D.T2.2.1 Good practice guidelines

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1. Table of content

2. Introduction

The objective of Task 2 of the I-CON project is to develop tools and techniques to improve competences and skills of food related SMEs through cross-sector related tools and techniques.

In the first sub-task of Task 2 of the I-CON project, advanced tools, techniques and methods were identified and analyzed in the disciplines of food safety, quality and labelling (FS); mechatronics (M) and food design (D) in order to provide support to SMEs. Then, these tools and techniques were used to find solutions for the collected regional needs provided by the Regional Partners of I-CON.
The aim of D.T2.2.1 is to present European and global good practices on the implementation of tools described in the previous task and additional present tools, solutions from the experience of I-CON project partners which can help SMEs to extend their knowledge, competences, management and entrepreneur skills.

3. Methods

3.1. What is a Good Practice?

Good practice cases can be defined as description of cases where such lessons learned are identified, which can be useful, adaptable and applicable for others as concepts, approaches, methods, procedures, systems, business models for developing and implementing solutions for other cases.

For the identification of best practices, a template was prepared by CBHU. The template was circulated among Partners for feedback, and they were asked to send at least 3 European/global good practices. For regional partners the provision of European/Global cases was optional.

This template was also used to collect information for D.T2.2.3- Handbook tool report.

These good practices can present the successful use of the tools identified in *D.T2.1.1- Analysis report of existing advanced tools and techniques* or other additional cases from the experience of the I-CON Partners.

The template covered the following aspects:

- Short description of the case
    - Describe the specific need or problem being addressed by the case
    - Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)
    - Describe the method, procedure, solution implemented
    - Describe the specific constraints of the business related to the implementation of the method and/or related to the region
    - Describe the results, achievements and typical failures

- Summarize what makes the case to a good practice
- Lessons learned (This part is used for the Handbook tool only (DT.2.2.3))
- Aspects, methods, transfer of methods, lessons learned (This part is used for the Handbook tool only (DT.2.2.3))
- Aspects for sustainable use, maintaining implementation (This part is used for the Handbook tool (DT.2.2.3)
- Recommendations for other applications.

4. Collected global and European good practices

4.1. Food safety, quality and labelling

4.1.1. Food quality and safety animation clusters called clubs

1. **Title of the case description:**

Food quality and safety animation clusters called clubs as tool for exchange and transfer of knowledge

CRITT Agroalimentaire PACA (Centre régional d'innovation et de transfert de tecnologie Agroalimentaire tecnologie, Agroalimentaire Provence-Alpes-Côte d'Azur Region), France (http://critt-iaa-paca.com/safety-and-traceability/)

Author: PTP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x	x	x				
Food safety, quality, label	x	x	x	x	x	x	x	x	
Food design	x	x	x	x	x				

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Food safety and quality experts are interested in strengthening their expertise and knowledge, in good professional and supportive network, in furthering their career and in constant need for a few more professional friends.

Target-oriented professional clubs can provide information about chosen specific field of expertise, enhance personal and professional development and provide endless networking opportunities.

Reasons for joining expert networking organization can be: broaden professional knowledge, taking charge of career, building a better resume, enhancing the network, being a leader, becoming a mentor, making new friends, giving back to the community, more strength in numbers, staying inspired and motivated (http://blog.cccctech.com/top-10-reasons-to-join-a-professional-organization/).

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

CRITT Agroalimentaire PACA (Centre régional d'innovation et de transfert de tecnologie Agroalimentaire tecnologie, Agroalimentaire Provence-Alpes-Côte d'Azur Region (PACA)), France food quality and safety animation clusters called clubs

The people who wish to take part in these clubs sign a chart at the beginning of each year that enables them to receive the invitation for each club meeting of the year for which they were registered. The subjects are given in agreement with the members of the clubs according to the current events. One or two subjects are tackled during each day's work. Each member of the club can speak about his experience, or outside contributors can be interviewed (on certain expert subjects). Study groups (by type of participant and/or according to the subjects) can be created per half-day to facilitate the exchanges. Sometimes the animator of the club can send a minute of the day but this is not always necessary.

The main stakeholders involved (including the beneficiaries)

All the employees of agro food companies in the region (and sometimes from other regions), "CRITT Agroalimentaire PACA" advisers, other advisers, as all the FRIAA (Fédération Régionale des Industries Agro-Alimentaires) and PEIFL (Le Pôle Européen d'Innovation Fruits et Légumes) advisers, which are always animators of this clubs (or sometimes expert on a subject).

The financial resources required for its implementation

This action is supported by the region council financial organisation, or other financial organisation, and in a small part by companies that are not members of CRITT.

- *Describe the method, procedure, solution implemented*

The CRITT organizes for years clusters which are called "clubs" on different subjects. They are Clubs of information and experience sharing where each participant can speak, transmits and receives information from other participants. Directors and employees of agrofood companies are invited to participate at these clubs 3 or 4 times a year per subject. The different subjects are: organic food, food safety, quality food, packaging, logistic, tourism and human resources.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Food technologists develop a wide range of products in the food and drink industry and make sure they are safe for consumers. They invent new processes and products, test food for safety and quality and find ways to keep food fresh for longer. Food technologists plan the production of food and drink products: blend together new ingredients to invent new recipes and ideas; modify foods, for example, to create fat-free products; conduct experiments and produce sample products; design the processes and machinery to make products in large quantities.

Some tasks may involve quality control as well as product development.

The food technologist needs to explain his/her ideas to other scientists and factory staff, and be confident in reporting any problems with processes. He/she needs to meet stringent health and hygiene rules and food production regulations.

Food experts and researchers use different techniques to:

- Get accurate nutritional information for food labels;

- Investigate ways to keep food fresh, safe and attractive;
- Find ways of producing food more quickly and cheaply;
- Test the safety and quality of food.

Food experts have to gain knowledge and experience of areas like chemical engineering, production planning, market and consumer research, and financial management.

So for a food technologist is of crucial importance to be in contact with other food technologists and to exchange information (problems and solutions) that is not declared/protected as know-how.

(https://www.myworldofwork.co.uk/my-career-options/food-scientist-or-food-technologist)

- *Describe the results, achievements and typical failures*

These clusters are a real success from the view of companies, especially in the subject of safety, quality, tourism and human resources. By the criteria of innovation, this type of best practice is a success because of the different way expertise exchange available (visit, external presentations, exchanges). Innovation „per se“ is included as horizontal principle.

4. Summarize what makes the case to a good practice

The results are:

- Increased knowledge on different aspects of agrofood production
- Created possibilities to exchange with other participants daily problems and solutions
- Created possibilities to go out of the office and to realize the problems of the others.

4.1.2. Member interest Groups of Campden BRI UK

1. **Title of the case description:**

Member interest Groups of Campden BRI UK

Author: CBHU

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x	x	x	x	x	x	x
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Learning and innovation have been discussed not just as opportunities but as pre-conditions for the sustainability of the sector.

The European Commission defines its innovation strategy as '…with an ageing population and strong competitive pressures from globalization, Europe' s future economic growth and jobs will increasingly have to come from innovation in products, services and business models. This is why innovation has been placed at the heart of the Europe 2020 strategy for growth and jobs…' (European Commission - Innovation Union, 2011).

The need for innovation covers a broad spectrum of developments, not just in products and processes but also in services, organization, and management. Innovation, however, is not easy to identify. Discoveries or inventions without any uptake by industry and without impact on the competitive advantage or the sustainability of the sector cannot be classified as innovation.

Networking is especially relevant for SMEs where individual companies do not have the internal infrastructure that supports sufficient interaction and knowledge exchange is deemed necessary for successful innovation support.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Campden BRI has over 2400 member companies in 75 different countries. Full Members' fees are based on a number of factors: location of sites, activities and processes, number of employees, annual revenue turnover.

- *Describe the method, procedure, solution implemented*

Campden BRI UK's Member Interest Groups (MIGs) are a pre-competitive collaboration between their members.

MIGs consist of Campden BRI members who share a topic of interest. The meetings are a good interface between Campden BRI and their members to meet and share experience, knowledge and ideas and learn from each other while the costs are equally distributed among the members.

Their names reflect their interests - some are sector based whilst some are discipline based:

- Agri-food
- Brewing and fermented alcoholic beverages
- Cereals, milling and baking
- Chilled and frozen foods
- Food and drink science
- Food service
- Heat preserved foods
- Manufacturing technologies
- Meat and poultry
- Microbiology
- Nutrition and health
- Packaging
- Processing, operations and preservation
- Quality and food safety management
- Sensory and consumer

There are 3 MIG meetings every year.

Members participating in MIG are encouraged to share ideas and approaches through informal presentations, small discussion groups and exchange of information on topical issues.

Progress on member funded research projects is assessed through regular presentations by Campden BRI staff, and external speakers provide further background information on other relevant topics.

Benefits for joining the MIG group include;

- Networking opportunities to join member interest groups that meet regularly, as a great way of keeping up with industry changes and network with peers.
- Keeping up to date with the latest news and research in food and drink innovation with exclusive website access.
- Helping to generate ideas for research projects and become a part of these projects by voting and getting access to results.
- Easy access to results of the member-funded researches in the field.

More information available on the website of Campden BRI UK: https://www.campdenbri.co.uk/research/migs.php

- Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution

Campden BRI members pay an annual membership fee to get all the above mentioned benefits. This cost is calculated based on the Annual turnover and the number of employees.

MIG meetings take place in Chipping Campden 3 times a year. Being available and travel for these meetings can be a barrier for companies.

- *Describe the results, achievements and typical failures*

There are 14 different Member Interest Groups, sector specific and discipline based ones as well. They cover the activities of the food industry. The meetings are attended by a range of member companies; in general there are 10-40 participants at each meeting.

4. **What makes the case to a good practice**

The MIG participants can learn from each other and they can get access to the results of the member-funded researches. By paying the annual fee they share the cost of research, which are both beneficial for them and for the Campden BRI as well. The collaboration does not create a competitive situation between the members.

4.1.3. Platform of crossed internal audits

1. **Title of the case description:**

Platform of crossed internal audits

Author: PTP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x	x	x	x	x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Obtaining or consolidation of national and international certifications of the Quality Management Systems and/or Hygiene and/or Environment (Systems of Management QHE or SMQHE) of type:

- "ISO 9001 or NF V01-005" (or reference frames related) as regards Management of Quality,
- "ISO 14001 or NF V01-007" (or reference frames related) as regards Management of the Environment,
- "ISO 22000 or IFS/BRC" (or reference frames related) as regards Management of hygiene and traceability of food products intended for human or animal consumption.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

The member companies of Coop de France Alpes Méditerranée, Regional Federation of Agrofood industries (FRIAA) and CRITT PACA,France decided to exchange means, which can facilitate the obtaining or consolidation of national and international certifications of Quality Management Systems and/or Hygiene and/or Environment (Systems of Management QHE or SMQHE).

Since January 2009, the CRITT is piloting, on behalf of the two regional federations: the Regional Federation of Agrofood industries (FRIAA) and Coop de France Alpes Mediterranée, the management of a platform of crossed internal audit in PACA area (created in 2003).

- *Describe the method, procedure, solution implemented*

The companies decided to set up a system of audit of System Management between firms (hereafter called Platform of Auditors). It acts to allow the companies candidates with certification or committed in a step QHE, to have the possibility of benefitting reciprocally from their matter of experiment, audit of SMQHE (hereafter called audit (S)) in the field of the agricultural Co-operation and Agrofood industry.

The platform gathers companies of different sizes, from small companies (like Kookabarra juice for example with 10 employees which produces fresh fruit juices) to big international groups (like Coca Cola with 200 employees on the site in the south of France). There are also several big cooperatives of wine or fruits. The main interest of each company is the same: continuous improvement of their quality system with the realization of internal audits.

The key points of the success of this platform are:

- The qualification of the auditors;
- Their experience;,
- The compliance with the rules of confidentiality and reciprocity;
- The big number of auditors available;
- The reactivity of the system.

This action is supported by the DRAAF (Regional Direction of Food Industry, Agricultural and Drill), the regional council, the department of Vaucluse and the general council of Alpes de Haute Provence.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Food safety audits help to identify and correct potential vulnerabilities in food processing to promote best practice methods, improve safety and help reduce liability.

Only independent, objective and professional audits can identify strengths and weaknesses.

Third-party audits help to identify and correct potential hazards and mitigate food risks to help ensure compliance and reduce exposure to health and safety issues.

- *Describe the results, achievements and typical failures*

- It allows experts to tap more in resources.
- It gets more participation in the QMS across the company.
- It allows professional development of people not normally associated with a quality function.
- "Fresh eyes": Professionals specialised in other topics than quality non-related are comparatively less familiar with the QMS and less skilful in this topic. However, their professional background and the naiveness allow them to see what a quality specialist may not see or take as "normal" and to ask good questions. For example, a design engineer may be a great resource for a validation process audit. The audit may also inspire the auditors to better do their own job.

4. **Summarize what makes the case to a good practice**

There are more and more companies present within the platform, thus more and more of audits carried out each years.

Other areas are interested by the installation of a platform of this type. The integration of new reference frames or new audited standards (like ISO 26000) have been thought about for next years. There is positive feedback of official auditors during certification audits.

4.1.4. Introduction of Pain de Belledone as part of the Bio Solidaire® initiative

1. **Title of the case study**

Introduction of Pain de Belledone as part of the Bio Solidaire® initiative

Author: STRIA

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label		x	x	x	x	x	x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The good practice is based on the following needs:

- Developing community partnerships between processing companies and producers, all working towards sustainability on national territories,
- Guarantee to producers a fair remuneration of their products.

Bio Partenaire wished to extend the Organic Fair Trade approach to stakeholders in the local organic commodity chain and to set forth a tool able to unite them in the logic of continuous economic development, both local and social. The organization worked to widen the scope of the Organic Fair Trade frame of reference and to adapt it to local national issues. As a consequence of these efforts, the second brand was created on these grounds: organic solidarity.

The values are embodied by the "Pain de Belledonne" bakery product as part of the BioSolidaire initiative. Pain de Belledone:

- re-creates connections between the business areas around agricultural products: farmers, millers, bakers,
- contributes to the maintenance of an economic activity in rural area to ensure the economic sustainability of that territory,
- contributes to a fair compensation of the agricultural products,
- proposes for the customers a responsible purchasing of products that bear ecological, economic and social values.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

As part of Biosolidaire initiative Pain de Belledonne (or simply Belledone) is an organic bread and pastry processing company that has developed economic and technical partnerships with local cereal farmers. The company commits itself for three years on a volume of cereals it will buy and on a fixed price, calculated independently on the market fluctuations, in order to ensure a fair compensation of the farmer's work. In the meantime, Pain de Belledonne supports the farmers in optimizing their production and the organization that requires: investment in equipment, technical advice, training etc.

Belledonne was founded in 1991, on the wild foothills of the mountains of the same name, in Savoie. With four regional bakeries, a biscuit factory and a chocolate factory, the company now has more than 100 employees and develops more than 200 organic products (breads, bread rolls, brioches, biscuits, cakes, chocolate bars, chocolates and festive pastries, marshmallows ...), distributed throughout France exclusively in organic specialty stores.

Known for its strong commitments in the organic sector, they have developed more than ten supply chains recognized for the quality of their products and for the dynamic innovation of their offer, they work every day to improve of their actions.

- *Describe the method, procedure, solution implemented*

The BioSolidaire-Belledone method is based on puts into practice the following values-practices:

1. Giving back organic agriculture its values:
    - environment protection,
    - a sustainable partnership between producers and processers,
    - global quality of the products;
2. Applying the principles of fair trade to North-North exchanges and consider solidarity trade and organic production as pillars for sustainable development.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

Constraints or challenges to tackle with:

- uneven quality of the flours: needs for a strong partnership in order to share know-how,
- defining the fair price: two very different worlds meet: the agricultural company and the processing company,
- need for geographical grouping for specific processes (sorting, hulling): to recover the investment linked to the development of equipment,
- quantities directly produced by farmers are limited: how is it possible to increase quantities for the critical production level,
- defining proximity, adaptation of some products to the wider territory: relevance of the flax compared to more humid areas.

