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# Packaging Sustainability and Food losses
# Madspild og bæredygtige emballager

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# Content

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- Food losses
- Packaging and food losses
- Packaging to prevent food losses
- Packaging and the environment
- Strategy for packaging sustainability
- Fibre-based packaging materials
- Coating of fibres
- Fibre bottles (Carlsberg)
- Other packaging formats

# Food losses 1

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- 1990's focus on packaging
- From 2010 new focus on food losses
  - One-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year
  - Food is lost or wasted throughout the supply chain, from initial agricultural production down to final household consumption
  - Food losses represent a waste of resources used in production such as land, water, energy and increasing the green gas emissions

(FAO, 2011)

# Food losses 2

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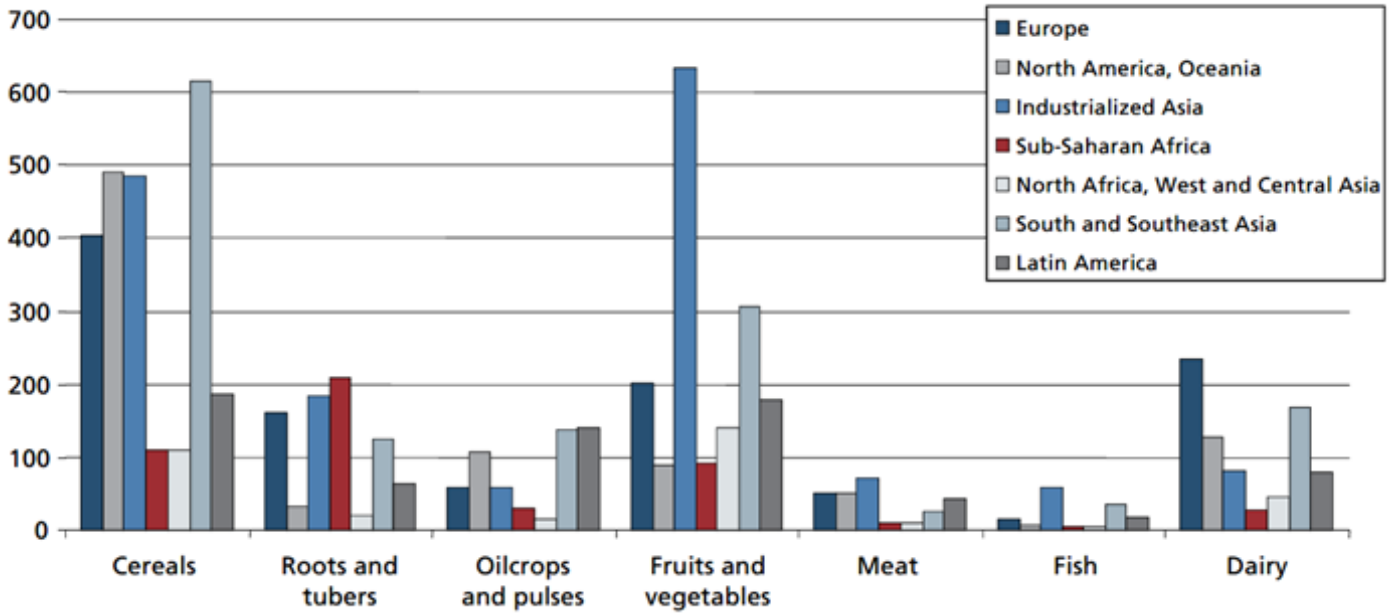


Food losses in regions and products (FAO 2011)

