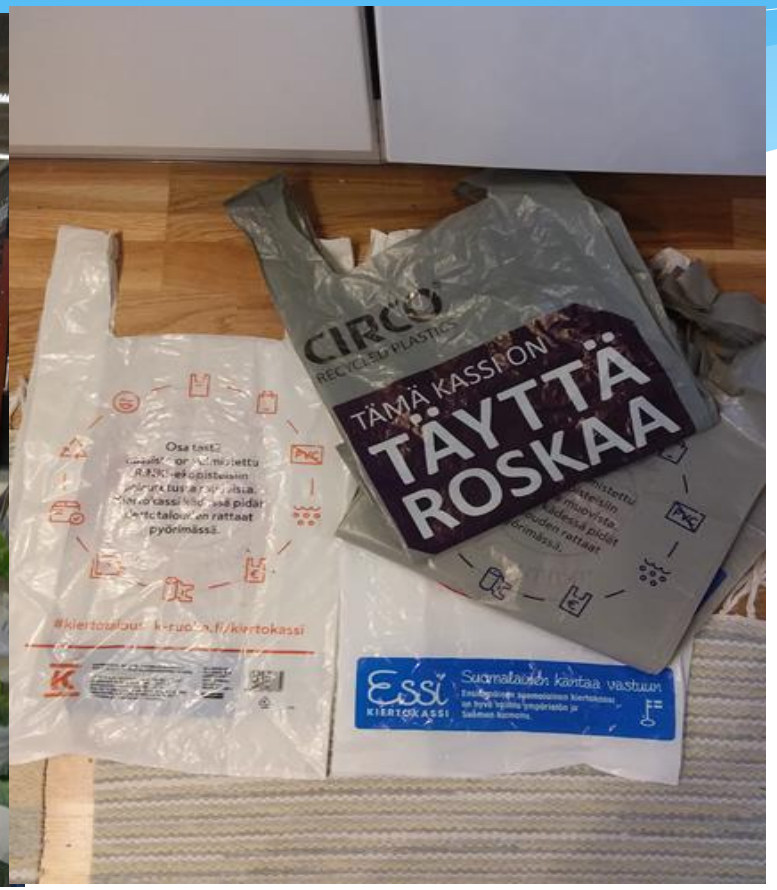
Flow packs

Thermoforming film

Stand-up pouches

Lidding film

When shopping, I use plastic bags and select myself them I take recycled bag from the cash desk and use it then as a waste bag.



This recycling system we have

BIOWASTE	is turned into soil
PAPER	is recycled into e.g. news-paper, kitchen and toilet paper
CARD-BOARD	is recycled into paper roll cores, book binding card-board and paper sacks and bags
MIXED WASTE	ends up in the waste-to-energy plant and is used for electricity and district heat production