- *Describe the results, achievements and typical failures*

To be entitled to use the ORGANIC SOLIDARITY* label, the company has to comply with the following principles:

- to be committed in an agro-organic certification,
- to settle a partnership between producers and the company for the sake of the products' quality as well as the development and sustainability of the business actors along the chain,
- to promote a sustainable trade policy with formalized commitments, allowing a fair compensation of the farm products as well as the access to stable markets, in a mutual solidarity,
- to cultivate close relations between the production area and the processing companies in order to re-localize economy,
- to encourage progression of the farmers and of food producers in a framework of a complementary ecological commitment so as to be in coherence with organic agriculture,
- to encourage the commitment of producers for social progress and for the participation of their employees,
- to contribute to the maintenance of the rural area and to the local development.

Further demonstrated results are the 12 organic solidarity commodity chains which are in operation as of today. To quote a meaningful example, the common wheat and small spelt commodity chain operates with the involvement of four farms and one industrial bakery, the Pain de Belledonne.

New chains in their preliminary phases of existence:

- development of a chain for spelt and rye with the partner farmers,
- development of a chain for flax seed and hulled sunflower: to avoid importation for products adapted to the land. This is delivered by working together with the Appui Bio association and the regional chamber of agriculture,
- development of a chain for wheat flour T80 in partnership with a miller: the quantity exceeding 200 tons does not allow working directly with the farmers.

4. **Summarize what makes the case to a good practice**

This good practices aim at promoting local economy relying on the strengthening of geographical and relational proximity between the food chain actors. The relational proximity means better mutual knowledge and solidarity between the involved actors. The creation of the BioSolidaire label highlights this proximity towards those consumers who consume more and more local food products as part of their regular diet.

4.1.5. Standards of Marine Stewardship Council for sustainable fishery

1. Title of the case description:

Standards of Marine Stewardship Council for sustainable fishery

Author: CBHU

2. Cross-reference table

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x						x
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Fisheries sustainability has previously mainly been addressed by NGO's by campaigning against consumption of certain fish species where stocks are threatened (e.g. cod in the Baltic) or where endangered species are caught as by-catch (e.g. dolphins killed in Tuna fisheries). Since there is very weak links between producers (both fishermen and processors) and consumers in the fish supply chain it was impossible to transmit differences in fishing practices and also different stock status in different oceans (e.g. cod stocks in the Baltic are under pressure, but cod stocks in the Barents sea is generally well and sustainable managed). So, it was not possible to affect consumer behaviour by making the fisheries more sustainable, and consumers didn't feel they could make a difference.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

The Marine Stewardship Council is an international non-profit organisation established to address the problem of unsustainable fishing.

The MSC is registered as a charity in the UK and a 501c3 non-profit in the US.

312 fisheries in over 30 countries are certified to the MSC Fisheries Standard for sustainable fishing.

- *Describe the method, procedure, solution implemented*

The solution was a joint effort by processors (Unilever), NGO's (WWF) and fishing communities called Marine Stewardship Council (MSC). They described criteria for sustainable fisheries which were approved upon within the group and a certification scheme and certification body. The criteria are mainly focused on fish stock status, but

also social aspects are considered. Fisheries could then apply for MSC certification from a third party certifier and their products could be labelled on consumer packages. Fisheries are certified for a period of 5 years, and then they need to be re-certified.

The MSC program is science-based. It meets best practice guidelines set by the United Nations Food and Agriculture Organisation (UNFAO) and the International Social and Environmental Accreditation and Labelling Alliance (ISEAL).

The certification program is open to all fisheries regardless of size, scale, location and technology. MCS has a dedicated Developing World Program and have developed tools to improve the accessibility of the program to small-scale and data-deficient fisheries.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

- The certification is costly.
- Information regarding the criteria that MSC builds on can be found on the MSC webpage, however it requires high level of interest from consumers to purposely look up these information.
- Further, only fisheries with very high level of interest in sustainability issues would decide to take part of it.

- *Describe the results, achievements and typical failures*

The MSC Fisheries Standard is used to assess the sustainability of wild-capture fisheries.

The MSC Chain of Custody Standard ensures traceability, meaning our eco label is only displayed on seafood from an MSC certified sustainable fishery.

Many companies, both in retail and processing are using the MSC as their main tool for working and communicating about their sustainability work to consumers.

Hundreds of improvements in fishery management have been recorded in certified fisheries. Limited seasons have helped rebuild stocks, and strict fishing area controls have helped protect habitats and ecosystems. Changes in fishing gear have also reduced by catch and minimized interactions with sea mammals and birds.

4. **Summarize what makes the case to a good practice**

The open access to both criteria and assessment is important. The stakeholder involvement in the definition of the criteria is also strength. Transparency can be said to be passive, i.e. interested parties need to find the information themselves on the web. The third-party certification and strict traceability strengthens the credibility.

4.1.6. Airborne's TraceMe honey application

1. **Title of the case description:**

Airborne's TraceMe honey application
Author: CBHU

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label		x	x	x	x	x	x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**
   - *Describe the specific need or problem being addressed by the case*

Mānuka honey is a monofloral honey produced in Australia and New Zealand from the nectar of the mānuka tree.

The typical raw unfiltered honey is a rich source of amino acids, B vitamins (B6, thiamine, niacin, riboflavin, and pantothenic acid), calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium and zinc. Manuka honey has a considerably higher level of enzymes than regular honey. These enzymes create a natural hydrogen peroxide that works as an antibacterial.

It is the most expensive type of honey in the world.

As a result of the high premium paid for mānuka honey, an increasing number of products are counterfeit or adulterated. According to Unique Manuka Factor Honey Association (UMFHA), in 2013, 1.700 tons of mānuka honey was made in New Zealand annually representing almost all the world's production, some 10.000 tons of produce were being sold internationally as mānuka honey, including 1.800 tons in the UK.

4. **Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)**

Airborne Honey Ltd was established in 1910 on Banks Peninsula, New Zealand. Now it is headquartered in Leeston, New Zealand. The company currently has 20 employees.

Airborne Honey Ltd. is a manufacturer of honeys including Clover, Manuka, Rata, Kamahi, Vipers Bugloss, Nodding Thistle, Rewarewa, Tawari, and Honeydew, Thyme plus a range of comb honeys, Royal Jelly and beeswax.

The main export areas are the following: Canada, China, Hong Kong, Indonesia, Italy, Japan, Republic of Korea, Malaysia, Saudi Arabia, Singapore, Taiwan, Thailand, United Kingdom, and United States.

- *Describe the method, procedure, solution implemented*

While New Zealand is a signatory to the Codex Alimentarius honey standard, there are no robust Codex based honey standards in Australia and New Zealand.

Airborne Honey Ltd. has developed an online app, the TraceMe application for consumers to authenticate the variety, quality, origin and parameters of the honey in the jar they have purchasing confirming that it is true to label.

To use TraceMe, consumers can simply scan the QR code on the label with their smart phone or go to www.airborne.co.nz, and enter the honey's batch number (in the box on the bottom left) to see for themselves what's in the jar and where it came from.

TraceMe displays details about the particular jar of honey, from which location in New Zealand was it collected, to heat damage levels, pollen presents.

The online tool was particularly welcomed by Chinese consumers, after experiencing so many food safety scares.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

High cost of developing an on-line tool can be an obstacle for companies. Certain aged consumers do not prefer on-line applications.

Language of the app also can be a barrier for the consumers.

- *Describe the results, achievements and typical failures*

Consumers are getting used to the fact that there are mobile applications for almost everything. TraceMe is an easy-to use, free application which allows to gather information on the purchased honey product. TraceMe strengthens Airborne's competitive position as honey producers in Australia and New Zealand.

For more information: www.airborne.co.nz

5. What makes the case to a good practice

Airborne Honey has built its reputation as a world leading honey brand by selling true to variety mono-floral honey and uses a proprietary quality assurance system to provide the authentication to consumers that what is printed on the label is what is in the jar. Airborne also complies with the internationally recognised CODEX honey standards.

This on-line app is also an example for ethical marketing strategy.

4.1.7. Guideline for Cleaning Suited Equipment

1. **Title of the case description:**

Guideline for Cleaning Suited Equipment
Author: CBHU

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x		x	x		x			
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

During the last decade the market of the fresh cut produce industry have undergone relatively rapid growth. However, with a growing fresh produce market the consumer-driven rising demands for more sustainable technologies pose new challenges for the fresh-cut industry.

There are numerous techniques used currently for disinfecting and sanitizing surfaces in food industry, but their sustainability aspects are less understood.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Like in the European fresh cut produce industry, in the Hungarian minimally processed vegetable industry the convenience salad producers use vide variety of raw green, leafy salad mixes. During the last two decades the European and the Hungarian market of the minimally processed vegetables (MPV) is growing continuously, among the players can be found both relatively new and small enterprises and larger groups such as the Eisberg Hungary, a member of the Eisberg Group (Eisberg Group is major producer and market leader of the European convenience salad industry).

- *Describe the method, procedure, solution implemented*

The rapid diagnostic assay developed in SUSCLEAN project were not directly implemented by the Hungarian producers of the convenience salad mixes, but throughout the last decade a range of other diagnostic rapid tests were used by the Hungarian salad industry.

The hygienic design application shortly demonstrated by the guideline can serve as an example how the risk of food cross-contamination from the equipment surfaces can be reduced by the hygienic design. The section of the guideline related to the effects of advanced surfaces directed a bit the caring of the salad producers for the new machinery geometries.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The constraints of the guideline are coming in particular from the fact, that the knowledge of the industry players are very limited both on the biofilm formation and in the area of the different type of advanced surfaces.

- *Describe the results, achievements and typical failures*

The information given by the guideline about the development of the novel diagnostic assay are interesting for the companies, but they use different other type of kits in their daily practices.

The short overview of the alternative equipment sanitizing strategies – chemical and physical treatments are helpful for the companies when they think on implementing new methods.

Useful background information on hygienic design of processing machinery is shortly listed in the guideline.

Both the MPV (minimally processed vegetables) industry and the machinery producer can found in the guideline useful examples (e.g., geometry modification for the reduction of the microbial trapping, effect of the advanced surfaces) related to the importance and basics on the design in MPV.

4. **Summarize what makes the case to a good practice**

The information of the alternative physical and chemical decontamination methods are important for all players of the sector, even if the new decontamination techniques are not ready to use and further research and development should be carried out at industrial conditions.

In addition the information of the alternative equipment sanitizing strategies given by the guideline are relatively easy to integrate into courses specifically organized for the industry in the subject of cleaning and disinfection food equipment.

The novelty of the guideline is the quantification of the consequences of the design improvement in terms of hygiene for the fresh-cut food industries. Data obtained here are relevant to be used in risk analysis processes.

4.1.8. Improvement of the environmental sustainability of spring water production industrial plants

Improvement of the environmental sustainability of spring water production industrial plants

Author: STRIA

1. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x		x	x	x	x	x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

2. **Short description of the case (from ½ page – 3 pages)**
   - *Describe the specific need or problem being addressed by the case*

The specific needs of the good practice case are as follows:

1 Improve the integration of the water industrial production plant with the surrounding environment

2 Preserve and efficiently monitor the quality of spring water

3 Reduce waste, plastics and energy consumption of the production process

4 Obtain ISO 14000:2004 environmental certification

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Fonti del Vulture Srl is a company in Basilicata Region specialized in extracting and distributing mineral water. The company is located in Fonti del Vulture, its main activities is bottling and distributing natural mineral waters called Lilia, Sveva and Vivien.

In February 2006, Fonte del Vulture was acquired by the US multinational Coca-Cola Company, thus started to emerge on the Italian mineral water market.

The volcanic area of Vulture of Basilicata Region has several natural and geological endowments including the presence of numerous natural spring waters.

- *Describe the method, procedure, solution implemented*

The volcanic area of Vulture of Basilicata Region is very interesting in terms of exploiting natural and geological properties based on the presence of numerous natural spring

waters, whilst, at the same time another interested of equal weight is to turn the area into a territory under environmental protection.

Vulture Mountain consists of a volcano at 1.327 meters high which is extinct since prehistoric times. The land surrounding it is very rich in terms of biodiversity and it is predominantly used for high quality agrofood productions, especially grape, wine and olive oil.

The volcanic soil is very rich in mineral waters and different industrial plants are present in the area for the exploitation of these natural resources. Mineral waters are naturally sparkling, characterized for the presence of carbon dioxide and oligominerals. Natural mineral waters are abundant in Vulture and coming from basal springs that do not alter the natural balance.

The quality of mineral water is linked to the quality of the surrounding environment, either wild or used in agriculture.

Agricultural practices, for example, can strongly influence the composition of groundwater with the intense use of pesticide and fertilizers, chemical compounds that are common causes of pollution. Development and application of good agronomical practices (GAP) in Vulture areas along with a public monitoring system of agricultural farms are certainly relevant also for mineral water production.

On the other hand the extraction and bottling of mineral water and the processing phases of mineral water production are energy intensive processes. Bottling uses also non-biodegradable plastic polymers (PET) which are potential pollutants and require special efforts and logistic organization for recycling. The old industrial plants produce plastic waste, using also part of the extracted water for washing of the lines. Substantial portion of the water is also lost during the extraction process and delivery to the final destination.

As a consequence of the above, strong room for production optimization is present in order to reduce energy and waste.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The objective of the project was to cultivate the water resources through activities aimed at preserving their natural balance.

The project followed an integrated approach by implementing the following activities:

- informing, raising awareness and training employees on environmental issues to promote a sense of responsibility towards the environment and to promote a culture of environment protection,
- using raw materials, energy and natural resources in a rational manner so as to reduce waste and implementing recycling processes, wherever possible,
- managing waste to reduce the produced quantity and seeking the most suitable way to collect the water and transport it to the final destination,
- reduce the environmental impact of the production activities.

The project mobilized 16 million Euros in three years, with two big infrastructural investments:

- one high throughput bottling plant with a daily capacity of 1.300.000 bottles, able to manage to use less PET bottles,
- 1MW photovoltaic plant to provide for the energy supply of the plant.

At project closure the company obtained the UNI-EN-ISO 9001:2000 and UNI-EN-ISO 14001:2004 environmental certifications.

- *Describe the results, achievements and typical failures*

On the eco-environment side, the installation of new generation plant characterized by a high throughput, with a production capacity of 1,3 million bottles per day (meaning a 30% increase compared to the previous capacity), the treatment of wastewater, quality controls on products and innovative monitoring systems for the rational control of the extraction of water resources, enabled to record in the years between 2008 and 2013, a net reduction in water consumption (-22%) and energy consumption (- 19 %) for each litre of bottled water.

Innovations in the packaging of all sizes of PET bottles allowed, compared to more than doubling of volumes, the reduction in use of plastics up to 1.023 tonnes in 2008. An important result obtained, thanks to a downsizing of all bottle sizes, ranged from a low of 9% on the 1.5 litre bottle to a maximum of 24 % on the 2 litres. The recycling of waste materials achieved excellence with a recovery of about 99% of the waste produced.

The company installed a photovoltaic power 1MW which will reduce the emission of 1,542 tons of CO2 into the atmosphere and covered an area of 29,000 m^2.

The takeover of the industrial plant by a big and high reputation company dramatically changed the company policy and the capacity of investment.

3. Summarize what makes the case to a good practice

This good practice emphasizes the importance of convincing environmental investments in food industry, which can be a strong guarantee of building a "green" brand.

4.1.9. Biosensor system (lactate biosensor)

1. **Title of the case description:**

Biosensor system (lactate biosensor) that ensures quality and efficiency in the fruit juice industry.

Author: CCIS-CAFÉ

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x							
Food safety, quality, label	x	x	x		x				
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Initiative for the development of biosensor system was to ensure quality and efficiency in the fruit juice industry. European small and medium-sized fruit juice producers must contend with the problem of contamination daily. Lactate-fermenting bacteria trigger unwanted fermentation that can cost companies millions in lost revenue. The problem, however, is that their presence may remain unnoticed for days before tests can identify them.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

European fruit juice industry. The fruit juice industry ranges from the farm and production level, through processing of fruit to juices, their bottling and packing, over to their delivery to the final consumer.

