Final Conference - EcoPaperLoop Project

2nd December 2014 in Krakow, Poland

The future quality of paper for recycling and its impacts on paper sorting and paper making

Johannes Kappen, Constanze Seidemann - PTS

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Overview

- **Paper for Recycling: What will it look like in future?**
- **Any options?**
- **Sorting as one key to success**

PAPER FOR RECYCLING: WHAT WILL IT LOOK LIKE IN FUTURE??

Quality of Paper for Recycling?
Take a look at the paper products produced!

Consumer

Paper products

News
Magazines
Office
Folding boxes
Corrugated boxes
Compound
…

Waste management industry

Collected Paper for Recycling

Gradelist EN 643

Collection system
Sorting effort
Composition
No Paper componets
Printing in coverage
…

Paper industry

Secondary fibre stock

Value of fibre stock

Strength
Optical properties
Impurities
Dewaterability
Deinkability
…

02.12.2014

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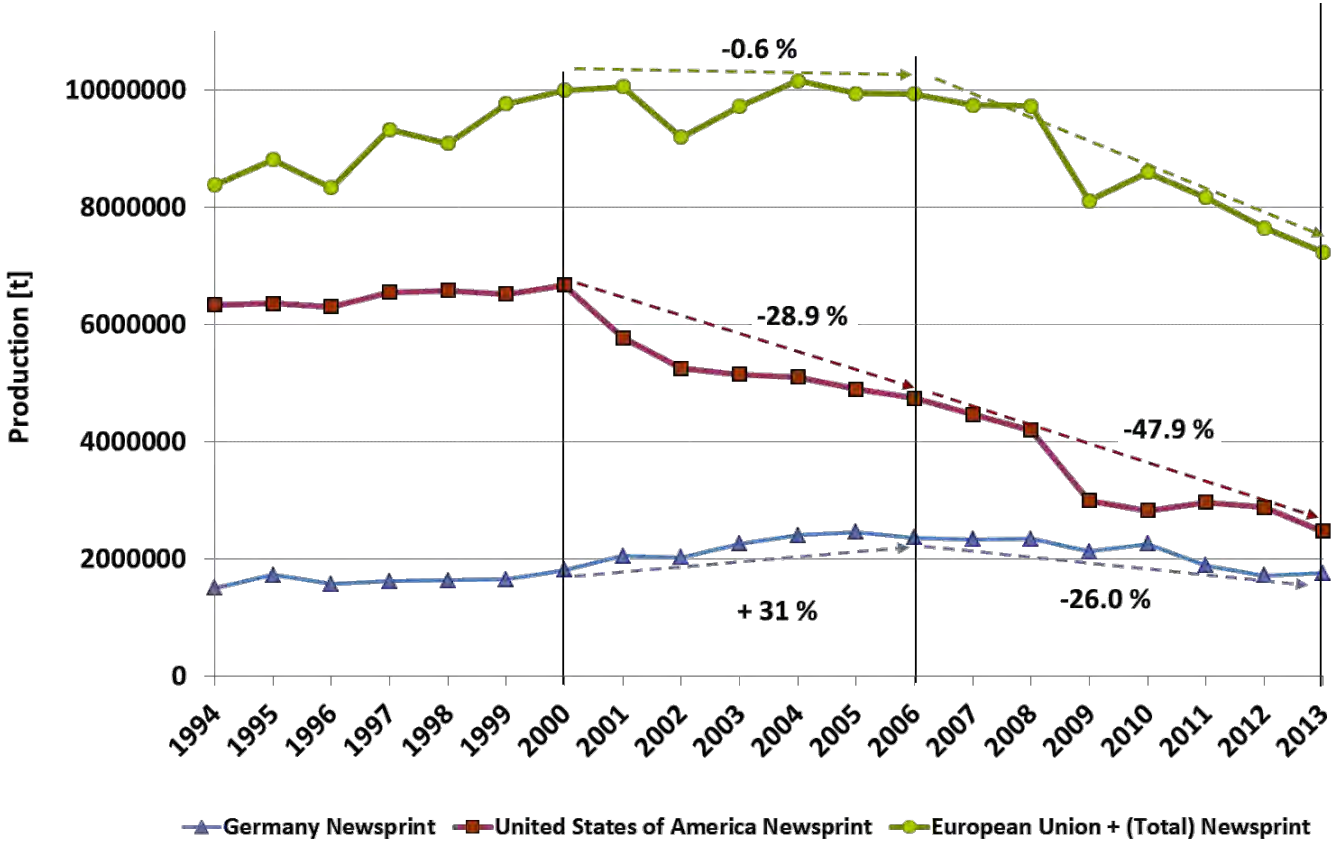
Consumption and Production of Newsprint

Consumption: USA: Reduction in newsprint from 1992 until 2011 by 54 %
Forecast USA. Down 47% from 2010 until 2020 (Source: Pulp and Printing Papers Forecast 2010–2020)

Forecast Europe: Down 56% from 2008 until 2020 (Source: The Future of Paper and Print in Europe 2008-2020)

Production does react:



Source: Data from http://faostat.fao.org, 12-10-14)

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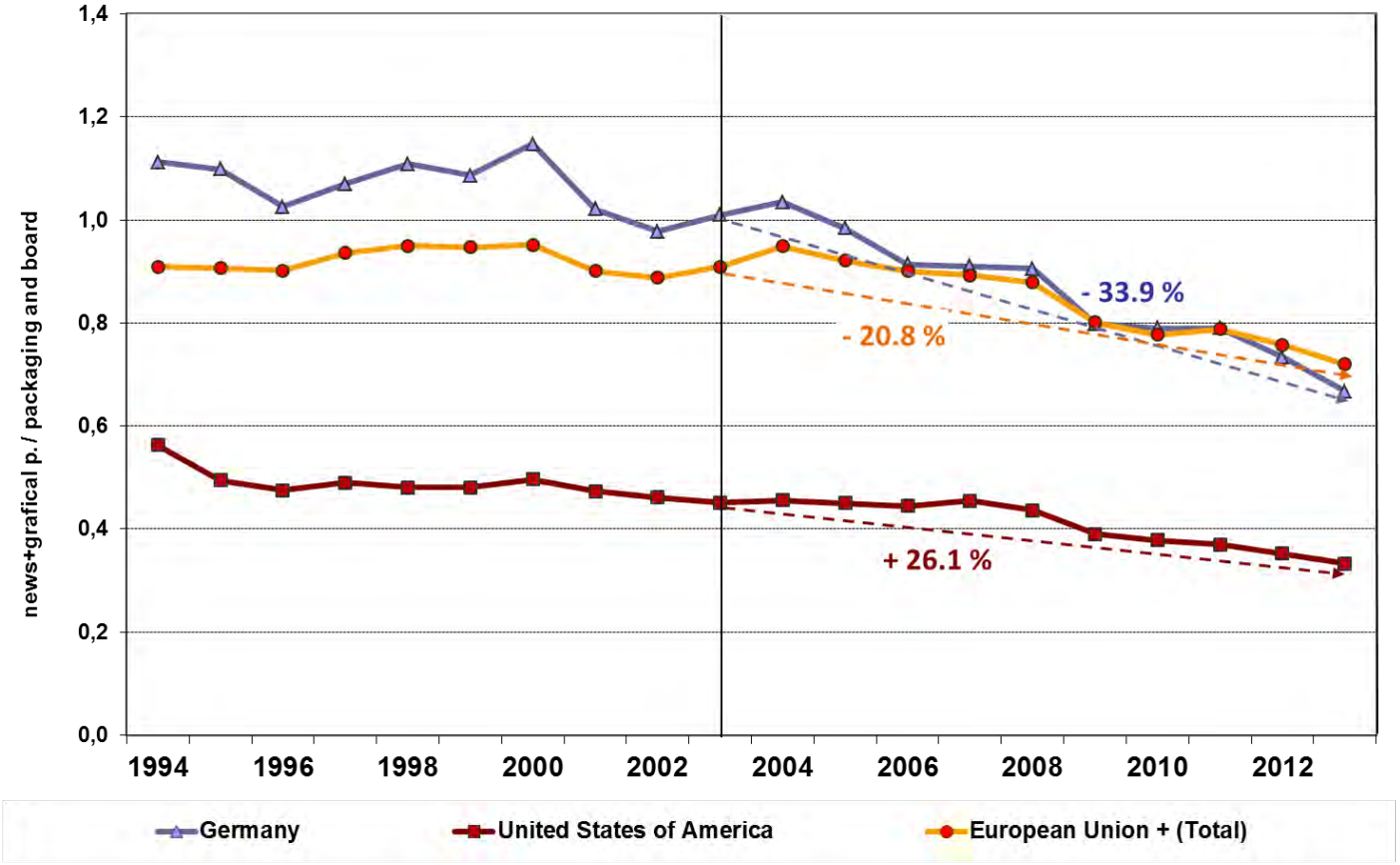
The structure of grades is undergoing significant change

Production of newsprint and graphical paper in relation to packaging an board significantly reduced during last 10 years.



Source: Calculated based on Data from http://faostat.fao.org, 12-10-14)

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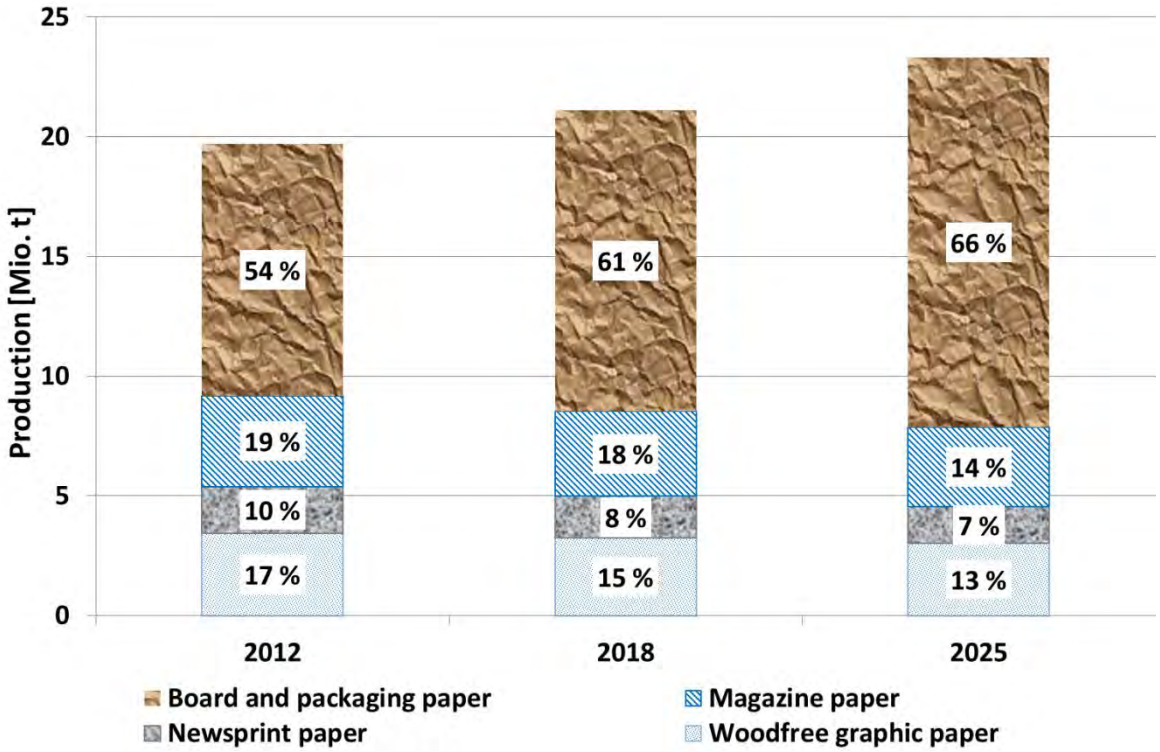
Megatrends and their impacts on the paper industry

