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WG2 INDUSTRIALISATION/MARKET INTRODUCTION

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ACTINPAK MEETING BLED, SLOVENIA

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A&I PACKAGING - INTRO

- **Active** = Influences internal environment of packaging to proactively ensure quality
- **Intelligent** = Senses changes and communicates that to consumer
- Active packaging more for *shorter* shelf-lives, intelligent packaging for *longer* shelf-lives
- Indicators, sensors, smart labels, RFID, NFC,.....
 - Freshness, temperature, leakage, tampering, security...
- Active materials (e.g. antimicrobial)
 - Scavengers (e.g. O₂), controllers (e.g. CO₂)
- Printed intelligence/electronics, functional inks
- Besides food also pharmaceuticals, health and environmental

A&I PACKAGING - INTRO

- A&I pack can help in
 - Food waste reduction
 - Monitoring product safety
 - Monitoring conditions
 - Ensuring quality
 - Consumer engagement
 - Anti-counterfeit
 - Track & trace
 - Security
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WG2 'Industrialisation/Market introduction'

The objective of this Working Group is to identify market demands, supply chain challenges and legislative restrictions that need to be considered so as to ensure a successful introduction of active and intelligent fibre-based packaging in real-world applications. Technological solutions discussed in WG1 will be considered from a different point of view to understand the optimal strategies for their development from lab scale to market application. Strong interaction with the industry will be needed in order to understand technological issues for the scaling-up and industrialisation of different processes, as well as to identify the non-technological problems that could endanger their market introduction. Legislative limitations will be discussed comparing the European situation with that of other countries where smart packaging has already found its way to the market and consumer expectations will be analysed for the different types of active and intelligent fibre-based packaging solutions, trying to clarify what active packaging means for consumers and which features have higher added value for the general public.

Methods and means - Workshops/discussions will be organised to address industrial issues and to help the industry enter the market with new smart packaging. Every year one or two specific meetings will be dedicated to a 'problem box' focusing on industrial challenges. Industry can introduce their current problems or issues, and one (or more) will be selected to be discussed using problem-solving methods (for example Ishikawa, 5 Whys, or TRIZ) and brainstorming techniques during the meetings. Furthermore, the meetings will be used in order to gather information, consumers' associations will be invited and the events will be open to non-experts for participation in order to reach the general public. The results of these activities will be discussed in multidisciplinary panels formed by technologists, industry covering the whole value chain, and market experts. The aim is to define strategies for an efficient industrialisation and market introduction of active and intelligent fibre-based packaging solutions. In particular, actions to be undertaken for the evolution of possible solutions from TRL 8 to 11 will be considered.

Anticipated results - The main results of WG2 will be the preparation of a publication, targeted towards the industry and non-experts, summarising the information collected as well as guidelines resulting from the discussion. A seminar and workshop will be organised for the same reason and a road map will be used as guideline to provide directions towards market implementation.

OBJECTIVES OF WG2 1(2)

- Identify market needs, supply chain challenges and legislative restrictions to ensure easy introduction of smart packaging
- Define strategies for efficient industrialisation and market introduction
- Strong interaction with the industry is needed to understand technological issues for the scaling-up and industrialisation of different processes
- Technical solutions recognised in WG1 will be discussed:
 - Evaluation of potential
 - How to proceed from lab to pilot and in the end – to the markets (increasing TRL level) → Evaluation of up-scaling and industrialisation of selected processes and concepts

OBJECTIVES OF WG2 2(2)

- Identification of **non-technological aspects/challenges** is also important
- **Legislative limitations** will be considered:
Comparison between EU and other countries where A&I packaging already on the market
- Analysis of **consumer expectations and communication with consumers** (together with WG4)
 - What active packaging means for consumers
 - Which features have higher added value

*Challenge:
We need wide range of
experts, e.g. legislation*

METHODS AND MEANS

- **Industry's involvement important** in order to evaluate technological and non-technological aspects affecting market introduction and industrialisation
- Involment & input of different interest groups important → **Identification of the value chain**
- Workshops, meetings and discussions...
- Industry can also introduce issues or problems that will be addressed within the COST action