- *Describe the method, procedure, solution implemented*

Biosensor system (lactate biosensor) is an efficient sensitive early warning system, which indicates a critical undesired bacterial spoilage during fruit juice production. The methodology was developed under the QUALI JUICE project for all the European juice producers for detection of microbial contamination with lactate producing bacteria. Firstly, it helps to identify critical points in fruit processing. Hence, a substantial basis is given for decision-making towards repeated preservation measures (pasteurization) in order to keep the juice suitable for human consumption. Thus, potential for saving raw material and production costs can be explored, increasing the productivity. The commercial lactate biosensors can be used to measure lactate concentration in juices during production of juice concentrate and in juices.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The disadvantages of the biosensor use in food and beverage industry are the fact that the measurement with biosensors is not included in standards and legislation and the lack of commercial biosensors devoted for lactate assay in food except YSI 2700 SELECT™ Biochemistry Analyzer (YSI Inc., USA). Only for the wine industry, the market offers specific biosensors for complex analysis of wine production and quality.

- *Describe the results, achievements and typical failures*

The use of the biosensors for this purpose could be the alternative for standard methods like enzyme kits and chromatography. The main advantages of the lactate biosensor use are as follows: shortening the time of analysis, the assay can be made by unskilled personnel after short training, the measurements can be done at the production site and the cost of analysis is lower as compared with standard methods. Biosensors consume energy so they are usually introduced when there is a risk of spoilage.

4. Summarize what makes the case to a good practice

The requirements and considerations for safe and hygienic production, handling and processing of fruit and vegetables into semi-industrial products destined for further processing and packaging are very high. Biosensors contribute to the fact that food sources are managed in a way that ensures that contaminants are not present in the food and/or food ingredients to levels which would render end products potentially harmful to human health or unsuitable for human consumption.

4.1.10. Innovative food packaging that extends shelf life and reduces footprint

1. **Title of the case description:**

Innovative food packaging that extends shelf life and reduces footprint.

(Innovative fully biodegradable and recyclable, multilayer, barrier and transparent structure for fresh pasta and different types of cheese that requires customized Modified Atmosphere Packaging (MAP). Project BIO4MAP (http://www.bio4map.eu/)

Author: PTP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x		x				
Food safety, quality, label	x	x	x		x		x		
Food design	x	x	x		x				

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

2017 brings many changes to the world of food and beverage packaging. Transparency in labeling, changing packaging formats for PET products, and the rise of the stand-up premade pouch are just a few things to watch for in year 2017. Top trends in packaging in 2017 are:

Clean and Clear Prepared Foods

A clean and clear label is the new global standard. Consumers demand total transparency, from farm to table. This means that when a food product is labeled 'environmentally friendly' or 'free range', the companies involved in its harvesting, processing, and packaging have to be able to demonstrate those claims. New nutrition__label requirements have also encouraged more transparency as far as product ingredients and nutrition facts are concerned, enabling consumers to make more informed choices when it comes to their health.

Pro Food World reports that consumers are tuned in to food safety now more than ever. They desire no surprises when it comes to the processing of their prepared food items, and they expect that third product's supply chain 'story' must be easy to find and to understand via clear and easy to read labeling. The desire for clear packaging goes one step further; not only do consumers desire package design that clearly articulates its contents, but they are attracted to packaging that also contains a clear window to view the products within. This provides a visual reinforcement that the product is fresh.

Single Serve Snacking Sustainability

Single-serve and controlled portion packaging has been welcomed by both the snack food industry and the consumers as well. For snack producers, offering their products in different packaging formats enables them appeal to different consumer demographic groups. For consumers, single-serve packaging allows them to snack without being concerned with measuring and calculation to figure out the nutritional content of a single serving size, not to mention that small packages are portable and convenient. Although this packaging format is very attractive from a market standpoint it presents a problem for those concerned with packaging waste.

The good news is that as more consumers demand sustainable packaging materials, the more innovation occurs in that market. Green and environmentally responsible packaging formats are becoming the standard instead of just a passing trend. Leading global producers of single-serving food products have been innovating with environmentally sustainable packaging materials as well as focusing on reducing the carbon footprint created by their products throughout the entire supply chain. As these technologies are adopted by a greater number of key industry players, the competition will increase in the sustainable packaging market, and packaging materials that may have once been cost-prohibitive will become more affordable for smaller businesses.

In almost all food packaging markets, the demand for premade custom pouches increased in 2016 and that trend is expected to gain further momentum in 2017. From its clean, premium look to ease of shipping and handling to innovations in flexible pouch packaging for messy items like creams, soups, and sauces, the demand for preformed pouches does not show signs of slowing down.

(http://www.vikingmasek.com/blog/2017-food-packaging-predictions-5-trends-to-watch)

The packaging developed within the project BIO4MAP "Transparent and high barrier biodegradable film and sheet for customized modified atmosphere food packaging "satisfies the top trends in packaging in 2017.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Result of BIO4MAP project (FP7) is bringing a new type of sustainable food packaging to the market that increases shelf life for fresh pasta and cheese, at a cost 25 percent lower than the other alternatives, and an environmental and carbon footprint reduced by up to 29 percent.

Project partners are coming from 5 countries: Spain, Belgium, France, Finland and Germany.

(https://phys.org/news/2016-08-food-packaging-shelf-life-footprint.html#jCp)

The development was coordinated by AIMPLAS – a research technology centre located in Spain with 25 years of experience in plastics research and development. The role of AIMPLAS in this project was, besides coordinating, focused on developing the biodegradable and oxygen-barrier material needed to comply with the final requirements of the food to be packaged, as well as being the responsible of processing the new materials developed to obtain the new multilayer packaging. Brought together, the materials contained in the BIO4MAP's packaging have a carbon footprint that is 57 % lower than that of materials traditionally use to pack cheese and fresh pasta. PLA (polylactic acid or polylactide) boasts excellent mechanical properties

and ease of recycling, whilst PVOH (polyvinyl alcohol) has a good gas barrier with water solubility: it disappears in the washing process, allowing PLA to be properly isolated and recycled. A wax coating processed by project partner Fraunhofer covers the external layer of the packaging, providing water vapour barrier and improving the flexibility of PLA.

All these materials are joined by a new generation of biodegradable adhesives, which is one of the main innovations brought by BIO4MAP.

While these materials were already commercially available, their processing as a coextrudate into a multilayer laminate had yet to be achieved. Altoni Pasta and Sachsenmilch are already counting on BIO4MAP's solution to pack their products, whilst the inter-supplier of Mercadona, Central Quesera Montesinos, is using it for the new packages of its cheesecake. All fresh food that requires a modified atmosphere packaging to be conserved is set to benefit from the use of this new packaging. Besides the above-mentioned partners, BIO4MAP also saw participation from Vallés Plàstic, which was responsible for applying the new coating, and Artibal, a manufacturer of waxes, lacquers and inks responsible of its formulation. The compounding company MAPEA has developed the biodegradable adhesive together with Finnish research centre Abo Akademi, and packaging transforming and manufacturing was handled by Bobino Plastique in France.

(http://cordis.europa.eu/news/rcn/126003_en.html)

- *Describe the method, procedure, solution implemented*

The newly developed packaging material consists at least 75 % of raw materials from renewable sources. It includes different layers of bioplastics – PLA, PVOH and adhesives – and a wax coating produced from olive leaves. It is easy to recycle, presents excellent mechanical properties, is biodegradable and protects its content from oxygen and humidity, thereby preventing the development of bacteria and fungi.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

There is the question of transferability of know-how due to intellectual property rights despite the fact that the project was co-financed by EU.

Another question is interaction between food and this kind of packaging. Food packaging chemicals in general are not disclosed, and in many cases we don't have their toxicology or exposure data. Upwards of 6,000 different manufactured substances are now listed by various government agencies as approved for use in food contact materials in the Europe — materials that can legally go into consumer food packaging, household and commercial food containers, food processing equipment, and other products.

Analyses have revealed substantial gaps in what is known about the health and environmental effects of many of these materials and raised questions about the safety of others. A study published in 2014 found that 175 chemicals used in food contact materials are also recognized by scientists and government agencies as chemicals of concern — chemicals known to have adverse health effects. Another published in December 2013 found that more than 50 percent of food contact materials in the U.S. Food and Drug Administration database of such substances lacked accompanying toxicology information filed with the FDA about the amount people can safely eat

(https://ensia.com/features/when-it-comes-to-food-packaging-what-we-dont-know-could-hurt-us/).

Toxicity data for this new packaging of concern are not publicly available. The pre-requisite of the practical application of this new packaging material is that its compliance to the EU Regulation 1935/2009 on food contact materials and its amendments to EU Regulation 10/2011 on plastic materials and articles intended to come into contact with food should be proven and demonstrated.

- *Describe the results, achievements and typical failures*

This best practice used two novel approaches in packaging design: active packaging and intelligent packaging principles.

Active packaging is packaging which, on top of the traditional passive barrier and information functions, is specifically designed to change the condition of the packed food to extend shelf-life, improve safety or enhance sensory properties.

The active material is included in the packaging as a coating in the inner part of the material, instead of being introduced in the structure of the polymer. It is based on the inclusion of the structure of the coating of the active natural components.

The coating is used only as a very thin layer, the amount of the material used is very small compared to other options. Also, it is active both in direct contact (as traditional materials) and in vapour-phase migration, thus reducing the risk of product alteration as well as chances for undesirable migration.

Intelligent packaging is an emerging technology that uses the communication of the package or material to facilitate decision making to achieve the benefits of enhanced safety and quality.

(http://artibal.com/)

4. Summarize what makes the case to a good practice

The new packages allow the easy recyclability and it is fully compostable in conditions according to the standard UNE-EN 13432. At production agricultural waste (leaves, greenery) is used as a raw material source for wax based coating production. The developed approach, technique and technology satisfies the top trends in packaging (sustainable food packaging that increases shelf life for fresh pasta and cheese, at a cost 25 percent lower than the other alternatives, and an environmental and carbon footprint reduced by up to 29 percent).

4.1.11. Landpack – Green Packaging Solutions from Grain Fields

1. **Title of the case description:**

Landpack – Green Packaging Solutions from Grain Fields

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x		x		x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

With a growing demand for online-available fresh food products, supermarkets face the problem of delivering fresh products, properly refrigerated to customers and shops. Especially those specialized in organic and ecological products require eco-friendly packaging that provide the desired and needed insulation and damping properties.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Landpack is a small engineering company from Munich, Germany which was founded in 2013. Presently, 12 employees are working for the company. The company produces packaging boxes made from dry stalks of cereal plants, which is a by-product in agricultural production or hemp.

- *Describe the method, procedure, solution implemented*

The straws are pressed into bulk, plate-like panels during a thermal pressure process and encased in a corrugated cardboard material, which is provided by a different company.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The company developed a unique plant specifically tailored towards their process. There are no readily available setups on the market. Food items can be stored in boxes for 65 hours maintaining temperatures of 1°C to 4°C.

- *Describe the results, achievements and typical failures*

Landpack produces odorless, moisture-regulating packages for a variety of products, such as fresh and chilled food (fish, meat, dairy, or bakery products), as well as heat- and shock-sensitive products (glass-bottles drinks, confectioneries, canned food, etc.).

4. Summarize what makes the case to a good practice

Agricultural by-products are often discarded as landfill, since they do not meet the criteria necessary for animal or human feed. Landpack is the first company producing climate-neutral, ecological insulating packaging based on the agricultural by-product straw, which can be disposed of in organic waste.

In terms of regionality, Landpack established collaborations with many local farmers supervising the whole process chain, thus providing constant quality.

4.1.12. Coolomats

1. **Title of the case description:**

Coolomats

Author: KiGPSO

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x					x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Shortening the supply chain reduces costs for the end customer while maintaining a satisfactory margin for the manufacturer. Thanks to proposed solution end users have access to fresh and healthy food at any time at their chosen location.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Medium-sized company in Silesia (Poland) operating in food delivery sector offers transport and storage services for food. The company Coolomat gives innovative solutions for the e-commerce industry.

- *Describe the method, procedure, solution implemented*

Coolomat is an automated Click & Collect solution, with an electronically managed system of lockers available for 24 hours. It is adapted for food storage, as well as regular parcels. Coolomat allows customers of online stores to pick up orders in a convenient location without having to wait for the courier at home or to wait in line at the store.

The lockers are installed in convenient locations for home-based travelers such as gas stations, large housing estates and outlets to suburban bedrooms. The basic unit consists of at least 35 cloaks, of which 21 allow storage of products at a temperature between +4C and -20C. The single module consists of 7 cloaks, the coolomats are centrally managed and the providers communicate with the system through dedicated application programming interfaces (APIs).

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

The company that manage cold storage has to work with many local suppliers to ensure the adding value attitudes i.e. quality and freshness of the products. However, it should be noticed that not every consumer segment is open for using on-line shopping applications.

- *Describe the results, achievements and typical failures*

Coolomat is an automated locker system which provides the opportunity to the consumers to order their food online, but it spares time for them as they can choose the location to delivery their products. The temperature of the lockers is adjustable which enables the consumers to order frozen, chilled and fresh products as well. However, it should be notices that complex and expensive cold chain management need to be implemented to ensure the quality of fresh products.

4. Summarize what makes the case to a good practice

Thanks to Coolomats end-users have access to fresh and healthy food at any time at their chosen location. In general usage of online shopping, including shopping of food products is increasing significantly. Complex IT management system is needed to keep this trend and increase customer satisfaction. By working with local suppliers, the company Coolomats not only supports their development but also provides the quality and freshness of food products to its customers.

4.1.13. Supply Chain Management online tool / ADONIS Cloud service

1. **Title of the case description:**

Supply Chain Management online tool / ADONIS Cloud service

Author: KiGPSO

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x			x			
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

For every improvement, the material and information flow models of an organization are essential to provide a common understanding for the inter-organizational Supply Chain. The transparency gained from the models provides the prerequisite to overcome the local optimum and optimize the complete Value Chain.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Small- and medium-sized companies from Poland and other European countries operating in various sectors related to production and distribution / logistics / cooperation in the supply chain benefits from the ADONIS Cloud.

- *Describe the method, procedure, solution implemented*

ADONIS Cloud service, which is based on Best Practices developed by the Supply Chain Council, supports the development of Process Architectures for all Supply Chain partners using standard processes and Key Performance Indicators (KPI's). Individual adjustments to processes or indicators are mapped in the tool and can be published for all involved stakeholders.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The implementation business processes modelling is very specific for each case. The implementation is dependent on sector and configuration of the chain. There are two implementation approaches: top-down and bottom-up are possible. It should be noticed that it is an IT solution challenging for some companies as it needs resources.

- *Describe the results, achievements and typical failures*

Standard version of the tool is available (https://us.boc-group.com/adonis/). Usually customizing services up to the specific situation is needed. Recommended approach for

implementation is top-down (usage possible from the beginning). By bottom-up approach the connections between models and recourses are often missing.

4. **Summarize what makes the case to a good practice**

The Adonis Cloud enables professional business process management and the design of the organization's process architecture. The whole value chain becomes transparent, with links to IT, services, products, documents and other resources, as well as dependencies on the organizational structure.

Thanks to Adonis Cloud Service it is possible to analyze and optimize the processes of the production and distribution within the whole supply chain. Reduction of involved resources and savings in delivery time and costs is possible to achieve. The ADONIS Cloud is not only an indicator system but also a cause-effect analysis tool. Individual adjustments to processes or indicators are mapped in the tool and can be published for all stakeholders involved.

The service provider takes care of hosting and operating the product in a secure data center – the customer does not need to keep the product on their own servers. The service provider can support the installation and deployment, if requested.