Megatrend	Impact on the paper sector
Increasing awareness of sustainability, quality and health in society	- Growing demand for packaging paper and board - More stringent requirements on the contents of health-related substances
Increasing scarcity of energy and raw materials (wood, etc.)	- Increasing use of paper for recycling - Substitution of fibre pulp by minerals (fillers)
Digitalisation of information and communication	- Decline in consumption/production of graphic paper
Price and cost orientation of consumers and industry	- Increasing pressure to implement cost reduction measures (yield improvement, formula optimisation, etc.)

Source: C. Seidemann et. al INFOR 171 R

A look into the future – Change in grade structure of the industry: Supply of PfR continues to change (GER)



- Forecast based on actual trends

Source: C. Seidemann et. al INFOR 171 R

Predictions here and in coming slides based on a research project combining market expectations and comprehensive balancing and model based quality calculations.

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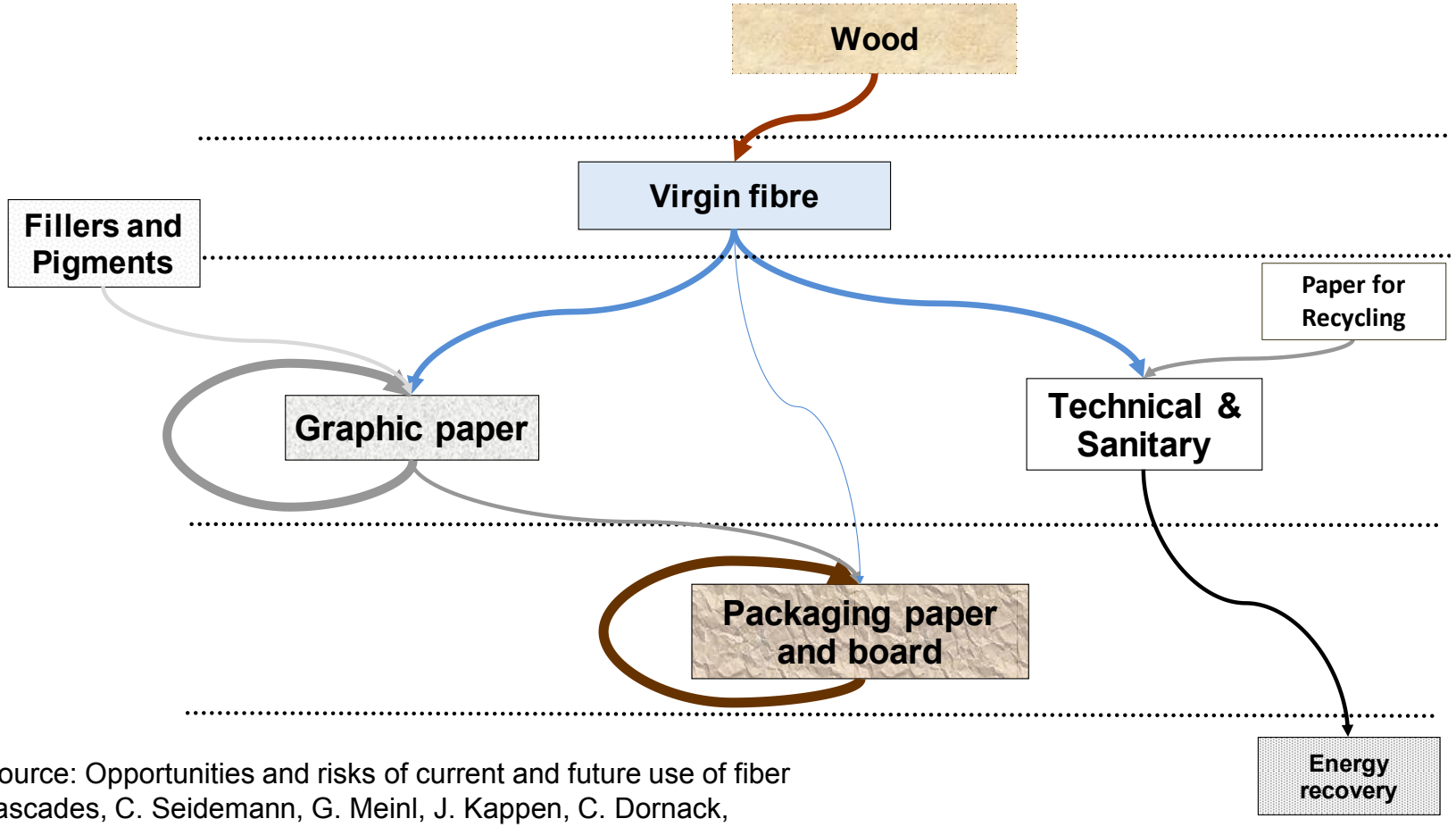
Current structure of the fiber cascades

Virgin fibre used mainly in the area of graphic production



Source: Opportunities and risks of current and future use of fiber cascades, C. Seidemann, G. Meinl, J. Kappen, C. Dornack, Deinking Symposium 2014

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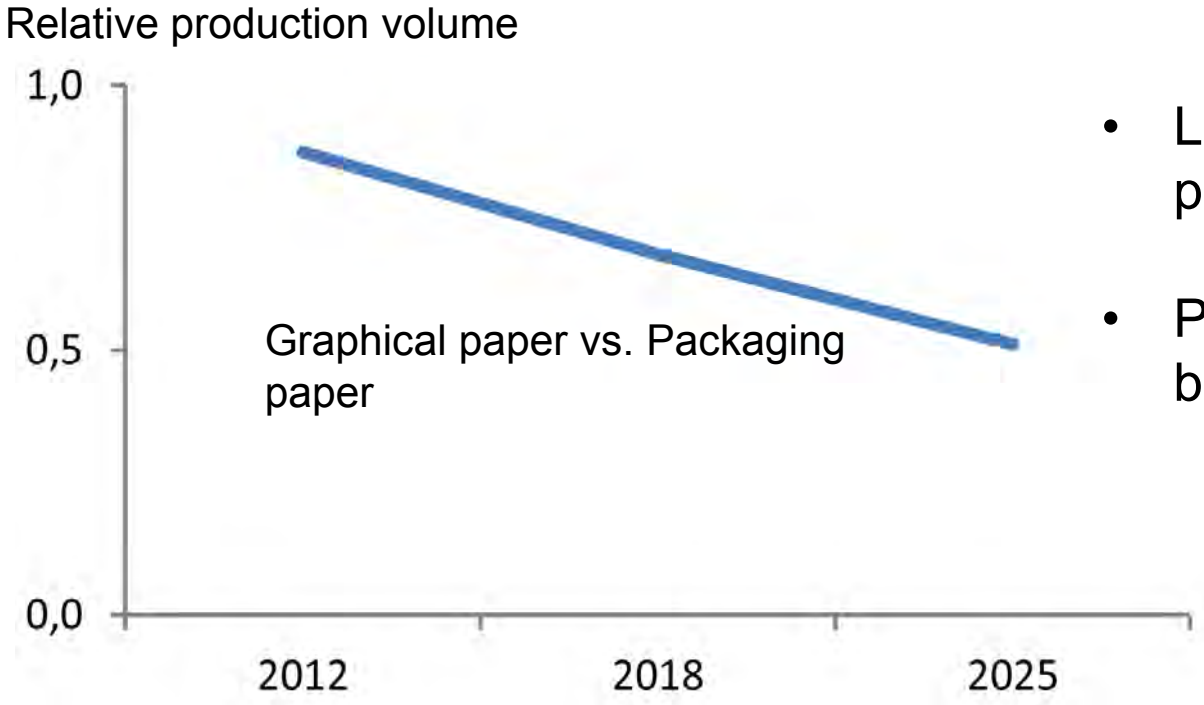
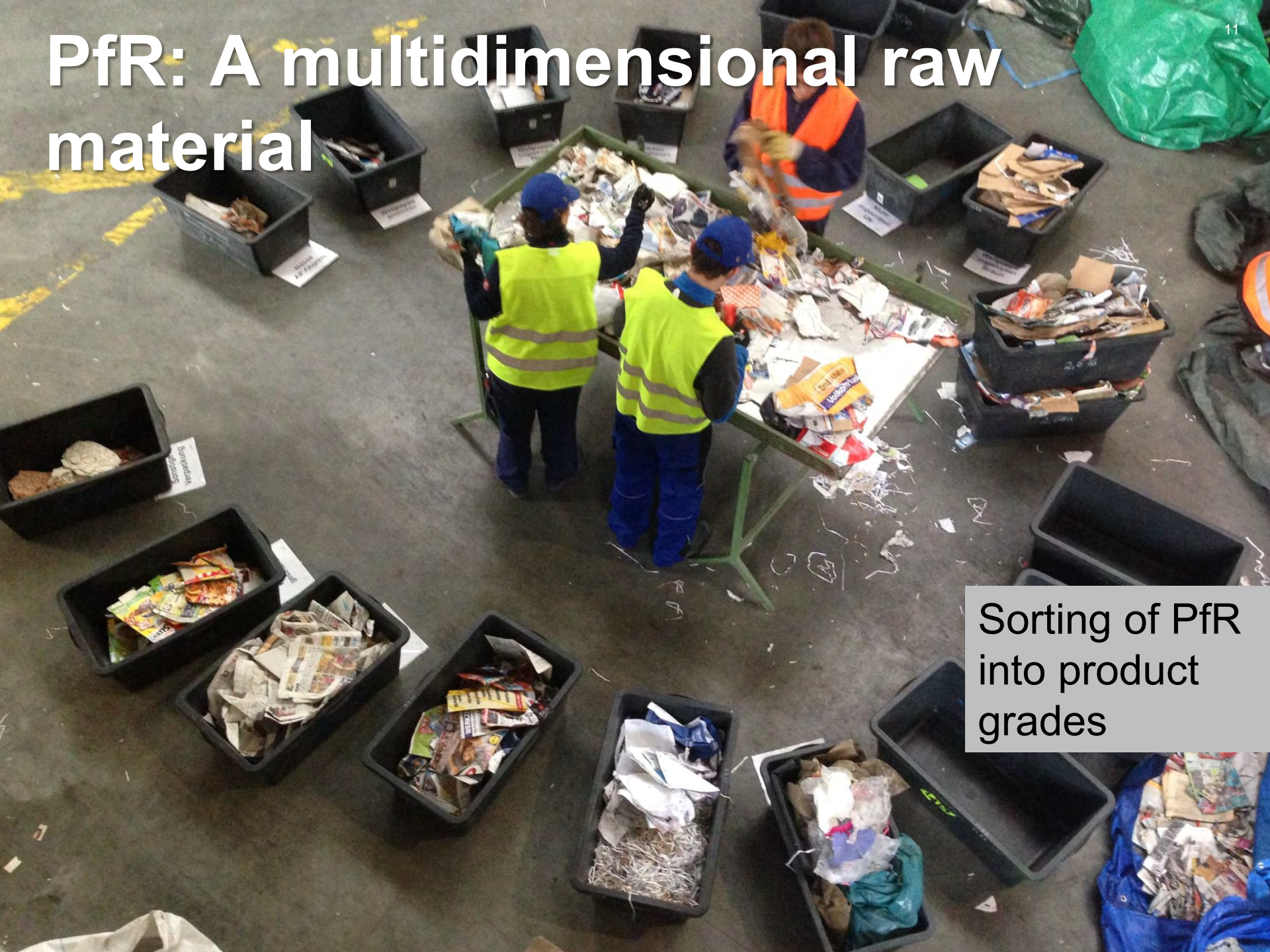