NOTES FROM THE FIRST MEETING IN AVEIRO

(SEPT. 2015)

- Industrial contribution essential – the **whole value chain** should be covered: packers, retailers, brand owners, packaging manufacturers, marketing people, advertising companies, consumers, etc.
- Finding out wishes, needs and demands of the whole supply chain, especially industry → Workshop (Utrecht) for networking with industry and to collect industry views → Feedback to WG1
- **Collecting information and categorising of current solutions** (WG1) → “Database” – Important information for WG work
- **Definitions of technologies, terms etc.** “active”, “intelligent”.. → “database”

NOTES FROM THE FIRST MEETING IN AVEIRO

- Main barriers for large scale use: cost and retailer level of acceptance
- Not only primary but also secondary shelf-life is important
- Not only food sector – also pharmaceuticals and healthcare etc.
- Safety is important, e.g. migration, food contact (direct/intimate/transportation package...)
- Fibre-based solutions in the focus (but not forgetting other materials)
- Return of investment; to get active and intelligent components and functions in the package cost effectively
- How to prove/verify A/I solution works?
- Liability issues
- How to measure the benefit/impact of these new technologies (e.g. for consumers & retailers)?!
- Low cost integrated technologies, e.g. both oxygen and migration barrier
- Paper-based pouches and flexibles increasing
- Packages with physical activation (inbuilt power source, energy harvest..)
- Anti-counterfeit, temp. control

SOME NOTES FROM MEETING IN UTRECHT

(Nov. 2015)

- WG2+4 workshop meeting, combined with AIPIA, industrial partners invited
- Altogether 78 participants, among them 28 from COST Action were present. Discussion was focused towards inventory of current solutions in active and intelligent packaging, how to involve industry and how to disseminate the knowledge.
- Battle - Fibre vs. plastics. Plastics have all the barrier properties
- Fiber-based packaging as primary package: barrier and shelf-life challenges
- Presenting of current solutions (state-of-the-art) for industry, showing case-studies/success stories
- Defining parties involved:
 - Retailers/brand owners
 - Food producers
 - Consumers (e.g. importance of social networks)
 - Packaging producers....
- **Crucial to know who will benefit, to decide who needs to be convinced.**

Who is the key decision maker in the value chain?

SOME NOTES FROM MEETING IN UTRECHT

-What is the benefit to each party:

- Retailer/Brand owner: PR benefit, sales...
- Consumer: product safety, "something fun"....
- Can be beneficial for several parties or targeted just for one party

-Will consumers pay extra for a package with A&I function? Added value?

-Implementation of A or I solution: in which step?
manufacturing/converting/printing/label...

-Bulk products vs. unit package → Different value chains (retailer or bulk supply chain) → Different challenges and needs (different type of materials)

-How to prove the advantages outweigh extra costs? How to prove AIP is working as it should?

-Express the less obvious benefits such as faster production, reduced material usage, etc.

-Start with proven developments

SOME NOTES FROM MEETING IN MUNICH

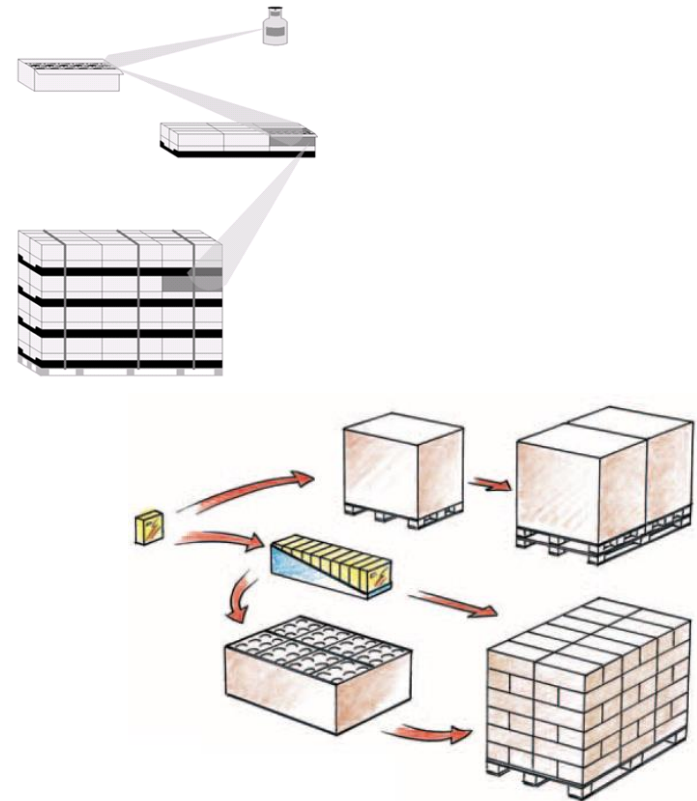
(APRIL 2016)