# Food losses 3

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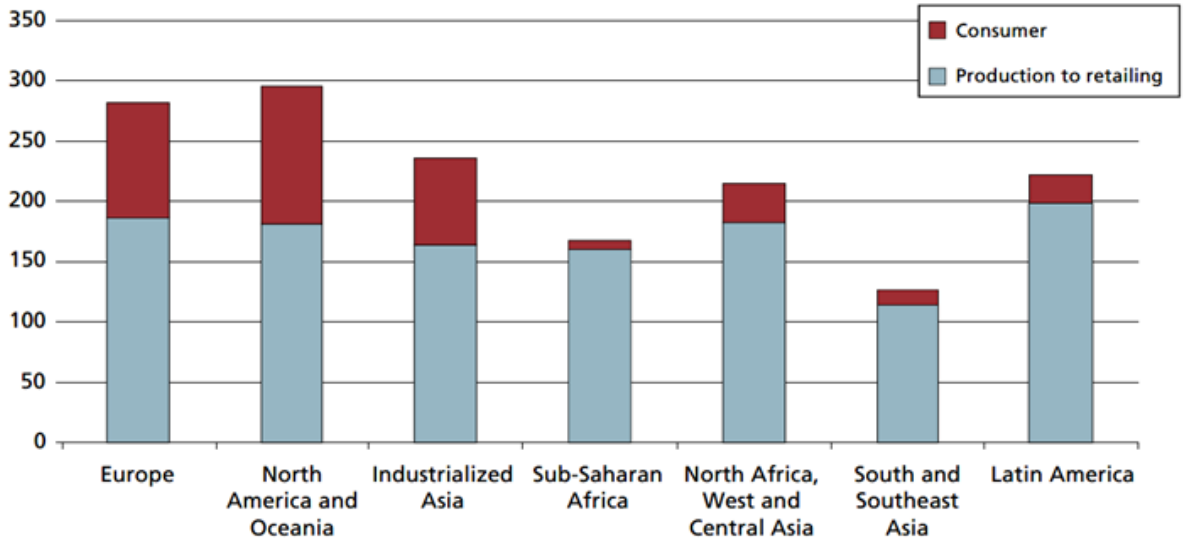


Food losses per capita in kg. per year (FAO 2011)

# Food losses 4

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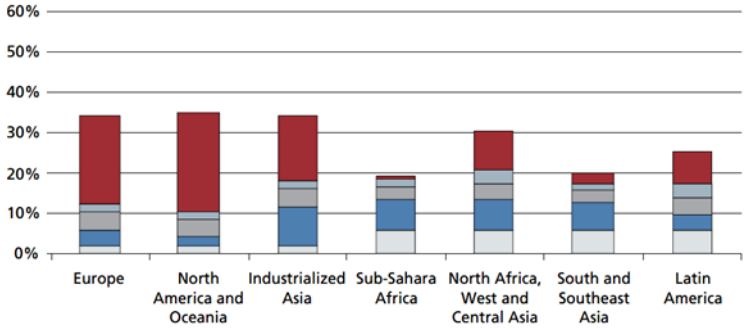


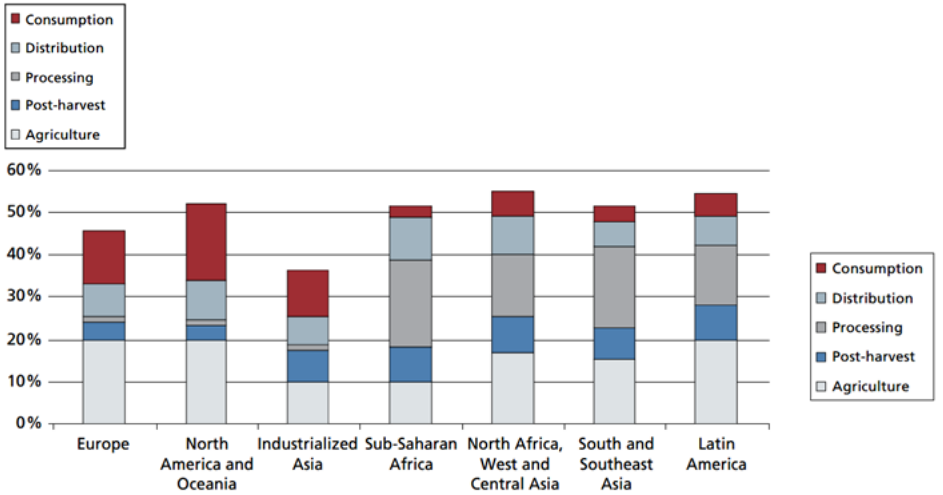


Cereals

Fruits and vegetables

Losses in percentage from initial production (FAO 2011)