- Less graphical paper will be produced.
- Packaging grades will become more important

Source: based on C. Seidemann et. al INFOR 171 R

PfR: A multidimensional raw material



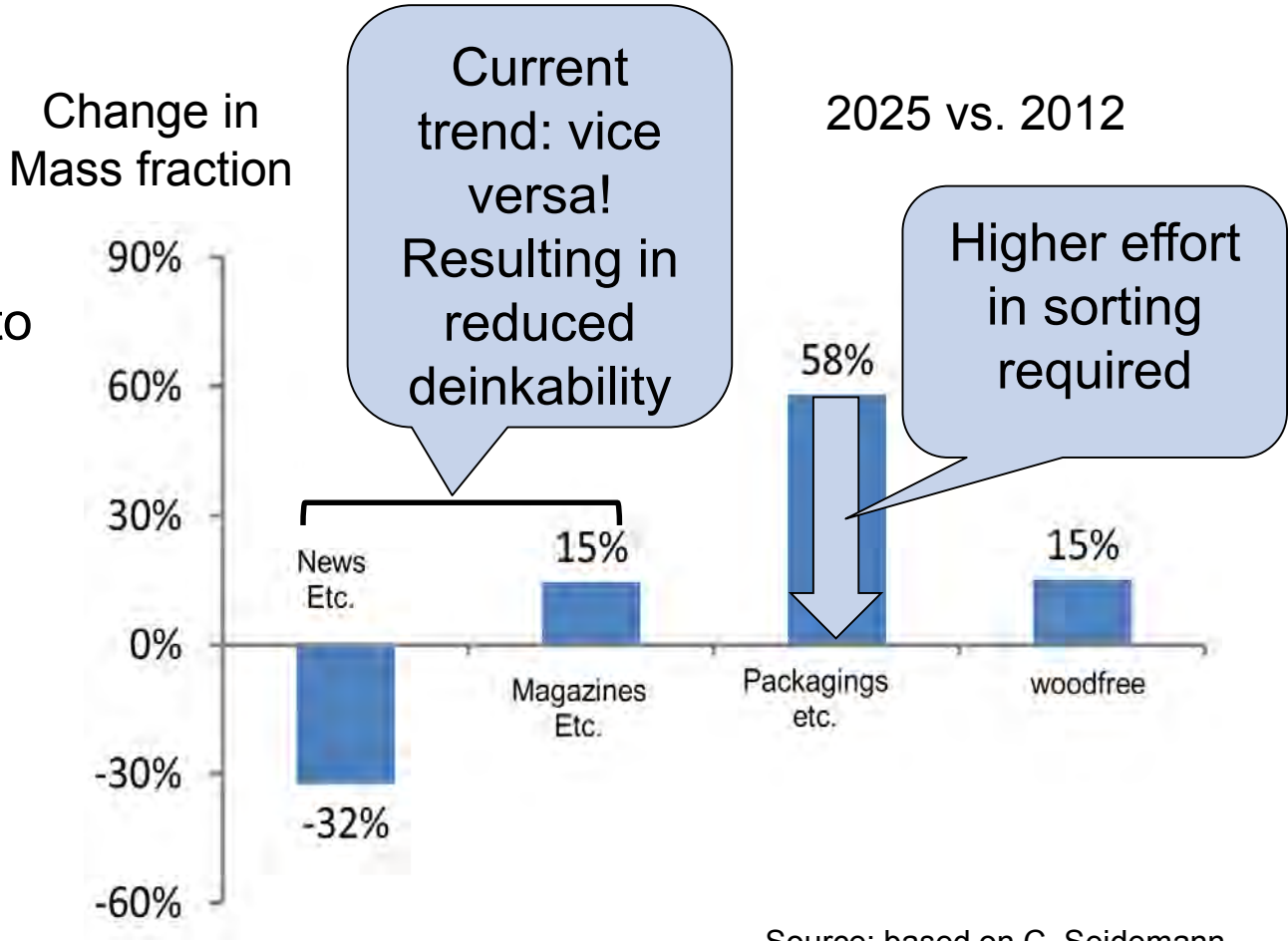
Sorting of PfR into product grades

Composition of 1.11 – How could it change? (GER)

1.11 is not a „natural grade, but refined due to sorting

Some of the impact will only „reach“ the PfR sorter

Trend between news and mag‘s reverted in last 12 months



Source: based on C. Seidemann et. al INFOR 171 R

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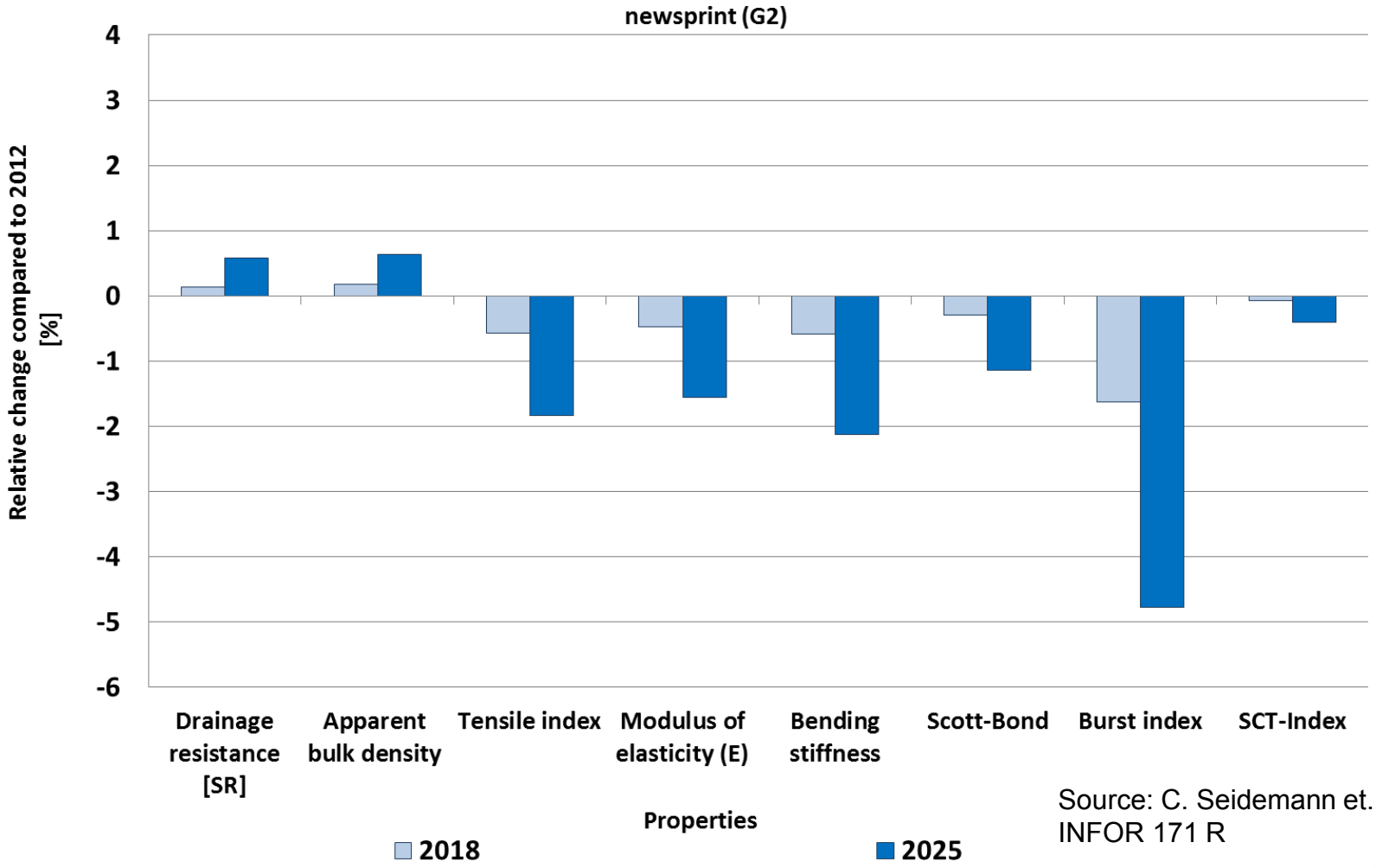
Impact on Newsprint produced (predicted values, GER)