4.1.14. ESN Guideline

1. **Title of the case description:**

   ESN CONSUMER TESTING GUIDELINES

   Author: CBHU

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label					x	x	x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Even if the companies believe that their new product idea is a guaranteed winner, testing the market before launching can help them to weaken what they're selling or how they're selling it, helping them maximize their profits, etc. To achieve this goal they are well-established consumer tests evaluating multiple aspects should be considered before the entire budget is committed for consumer test:

- availability of the right staff responsible for setting up consumer tests, writing briefing including research questions, methods, etc.,
- defining the right consumer test questions and to choosing the right method fitting to purpose,
- having the right, reliable consumer test provider.

The guideline developed by European Sensory Network (ESN), which is a powerful international network of leading research institutions and industrial partners at the cutting edge of sensory and consumer sciences, brings together 32 member organisations acting in 17 European countries, and five non-European countries, is useful tool to carry out well established consumer test.

Most of the guides and books are available based on theoretical approach, not the practical one. The ESN Consumer Testing guide follows the ESN practical strategic thinking, as a result of an ongoing dialogue between the ESN members and industry partners.

(In our case: “What are their main problems in terms of consumer tests?; What questions do the industry have to answer? etc.) The real industry needs were collected and solutions were built in the guide by researchers/experts.

The guideline is unique because it focuses on the topics covering real industry needs. The content of the guide is phrased not theoretically, formed into practical questions and concrete answers on questions together with extra information about the topics and with availability of the experts of the topics.

Generally
The topics covered in the guide intend to provide guidance in the choice of adequate consumer testing method for the people dealing with marketing, new product development (NPD) to give proper answer for decision makers, using the right methods, etc. on the following main topics formed to questions:

- “How to improve my product?
- Better than the competitor?
- Does the taste match the concept?
- How can I measure the sensory variation in my product?
- What is the Best Combination for Multiple Products?
- What is a good score for my product?
- Is there a market niche?”

Concrete example how the topics from the guideline was implemented:
The research question was: Are the recently used raw material, raspberry guarantee the consumers’ preferred product? What are the key sensory characteristics of the most and least successful frozen raspberry? Does the variety influence the preference of the consumers? – **PREFMAP (preference map)**

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Jász-Tész Kft. Hűtőház was founded in 1959 by the cooperative of the inhabitants of the local village**.**

It is a Hungarian fruit and vegetable processing SME. It was transformed to a public limited company in 1999 having cca. 1000 small shareholders. It was transformed to a closed Plc. in 2006. It operates as Jász-Tész Kft. Hűtőház from May 2009. The main activities of the company cover manufacture, packaging, storage and wholesale of frozen fruits and vegetables and agriculture. Main products are: fruit/vegetable processing, such as frozen cherries, blackberries, green peas, green beans, broad beans, onions, tomatoes, peppers, Brussels sprouts, broccolis, cauliflowers, root vegetables, mixed vegetables. Products are exported and sold to the domestic market. The marketing benefit of the company is its quality oriented, raw material basis.

- *Describe the method, procedure, solution implemented*

Generally the guideline provides information, inputs to choose the right method including questionnaire set up, design of the questions according to the aim of your consumer

research. Furthermore the topics covered in the guideline generated other research studies that are available on the website.

PREFMAP (preference map)

The use of the method is based on the sensory profile of the products (with the use of different raw materials/raspberries) and help to identify the product position and which attributes are the key drivers of the consumers' preference.

Information about the individual sensory attributes are superimposed on preference map to provide a clear identification of which attributes are contributing most to to the differentiation among products. This technique is an aid for effective product communication.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

The use of the guide provides inputs to specific consumer/sensory constraints of the business related to the implementation of the methods.

There are two main benefits firstly it helps those SMEs, who could not phrase their problem technically, scientifically correct, but they could ask the questions regarding their problem/need. In that case the guide structure is helpful, because the content/topics appearing in common consumer/sensory questions. It makes the guide more user friendly and it is easy for the reader to identify the area where they need supports.

In those cases when the company has more knowledge on a specific topic the guide gives exhaustive list about the potential literature sources for further investigation in well structured, easy to followed way.

If the company has limited capacity on consumer/sensory fields but wants information about the market, sensory properties of the products, etc. the ESN guide and website help them to find the right advisor/researcher with the competencies in country vice among the ESN members. All information including general, competencies, research areas, etc. about the ESN members is available on the website.

- *Describe the results, achievements and typical failures*

As a conclusion the right choice of the method based on the recommendation from guideline the research provided successful and reliable results.

The company has compared the different varieties/types of raspberry raw materials using the recommended methods from the guide. With the use of the technique the research has concluded that the traditional variety, Fertődi Zamatos raspberry growing by the company have better sensory characteristic, more aromatic and sweeter and rather preferred by the consumers, than the imported varieties.

The results can be used well as an argument in the commercial / trade agreements on benefits. It also gave useful information to other frozen food companies using this variety.

However the guideline provides a practical support for the users, but sometimes the resource for the implementation of the method are assessed wrongly, that is why important the involvements of the advisors and experts.

4. **Summarize what makes the case to a good practice**

- Practical experience on consumer tests are collected in a user-friendly way on the website.

- It handles/concentrates the most common problems the companies are facing with during the consumer survey.
- It provides systematic, structured information about the methods in an industry user format.
- It is online and make the necessary information easy to find, because subpage of ESN support the readers with extra videos, articles, etc. to have better knowledge on certain topics,
- The availability of the online surface for making the search easier, quicker.
- The specialists and potential advisors/researchers of the topics with their availabilities are at the end of the certain guide chapters.
- The target users of this tools are very wide, from marketing to NPD and also from small businesses to the big companies.
- Free for public, online available.

4.1.15. Hanovia UV disinfection systems

1. **Title of the case description:**

Hanovia UV disinfection systems

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label		x	x	x					
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The meat and fish processing industries are known for their cleanliness. One of the ways in which meat and fish processors can improve their processes is through the introduction of UV disinfection systems. UV kills microorganisms by penetrating cell membranes and damaging the DNA, making them unable to reproduce and therefore killing them.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Hanovia in the UK (a subsidiary of Halma Plc) is well known for its systems and has introduced them to companies all over the UK and Europe for disinfection applications.

Key aspects: Hanovia UV disinfection systems are compact and can be easily incorporated into a number of meat processing applications, including treatment of wash water, brine chillers, meat marinade and pickle injectors and also for disinfecting wastewater for reuse in processing.

- *Describe the method, procedure, solution implemented*

Hanovia UV disinfection systems eliminate the use of strong chemicals which could contaminate or taint products. The system is always on, giving reliable operation with very little maintenance. There are automatic internal wipers to keep the UV lamps clean, so that there is an optimum UV output throughout the period of use.

The UV lamp is usually housed in a quartz sleeve, which keeps the lamp dry and also allows the full UV spectrum to enter the water passing through the system. The lamp is usually mounted in a stainless steel processing chamber and the system can usually be used to treat a range of liquids and process water.

- *Describe the results, achievements and typical failures*

The use of UV systems can be extremely effective at destroying harmful bacteria such as Listeria and E. coli.

The use of UV disinfection can also dramatically reduce water use by processing plants because it can be reused. The reuse of disinfected wastewater in applications such as chillers and cooling towers means that more fresh water can be used in washing and processing

4. **Summarize what makes the case to a good practice**

Meat and fish processors can easily improve their processes through the introduction of UV disinfection systems. The use of UV systems on recirculating brine chillers and meat pickle and marinade injectors can be extremely effective at destroying harmful bacteria such as Listeria and E. coli. UV systems can also be configured to operate effectively through a wide range of temperatures and applications, from super-cooled brines to very hot sanitation cycles.

Hanovia UV disinfection systems are compact, can be easily incorporated into a number of meat processing applications and can also reduce water use by reuse. The system is always on, giving reliable operation with very little maintenance – typically, the UV lamps only need replacing once a year.

4.1.16. LumoVision: Innovation in quality control in origin

1. **Title of the case description:**

LumoVision: Innovation in quality control in origin

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x						
Food safety, quality, label	x	x	x						
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Mycotoxins are toxic secondary metabolites produced by certain filamentous fungi (molds). They can enter our food chain either directly from plant-based food components contaminated with mycotoxins or by indirect contamination from the growth of toxigenic fungi on food. Mycotoxins can accumulate in maturing corn, cereals, soybeans, sorghum, peanuts, and other food and feed crops in the field and in grain during transportation. Consumption of mycotoxin-contaminated food or feed can cause acute or chronic toxicity in human and animals.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Bühler innovates with Microsoft to tackle toxic grain contamination. Food technology company Bühler has announced a breakthrough in sorting technology, called LumoVision, that will mitigate toxic contamination in maize, as well as improving yields by identifying and removing aflatoxin-infected grains, known to cause cancer.

- *Describe the method, procedure, solution implemented*

The company has partnered with Microsoft to develop LumoVision, described as a 'significant advancement' for the grains industry, defending against aflatoxin and other mycotoxins. The sorting technology is reportedly faster and more efficient than existing solutions and can eliminate up to 90% of contaminated maize.

LumoVision is the first optical sorting technology able to identify toxins based on direct indicators of contamination. It uses real-time cloud-based data to analyse risks of contamination.

The technology analyses the colour of each kernel under fluorescent UV lighting and identifies kernels that glow a specific bright green colour as contaminated. LumoVision is equipped with highly sensitive cameras to detect this exact shade.

Air nozzles then blow the contaminated kernels out of the production line within milliseconds of detection. The system can process up to 15t of kernels per hour.

Microsoft's cloud-based infrastructure then helps to reduce overall yield loss by combining the data from the cameras with existing information stored in the cloud to provide a risk analysis.

With data science techniques and tools they can develop sorting algorithms, while connectivity and internet-of-things (IoT) solutions allow them to combine their optical sorting with real-time risk models.

- *Describe the results, achievements and typical failures*

The system is known to reduce yield loss to below 5%, compared to current solutions operating at 7%-25% yield loss.

4. **Summarize what makes the case to a good practice**

First optical sorting technology able to identify toxins based on direct indicators of contamination, using a real-time cloud-based data to analyse risks of contamination.

- Higher speed: LumoVision processes up to 15 tons of product an hour - a far greater speed than any previous solution.
- Higher accuracy: LumoVision processes up to 15 tons of product an hour, eliminating up to 90% of contamination.
- Higher yield: LumoVision, coupled with the cloud technology from Microsoft, reduces yield loss to below 5%.

4.1.17. Coffee waste valorization using Eco-Roasting technology

1. **Title of the case description:**

Coffee waste valorization using Eco-Roasting technology

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label				x	x		x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

In 2017, the coffee industry produced roughly 9.5 million tons of Arabica and Robusta beans. While Arabica beans are mostly used for premium coffee products, being rich in flavor, Robusta beans are mostly utilized to produce instant coffee due to their superior solubility. In the past, the lion share of spent coffee grounds were discarded as landfill or occasionally used for composting, where they accelerate the decomposition of other food wastes that are sent to landfill and thus increase methane production rates significantly. Further they pose a potential source of hazardous pathogens that can contaminate surface and ground water courses. A couple of scientific publications have shown that spent coffee grounds are a potential source of bioenergy and phenolic compounds, after appropriate pretreatment. In the face of increasing need for waste reduction and environmental protection, new possibilities to handle/process spent coffee grounds need to be scrutinized, exploited and applied. Eco-Roasting offers a way of utilizing coffee grounds for the production of biofuel. The energy within this fuel is then used for roasting coffee beans as a closed loop system

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Eco-Roast is a small franchise roasting-company, established in 2009 in Shaftesbury, England by the 918 Coffee Co. The company sells premium quality roasted coffee to customers and collects the customer's spent coffee grounds for further usage.

- *Describe the method, procedure, solution implemented*

The method employs a de-watering and compressing step of spent coffee grounds to eliminate present moisture und increase density for improved burning properties

and handling purposes. Dried coffee bricks are then placed in the combustion chamber and burned, to create the necessary heating energy for the roasting process of fresh coffee beans. Excess heat can be used for heating of the roaster or drying of coffee bricks.

ECO ROAST

DELICIOUSLY RESPONSIBLE COFFEE

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The technology is connected to a franchise company. Therefore SMEs are only able to use the technology as long as they are eligible franchise-partner, which also means that they are merely „renting" technology and equipment. Although excess heat energy can be stored in thermal storage tanks, it cannot be conserved for an extended period.

- *Describe the results, achievements and typical failures*

The company is knowledgeable in both business and roasting matters and offers substantial support for upcoming coffee shops and roasteries. Heat generated during the combustion process can be stored in thermal storage tanks for heating the roaster.

4. Summarize what makes the case to a good practice

The Eco Roast process adds value to a waste product, which was formerly discarded as landfill or only utilized energy-inefficiently. By valorizing the inherent energy left in spent coffee grounds and using it for roasting purposes coffee beans, a circular sustainable economy can be achieved. It addresses an important industry (coffee), which has seen a steady increase over the past years, producing huge amounts of waste.

4.1.18. Ethylene-adsorbing filters increase the shelf-life of fresh produce

1. **Title of the case description:**

Ethylene-adsorbing filters increase the shelf-life of fresh produce

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x			x		x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Worldwide, there is a large discrepancy between produced food and food actually being consumed and not wasted. A total 30 % of produced food is lost before it can be consumed due to spoilage, improper handling and supply chain disruption. At the same time approximately 1 billion people are undernourished due to problems associated with food safety and transportation. One major impact on wastage is periods of excess supply, during which the market is flooded with products of which a large portion cannot be sold to the customer and hence gets thrown away. This problem is associated with the difficulty of finding adequate storing solutions, especially for fresh products like fruits, vegetables and meat.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

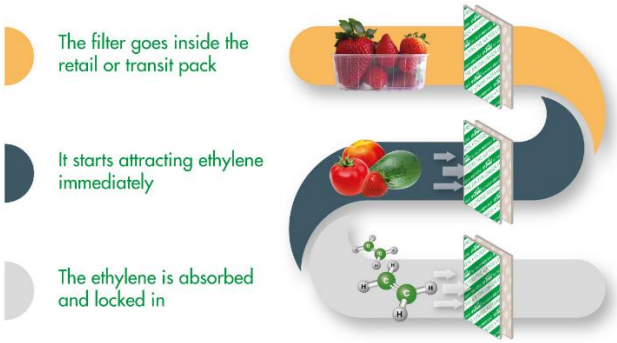
It's Fresh!® was established 2008 in Cranfield, UK. The company is a highly specialised technical innovations company focused on delivering comprehensive solutions for food freshness. These unique technologies are delivered via state-of-the-art materials science developed in partnership with world leading research & technology organisations.

- *Describe the method, procedure, solution implemented*

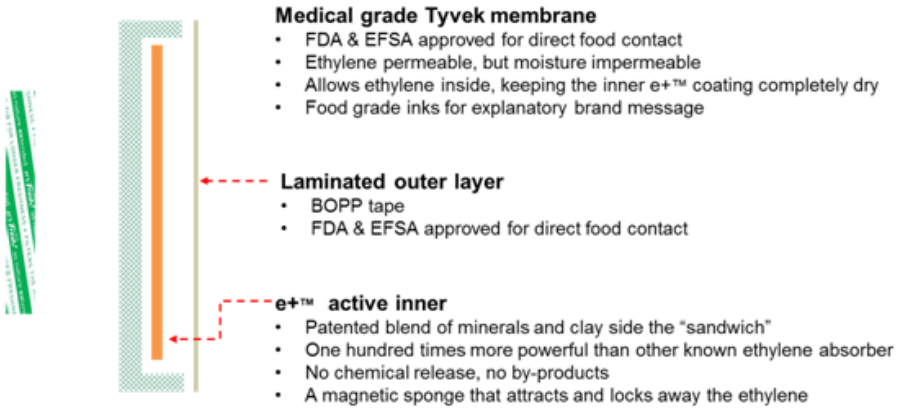
It's Fresh!® developed a filter, that works by binding ethylene, a ripening gas for fruits and vegetables, depleting ethylene contents in the direct atmosphere of the fresh produce. This protective atmosphere is referred to by the company as "freshasphere".

The non-invasive filters delay over-ripening, reduce losses and increase sales and profits. The technology behind the filters is called “e+” and is a proprietary blend of minerals and clay compounds able to adsorb and bind ethylene molecules through a process called chemisorption.