RÖÖRI
JÄTKÄSAARI

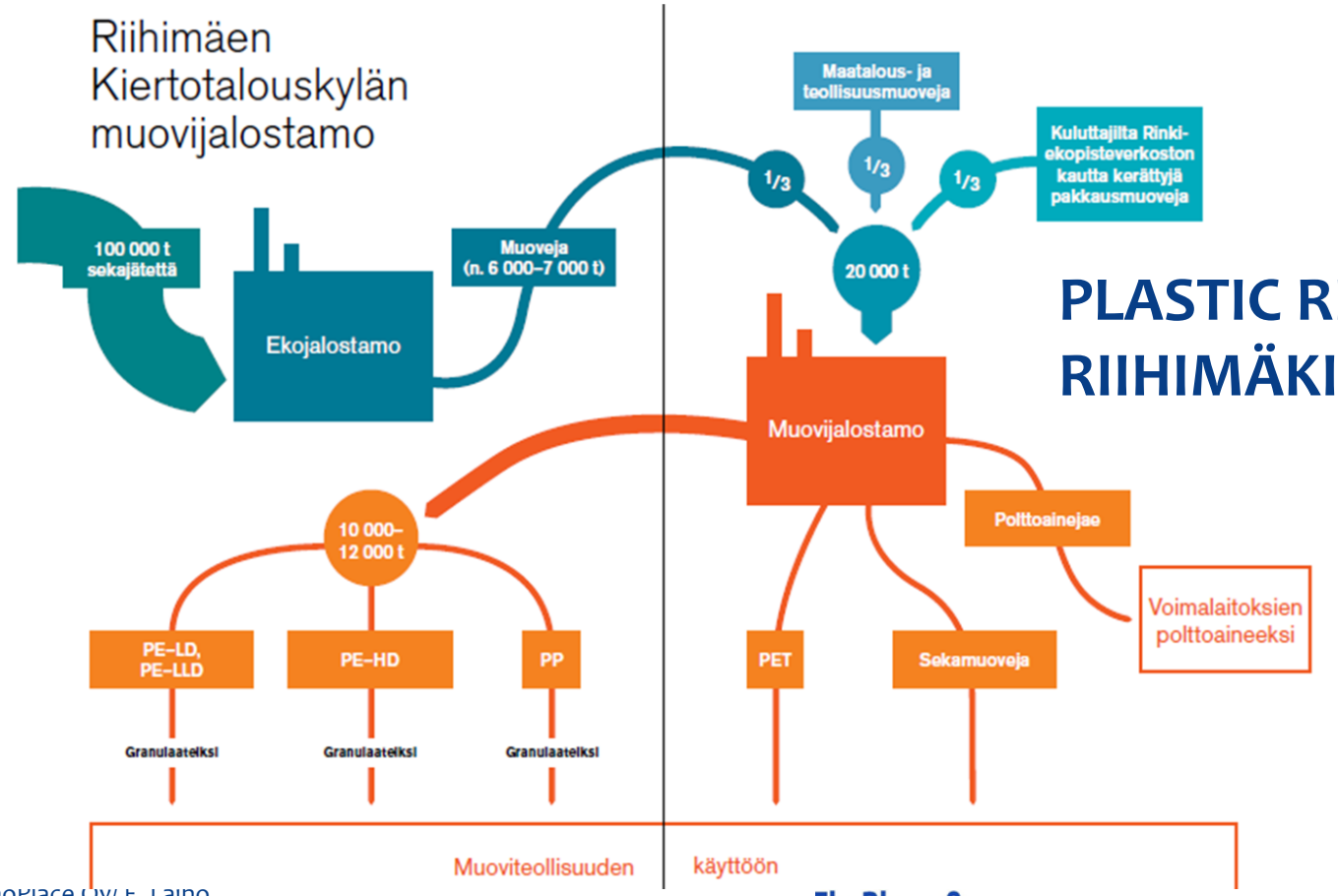
“*Mixed Waste*” ends up in the waste-to-energy plant and is used for electricity and district heat production. Extrusion coated *liquid packaging and paper cups* go to cardboard tubes . Fibres are used for chipboard or core production. Rejects are incinerated.