Source: C. Seidemann et. al
INFOR 171 R

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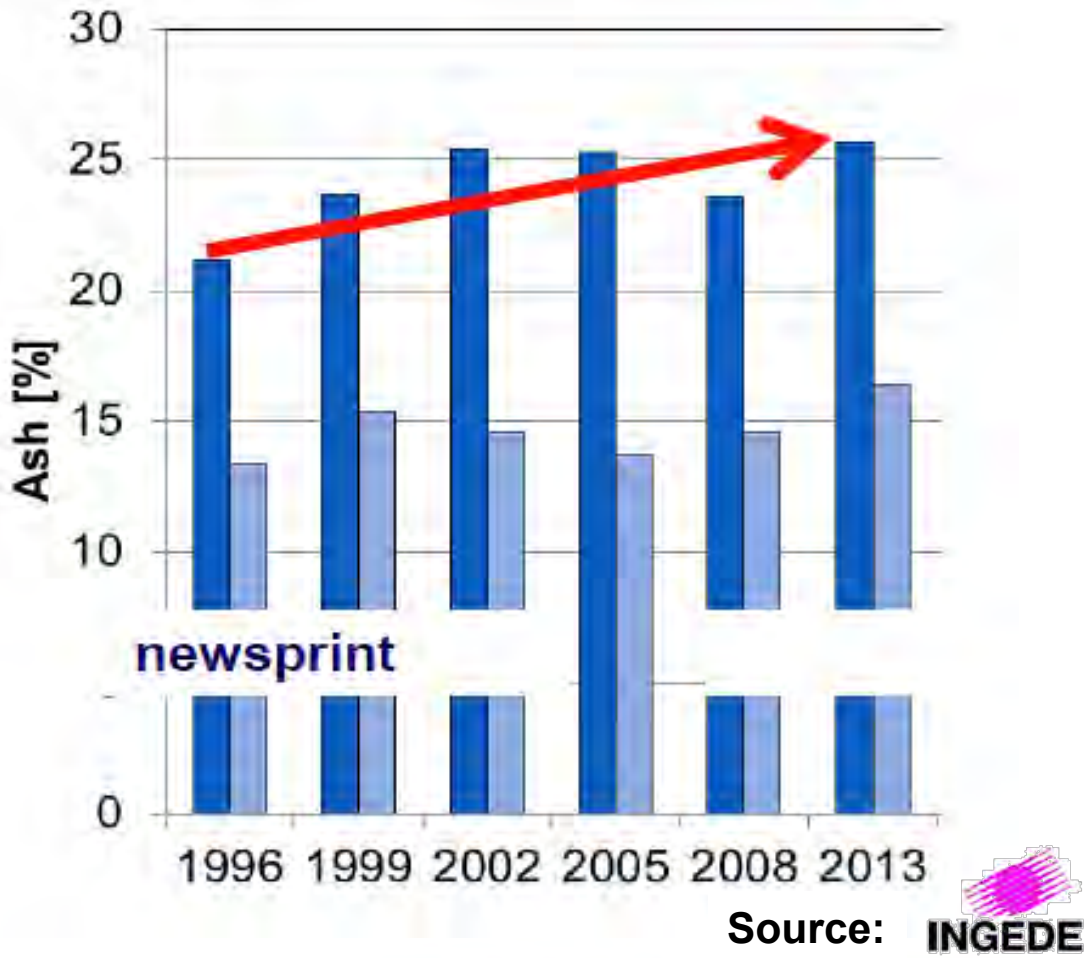
Change in graphical PfR quality: ash content



This trend to some extend depends on the ration between news and mag‘s

A reverted last 12 months does not mean that it will be so on the long run!

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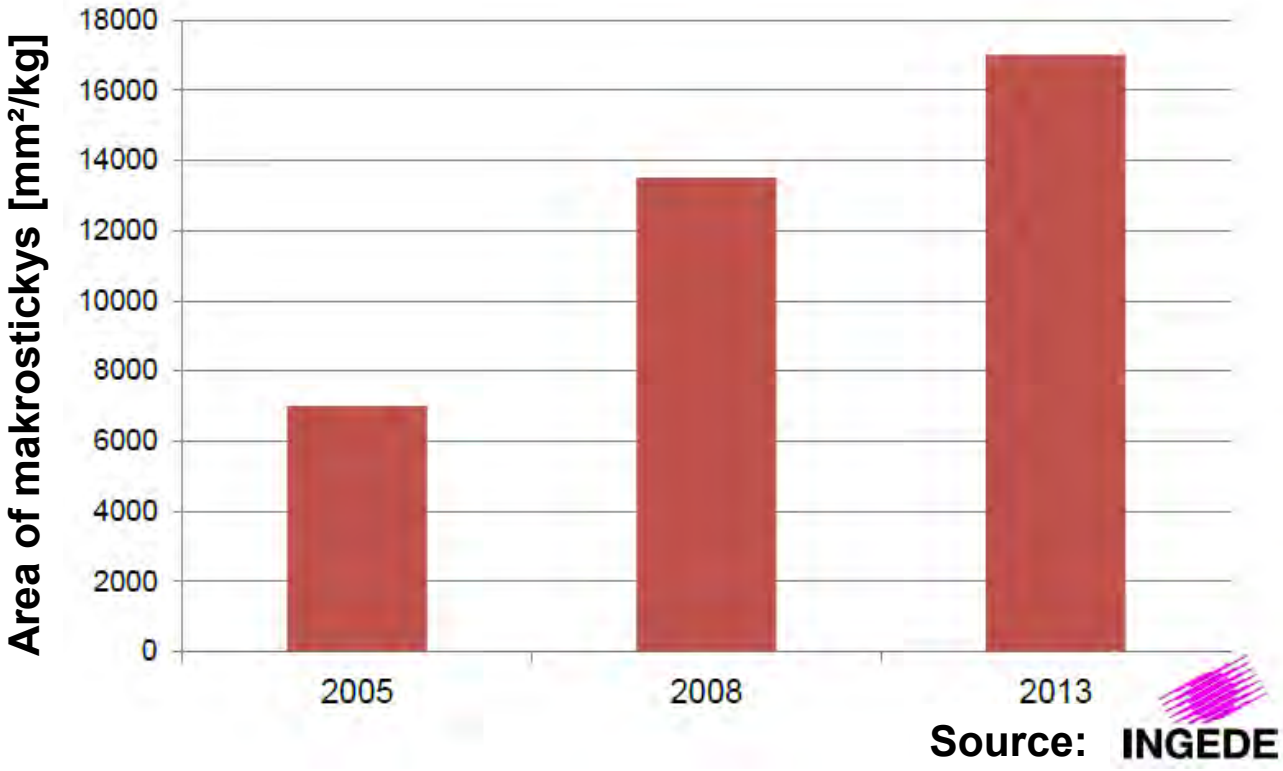
Change in graphical PfR quality: makrostickys area (INGEDE members)



More complex finishing and converting leave its footmarks in PfR (1.11, undeinked pulp)

Further increase expected

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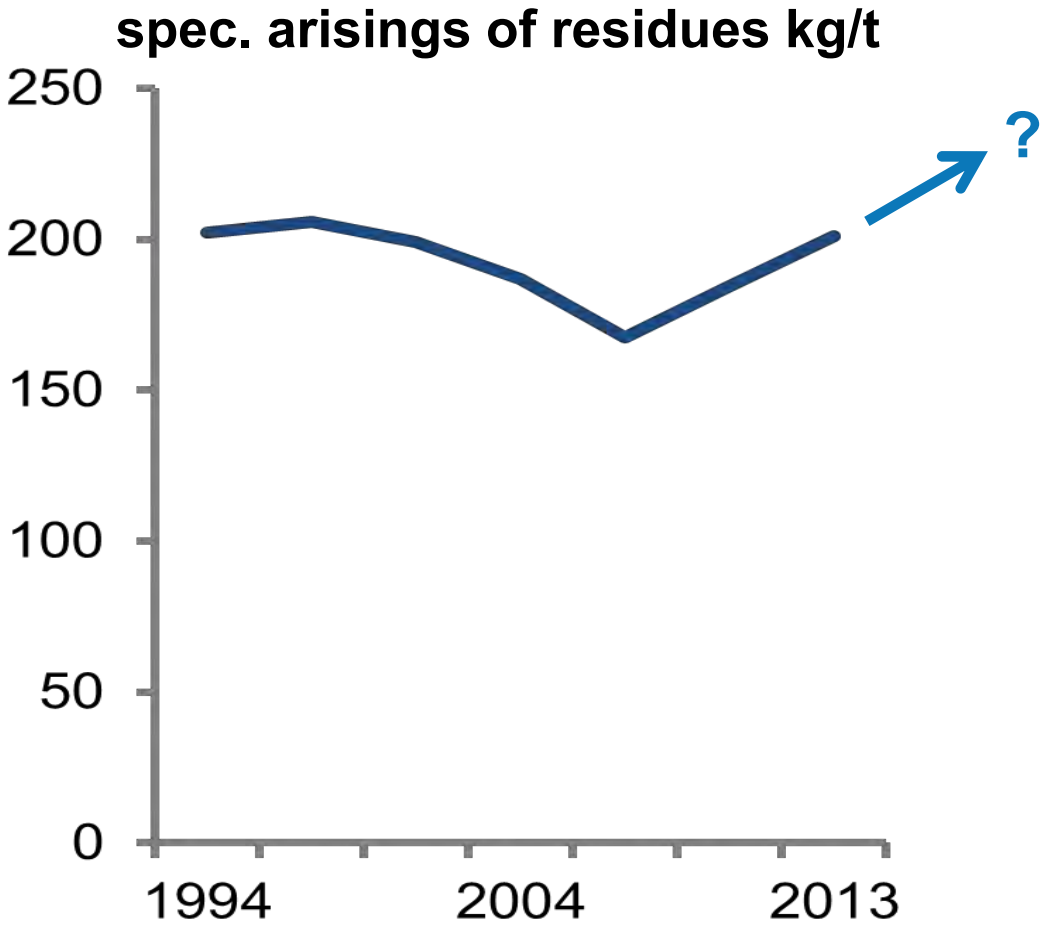
Residue arising: A clear indicator on PfR quality

The waste arisings in paper making are increasing (Germany)

Most probably a result of the downturn of the quality of PfR



Source: INFOR 172,
(PTS-VDP-residues monitoring)

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AND HOW ABOUT
PACKAGING
GRADES?