The filters are simply loosely packed alongside the fresh product. Filters can also be integrated into labels or soft pads for impact-sensitive fruits like strawberries.



(http://www.itsfresh.com/img/template/ethylene-filter-1-2-3.png)



(http://www.itsfresh.com/img/template/its-fresh-filter-diagram.png)

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

Depending on the type of fruit or vegetable and its respective ethylene production and sensitivity, the filter is more or less effective in delaying the ripening process.

- *Describe the results, achievements and typical failures*

The technology has successfully been implemented in different case studies. Four studies, including different berries, stone fruits, tomatoes and pears higher sales, ranging from 2-15% and waste drops of 41-71% were reported. The shelf life of many fruits could be extended by at least two days. Information on typical failures is not available.

4. Summarize what makes the case to a good practice

- It's Fresh!® filters are simple, easy-to-use and cost-effective
- Filters can be disposed of in normal recycling bins, while the bigger filter sheets used for transporting are reclaimed for re-use.
- Filters can be used multiple times, until the adsorbent is saturated with ethylene.

4.1.19. Hand-held moisture meter using NIR

1. **Title of the case description:**

Hand-held moisture meter using NIR

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x		x	x	x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Controlling the moisture content of dry products is essential for the cheese production. However, accurately measuring was mostly entrusted to highly skilled personnel due to the complexity of measuring devices and the requirement of accurate calibration prior to measuring. Additionally, moisture testing was very time-consuming and demanded off-line handling of samples.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Kett was initially founded in 1946 in Villa Park, California. The company started out as a supplier for moisture meters and metal detectors. The company was driven by the idea of inventing a handheld moisture analyzer for convenient, fast and reliable use in different sectors of the agricultural field, especially for rice farming. To this day, Klett is known for developing scientific and test filmetrics and other devices for other agricultural applications. The company expanded into coating thickness gauges as a result of the emerging Japanese automotive industry. Today, the company has roughly 35 employees.

- *Describe the method, procedure, solution implemented*

The handheld, portable moisture meter KJT130 functions according to a point-and-measure approach, which allows for convenient usage. The technique revolves around a spectroscopic measurement, using Near-infrared light (NIR), which is emitted by a special laser. The light is then partly absorbed and partly reflected and, after post-

processing, creates a characteristic spectral curve by plotting the wavelength over the absorbance of light. The curve shape is unique for specific components, such as water, while absorbance is proportional to the content or concentration of that component. By comparing absorbance values to a known standard, concentration of the component can be determined immediately.

Its key benefits are:

- Ability to measure different, if unique, solid materials
- Instant non-destructive measurement
- Facile calibration
- Different probes for various materials available

(https://dy6rjbj03jij9.cloudfront.net/wp-content/uploads/Kett-portable-moisture-meter-500x400.jpg)

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

In order to use NIR, calibration must be carried out beforehand. Additionally, only the surface moisture can be measured. Hence, samples must be very flat and there must be a known relation between surface and total moisture content. Although NIR accuracy is generally good, it is often used as secondary method. Official moisture determination methods usually still involve Karl-Fischer titration and/or oven drying methods, as most reliable technique for testing laboratories.

- *Describe the results, achievements and typical failures*

Typical Failure: Optical measurements are sensitive to improper calibration

Achievements: Fast measurements enable farmers to quickly react to irregularities or deviations in moisture content of ingredients and initiate corrective actions (e.g. storage). A wide range of solid materials can be analyzed (listed below)

INDUSTRY	APPLICATION	DESCRIPTION
Construction	Composite Block Moisture	Ability to input calibrations allows manufacturer to get accurate readings on proprietary products
Pulp/Paper	Particle Board and Plywood Moisture Testing	Any composite or layered material can be measured instantly - without any sample alteration or preparation
Building Materials	Drywall /Gypsum Board Moisture	Easy assessment of product quality. Can also be used for mold location identification and leak detection without harming the product surface in any way.
Food	Dry mixes	Instant, non-destructive test of kibble, trail mix and other mixed dry products
Minerals	Gravel and Aggregate Moisture	Simple, instant test of of any pile or tote

4. Summarize what makes the case to a good practice

At-site moisture measurements are more cost- and time-efficient compared to off-line measurements. The device also enables unskilled workers to get accurate moisture measurements and does not require specially trained personnel.

4.1.20. Up-cycling of poultry feathers into food packaging material

1. **Title of the case description:**

Up-cycling of poultry feathers into food packaging material

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label				x			x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

A growing demand for online-available, fresh food calls for appropriate transport media which is able to maintain sufficient thermo-isolation and is made from renewable or side-stream resources to address the current state of general ecological sensibility. Companies specialized in organic and ecological products require equally eco-friendly packaging materials that provide the required dampening and insulation properties. In the best case modern materials should therefore be reusable, fossil-free and biodegradable. Annually, roughly 120 million tons of poultry are produced. While most of the flesh and bones are processed into food and feed, the parallel production of a vast amount of feathers is easily overlooked. However, in the spirit of pushing forward circular business models, potential options for side-stream valorization should be considered. From usability standpoint feathers contain a number of desirable material properties: They are water-repellent, light-weight, flexible, bio-degradable and provide good thermo-insulation, making them suitable for potential packaging applications.

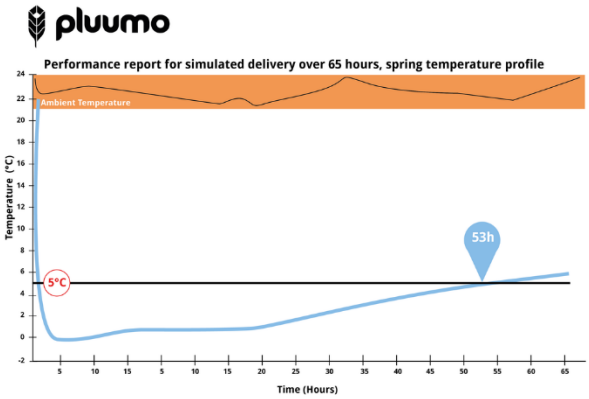
- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

AEROPOWDER is an award-winning startup creating novel materials from surplus feathers. The startup was co-founded in 2016 by two PhD students from Imperial College London. The company specializes in converting poultry feathers into different materials for diverse applications. Their specially developed feather granulate can be processed into different shapes and molds, for example a biodegradable bicycle saddle. Most recently the world's first thermal packaging material (called Pluumo) made from surplus feathers was introduced.

- *Describe the method, procedure, solution implemented*

Pluumo is a strong, lightweight, flexible and thermally insulating mat, which can be used for packaging temperature sensitive food products, such as vegetables, fruits dairy products and meat. Due to the mat's flatness, it provides improved packaging and storage efficiency, compared to common bulky polystyrene boxes, while still maintaining comparable insulation performance. It consists of a compostable (certified according to EN 12432) protective sheet made of starch-like components, which is filled with the feather material. Before filling, the feathers are thoroughly cleaned and processed into a unique textile. The company claims that Pluumo's cooling performance is superior to Styrofoam.

(https://thespoon.tech/wp-content/uploads/2018/05/pluumo_2-696x444.jpeg)



(https://static1.squarespace.com/static/5a428673f09ca41880b8bfcb/t/5c40a85603ce6408ad67b35a/1547741282677/Performance+Website-black-01.png?format=1000w

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

Not known for this case.

- *Describe the results, achievements and typical failures*

Starting out as a student's project, AEROPOWDER was founded in 2016 after winning the Mayor of London's Low Carbon Entrepreneur Competition. It was able to secure its first customer, a butcher in Oxford. Nowadays, Pluumo insulation sheets are produced in Denmark and distributed across Europe.

The company managed to become part of the European accelerator program Climate-KIC and already successfully participated in different competition programs for sustainable packaging.

Typical failures are not known. However, the density of the sheets needs to be adapted to the desired cooling performance. Further, the cleanliness of the feathers needs to be assured to avoid hygiene-related issues.

4. Summarize what makes the case to a good practice

Pluumo is solely based on a major waste-stream, poultry feathers, without the need of using materials intended for further industrial use. It presents a viable alternative to conventional Styrofoam insulation material, offering the chance to reduce environmental impact caused by the fossil-based chemical industry.

4.1.21. Prolific: Integrated cascades of PROcesses for the extraction and valorisation of proteins and bioactive molecules from Legumes, Fungi and Coffee agro-industrial side streams

1. **Title of the case description:**

Prolific: Integrated cascades of PROcesses for the extraction and valorisation of proteins and bioactive molecules from Legumes, Fungi and Coffee agro-industrial side streams

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label				x	x				x
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Agro-industrial residual biomass, side streams and food production by-products such as legumes, fungi and coffee are likely to constitute rich sources of valuable ingredients. Their potential is yet to be fully realized. The Prolific project will apply a range of processing technologies to agro-industrial residues of legumes, fungi and coffee in order to recover significant amounts of proteins/peptides, fibres and other value-added compounds.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

PROLIFIC is a new European research project with the partnership of 17 partners from 8 European countries. Its ambitious goal is to transform waste from legumes, mushrooms and coffee into new food products, animal feeds, packaging materials and even cosmetics.

The partners involved will work to develop technological and industrial solutions for the recovery of proteins and other bioactive molecules (such as fibres and polyphenols) from the processing waste of the agro-food industry, in particular the production of legumes, mushrooms and coffee. The aim is to produce 16 prototypes of products for the food sectors (vegan / vegetarian, cereal-based, meat-based products), feed (for poultry and pigs), bioactive packaging (for food and cosmetics), and cosmetics.

- *Describe the method, procedure, solution implemented*

Once extracted by economically and environmentally sustainable protocols, the outputs will undergo enzymatic modification and conditioning techniques in an upscaled, industrially-relevant environment. Ultimately, this will provide viable amounts of the compounds and fractions necessary to produce 16 prototypes for the food, feed, packaging and cosmetic sectors. The Prolific project's R&D&I activities and partners are streamlined around a core innovation cycle, principally driven by industrial end-users that know precisely what their customers need and the what are the technical and industrial demands of their sector.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Information is currently not available.

- *Describe the results, achievements and typical failures*

Information currently not available (Prolific project will end on the 31th of August 2022).

4. **Summarize what makes the case to a good practice**
   - Establishing flexible and fully-scalable biorefinery extraction protocols for isolating proteins and bioactive compounds from plant residues;
   - Converting extracted fractions into valuable ingredients tailored to the specific final applications of industrial end-users;
   - New applications of extracted bioactive molecules in the food sectors, feed, bioactive packaging, and cosmetics.

4.1.22. Tempix temperature indicator for smart labelling

1. Title of the case description

Tempix temperature indicator for smart labeling

Author: CBHU

2. Cross-reference table

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label		x	x		x	x	x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. Short description of the case (from ½ page - 3 pages)

- *Describe the specific need or problem being addressed by the case*

Climate change and global warming has a cause and effect on our global food system.

As supply chains grow longer, losses and wastage will grow unless proactive steps are taken to secure the cold chain.

Tempix is a Swedish privately-owned company based in Gävle Sweden (https://www.tempix.com/). Tempix has an awarded packaging technology (Scanstar 2012, World star 2013 winner). Tempix has a worldwide patented solution for securing the cold chains for food, pharmaceuticals and other products. The Tempix system includes a temperature sensitive smart label that can be used on consumer or transport packages.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

There is a retailer chain in the Nordic region (in Finland) which will to secure their cold chains of fresh fish with smart label system of Tempix. This smart label makes it impossible to sell the products if there is not enough "cold chain time" left for the consumers' home journey from the shop.

- *Describe the method, procedure, solution implemented*

The Tempix temperature indicator will reveal whether a particular product has been handled at too high temperatures during its journey from the producer to the final customer.

The labels containing a small amount of liquid are located next to the barcode. When the black control bar in the Tempix indicator is visible, the customer can be sure that

the product has been transported and stored at the correct temperature in the cold chain. If the product is kept in the correct temperature range, the indicator will remain unaffected for an unlimited amount of time.

The liquid reacts to temperature changes. If the product has been exposed to conditions above the stipulated temperature for an extended period of time (if the product has been in a too warm temperature for too long / if the cold chain has been broken), the liquid destroys the barcode, and the control bar in the window will disappear and the bar code will be blocked (the barcode becomes unreadable for the cash registers and does not approve the product being sold).

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Until now only in case of fresh fishes was TEMPIX applied as smart label system. However, the settings of the label can be tailor made depending on the specific requirements of different products.

- *Describe the results, achievements and typical failures*

With these smart labels, consumers can also be sure that the cold chain is unbroken. The temperature indicator can be used for different temperature requirements. The indicator works in the -30°C to +30°C temperature range and is accurate to 0.5°C intervals.

4. **Summarize what makes the case to a good practice**

The transparency makes it easier to take control of the handling process and responsibility becomes clearer when it comes to manufacturing, storage and transport. The result is an improved quality approach by those handling the temperature sensitive goods.

4.1.23. Stickers for extending shelf-life of fruits for up to two weeks

1. **Title of the case description:**

Stickers for extending shelf-life of fruits for up to two weeks

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x		x	x		x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

On a global scale fruits and vegetables account for the highest wastage rates of any food products. In total, roughly 45 % of fruits and vegetables are lost between primary production and consumption. The reasons for food loss are manifold and are greatly affected by the producing country and its infrastructure. Factors include, soil quality, post-harvest treatments, processing effectiveness and cold chain management. Particularly, problems arise during periods of excess supply, during which the market is flooded with produce of which large portions cannot be sold to the customer and hence gets thrown away, because their storage time exceeds their shelf-life. During storage, climacteric fruits produce ethylene, a gas accelerating their ripening process significantly. When fruits are exposed to or in proximity of ethylene, their ripening process and respiration rates are increased proportionally to the gas concentration. As a consequence, fruits lose their characteristic sensorial properties such as firmness, color, taste and smell and are often thrown away rather than consumed. These problems are existing both at large retailers and private households and needed to be addressed adequately.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

StixFresh started out as an idea of inventor Zhafri Zainudin and came to live at a conference in Dubai, when he met engineer Steve Hulteng and entrepreneur Moody Soliman. It is now a start-up company based in Kirkland, Washington (USA) and established in 2017. Stixfresh is focused on developing and commercializing disruptive and innovative technologies that have the potential to reduce food waste. The

company's focus is using natural products and methods. Currently the company has only one product, the Stixfresh stickers, which have the potential to slow down the ripening process of certain fresh fruits and vegetables. The company currently employs <10 workers.

- *Describe the method, procedure, solution implemented*

StixFresh stickers are coated with a mixture of ionized sodium chloride and beeswax, which slows down the ripening process by absorbing ethylene. The product was first applied to mangoes and was eventually transferred to other products having similar properties, such as skin texture and size. Feasibility has been shown for mango, avocado, dragon fruit, papaya, star fruit, apple and pear. Stickers recently acquired the GRAS status and the company claims their stickers could even be consumed along with the fruit. The stickers are intended both for private households and large producers. Trials have shown that fruit freshness can be extended for up to two weeks.

(https://static.wixstatic.com/media/d54f0f_76cffb5d42764633b227704dca20f572~mv2.jpg/v1/crop/x_481,y_54,w_1012,h_1012/fill/w_490,h_490,al_c,q_80,usm_0.66_1.00_0.01/d54f0f_76cffb5d42764633b227704dca20f572~mv2.jpg)

(https://dy6rjbj03jij9.cloudfront.net/wp-content/uploads/stixfresh.jpgjpeg)

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*
  - Stickers are not readily usable for other fruits, due to problems associated with sticker adhesion.
  - - Stickers are for single-use only.

- *Describe the results, achievements and typical failures*
  - StixFresh is able to prolong shelf-life of a variety of fruits by 50 %.
  - Since 2017 they have sold over 1.3 million stickers

4. Summarize what makes the case to a good practice

StixFresh stickers provide a simple, natural solution to a complex problem.

Their technology equally addresses large companies and retailers, as well as private households and has relevance at global scale.