# Food losses 5

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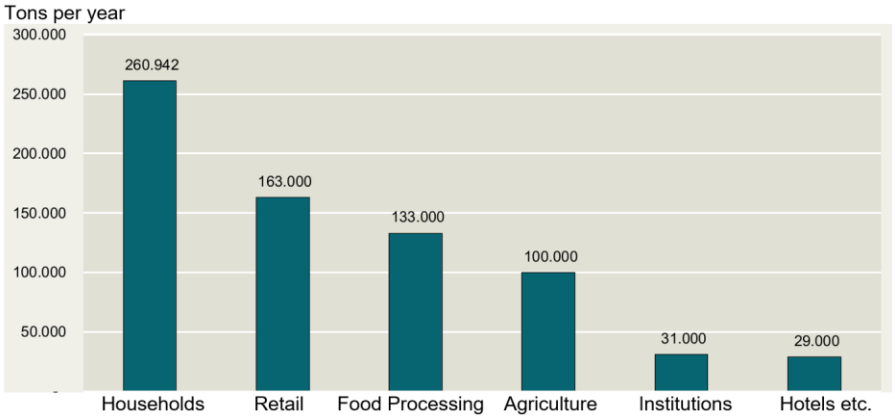
- Danish food losses




| Food losses top 10 in Denmark | % (weight) of total food losses |
|---|---|
| 1. Processed leftovers | 14% |
| 2. Vegetables - unprocessed | 13% |
| 3. Bread, cakes etc. | 12% |
| 4. Fruits | 9% |
| 5. Vegetables - processed | 8% |
| 6. Dairy products | 5% |
| 7. Meat - unprocessed | 4% |
| 8. Dry foods – candy, nuts, raisins etc. | 4% |
| 9. Frozen meat - unprocessed | 3% |
| 10. Bread with meat, butter etc. | 3% |

| Product | Losses at retailers[1] | Losses at consumers[1] | Calculation in million tons $CO_2$-eq[2] |
|---|---|---|---|
| Fruit and vegetables | 10% | 19% | 7,1 |
| Meat | 4% | 11% | 84,4 |
| Dairy | ½% | 7% | 7,3 |
| Cereals | 2% | 25% | 19,8 |
| Oil and fat | 1% | 4% | 2,4 |

# Packaging and food losses

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| | |
|---|---|
| Food production (agriculture + processing) | 80% |
| Distribution (transport + storage + retail) | 15% |
| Packaging | 5% |

- Or

| | |
|---|---|
| Food production (agriculture + processing) | 70% |
| Distribution + consumers | 30% |
| Packaging | < 1% |

- First conclusion:

**The environmental impact from packaging is marginal**

# Packaging prevent food losses 1

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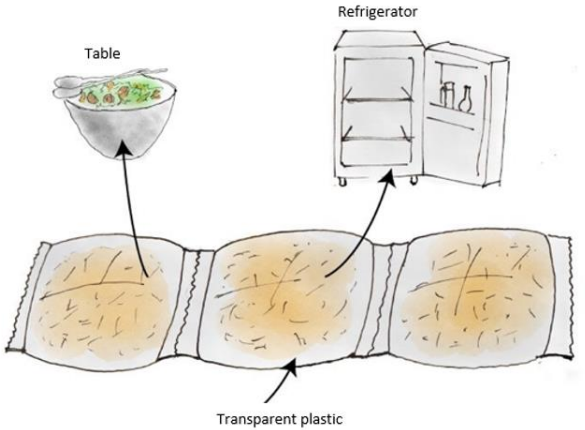
Packaging perform following tasks:

- Protect in the supply-chain from agriculture to consume
- Protect the food quality
- Increase shelf life
- Divide and protect in usable portions
- Be a tool in the final preparation of the meal
- Be able to store and prepare leftovers



# Packaging prevent food losses 2

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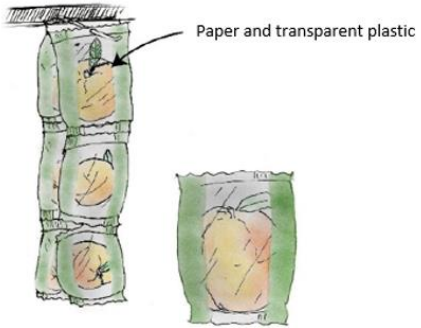


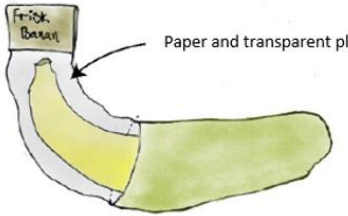


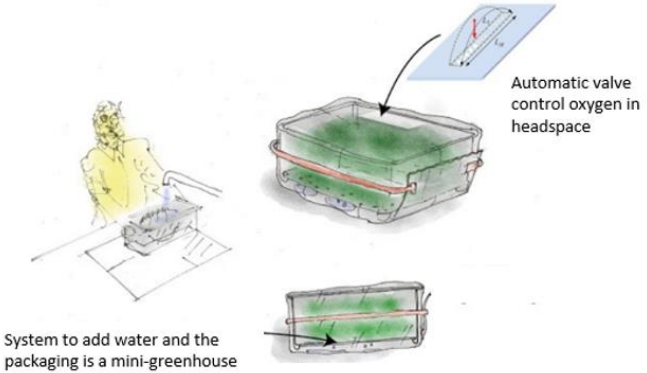


- Second conclusion

  **Packaging secure the food for consume – but not more.**

# Packaging and the environment 1

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- Packaging is a gift to the environment, BUT:

# Packaging and the environment 2

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- Polluting objects


# Packaging and the environment 3

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- Sources of the plastic in the oceans

# Strategy for packaging sustainability

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Priorities in packaging sustainability:

1. Optimize the packaging – but still prevent losses
2. Re-use of packaging
3. Recycling of packaging materials
4. (Chemical recycling)
5. Incineration with energy use
6. Composting – biodegradation
7. Landfill

Third conclusion

**Plastic packaging must be replaced with fibre packaging**

# Bio plastics?

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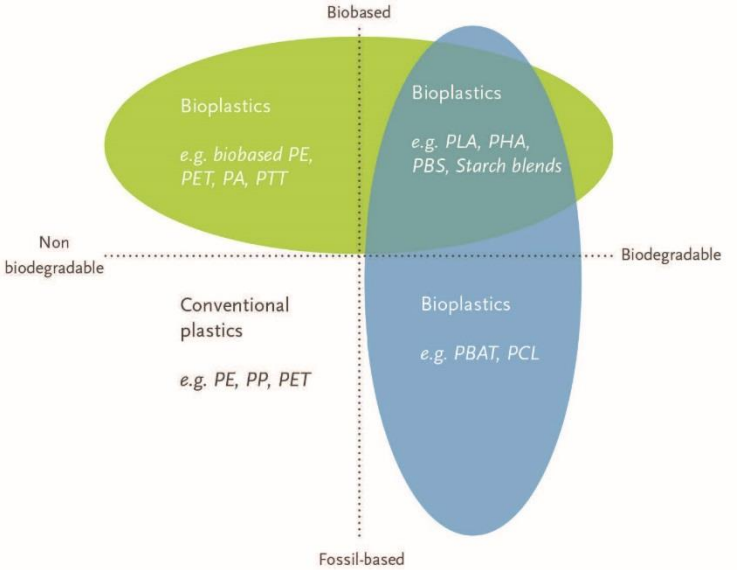