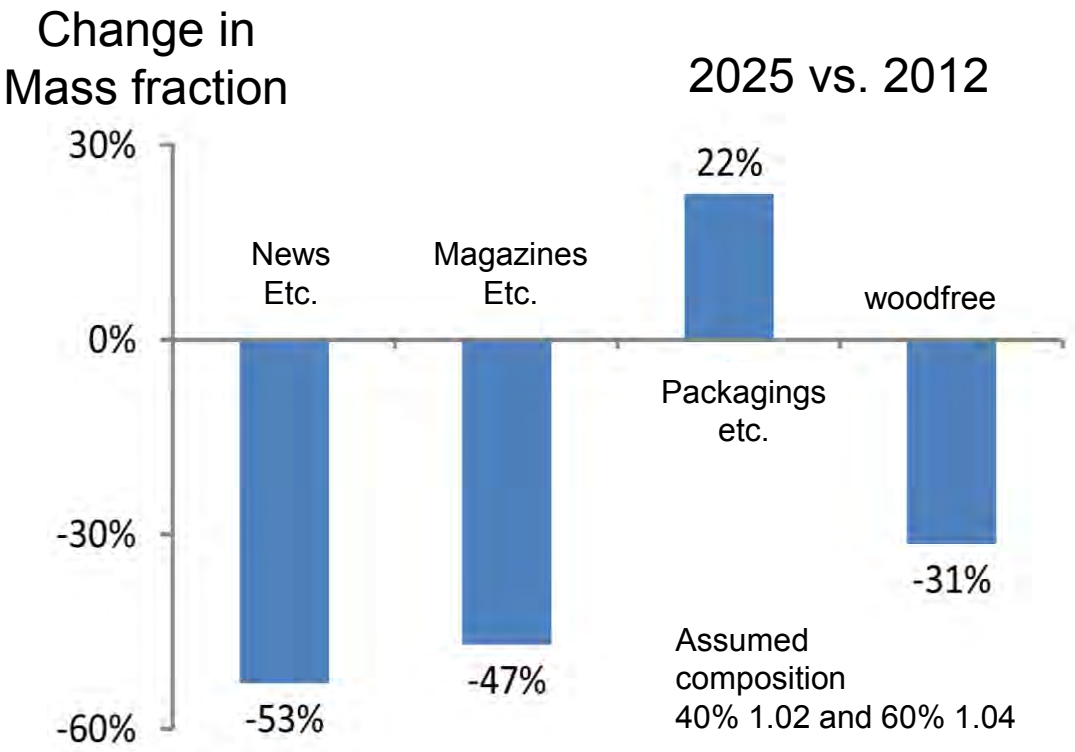
Quality of PfR for packaging – How will it change? (GER)

Forecast:

Dramatic change in the composition of PfR

PfR will be one generation older on average

Strength properties to drop by 10 -15%.



Source: based on C. Seidemann et. al INFOR 171 R

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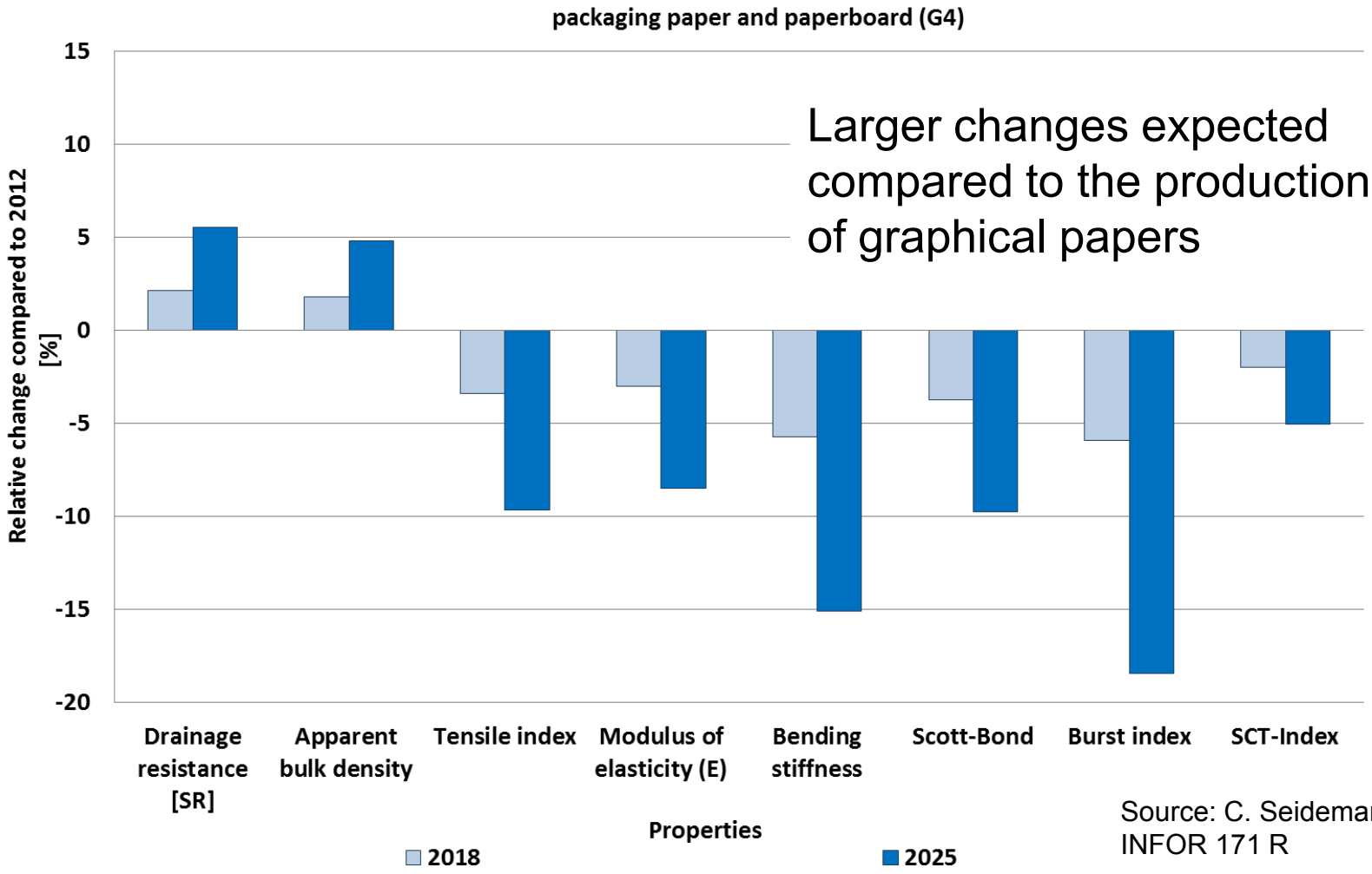
Impact on packaging paper and paperboard produced (predicted values, GER)



Source: C. Seidemann et. al INFOR 171 R

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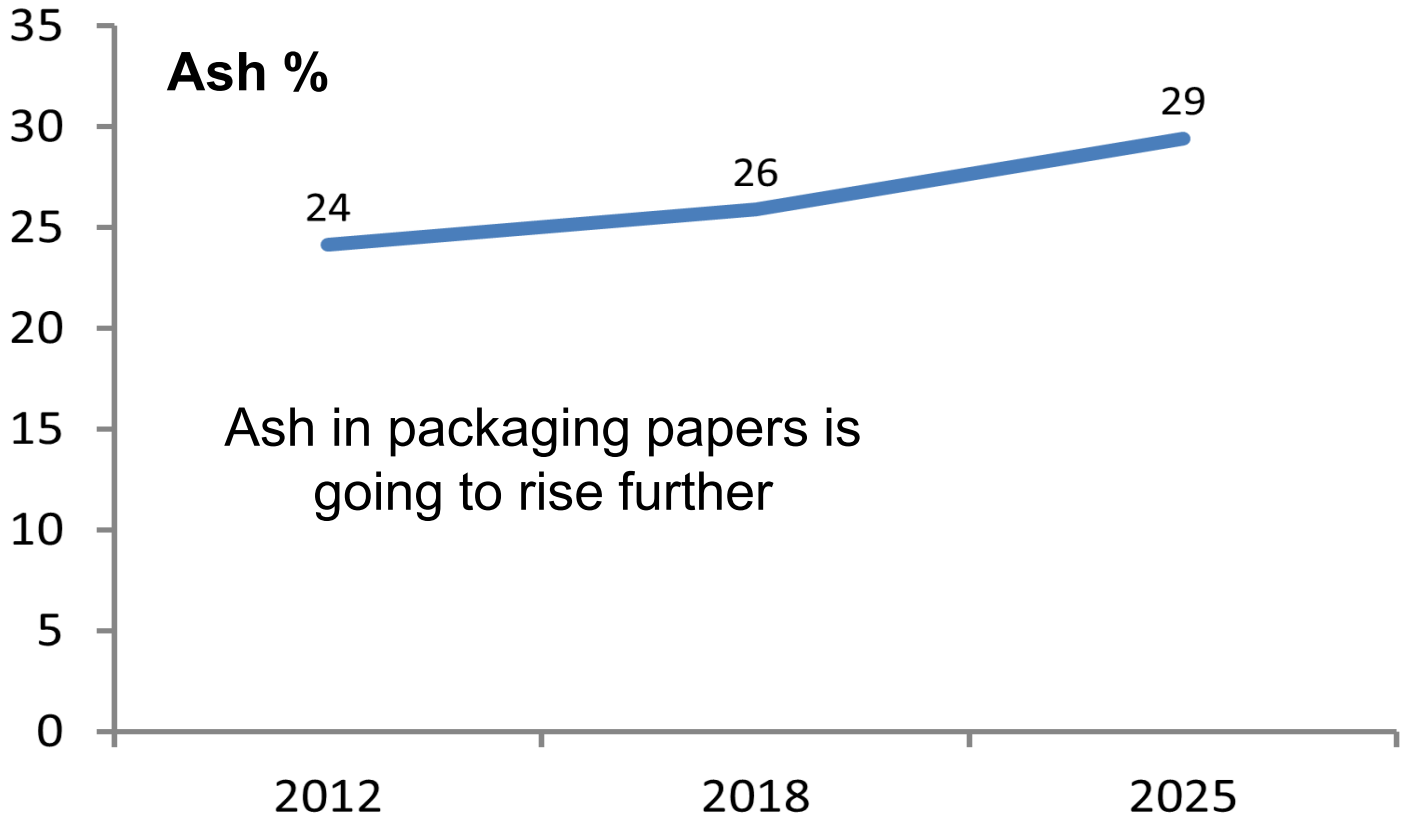
Impact on packaging paper and paperboard produced (GER)