4.1.24. Smart label indicator for reduced food waste accumulation and improved food safety

1. Title of the case description

Smart label indicator for reduced food waste accumulation and improved food safety

Author: UHOH

2. Cross-reference table

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label	x	x	x	x	x	x	x		
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. Short description of the case (from ½ page - 3 pages)

- *Describe the specific need or problem being addressed by the case*

Annually around 1/3 of total food, corresponding to 1.3 billion tons is lost or wasted globally. Food loss or waste starts at initial agricultural production and ends at household consumption. Those losses correspond to a significant waste of resources, such as energy, water and land, which in turn reinforce climate change. In general, food loss can be observed across all supply chain actors, however often they can be related to improper cold chain management. Much food is also wasted due to best before dates, being misinterpreted by consumers leading to uncertainties about the freshness. To avoid food poisoning from products that surpassed their best before date, customers often decide to throw away what could possibly be perfectly safe food.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Insignia Technologies Ltd. is a medium sized enterprise (11-50 employees), based in Lanark (Scotland) specializing in the development of smart pigments and inks, which change colour upon exposure to different triggers (temperature, UV light, CO_2).

- *Describe the method, procedure, solution implemented*

Insignia uses intelligent labels that can be easily incorporated into different materials. Labels change colour depending on changing CO_2 or temperature levels over a pre-calibrated time period. Indicator chemicals can be tailored towards different applications and time periods. This way labels are able to give information about freshness, opening times, cold chain integrity and tampering/damaging to the package itself. Labels are produced using a narrow web flexo printing press, accounting for a scalable process.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

One constraint is related to the detection range of the biosensor. Organic substances that are produced during spoilage, such as organic acids, biogenic amines or oxidation products are not detected.

- *Describe the results, achievements and typical failures*

Biosensors are already available for different applications, such as leak detection labels for modified atmosphere products, freshness timers for deli products and for jarred products. The company was also able to convince investors and raise a significant amount of funding for research. Typical failures occur when packaging is not handled correctly or when packaging is not closed again after initial opening, leading to CO2 leakage that cannot be properly detected by the marker.

4. **Summarize what makes the case to a good practice**

Smart biosensors for detecting the real expiration date of sensitive products (meat, etc.) can be a good solution to food waste accumulation. Those biosensors may also assist in preventing or reducing the number of foodborne diseases, caused by improper cold chain management and consumption of food that surpassed its best before date.

4.2. Mechatronics

4.2.1. Green Biotech Cluster of Basilicata (BIOGREEN)

1. **Title of the case description:**

Green Biotech Cluster of Basilicata (BIOGREEN)

Author: STRIA

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics		x	x		x	x	x		
Food safety, quality, label									
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The case intends to provide answers for the following needs:

1. Concentrating the R&D offer of Basilicata Region in the green biotech field by establishing a governance and infrastructure collaboration system among key actors present in the region (research centres, SMEs, tech transfer organization, public agencies),
2. Facilitating the access of SMEs to innovation and research project to improve their competitiveness,
3. Fostering local development by increasing the number of SMEs in high tech fields, and increasing the employment of young and graduated people.

The cluster has direct relevance and targeted services for the agro-food industry of Basilicata Region where several SMEs produce food goods from agricultural crops of different grains. Bakery industry is one of the leading branches of the regional food sector in Basilicata. The good practice has merits in terms of I-CON mechatronics issues as proposes organisational and technological restructuring at the food industry companies as part of the complex solution consisting of tangible (machinery, for example) and non-tangible (as knowledge development and innovation brokering).

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

ALSIA (Lucan Agency of Innovation and Development in Agriculture) is the operational tool of Basilicata Region Institution for the agri-food systems, with responsibility for the management of the Agricultural Development Services. Tasks and organization of the Agency were established by Regional Regulations LR n. 38/96, as subsequently integrated by the Regional Regulations nn. 21/98, 61/00 and 29/01. The Agency has an important role as well as connecting element in the primary sector of the actions made by each of the structural components of the system in Luke about the Agricultural Development Services.

The Agency conducts research, development and innovation activities in the fields of agriculture, agro-industry, green chemistry and bio-economy. The activities focus on the use of modern green biotechnologies, which focus on the use of photosynthetic plants and organisms for the production of foods and products for the industry, even in high value added segments such as cosmetics and pharmaceuticals. The Agency, in the value chain that leads from research to applications, is positioned between fundamental research and the market. In particular, its specific role is to exploit the research results wherever they are produced, translating them into pilot and demonstrative activities for the development of new food products and new processes.

With particular focus on the Mediterranean crops, the Agency has active research into the induction of resistance to biotic and abiotic stress, for the production of functional foods, for the production of plant medicines, for the production of special oils for the industry.

ALSIA provides support and research to businesses using modern genomic platforms (TILLING, Wide Genomic Selection with NGS) and Plan Phenomics.

The research is conducted in the Agrobios Metapontum Research Center of the Agency, located in Metaponto, at the heart of one of the most important agro-industrial areas of the Basilicata Region.

The main tasks of the Agency are the following:

- carrying-out specific advice, training and transfer services for farmers aimed to the modernization, upgrading and development of agricultural activities in order to increase production, enhance the quality of products and reduce the use of pesticides,
- providing support and services for the optimization in the utilization of water resources and irrigation systems, product's traceability, and biological control of crop diseases,
- implementing and participating to regional, national and EU projects in the field of research, experimentation and commercial promotion of agricultural products, geographic information systems, acquisition of patents and/or know-how which promotes the innovation in the production processes of agricultural holdings,
- promoting the increased use of biotechnology in the production processes and the valorization of regional products, and providing technical assistance to support organization and marketing models based on the quality certification systems for agricultural processes and products innovation,

- providing the management of Demonstrative Experimental Farms, based in Aliano, Gaudiano, Matera, Melfi, Metaponto, Villa d'Agri, Fussy and Rotonda, through which it carries out research, experimentation and dissemination activities.

- *Describe the method, procedure, solution implemented*

The start of a well-articulated initiative requires a set of actions in an integrated and coordinated way including, among other things, the development governance system and rules of the relationship between the partners, political attractions of context, incentive systems for businesses, financial instruments, support to start-ups and spin-offs.

The actions foreseen cover four key areas:

1. The structuring and launch of the Biotech Cluster with operative activity in Metaponto,
2. The creation of a vibrant " biotechnology ecosystem " within which it is possible to develop R & D projects of excellence,
3. Investment in human capital,
4. Creation of a network of international collaboration with other Biotech Clusters.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The Project Cluster is divided into four sub-programs. All of these programs (see below) are opened for food industry enterprises which needs guidance on the production processes, product development knowledge or food safety. Based on the concrete need of the agro-food SME is, the following options are available:

1. Infrastructures and Development Program of the Biotech Cluster: restructuring of regional structures localized in Pantanello to host national research centers, businesses, conference room, training center, summer school. Investments in the acquisition and enhancement of technological platforms, development of pilot and demonstration projects, industrial R & D projects;
2. Program to accelerate biotech enterprises: financial support to start-ups, intellectual property management, brokerage of innovation, technology transfer, Advisory Unit to the business, product development;
3. Program for the development of human capital for businesses: postgraduate schools degree, international Master's and Doctoral Schools, summer school;
4. Horizontal program of Project Management: coordination, secretariat and facilitation, global marketing and internationalization, “Europe Antenna”.

- *Describe the results, achievements and typical failures*

Possible demonstrated results:

The operation of the cluster has been characterized by intense contacts and relations with industrial SMEs and large enterprises. Five SMEs and two large companies already joined the cluster as partner cluster founders, and many other are asking to actively participate to the initiative. The project has been able to attract also foreign investments. Three large companies, international and national, are investing in challenging multi-year R&D

programs that uses the technological platforms and human skill present in Metaponto resulting in new production technologies/processes.

Possible success factors:

The smart specialization of the cluster in the green biotech sector (up to 2013), compared to the other Italian national clusters focused more on the red or pharma biotech, is regarded as an important identity attracting feature. The recent investments of Regional Basilicata in excellence and unique technological platform, such as the plant phenomics Scanalyzer System, has also created an extraordinary magnet for the new wave of investment in the green industry in food industry processing units/plants.

The limited size of Basilicata Region is supportive for research actors and also for the development of projects and agreements.

Difficulties encountered:

Slow political decision and some bureaucracy hindered the rapid start of the cluster. Also some partners embraced the initiative with some skepticism. Cooperation is typically difficult to be activated even among research institutes. However a strong political decision and a clear plan help in motivating and establishing good rules of partnership.

4. Summarize what makes the case to a good practice

This practice shows how to target innovative niche markets by biotech applications based on local agro-food production and traceability available, introducing novel mechatronics or process development solutions if that is required. Such developments are very important for those consumers who consuming high quality and traceable food goods.

4.2.2. The FRISBEE tool

1. **Title of the case description:**

The FRISBEE tool.

Author: CCIS-CAFE

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x			x			
Food safety, quality, label	x	x	x			x			
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Fresh foods demand good methods to keep food products at an acceptable low temperature all through the production line, transport and storage. Storage temperature is important in all stages of the products shelf life, and storage by producer, the retailer and the consumer. The market opinion is still that fresh foods are better than frozen foods. Thus, the demand for keeping the food fresh is increasing, and the requirement for keeping the right temperatures is essential.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

The European food cold chain. Six main product categories have been considered in the project: fruits, ready to eat meals, meat, fish, vegetables and milk products.

- *Describe the method, procedure, solution implemented*

The FRISBEE tool is software for assessing cold chains with respect to quality of products, energy use and the CO2 emission (environmental) impact of the refrigeration technologies involved in the cold chain. It contains validated kinetic models that can predict how the quality and safety changes along the cold chain as a function of temperature and time.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The problem is a low consumers' acceptability of emerging technologies and how willingness of the companies' to use new software.

- *Describe the results, achievements and typical failures*

The FRISBEE project has developed a comprehensive database of the cold chain in Europe in order to identify refrigeration needs and available current technologies in the food industry, and investigate consumer needs and expectations with respect to the food cold

chain. The efficiency of food refrigeration has a safety, economic and environmental impact that affects not only consumers, but also the refrigeration industry as a whole. Anyone can join the database and take advantage of the ColdBase.

4. Summarize what makes the case to a good practice

To be competitive the European food industry requires new processes that are economic to operate. The FRISBEE project have developed new market opportunities (nanostructured material, household refrigerators with PCM, superchilling) for European industry and provided them with a competitive advantage. SMEs in particular will benefit from development and demonstration of high-tech (e.g. nanostructured materials: Bionica start-up created thanks to innovating material developed within FRISBEE), eco-efficient processing and smart control applications.

4.2.3. Improvement of water consumption and implementation of a sustainable water cycle by sewage treatment plants in several dairy plants of FrieslandCampina

1. Title of the case description

Improvement of water consumption and implementation of a sustainable water cycle by sewage treatment plants in several dairy plants of FrieslandCampina

Author: UHOH

2. Cross-reference table

	1	2	3	4	5	6	7	8	9
Mechatronics	x				x				x
Food safety, quality, label									
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. Short description of the case (from ½ page – 3 pages)

- *Describe the specific need or problem being addressed by the case*

Food production is accompanied by the use of huge amounts of waters. This begins with watering in feed and food cultivation and is continued in production sites themselves. For improvement of cost and energy efficiency and sustainability, new ideas for the water cycle in food production have to be found.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

FrieslandCampina is one of the world's largest dairy companies and produces and sells consumer products like milk, yoghurt, butter, etc. in many European countries, Asia and Africa. Additionally professional customers are supplied with e.g. cream and butter (bakeries, caterer) and half-finished products and ingredients are sold to manufacturers of infant nutrition, food industry and pharmaceutical sector.

FrieslandCampina employs approximately 22.000 people and has branch offices in 33 countries. The central office is based in Amersfoort (Netherlands).

- *Describe the method, procedure, solution implemented*

Some plants of FrieslandCampina (e.g. Heilbronn, Germany; Aalter, Belgium) have their own waterwaste treatment plants to improve their cost and energy efficiency and reduce the produced water waste. In March 2016 the waste water treatment plant in Aalter was installed. Daily 2.100 m^3 of water are reusable. Thus the water consumption of this production site is reduced by 60 %.

The method is simple, because sewage treatment plants are already known. Physical, chemical and biological processes are used to remove contaminants. During this process produced sewage sludge can then again be further processed for energy production to either run the wastewater treatment plant or use it for other purposes. This makes this process simple and energy efficient. It is simply a water waste treatment plant combined with a biogas plant.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Constraints are related to the country where a sewage plant is implemented, there are different conditions by the government.

Odor has to be controlled, sewage sludge which is not further processed has to be treated and disposed of in a safe and effective manner. Digestion and composting have to be done with the sludge in order to reduce the amount of organic matter and the number of disease-causing microorganisms.

- *Describe the results, achievements and typical failures*

Results are good, the production site in Aalter could reduce their water consumption by 60 %. Sometimes there are problems with bacterial cultures during the process, depending on what is used for CIP cleaning this can have an effect on the efficiency of the wastewater treatment process. This has to be monitored.

4. Summarize what makes the case to a good practice

FrieslandCampina has successfully implemented a method to reduce their wastewater and make the water cycle during production more efficient and sustainable. When combining this method with other techniques, the improvement of energy efficiency can be immense. This will help with problems regarding energy efficiency and sustainability we already have.

4.2.4. The SAFE-BAG

1. **Title of the case description:**

The SAFE-BAG (Novel continuous in-pack decontamination system for fresh produce)

Author: CCIS-CAFÉ

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x	x	x				
Food safety, quality, label	x	x	x		x				
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

While fresh fruit and vegetable consumption is linked to many health benefits, it can also be a source of foodborne illnesses and as such we are witnessing an increase in the number of outbreaks associated with ready-to-eat fruit and vegetables. The treatments currently used, including chlorine washing, often leave a chemical residue and waste water. Because there is a growing demand to reduce the amount of chemicals used in the process, an effective yet environmentally-friendly decontamination system based on plasma was developed.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

European fresh-cut fruit and vegetable manufacturers and suppliers. Fruit and vegetable processing and supply chains represent a major pillar of the European food and drink industry. Also in Slovenia there is a growing market for minimally processed vegetables and fruits such as convenient salad mixes and fruit salads.

- *Describe the method, procedure, solution implemented*

Plasma is electrically energized gas whereby constituent molecules of the gas split to yield free electrons, ions, quanta of electromagnetic radiation, etc. There are several types of plasmas depending on the conditions in which they are generated. The food package is treated between two high voltage electrodes. The high-voltage process ionizes the gas within the electric field, including the gas contained within the package. It is this mix of active species which results in the anti-microbial effect. Crucially the active gas reverts back to stability shortly after, meaning no residual chemicals are left on the product. An important novelty of this technology lies in generating the plasma inside a sealed package

containing the produce, which facilitates rapid treatment and eliminates the risk of post-process contamination.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The application of ACP requires consideration of the packaging material utilized and the potential for interactive effects on microbiological safety retention and toxicological safety profiles of the packaging material that may occur. While the overall migration increased after ACP treatment of different food simulants, the migration still remained less than the limit provided by EU regulations for food packaging materials.

- *Describe the results, achievements and typical failures*

Researchers found that nitrogen oxide levels (a second reactive gas) were also linked to effective treatment. They showed that in all cases increased treatment time led to fewer pathogens. Scientists tested the treatment on bags containing strawberries, cherry tomatoes and spinach, using *Escherichia coli* and *Salmonella* as the test bacteria. They found that strawberries and cherry tomatoes were not adversely affected, but spinach wilted regardless of treatment mode. These advancements may lead to chlorine-free fresh produce with a longer shelf life. This research will also reduce the amount of water wasted during traditional washing procedures.

4. **Summarize what makes the case to a good practice**

The impact of the results hold benefits for consumer safety and confidence, extended shelf-life and increased demand for fresh produce, which will in turn impact on the competitiveness of hundreds of European fresh-cut processing SMEs.