Rinki is coordinating and reporting packaging recycling in Finland

RINKI

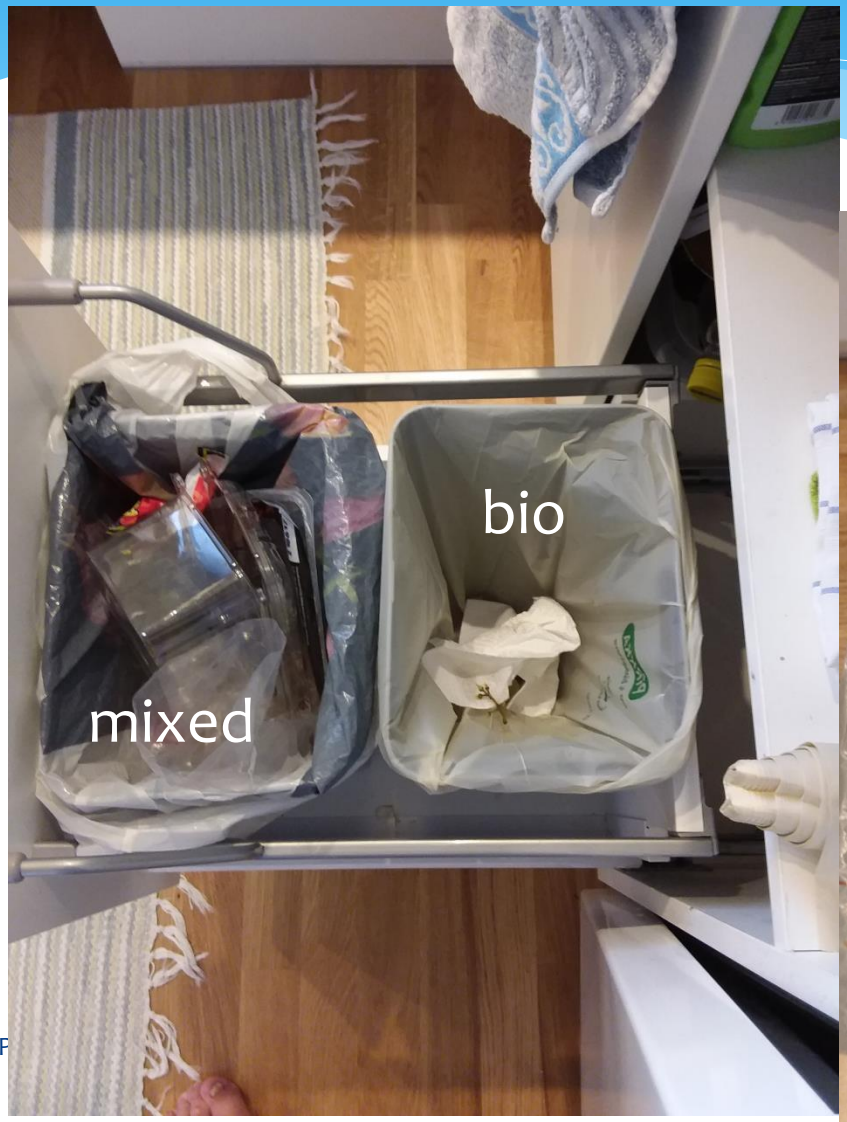
Source: Pasi Järvinen : " Muovien kierrätys ja hyötykäyttö Suomessa", Muovifakta 2016

Muovijalostamo Riihimäella



PLASTIC REFINERY IN RIIHIMÄKI (Fortum)

I have two waste boxes at home: mixed and bio
There is close separate containers for glass, big mixed waste and for special waste.



Plastic packaging
goes to shopping bag
inside mixed waste box

Conclusions= challenges for sustainability in plastics and plastic packaging

EhoPlace Oy/Erkki Laiho/ June 2017

1. **We need consumers‘ education and information . Without plastics reduction of food waste is almost impossible. Plastics in packaging should be finally accepted.**
2. **By education, marine littering can be reduced, but we need also research and development for eliminating so called “microplastics” in the sea.**
3. **Instead of feelings and resumptions , openness and realities are needed for marketing . The secrecy of plastic does not help any more..**
4. **“Bio, carbon foot print, sustainability” etc. . we need real calculations and clarifications instead of commercial tricks.**
5. **Common sense for recycling. Reuse of recycled plastics needs development. In not dense populated country like Finland energy recovery (incineration) is often the best alternative.**
6. **The main purposes of packaging cannot be forgotten when competing between different packaging materials. When using combinations and multilayer solutions where plastics are with, “greenest” results can be achieved.**

Active and intelligent packaging solutions

TUT Actinpack Summer School; June 12-16, 2017

Thank you!

Erkki Laiho/EhoPlace Oy