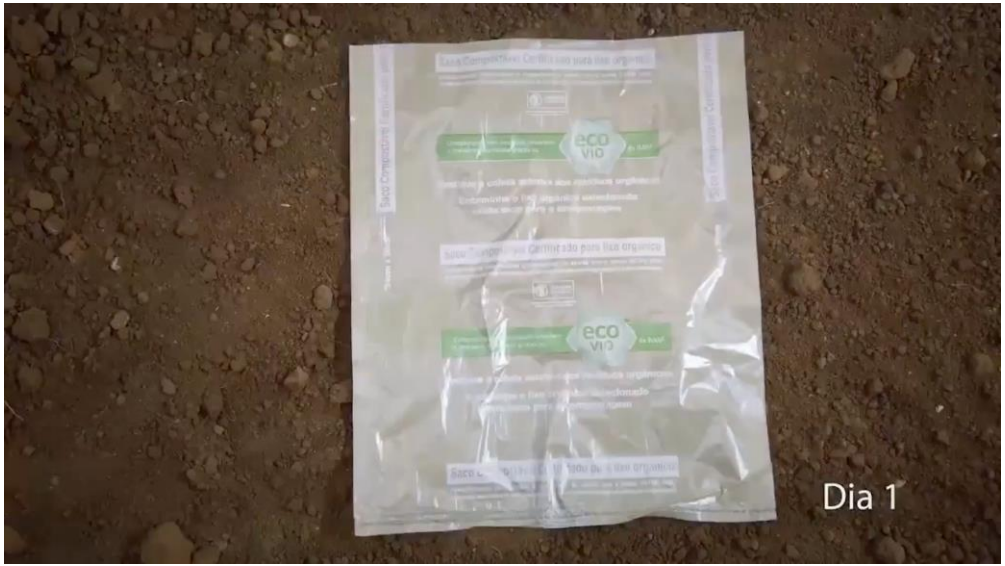

# Fibre-based packaging materials

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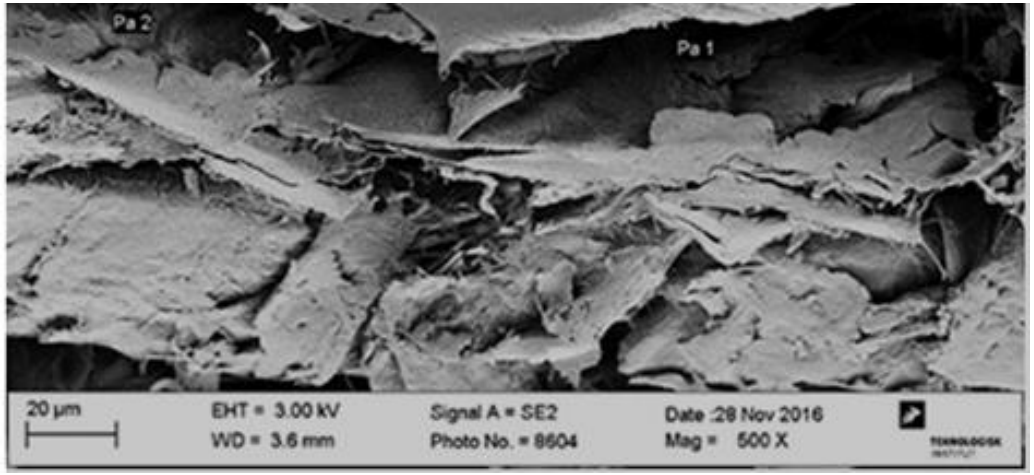
- Barriers is a challenge on fibre
- Protection against liquids, gasses is a requirement
- New materials must work in existing filling machines