- Three demonstrators have been created
- Survey has been created to collect data from the value chain
- Some industrial views:
 - Interest towards different solutions (scavengers, antimicrobial, moisture controlling...
 - Target applications vary: food + other products
 - Price
 - Is it possible to produce/utilise existing production processes

WG2 DISCUSSIONS IN MUNICH

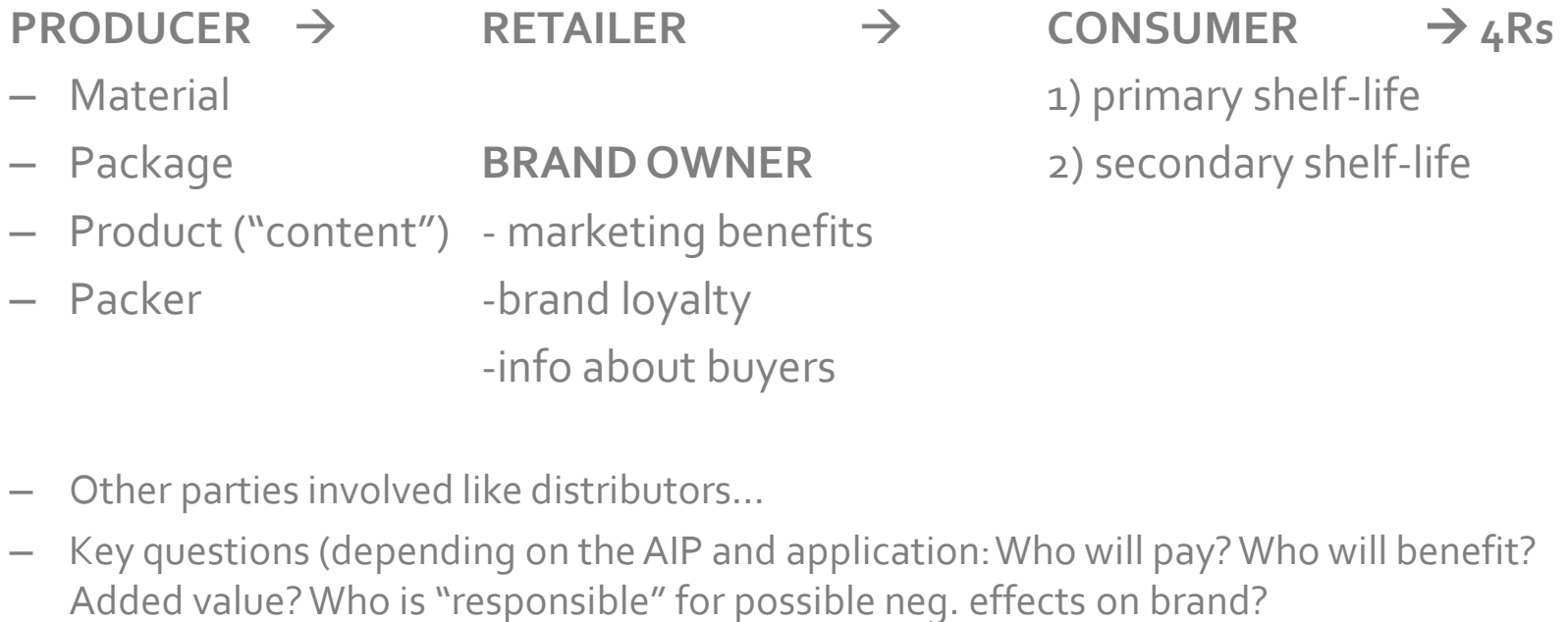
Definition of value chain → Not so easy...