Source: INFOR 162, 171

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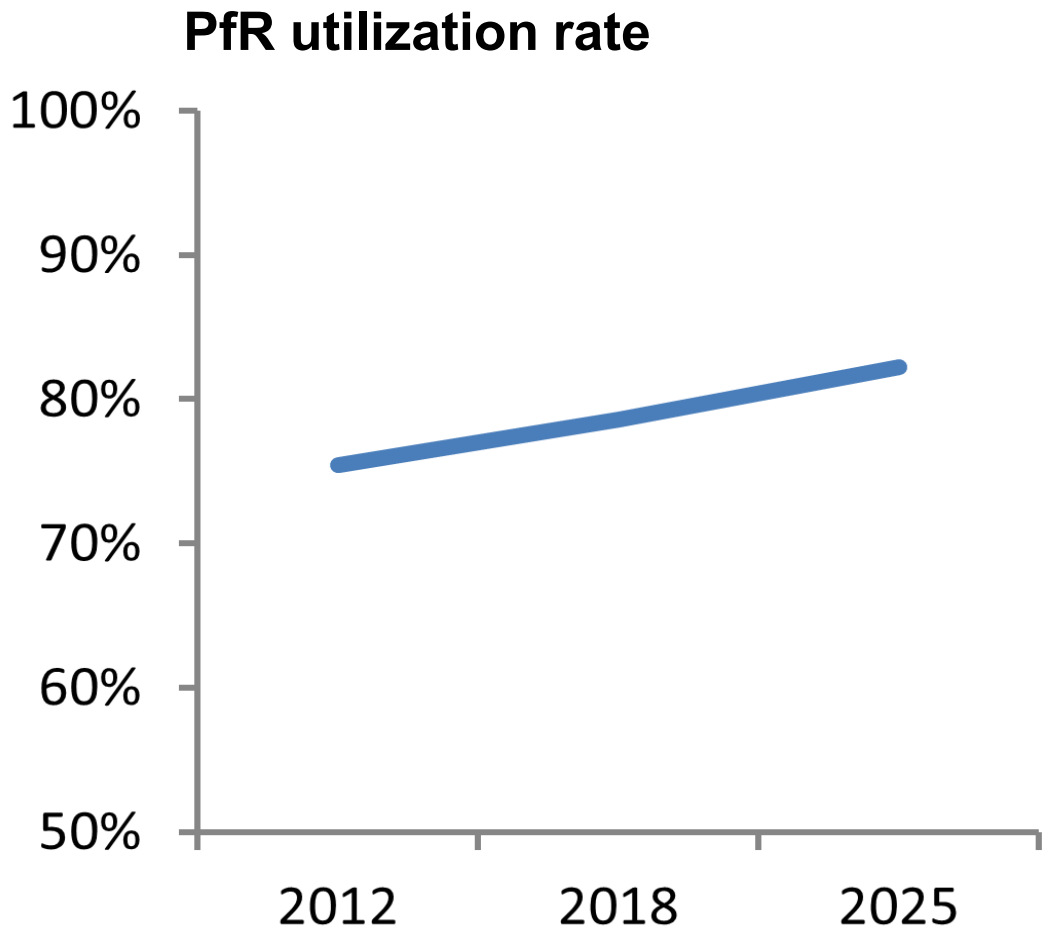
The impact on our circular economy (GER)



Forecast:
The utilization rate will increase above 80% in Germany.

Where are the **limits of recycling**?
Will papermaking still work out?

(without hygiene and "other" paper grades)

Source: VDP, C. Seidemann et. al. INFOR 171 R

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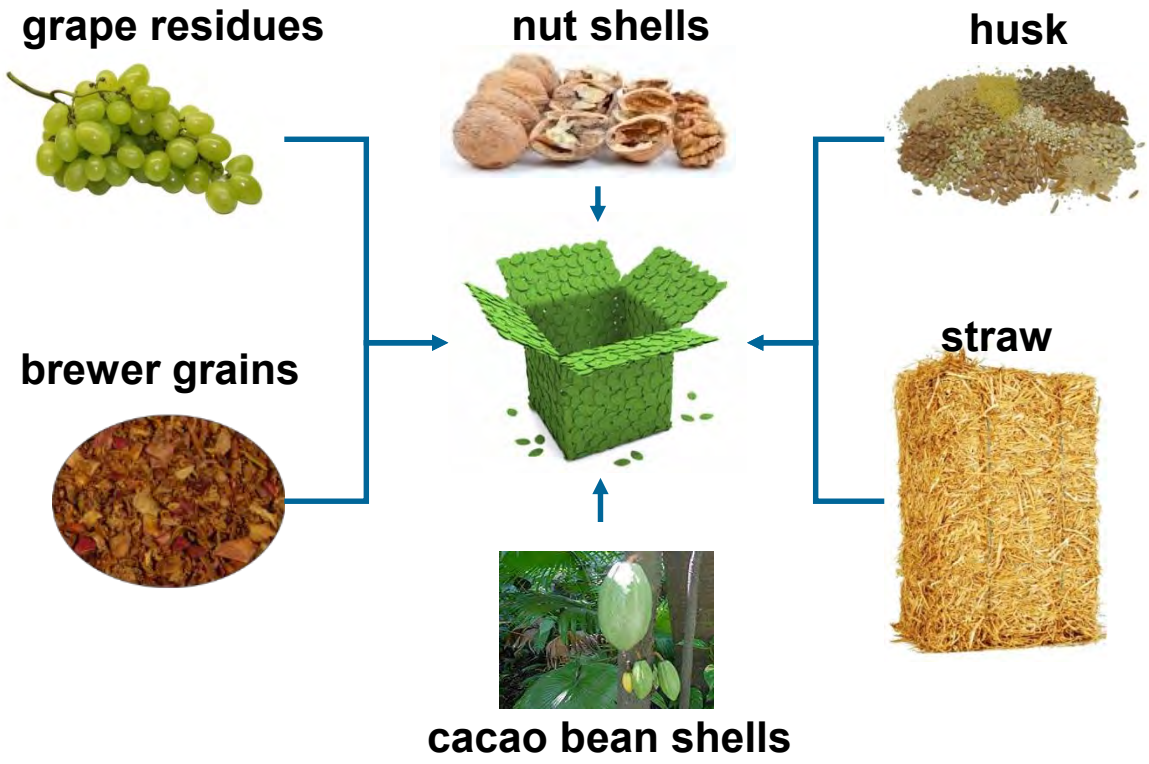
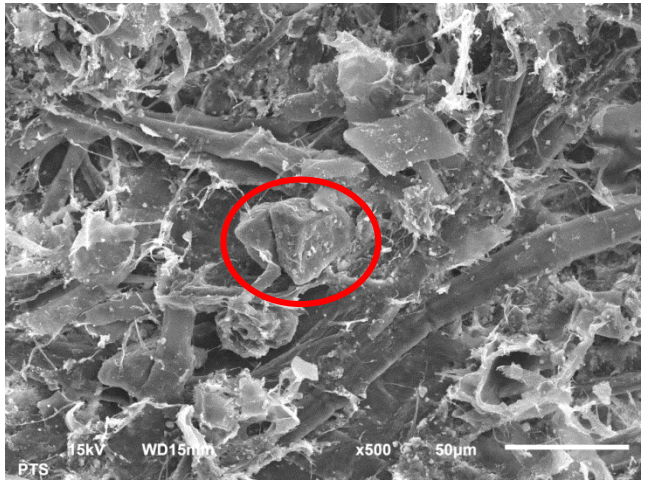
Agricultural residues – a new threat?

Green packaging – Cheap packaging – Sustainable packaging?



More bulk but significantly lower strength



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Contaminants – What is the next issue after mineral oil?

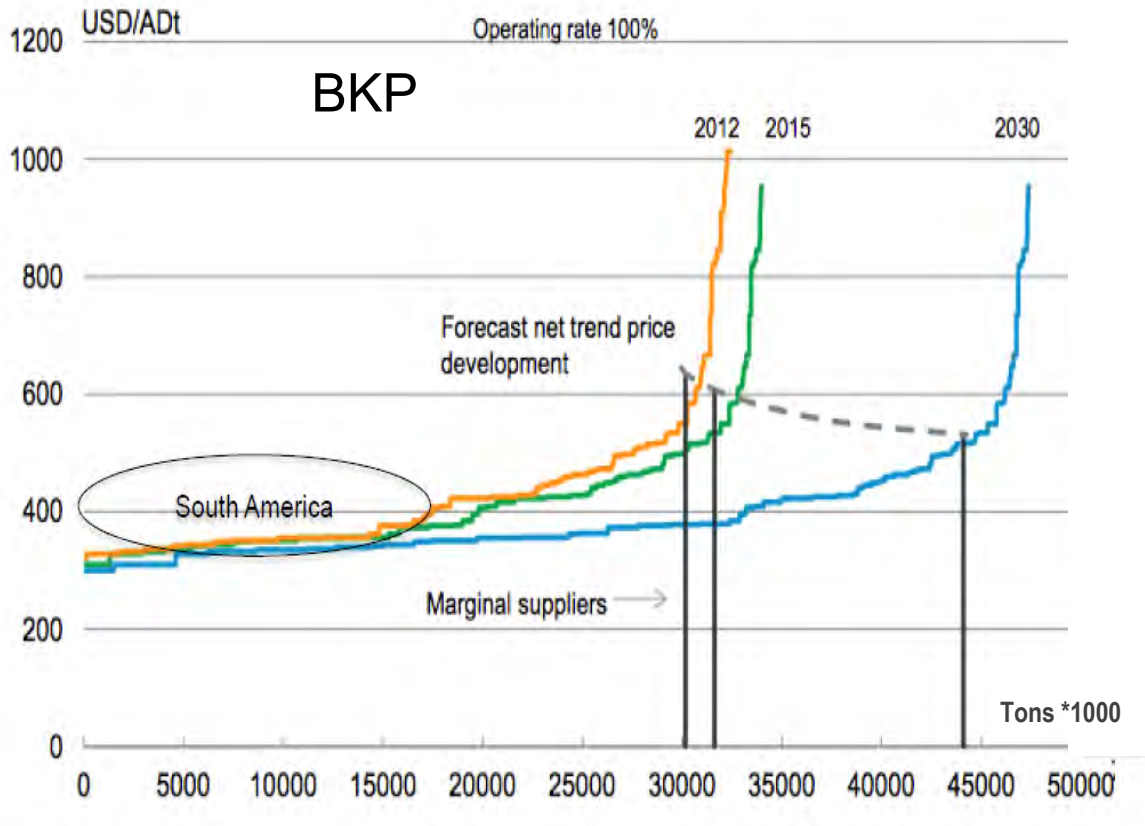
- **PAA (primary aromatic amines) contained in the coloring 7 printing of napkins (azo dye).**
- **Phthalates and its substitutes (DEHT, DINCH, …) contained in adhesives etc.**
- **Benzophenone caused primarily by an increasing amount of UV-prints (non-food applications)**
- **NIAS (non-intentionally added substances) added into products via pigments and chemical formulations**

And futheron:

- Bisphenol A and its substitutes
- Photoinitiators (Michler's Ketone, (Methyl-)Benzophenones …) contained in dyes and pigments
- Nanomaterials
- Xenobiotika / hormones, endocrine compounds
- Poly-/ perfluorinated organic compounds…


ANY OPTIONS?

Will chemical pulp dominate the play?



Source: Pöyry cited in “Virgin and Recovered Fiber Competitiveness”: Otavio Pontes – Biomaterials Business Area, bvse Altpapiertag 2013, Düsseldorf

Cheap chemical pulp are made available on European markets.