# Coatings 1

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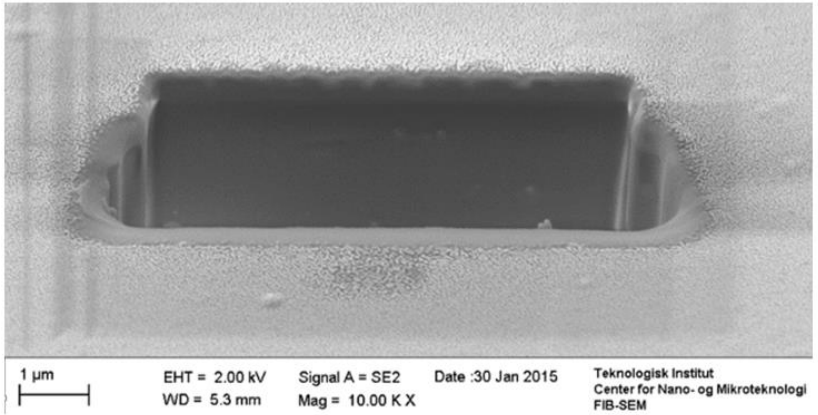
DTI use a double coating strategy

Nano-scale plasma coating top layer <0.01%

Micro-scale intermediate bio-coating 1-2%

Main component:
moulded fibre surface 98-99%



# Coatings 2

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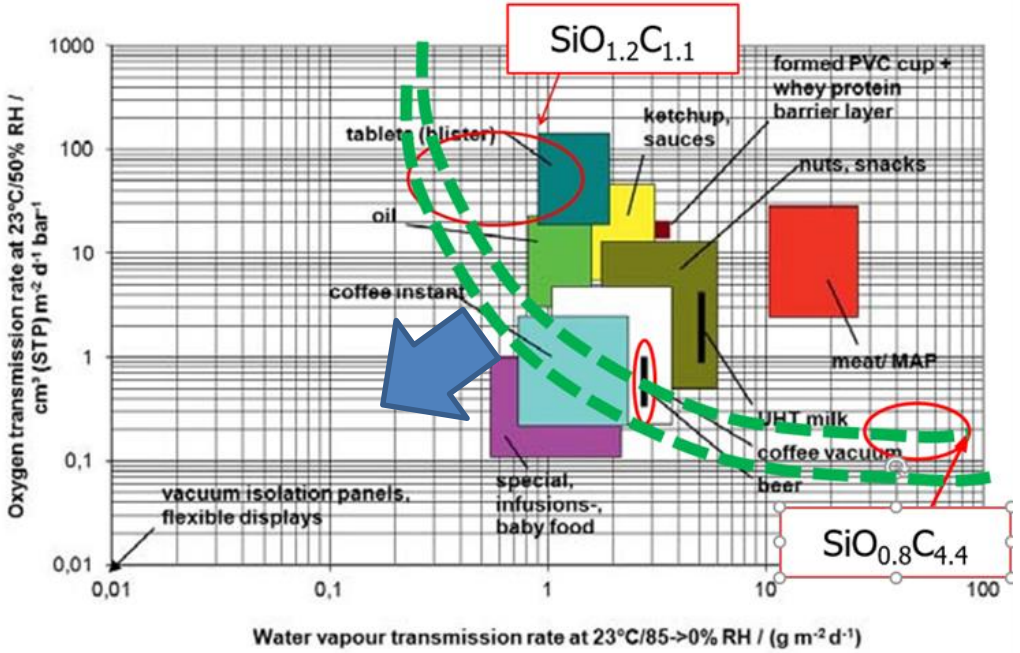
DTI barrier performance



# Fibre production 1

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## 2D

Flexibles and sheets

- R2R, lamination, cutting

## Open 3D

Trays, cups etc.

Moulding with moulds

## Closed 3D

Bottles, jars etc.