- Different depending on the package and application
 - food, pharmaceuticals, cosmetics, health care..
 - single vs. bulk (wholesale) package
 - Also needs and barriers are different (e.g. function, cost)
- “Dynamic” value chain, role of social media
- Who benefits from the AIP in the end (retail, consumer...)?
- Who are the decision makers in the value chain - Who should we convince?
 - If there is a specific major barrier, it is hard to beat despite how technologically good AIP solution we have



WG2 DISCUSSIONS IN MUNICH

VALUE CHAIN



**“Bottlenecks”:
brand owners & retailers???**

WG2 DISCUSSIONS IN MUNICH

- There clearly are various barriers/challenges:
 - Social (e.g. Consumer acceptance, consumer “request” or need)
 - Legislative (e.g. Food contact, migration, “nano”)
 - Economic (costs of new solutions vs. Added value/benefits)
- We need more views, especially from industry (retailers, brand owners, etc.) and, on the other hand e.g. from legislation.
- However, there are a lot of opportunities to fulfill **market needs and the needs of different parties of value chain**
- **WG1 data on existing/potential solutions to be evaluated also in WG2**
- In order to evaluate the “degree” of barriers, we need to focus on certain AIP solutions and specify the value chain

WG2 INDUSTRIALISATION AND MARKET INTRODUCTION

WG2 MEETING - BLED

GRANT PERIOD 2 TARGETS

- Collect information from the value chain parties and use this in AIP development
- Increase awareness about AIP through all value chains
- Draft a review paper/publication
- Analyse the selected demonstrator cases
- Virtual showroom - *established*
- Definition document - *established*
- Training schools (*Swansea 2016*), workshops (*Utrecht 2015*)...

TOPICS FOR THE WG MEETING IN BLED

1. Virtual showroom
2. Definition document
3. Evaluation of survey results
 - Draft a publication based on the survey
 - Is there some data lacking?
 - Survey to consumers?
 - Any other publication ideas in the area of non-technological aspects? Some planned jointly with WG1
4. Analyse the selected demonstrator cases
 - Non-technological aspects, market introduction/industrialisation
5. WG meeting in Spring 2017
 - Participants, topic, place
6. Planning of training school at TUT (Finland) for academia & industry

VIRTUAL SHOWROOM ON THE WEBSITE

[ABOUT](#)[WORKING GROUPS](#)[ACTIVITIES](#)[MEMBERS](#)[RESOURCES](#)

SHOWROOM



Antimicrobial

France



Active packaging

Netherlands



Augmented Reality

Netherlands



FreshPaper

USA

- Examples of existing solutions: everybody can provide more examples (to Sanne)
- To increase awareness of AIP

DEFINITION DOCUMENT

Term	Definition
2D codes	A 2D (two-dimensional) barcode is a graphical image that stores information horizontally and vertically, enabling fast data access.
Active barrier	active (or dynamic) barriers work by impeding the action to be carried out >> but what is the difference to functional barriers??
active packaging	intended to extend the shelf-life or to maintain or improve the condition of packaged food. They are designed to deliberately incorporate components that would release or absorb substances into or from the packaged food or the environment surrounding the food
Augmented Reality	Augmented reality refers to the overlaying of virtual objects on top of users' view of their environment in an interactive, multi dimensional and real-time way.
Biomaterials	Biomaterials encompass a whole range of materials which can be biobased, biodegradable, or both. Biobased means that the material or product is (partly or wholly) derived from biomass (plants). Biomass stems from e.g. corn, sugarcane, or cellulose – forest and agriculture products. The term biodegradable depicts a chemical process during which micro-organisms that are available in the environment convert materials into natural substances such as water, carbon dioxide and. The process of biodegradation depends on the surrounding environmental conditions (e.g. humidity or temperature, exposed or buried), on the material. Fibre-based materials meet both properties.
Bioplastics	Bioplastics encompass a whole range of materials which can be biobased, biodegradable, or both. Biobased means that the material or product is (partly or wholly) derived from biomass (plants). Biomass used for bioplastics stems from e.g. corn, sugarcane, or cellulose – forest and agriculture products. The term biodegradable depicts a chemical process during which micro-organisms that are available in the environment convert materials into natural substances such as water, carbon dioxide and. The process of biodegradation depends on the surrounding environmental conditions (e.g. humidity or temperature, exposed or buried), on the material.
Cellulose-based bioproducts	Materials derived from renewable biological resources. After the cellulose is isolated from wood, the cellulose-based products can be developed.
Cellulose-based packaging materials	packaging materials made of cellulose materials either in fiber form (cellulose pulp) or folis, molds (CNF, NCC)