But: short fibre pulp from south America will not help to increase strength properties of PfR

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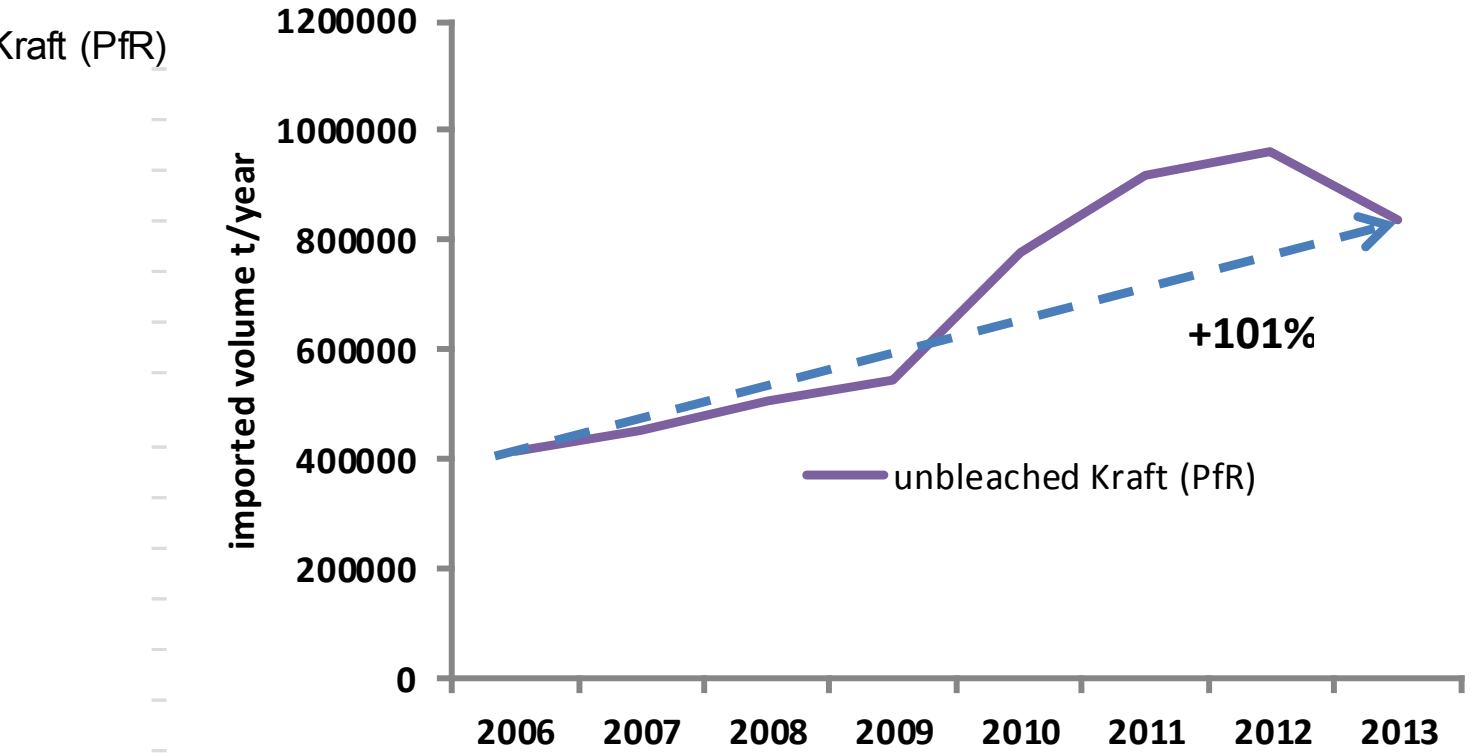
Packaing paper mills react by buying imported kraft grades

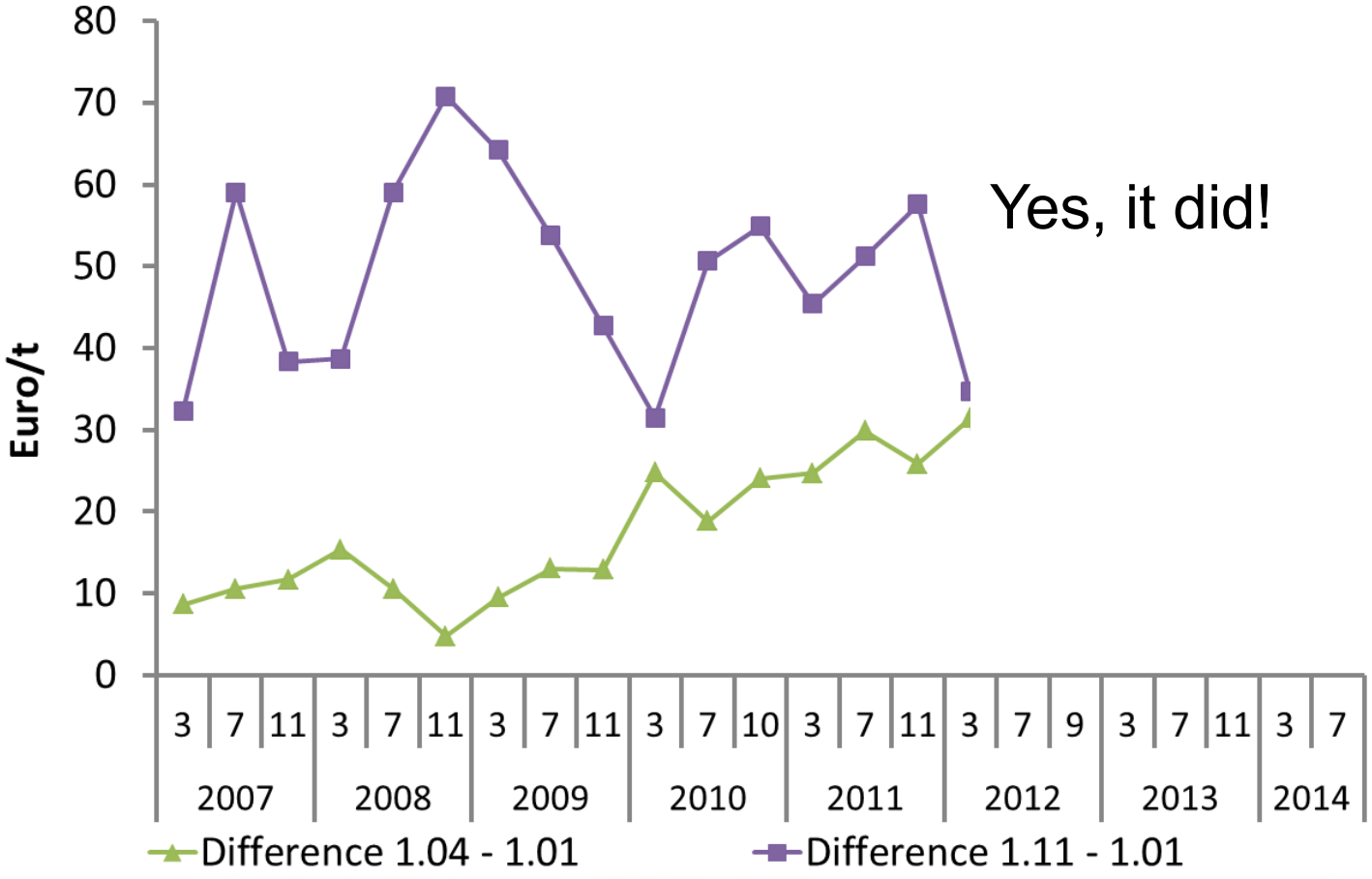
Significant increase of the imported volume of kraft paper for recycling to Germany – means to process the raw material properly are missing



Source: VDP Statistics

Does it pay of to sort PfR to the requirements of packaging grade producing paper mills?

Data: Germany, VDP



Yes, it did!

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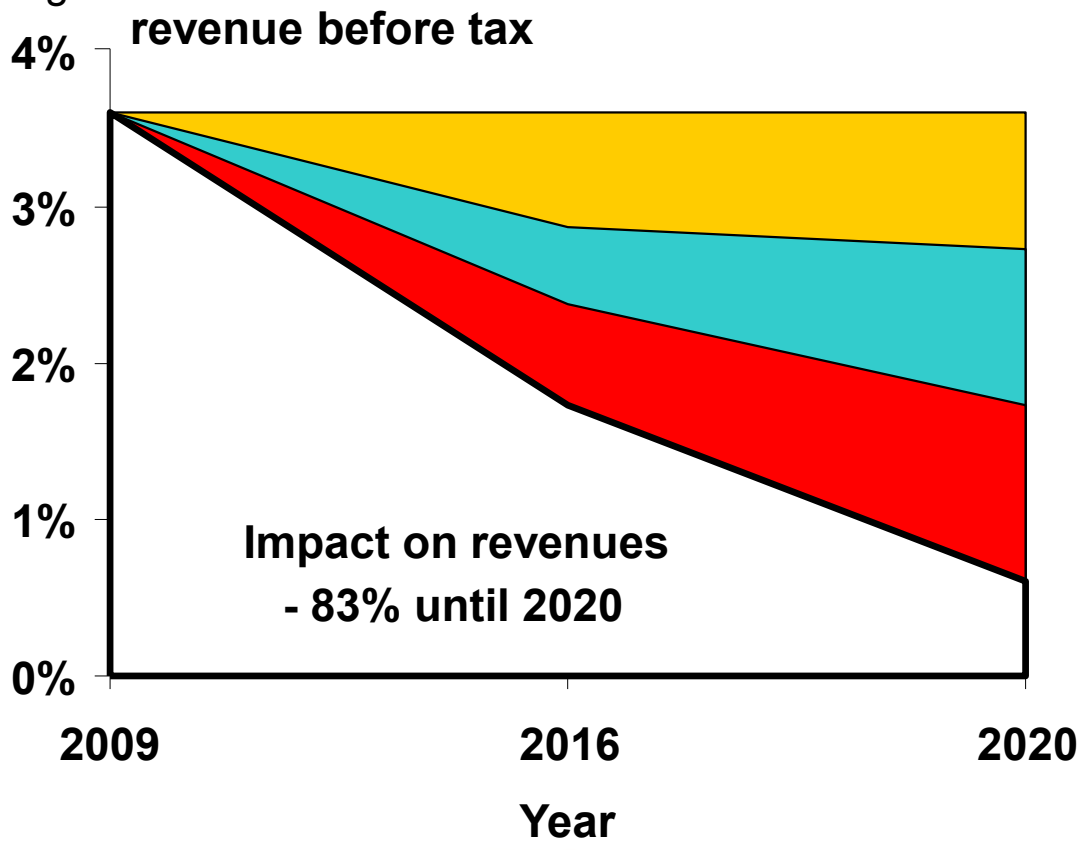
Incoming goods (1.01) of a sorting plant
Target Grade: 1.11
Spain 2013
Is this the future?
And what does it mean?

The economic future of paper sorting?