Alternative technologies

# Fibre production 2

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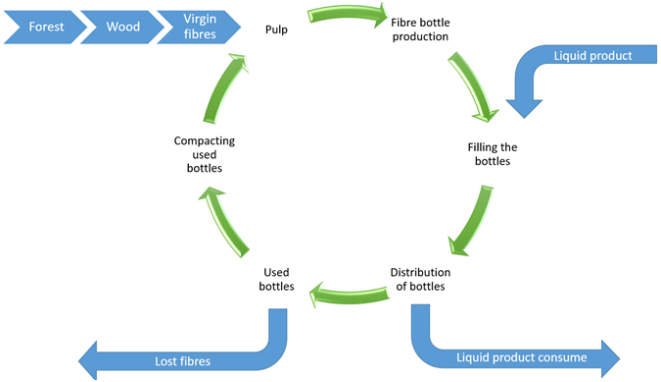
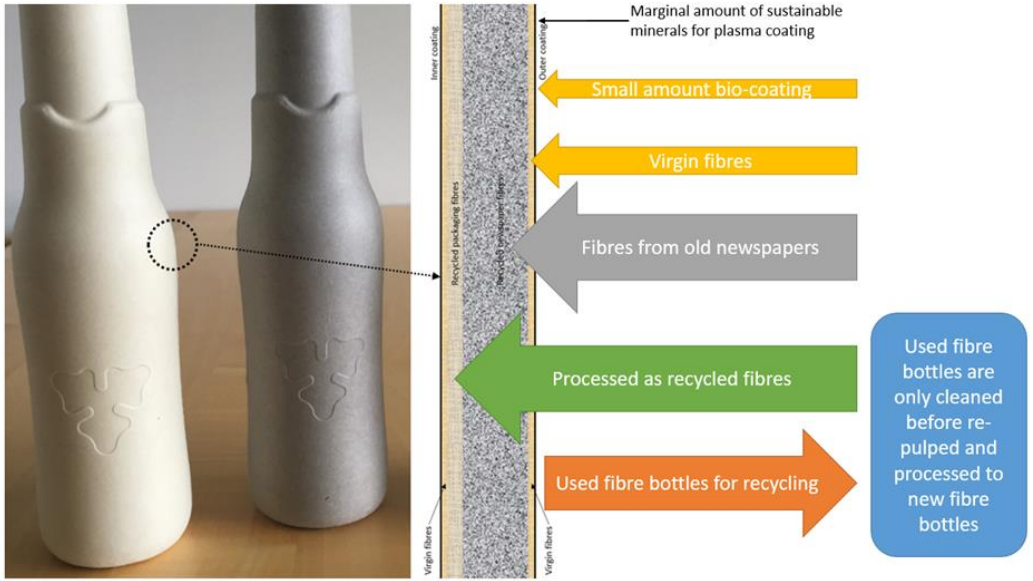
## Circular economy



# Fibre production 3

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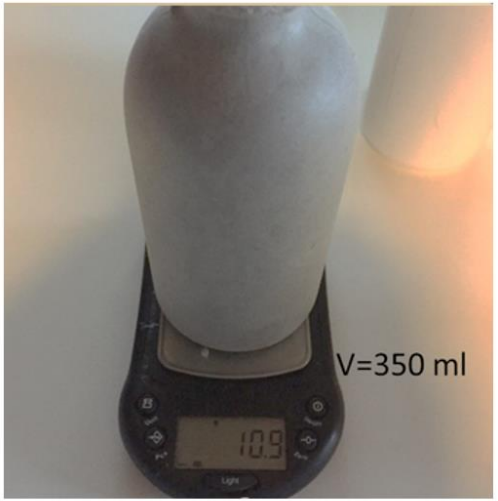
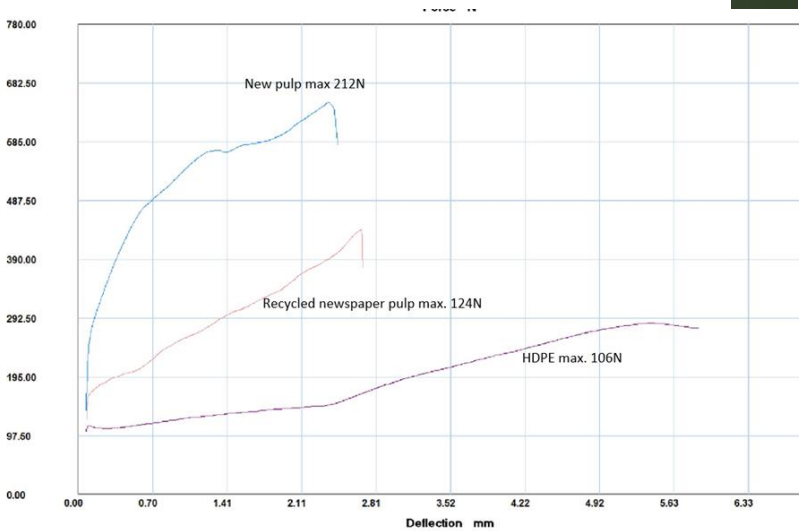
## Technical performance