4.2.5. Mobile juice press

1. **Title of the case description:**

Mobile juice press

Author: KiGPSO

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x				x				
Food safety, quality, label		x							
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The planter does not have to organize transportation, spend his time and money to get the fruit to the press, and for pressing he pays as much as he takes the stationary press.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Small companies, all over Poland, fruits processing, juices

- *Describe the method, procedure, solution implemented*

The mobile press is simply a press on trailer. The kit on the mobile platform creates a complete line - from fruit washing, grinding, pressing, and pasteurization to bag-in-box packaging or bottles. They can be used anywhere with access to clean water from the aqueduct, three-phase electricity and, of course, fruit and / or vegetables. The planter does not have to organize transport, spend his time and money to get the fruit to the press, and for pressing he pays as much as for pressing on the stationary press.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Challenge to build collaborative hubs, bringing together farmers supplies from multiple small producers in order to explore capacities of the mobile juice press.

- *Describe the results, achievements and typical failures*

Farmers pay the same amount of money for pressing as in case of stationery press. However they do not have to waste money and time on fruit transportation. The juice pressing is taking place on the farm. As a result production process is optimized and efficiency increases.

4. Summarize what makes the case to a good practice

Planters who want to process their fruits into juice have an opportunity to use mobile juice press. The machine works exactly the same way as the stationery juice press, however the processing takes place on the planters' property. Thus, there is no need to organize transportation and pay for it. This solution also saves time. The mobile juice press allows optimizing the production process and increasing efficiency.

4.2.6. Digitization of the starch factory

1. **Title of the case description:**

Digitization of the starch factory

Author: BIZ-UP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x			x	x	x	x	
Food safety, quality, label	x	x			x	x	x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Industry 4.0 did not even exist as a catchword at the time before the project at AGRANA.

Digitization in the sense of networking of all systems over the supply chain from the goods receipt to the goods issue and the production was one of the main objectives of the project.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

AGRANA refines agricultural raw materials into high-quality foodstuffs and a wide range of preliminary products for industrial applications. Roughly 8,800 employees working at more than 50 production sites worldwide generate revenues of around €3 billion. The company was founded in 1988 and is now the leading sugar company in Central and Eastern Europe and is also an important producer of special products and bioethanol in the starch segment in Europe. In addition, AGRANA is the global market leader for fruit preparations and the largest European producer of fruit juice concentrates.

- *Describe the method, procedure, solution implemented*

As a homogenous and integrated overall system (Distributed Control System (DCS) with central engineering and a common data basis), Simatic PCS 7 enables the complete automation of both manufacturing and process engineering processes.

Automation of the starch factory and connection of the existing automation of the bioethanol plant and the starch factory to MES (Manufacturing Execution System) and LIMS (Laboratory Information Management System). Data exchange with the ERP (Enterprise-Resource-Planning) system.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The challenge was that, in addition to the new construction of the starch plant, the ERP system was also completely replaced. Furthermore the existing logistic, MES and laboratory systems (LIMS) were replaced. This was done during the ongoing operation. In addition, there was a very short implementation period of half a year.

- *Describe the results, achievements and typical failures*

Through the new control systems and the automation of the processes the staff at the wheat starch factory found out an optimum productivity mode very quickly. After half a year production the desired quality and quantity were achieved. By a meaningful rule parameterization, the automation systems (Siemens) also helped saving energy. That applies especially for the over 600 drives, which are all based on frequency converters.

By extracting the heat from the feed drying zone of the ethanol system we managed to heat the new wheat drying facility, which provided around half of the required dryer energy from previously unused waste heat.

4. **Summarize what makes the case to a good practice**

The two plants are operated independently of one another but are linked through a uniform operating concept and a centralized control center.

Significantly higher volume of materials handled with same staff levels in raw materials receiving, laboratory and shipment thanks to the end-to-end automation of all processes and workflows.

Optimal deployment of staff and synergies in maintenance and training thanks to the shared control center.

Comprehensive overview at the push of a button – everything from order control in SIMATIC IT to laboratory information and process data to inventory status in the dispatch silo can be accessed thanks to the extensive data integration of the systems.

Control and execution of the complete goods logistics and production processes with data integration to SAP.

Reduction of data entry to a minimum thanks to event driven, automated data transfer from SAP to Transporeon (web-based truck time management tool), SIPASS, SIMATIC IT and SIMATIC PCS 7.

Energy savings thanks to optimized controller settings.

Recovery of roughly half of the dryer energy required to heat the new wheat drying plant through the extraction of the previously unused waste heat from the feed drying area of the bioethanol plant.

No downtimes and thus no impact on the production process during the upgrade of SIMATIC PCS 7 to the latest version (bioethanol plant).

4.2.7. Migration of existing Control Systems

1. **Title of the case description:**

Migration of existing Control Systems

Author: BIZ-UP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x			x	x	x	x	
Food safety, quality, label	x	x			x	x	x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The company wanted to implement the same automation control software in their branch in Romania, as is used in the other branches.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

One of the biggest brewing companies in the world dominates and designs the beer market in some parts of the world. 70.000 employees working at 80 production sites all over the world and generate of around €23 billion. The company was founded in 1895. The performance spectrum, reliability and the high quality claim is recognized and makes them to the preferred partner in the beverage sector. The trade is geared towards sustained value growth and secures financial success.

- *Describe the method, procedure, solution implemented*

The automation in the alcohol industry as well as the data exchange of the different machines is controlled by a special ERP system and monitored and secured by the S7-400 control system. Hence this Romanian branch has implemented the same automation system in all its production plants.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The challenge was that there was only a short break in the production. Also the integration with the global EMI system of the company was a problem. However, not only the processes but also the critical parts have to be monitored to reach a higher safety level in the plant.

- *Describe the results, achievements and typical failures*

After the installation the desired quality was achieved very quickly and the productivity was increased. Additionally, the Siemens systems will also help to further improve plant and human safety in that branch. The whole company has now only one supplier for the automation system in all its branches.

4. Summarize what makes the case to a good practice

The plant is operated independently with a special control center.

Significantly higher volume of materials handled with same staff levels in raw materials receiving, so the efficiency of the system has increased.

Optimal deployment of staff and synergies in maintenance and training thanks to the shared control center.

Comprehensive overview at the push of a button - from order control via the global EMI system. The tank monitoring to display the quality of the products which is for the stage of completion very important.

Reduction of data entry to a minimum thanks to event driven, automated data transfer from EMI to Transporeon (web-based truck time management tool), SIPASS, SIMATIC IT and SIMATIC PCS 7.

The actual installation is one of the biggest S7-400 solutions in food and beverage worldwide.

4.2.8. PCS7 (Process Control System) for Dairy

1. **Title of the case description:**

PCS7 (Process Control System) for Dairy

Author: BIZ-UP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x			x	x	x	x	
Food safety, quality, label	x	x			x	x	x	x	
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The company needed al highly flexible production automation for the production of more than 100 different final products, which are produced in alternating time slots.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

The Dairy plant refines agricultural raw materials into high-quality foodstuffs and a wide range of preliminary products for consumer applications. 300 employees working at two production sites in Austria generate revenues of around €200 million. The company was founded in 2013. Currently the company offers about 600 different products. With the introduction of the automated system, the total capacity increased to around 15.000 T / year.

- *Describe the method, procedure, solution implemented*

The PCS7 (Process Control System) was implemented in the dairy for controlling the production process. Additionally, production-planning and a traceability system with the DCS (distributed control system) were integrated. Furthermore, the automation of a new-built cheese factory had to be developed and integrated in the process control system of the dairy headquarter.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The challenge was that the integration had to be take place during the ongoing operation. Also the first time of the integration of the new PCS7 Advanced Process Functions was not easy because of the short implementation phase (6-9 month).

- *Describe the results, achievements and typical failures*

The realization of the new process control solution PCS7 is one of the biggest Industry 4.0 solutions in food + beverages worldwide. It offers high flexibility for producing of more than 100 different milk products. The process control solution is vertically integrated with

the ERP software on the one hand and also with the MES (Manufacturing Execution System) on the other hand.

4. Summarize what makes the case to a good practice

The new plant is operated independently with a special control center, but process data can be called up from the headquarter.

Significantly higher volume of materials handled with same staff levels in raw materials receiving, so the efficiency of the system has increased.

Optimal deployment of staff and synergies in maintenance and training thanks to the shared control center.

Comprehensive overview at the push of a button - from order control via the PCS7 to the tank monitoring to display the quality of the products. Which is for the stage of completion very imported.

Control and execution of the complete goods logistics and production processes with data integration to SAP.

Reduction of data entry to a minimum thanks to event driven, automated data transfer from ERP to Felix and SIMATIC PCS 7.

The actual installation in both plants is one of the biggest PCS7 solutions in food and beverage worldwide.

Cheese Factory (Scope of supply)

- PCS7 V8.0, APF + TP4Dairy,
- redundant systems
- Interface to MES System “Felix”
- Unit Integration (Cheese vessel, Cheese press, Saltbath)

4.2.9. Weight Saving by Testing and Stress analyses for Agriculture Machines

1. **Title of the case description:**

Weight Saving by Testing and Stress analyses for Agriculture Machines

Author: BIZ-UP

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x			x				
Food safety, quality, label									
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case**

- *Describe the specific need or problem being addressed by the case*

Heavy tractors and trailers strongly compact the soil when driving on the fields and pastures. Additionally, heavy vehicles need a lot of fuel. Consequently, vehicles with lighter weight are needed to solve these problems.

- *Describe the method, procedure, solution implemented*

The heavier parts of the vehicles are being redesigned and reconstructed with using lightweight materials and / or light weight metal structures, e.g. replacing full-material by light-weight-structured material. The mechanical stress that the new parts must bear, were simulated with FEM (finite elements method) software solutions.

Afterwards the parts were tested in the lab, performing mechanical and lifecycle tests. Finally the parts were mounted on the trailer instead of the previously used full-metal-parts and the trailer was tested in the field.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Farming is a very traditional sector. The mechatronics companies needed to put a lot effort on convincing the farmers, that these new light-weight materials provide the same performance as the „always before" used parts.

Another challenge was, that the mechanical specifications of some existing parts were not known, because these parts were constructed long time ago, mostly based on the experience of the constructing engineers. These "old" parts had to be simulated with FEM in order to obtain their mechanical specifications, used as basis for constructing the new light-weight parts.

- *Describe the results, achievements and typical failures*

At the start of the development in 2015 the total weight of the trailer was about 6,5 tons without load. After the stress calculation a potential saving of 500 kg (only for the trailer) was determined; after 2 test-campaigns and a new FEM calculation the total saving for the serial trailer was 890 Kilograms. This amounts to a weight loss of 13%.

Additionally, the compaction of soil in the fields and pastures and thus the effort for loosen up the soil was reduced significantly and the fuel consumption was reduced noticeably.

4. **Summarize what makes the case to a good practice**

As farming is a very traditional sector, this case can be used to show, that new light-weight structured materials can replace the well-known materials by maintaining all necessary features, e.g. mechanical strength.

Additionally, this best practice case shows that the usage of new technologies leads to improved products with less energy consumption.

4.2.10. Agrimax: multiple high-value products from crop and food-processing waste

1. Title of the case description:

Agrimax: multiple high-value products from crop and food-processing waste

Author: UHOH

2. Cross-reference table

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x	+x					
Food safety, quality, label									
Food design									

1.Cost efficiency
2.Quality assurance
3.Risk assessment and risk management
4.Compliance to regulations
5.Product performance
6.Information for users
7.User's satisfaction
8.User's feedback and reaction
9. Others

3. Short description of the case

- *Describe the specific need or problem being addressed by the case*

In Europe, around 90 million tonnes of food and 700 million tonnes of crop are wasted every year.

Agrimax is an EU-funded project that is developing and demonstrating the production of multiple, high-value products from crop and food-processing waste. The project aims to maximise the EU's sustainability, while providing new bio-based compounds for the food, packaging and farming sectors.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Agrimax will construct two pilot processing plants, one in Italy and one in Spain, capable of processing waste from all four selected crops (cereals, olives, potatoes and tomatoes). Local agricultural cooperatives will be involved by providing waste for processing. Their contributions will be coordinated with the help of an online platform.

- *Describe the method, procedure, solution implemented*

The project will develop two pilot processing plants and use them to demonstrate the technical and commercial feasibility of extracting high-value compounds from agricultural and food processing waste. By applying them sequentially, Agrimax will produce a cascade of bio-based compounds with high-value applications, such as:

- Packaging (bio-polymers, bio-composites, bio-based coatings, active packaging, stabilising agents)

- Food (additives, ingredients, natural flavourings, edible coatings, microbial growth media)
- Agricultural Materials (biodegradable pots, mulching films, bio-fertilisers).

- *Describe the results, achievements and typical failures*

Local agricultural cooperatives will provide waste for processing and their contributions will be coordinated with the help of an online platform. End users will test the new, bio-based compounds products to validate their cost effectiveness and performance.

4. Summarize what makes the case to a good practice

By reducing waste and our dependence on fossil-fuels, Agrimax will help to maximise the EU's sustainability, while providing new bio-based compounds for the food, packaging and farming sectors, and creating new growth and jobs.

4.2.11. Jet precooling for fresh produce for reduced precooling time

1. **Title of the case description:**

Jet precooling for fresh produce (vegetables & fruits) for reduced precooling time

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x		x		+	+	
Food safety, quality, label									
Food design									

1.Cost efficiency
2.Quality assurance
3.Risk assessment and risk management
4.Compliance to regulations
5.Product performance
6.Information for users
7.User's satisfaction
8.User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

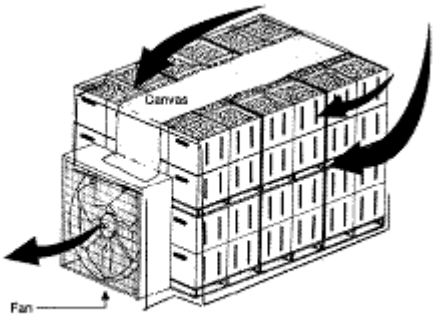
After harvesting, organically grown, fresh produce needs to be cooled quickly to avoid early onset of spoilage. Finding the best way to quickly, efficiently and economically cool fresh vegetable and fruit products off has been among the top problems for growers.

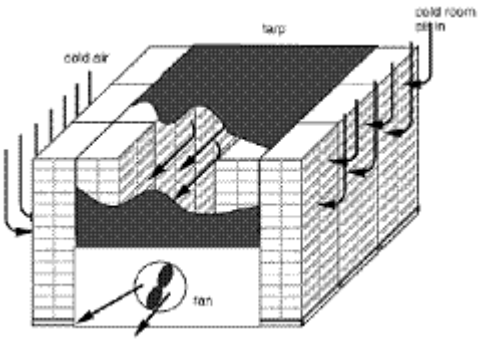
- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Organically Grown Company was founded in Oregon, USA in 1978. What started out as a nonprofit coop. has evolved into the largest wholesaler of organic produce (fruits, vegetables and herbs) in the Pacific Northwest area. The company consists of over 200 employees and different growers (as constituted in 2013) and owns facilities in Eugene, Seattle, Portland and Spokane.

- *Describe the method, procedure, solution implemented*

The company implemented a post-harvest jet precooling system which makes use of a forced air flow cooling through the product panels. It is a simple concept by which a fan evacuates air from an empty space between two panels containing fresh products and replacing the evacuated air by cool air. The empty space is covered by tarps at the top and bottom ensuring cool air is flowing through the product.





(taken from http://eagri.org/eagri50/HORT381/lec08.html, 01.03.2018)

http://pre-coolers.net/

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Jet-precoolers temperature limit for basic operation is -10 °C. The company however offers individual solutions for special inquiries.

- *Describe the results, achievements and typical failures*

Post-harvest cooling times were reduced from 4 - 5 hours to 1.5 - 2h, increasing productivity, while lowering energy costs and preserving product freshness. Shelf life could be increased by several days. Due to the simplicity of the equipment, typical failures are mostly related to power failures.

4. Summarize what makes the case to a good practice

The company was able to increase its productivity, shelf life and cut cooling time to one third by changing from a homemade cooling system to a novel precooling technique called “jet cooling”.