- Excel file with keywords (will be shared among participants, can be updated by all)

WG2 SURVEY

☐ To collect information from value chain parties and get feedback to other WGs

☐ Questions:

- What is your role in the value chain?
- Would you be interested in a) using, b) testing A or I solutions?
- What kind of A or I solutions would you like to have? What kind of functions would you consider beneficial?(Interest in the active and intelligent packaging solutions, market needs)
- What are the main barriers preventing the use of A or I solutions (Issues and challenges related to active packaging materials)?

RESULTS OF THE SURVEY

- 100 answers
- 28 countries (European + US, Japan, South Africa, New Zealand)
- Mostly R&D

<https://www.surveymonkey.com/results/SM-SYJYLLZR/>

Retailer	0.00%	0
Brand owner	3.00%	3
Packaging producer	5.00%	5
Producer of products to be packed	0.00%	0
R&D / Academia	61.00%	61
Consumer / Consumer group representative	2.00%	2
Waste management	0.00%	0
Packaging material producer	16.00%	16
Converter	4.00%	4
Printer / Printing house	0.00%	0
Food industry	1.00%	1
Packaging designer	1.00%	1
Other (please specify)	Responses 7.00%	7
Total		100

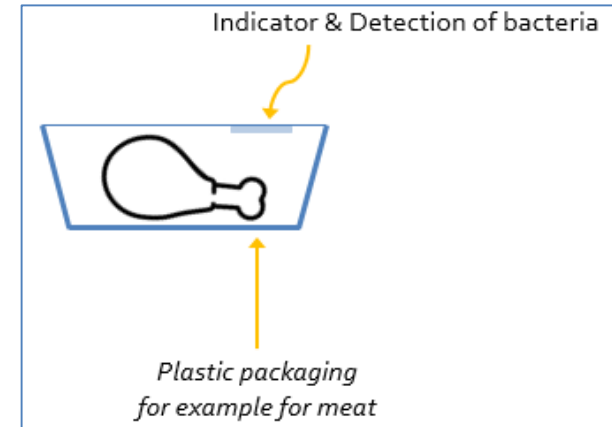
FURTHER SURVEY?

- Survey to get info on consumer expectations
 - How to organise – with help of consumer organisations.
 - Well defined questions – simple and short
 - 2-3 concrete examples (with pictures even) for consumers to evaluate
 - Different package applications (food, medical,...?)
 - Function: “Would you like a package with function X?”
 - “How much / Would you be willing to pay some/more for this function X?”
 - E.g. extended shelf-life, nutritional benefits/health, safety...
 - Specific target groups (like allergies)