PE bottle




Fibre bottle



# Fibre production 4

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## Business case

Variable costs for 330 ml. bottles:

- PE plastic: 0.038 €/bottle
- PET plastic: 0.018 €/bottle
- Virgin fibres: 0.009 €/bottle
- Recycled fibres: 0.006 €/bottle

| | Fibre bottles | PET bottles |
|---|---|---|
| Annual production capacity | 18 mill. | 7.6 mill. |
| Bottle production with support equipment | € 1.300.000,00 | € 400.000,00 |
| Inner coating equipment | € 1.000.000,00 | € - |
| Outer coating equipment | € 500.000,00 | € - |
| Total equipment investments | € 2.800.000,00 | € 400.000,00 |
| | | |
| Productivity | 70% | |
| Interest rate | 5% | |
| | | |
| Production costs | Costs per fibre bottle | Costs per PET bottle |
| Variable costs | € 0,0080 | € 0,0180 |
| Equipment costs | € 0,0228 | € 0,0771 |
| Total costs | € 0,0308 | € 0,0951 |

# Fibre bottles

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- First market introduction in 2018 by Carlsberg

**SUSTAINABLE INNOVATION**

We initiated the development of a **bio-based and biodegradable bottle** with EcoXpac, one of our partners in the Carlsberg Circular Community.


# Other packaging formats

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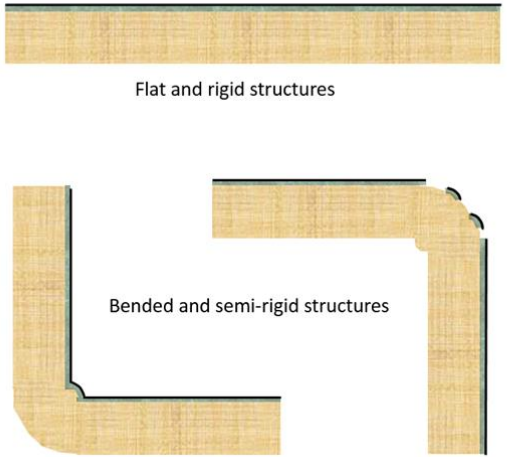


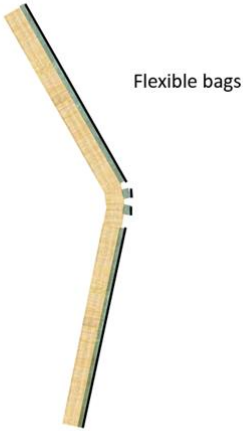


# Conclusions

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1. The environmental impact from packaging is marginal.
2. Use the packaging needed to secure the food for consume – but not more.
3. Plastic packaging must be replaced with fibre packaging
4. New packaging materials must work in existing filling machines.
5. The new composite coatings can upgrade all bio-packaging to meet most all product's needs.
6. More development must be done before fibers can replace plastic packaging.

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# Questions??

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