The calculation is based on the assumption that sorting plant troughput is constant, change in input quality leads to less 1.11 being produced, higher variable cost and higher effort for baling of 1.04.



… lower product price Grade 1.11

… rise in variable cost

… rise in cost for baling of 1.04

Basis:	**62% 1.11; 21% 1.04**
Sales:	**68% of grade 1.11**
	Price of 1.04 17 € below 1.11
	Price of 1.02 32€ below 1.11
Cost:	**21% variable cost of sorting**
	3% for baling

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Efficient sorting: Key impact on quality of PfR

ENTSORGUNGSTECHNIK BAVARIA GmbH

Product 1.11

A new approach on automation of sorting plants

Recovered Paper

Gefördert durch:

Bundesministerium für Wirtschaft und Technologie

aufgrund eines Beschlusses des Deutschen Bundestages

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Questions to be solved

ENTSORGUNGSTECHNIK BAVARIA GmbH

For incoming material the variability is very high: Examples (Grade 1.01) at different days:

But:

- Not enough / no verified information on incoming quality
- Insufficient adaptation of production speed depending on change of incoming material
- Too little changes of operational set points of sorting plant stages as incoming material changes

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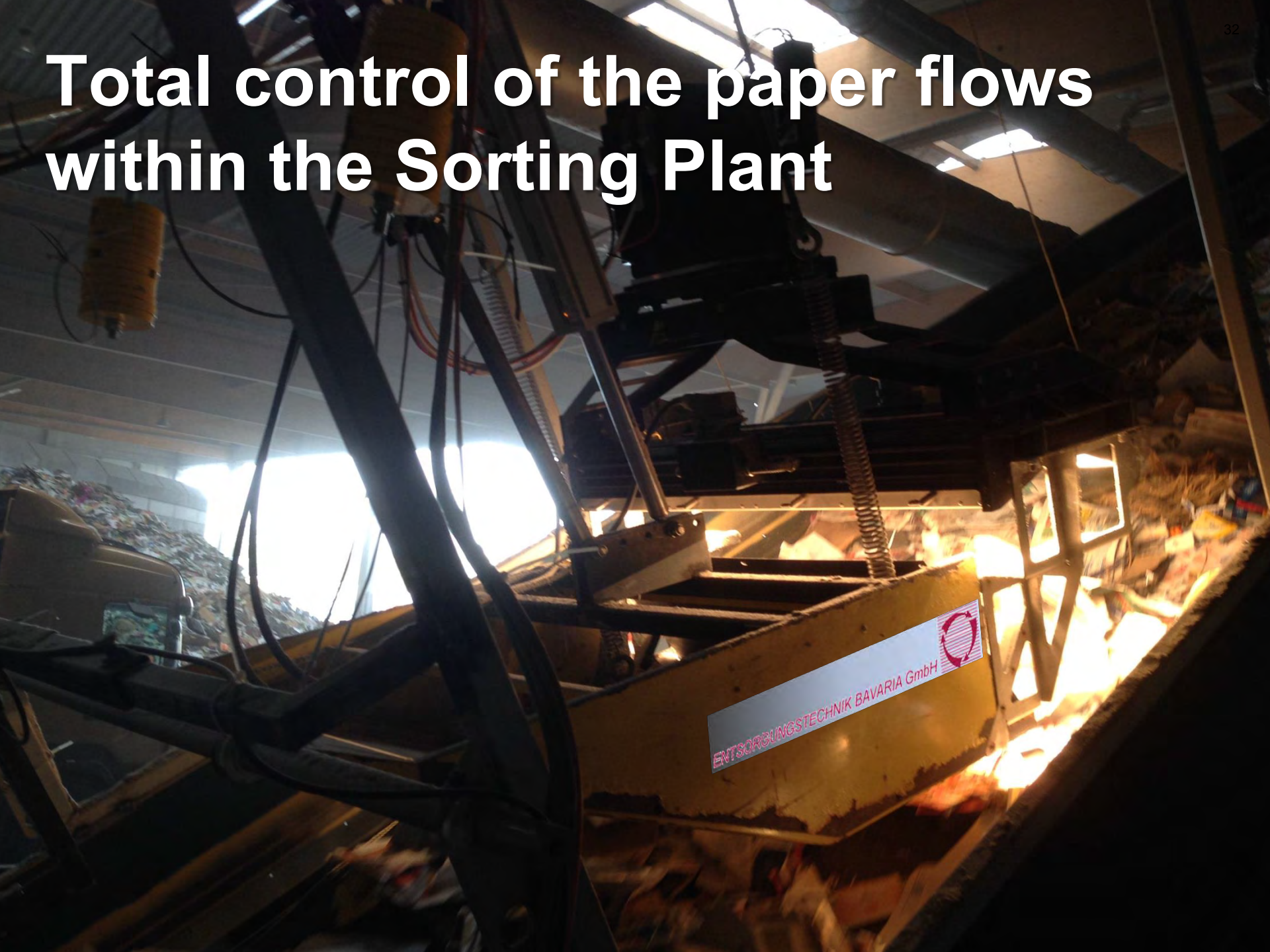
Total control of the paper flows within the Sorting Plant



Features of the sorting plant controller

ENTSORGUNGSTECHNIK BAVARIA GmbH

- Online measurement combined with model based caculations:
- PfR-fractions (graphical paper, board etc.)
- Humidity
- Mass flows
- Size distributions
- Recommendations

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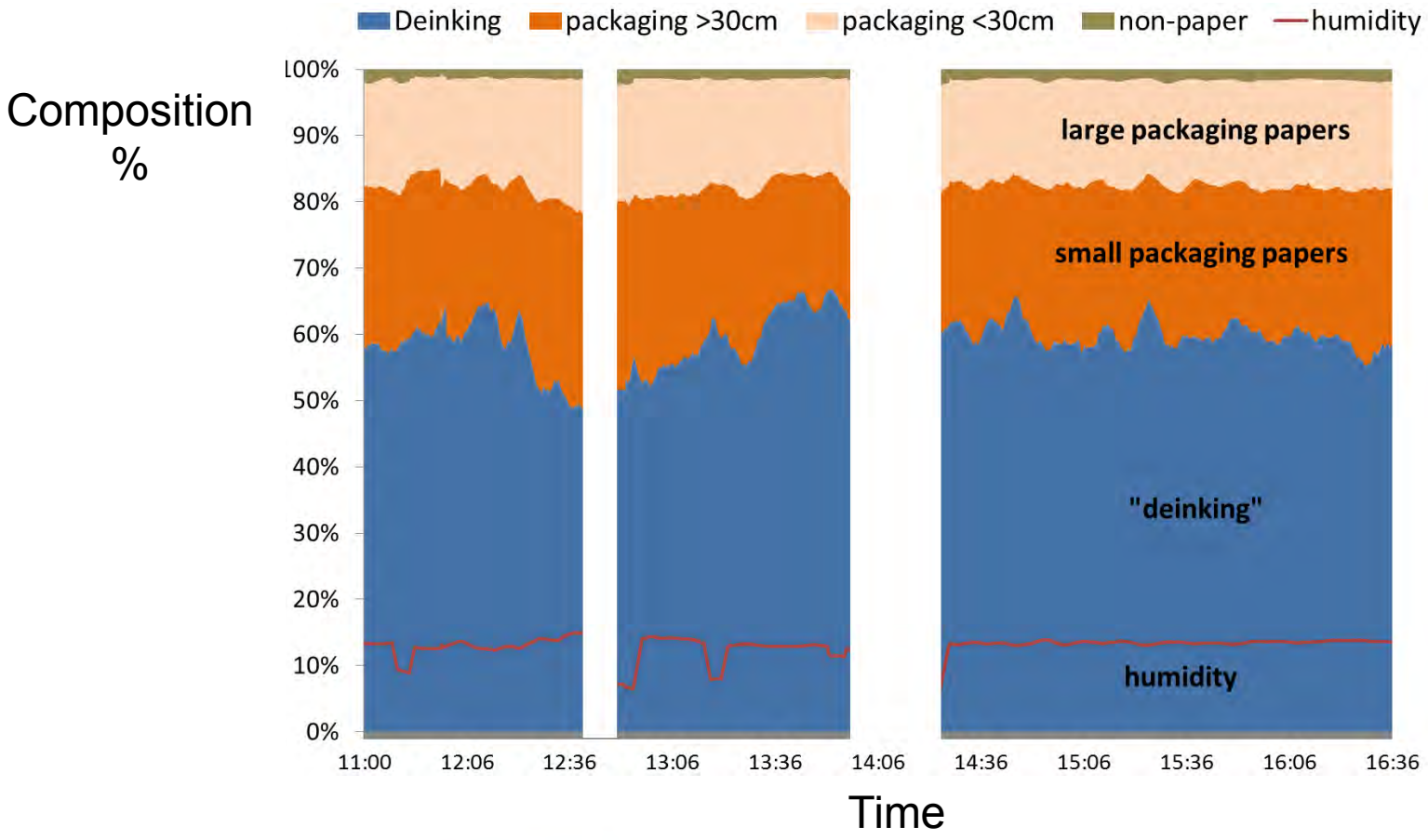
Real data gathered in the installation

ENTSORGUNGSTECHNIK BAVARIA GmbH



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Functionality of the controller

ENTSORGUNGSTECHNIK BAVARIA GmbH

Model enhanced Sensor:

- Quality of incoming material is measured as a maximum of up to 14 fractions of paper grades
- Either online Measurement or model based prediction of size distributions of PfR-fractions
- Model based mass flow prediction
- Compensation of de-mixing effect on conveyor band

Prediction of

- **Quantitative and written assessment of the incoming material**
- **Ability for sorting the paper**
- **Mass flow to optical sorting stages / bottle neck stages**

Recommendations on how to operate the system

Benefits

ENTSORGUNGSTECHNIK BAVARIA GmbH

- **Maximises throughput – increased productivity (Keep operation at the upper tolerable production speed limit)**
- **Reduction of still stands (too wet material etc.)**
- **Written recommendations on operational set points of the sorting stages**
- **Improved output quality**

Commment of the manager after 2 days of operation:
„Don‘t you ever turn it off again, please!“

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More options on how sorting can support the improvement of the quality of paper for recycling

Monitored product quality:

100% control of the produced PfR
-> certified quality delivered to paper mill

Other sorting targets:

High quality packaging PfR

High brightness / woodfree PfR

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Outlook

- The quality of PfR will change and both paper makers as well as recycling companies will have to adapt to it
- A good look on what is being produced as paper will tell what to expect on the raw material side as well
- Quality is a multidimensional issue – management of PfR needs some foresight and smart sensors to control it
- The sorting of paper still comprises lots of options for an improvement of quality of paper for recycling and the production of specific grades

Questions?

YOUR CONTACT

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