DEMONSTRATORS - EVALUATION

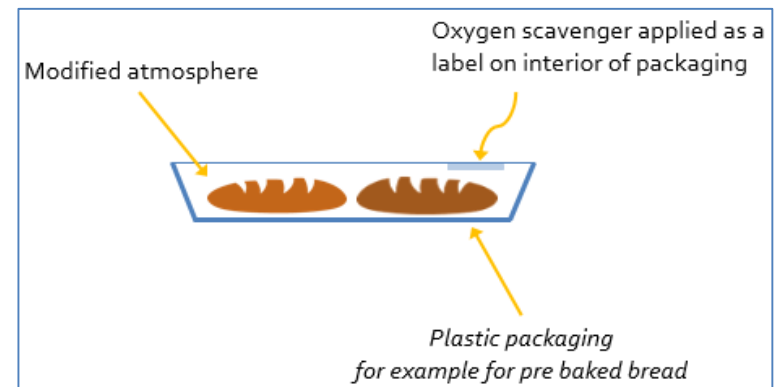
1. Intelligent packaging for meat & fish products – detection of bacteria

-informing consumer



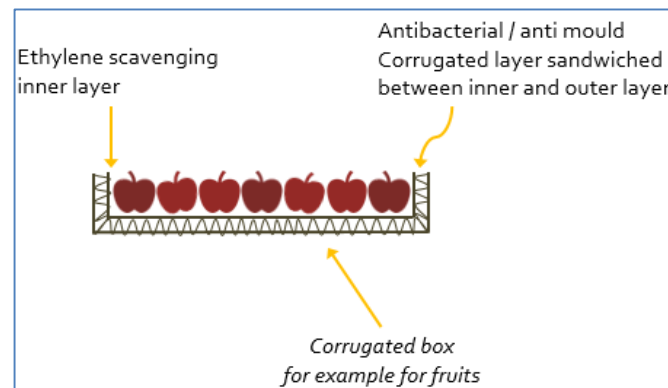
2. Active packaging for pre-baked products (like bread)- oxygen scavenger

-preventing



3. Active packaging for fruit/vegetables- antibacterial/ethylene scavenger

-preventing



EVALUATION OF EXISTING SOLUTIONS

- In order to evaluate the “degree” of barriers, we need to focus on certain AIP solutions and specify the value chain
 - Information from WG1 of existing solutions!
- Especially industrial participants to evaluate potential of selected solutions

TRAINING SCHOOL AT TUT IN FINLAND

- Summer 2017 (preliminary: week 24 in June)
- ~1 week with lectures and practical work
- For academia and industry
- Academic and industrial lecturers, COST partners also as lecturers
- Topics (draft):
 - Packaging materials and production
 - Packaging concepts and AIP solutions
 - Sustainability and LCA
 - Practical work:
 - Pilot-scale coating process, lab scale demos
 - Analysis of produced materials (e.g. barrier)



ACTIONS DISCUSSED IN WG MEETING IN BLED

1(2)

1. Virtual showroom – open for updates
2. Definition document – to be circulated among participants
3. Evaluation of survey results
 - Going through the results & discussion
 - Draft a publication? based on the survey.
 - Is there some data lacking? -> Brand owners, retailers... New “targeted” survey?!
 - Survey to consumers? -> Yes! (In different countries, own language?)
4. Case studies to be evaluated (“business” cases):
 - One successful, one unsuccessful: comparison what has succeeded – what is preventing
 - Packaging example showing effects with and without an A/I solution → Good case study attracts
 - Economical study, profitability

ACTIONS DISCUSSED IN WG MEETING IN BLED

2(2)

5. Other topics raised in the discussion:

- How to approach companies? Who to contact in companies? → Talk to “right” people!
- Industry has a need – they look for a solution from us *Or* We offer a solution that industry does not know yet -> we should show the potential
- Role of consumers: awareness (environmental issues, recycling, etc.), affects selection of products
- Cost of the new solution vs. added value, affects on profit
- Depends on the package how much additional cost is “accepted”
- Legislation “pushes” but also hurdles development and market introduction

6. Next WG meeting in Spring 2017 (together with WG3)

- Participants, topic, place → To be decided.

7. Discussion about training school at TUT (Finland) for academia & industry

8. Publication about legislation (discusses in the session with WG1): EU level, national level

- Johanna Lahti collects a group: Sara Limbo, Fatima Pocas, Paulius Pavelas Danilovas, Tanja Radusin, Paula Ferreira..

WG2 INDUSTRIALISATION/ MARKET INTRODUCTION

Thanks for all the participants!

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