4.2.12. Sustainable packaging: Boix forming machine for punnets and trays

1. **Title of the case description:**

Sustainable packaging: Boix forming machine for punnets and trays

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x	x		x				
Food safety, quality, label									
Food design									

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Sustainable packaging is currently an important pillar of policy for many growers and retailers. With changing wishes and requirements, it is important to be able to realize new packaging solutions quickly and efficiently.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Boix, manufacturer and worldwide supplier of tray forming machines, puts great emphasis on cardboard punnets as a sustainable packaging solution. Boix Europe is the main dealer for Boix packaging machines in Europe and market leader in forming and gluing both corrugated and solid board packaging. The machines find their way to various market sectors: from agricultural to industrial use in food and non-food sectors. Boix stands for high quality standards and an excellent service.

- *Describe the method, procedure, solution implemented*

The MCT-1 punnet machine is an automatic and adjustable double-headed punnet forming machine for automatically and mechanically setting up punnets and small trays from both corrugated and solid board. The compact packaging machine is mechanically driven by 1 motor that drives 2 adjustable heads with the aid of connecting rods. This allows the machine to set up 2 different sizes of trays and punnets of corrugated board and solid board with a capacity up to 6.000 – 7.000 trays per hour. No qualified technician is required for changing formats.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

The machine is an entry-level model from the range of Boix tray formers. The delivery time is approximately 30 to 60 days.

- *Describe the results, achievements and typical failures*

The small cardboard trays and punnets (min 70x70x30mm to max 400x300x150mm) that can be set up with tray former are suitable for packaging vegetables, fruit, prepacked bread, snacks, potato products and meat products.

4. Summarize what makes the case to a good practice

- The boxes and cardboard trays set up by Boix packaging machines are now the standard as a sustainable packaging solution for the packaging of vegetables, fruits, snacks, potato products, meat products, bread, pastries and other confectionery products.
- MCT-1 punnet machine allows to set up 2 different sizes of trays and punnets of corrugated board and solid board with a capacity up to 6.000 – 7.000 trays per hour.
- No qualified technician is required for changing formats.

- Boix showroom: interested people can see tray forming automation in action at the Boix Europe showroom and discuss a partnership that will help them grow their cardboard packaging business http://insights.boixeurope.com/request-a-demo?hsCtaTracking=24d3f12b-94bb-4d57-b010-53f8a3969fec%7C4062511d-0a2e-40dd-b58c-647c8a4f5bf0

4.3. Design

4.3.1. Automatic Milk Dispensers

1. **Title of the case description:**

From Producer straight to Consumer: Automatic Milk Dispensers

Author: UNISEF

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics	x	x		x			x		
Food safety, quality, label									
Food design	x	x		x		x	x		x

1.Cost efficiency
2.Quality assurance
3.Risk assessment and risk management
4.Compliance to regulations
5.Product performance
6.Information for users
7.User's satisfaction
8.User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Small cattle farmers often complain from low prices imposed by dairy factories, and needed a solution to sell their milk to the final consumer trimming the distribution chain.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Small family-run cattle farms whose one of the main products is fresh milk. Experts on the field say that these devices have been of particular success all around Italy and, especially in the last 5-6 years, in Slovenia and Croatia.

- *Describe the method, procedure, solution implemented*

The solution widely consist in the installation at the farm site of an Automatic Milk dispenser, allowing direct access to final customers.

Farmers clean and refill the Milk Dispenser on a daily basis, checking that all working parameters (temperature, bacterial load, etc.) stay inside the normal range. Customers can fill their own bottles or buy new ones on the spot through a siding Automatic Bottle Dispenser.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Cost for purchase and installation of an Automatic Milk Dispenser, averaging €20.000-€25.000 but also up to €40.000, can be a barrier for small farmers. Management and maintenance of the Dispenser and of the correct milk preservation indicators can result burdensome, particularly under the bureaucratic aspect.

- *Describe the results, achievements and typical failures*

Farmers are almost completely relieved of the time otherwise needed to take care of final customers.

Farmers obtain more than the double of the price they are paid by the few large and dominating dairies collecting companies. Final consumer can buy their milk saving 30% on the average supermarket price.

Packaging is virtually reduced to none.

Many consumers enjoy and give value in knowing and choosing by themselves where the milk they drink comes from.

Many farmers don't find affordable the initial investment needed to acquire an Automatic Milk Dispenser.

4. **Summarize what makes the case to a good practice**

At present consumers demonstrate an increasing attitude against waste of the materials used for food packaging. The experience of Automatic Milk Dispenser shows that packaging can be drastically reduced if some other paradigm can be put into play, i.e. the food distribution chain.

In this case we have a wonderful example of "delivering" food or drink not with a product (packaging) but as a service (dispenser), wasting no packaging material at all.

Once again we learn that the target of Food Design cannot be the solution to mere "food packaging", but the solution to "food delivery and availability" to final consumer.

4.3.2. Frutformas – reshape fruit

1. **Title of the case description:**

Frutformas – reshape fruit

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label									
Food design	x	x	x	x		x	x	x	

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The idea to dehydrate fruit is centuries old, and was used as a means to conserve. Following a number of attempts and iterations, the consortium developed a new method to dehydrate fruit, ready to be eaten.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Frutaformas® is a Portuguese business dedicated to dehydrated fruit, through a natural process. The product proceed from Certificate of Origin sources, i.e., fruit that is obtained, produced, manufactured and processed in a particular region - Alcobaça apple, Rocha pear, Açores pineapple and Fundão cherry.

- *Describe the method, procedure, solution implemented*

Frutaformas products are dehydrated fruit snacks made from Certificate of Origin fruit. Products are marketed in different shapes: slices, lingots and hearts, and are available in two varieties: gourmet and healthy. Targeted at younger audiences, there is also the "Little Fruit" product, which presents the fruit in a "healthy and fun way" to children. In fact, according to the owners, Frutaformas was primarily developed in order to cater for an younger audience, and encourage them to eat fruit in a healthy, 100% natural way.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Frutaformas is underpinned in two main pillars: Health and Nutrition. These are closely related with the perception that the public needs a new generation of products to respond to the growing problems associated with bad eating habits (e.g. Childhood Obesity),

namely natural products, without any added sugar or preservatives, and exhibiting a nutritional intake similar to fresh fruit.

- *Describe the results, achievements and typical failures*

1. Increase in demand for fruit-based snacks and fruit ingredients.
2. New appetite for nutritional greens / fruits.
3. Snackification of everything – replacing conventional breakfast foods with breakfast pouches, bites and biscuits.

4. Summarize what makes the case to a good practice

The route of Frutaformas has been quite safe and supported the mission and values that this project presents. With an upward growth since the beginning, the company set out 2015 as the year to initiate internationalization attempts. In 2016 the product is exported to the UK, Norway, Belgium and Luxembourg. For the future, the company is setting its eyes neighboring Spain, as well as on the Middle East.

4.3.3. Design for Details- DOPLA

1. **Title of the case description:**

Design for Details: how DOPLA's Lowered 200R plastic Cup redesign allowed a whooping 20% volume reduction!

Author: UNISEF

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label									
Food design	x				x		x		x

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The company understood that frequently its professional customers don't have much room available in their shop/bar/restaurant for storage of consumable materials, i.e. plastic cups, and flatware or paper towels.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

DOPLA S.p.a. is a company producing plastic tableware: dishes, cups, cutlery with a yearly turnover of €140mln (2016). It has two production facilities in Italy, adding a total staff of 240 people, and one in Czech Republic, with 226 more employees.

- *Describe the method, procedure, solution implemented*

DOPLA went through a careful and delicate redesign of the shape of its already best-selling plastic cup in order to make more compact the stacking of these cups in piles.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution:*

The redesign process took care to not introduce any change in the already implemented manufacturing technology, but to only act on the geometrical features of the product.

Redesign has been developed using CAD systems, requiring then just two manufacturing tests to refine the final design.

- *Describe the results, achievements and typical failures*

The resulting product *Lowered 200 R Cup* sports this improvements:

- film for the primary pack packaging: -16%
- cardboard used in secondary pack: -17%
- CO_2 emissions from production and transportation: -25%

- products transported/stored in the same volume +25%

Lowered 200 R Cup was rewarded at 2015 Eco-friendly Packaging Award hosted by CONAI (Italian National Packaging Consortium).

4. Summarize what makes the case to a good practice

Careful design of fine details can improve product performance AND reduce resources and costs needed for its production and distribution.

But, first of all, the success of this operation lies in the correct recognition of a specific users' need.

4.3.4. Sensory Analysis of plastic bottles

1. **Title of the case description:**

Sensory Analysis of plastic bottles

Author: UNISEF

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label						x	x	x	
Food design				x	x		x	x	

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The company desired to know how positively a specific line of its products impacted on people as containers for cosmetics.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

PLASTOPIAVE srl is a company in Conegliano (Italy) manufacturing blow-molded plastic containers suitable for cosmetics, pharmaceuticals and food. It sports a yearly turnover of €34,5mln (2016) from a total staff of 190 people.

- *Describe the method, procedure, solution implemented*

The company used Sensory Analysis to assess how its selected products are perceived for the intended use of containing cosmetics.
A specific selection of descriptors has been chosen with regard to physical perception for the three senses - vision, smell, touch - which are reasonably involved in a shopping environment.
A second selection of descriptors has been added regarding 2nd level perceptions (e.g.: opinions that people base of physical perceptions but are further elaborated or recalled with a spontaneous psychological/intellectual process): sturdiness, elegance, comfort of use, hygiene, personal care aptness.

The Sensory Analysis has been conducted strictly following EN/ISO 13299 - *Sensory analysis -- Methodology -- General guidance for establishing a sensory profile* and all related regulations and guidance.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

To solve any specific constraints to the application of Sensory Analysis it is quite advisable to appoint the analysis execution to a specialized contractor correctly organized to fulfill all necessary requirements of location, method and procedure.

However, the customer company is required to deeply involve with the Sensory Analysis contractor in the definition of the output parameters, so that these parameters can be of maximum utility to further evaluations and developments the company intends to operate.

- *Describe the results, achievements and typical failures*

The result of a professional Sensory Analysis consist of a report containing the complete description of the operations and the analysis, synthesis and the full records of the performed evaluations.

The Analysis client can achieve a reliable and reproducible set of information about how its product(s) is perceived under a sensory point of view.

Typical failures might be those related to:

- non-optimal definition of the context a product is to be evaluated in;
- non-optimal definition of output parameters that can then successfully put into use to better position/develop the product for the given context.

4. Summarize what makes the case to a good practice

Most often people think that attributes like "bad" or "nice" are the result of extremely personal perceptions.

This case demonstrates how, following a strict method and standard processes, human perceptions of an object can be measured and evaluated in a reliable and reproducible manner.
It also represent how much it is of great significance to understand when the part of the product that is really perceived is not the sold good itself but nothing more than its packaging.

4.3.5. 3D printed snacks made from food waste

1. **Title of the case description:**

3D printed snacks made from food waste

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label									
Food design					x		x	x	x

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

One-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year. However, one tech-minded foodie has created eye-catching 3D printed concoctions from residual food. Food is lost or wasted throughout the supply chain, from initial agricultural production down to final household consumption. Reducing food losses and waste is gathering increasing global interest and action. Governments, research institutions, producers, distributors, retailers and consumers have all different ideas about the problem – the solutions – and the ability to change. One tech-minded foodie is hoping to redeem humanity from its profligacy by creating eye-catching 3D printed concoctions from residual food.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Dutch designer Elzelinde van Doleweerd's Upprinting Food project aims to trim back on food waste by taking unsold or commonly overabundant food like fruit, vegetables, bread and rice and using the latest tech to put a new spin on things.

By creating printable pastes from the foods, she's able to form attractive shapes that are then baked, dehydrated and arranged to form attractive meals with a longer shelf life. Ripe bananas and knobbly carrots that aren't pretty enough to be sold are prime candidates for the 3D Food Company's advanced printer.

More information can be found at https://upprintingfood.com/ and https://www.youtube.com/watch?time_continue=1&v=k3y-jOOly6c

- *Describe the method, procedure, solution implemented*

The vegetables and fruit peels are bolied, the bread dried and/or the boiled rice used. The ingredients are mashed, mixed together, ground and sieved. A smooth paste can be printed and baked afterwards. The dehydration technique is used “so no bacterial activity can take place. This way the food is safe to eat and it can be saved it for a very long period.



- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Information not available.

- *Describe the results, achievements and typical failures*

The result is a crispy and tasty food that resembles a cookie or a cracker. Looking at the growing population, more food is needed in the future, but on the other hand, one third of the food produced is wasted nowadays. With the use of new technologies, Upprinting Food project wants to explore societal food challenges.

4. **Summarize what makes the case to a good practice**

- Creating 3D printed snacks made from food waste by taking unsold or commonly overabundant food.
- Different type of food waste (like fruit, vegetables, bread and rice) can be used to put a new spin on things.

4.3.6. Cadel Deinking: innovative plastic recycling process

1. **Title of the case description:**

Cadel Deinking: innovative plastic recycling process

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label									
Food design				x			x		x

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Plastic recycling is the process of recovering scrap or waste plastic and reprocessing the material into useful products. Since the vast majority of plastic is non-biodegradable, recycling is a part of global efforts to reduce plastic in the waste stream, especially the approximately 8 million tons of waste plastic that enters the Earth's ocean every year. Compared with lucrative recycling of metal, and similar to the low value of glass, plastic polymers recycling is often more challenging because of low density and low value.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

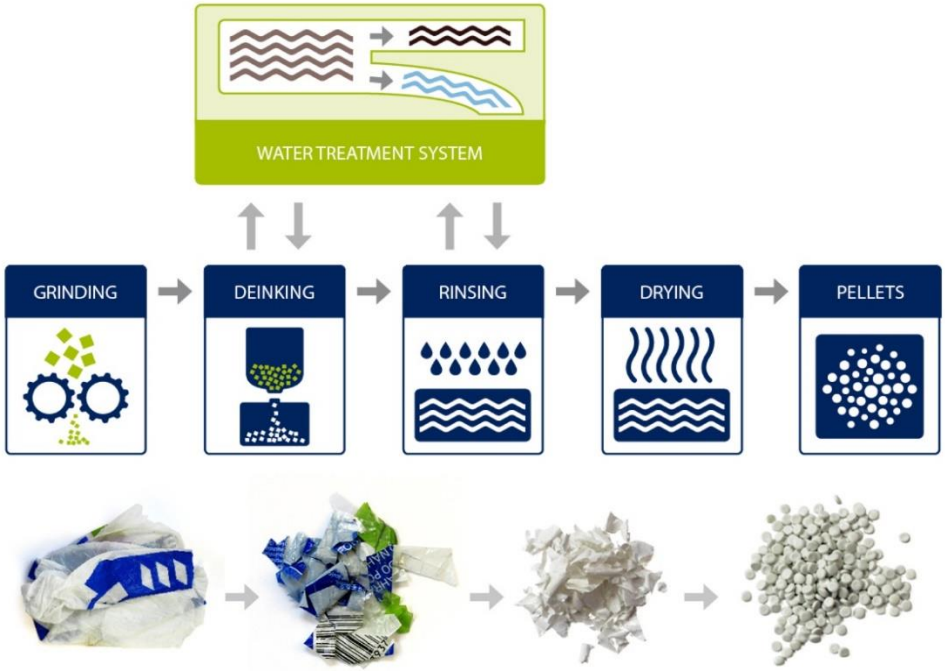
Cadel Deinking (Alicante, Spain) is a technical company created to implement an innovative plastic recycling process that can remove printed ink from plastic surfaces in recycling and converting companies. The technology developed by this company lets remove ink from plastic before it is recycled and obtain a product with a quality similar to that of new plastic. It can therefore be used in the same applications as a new material.

This technology is unique in the world, and its patent has been extended to more than 20 countries.

- *Describe the method, procedure, solution implemented*

Cadel Deinking has developed a unique process that removes printed ink from plastics before obtaining a recycled material. This gives the product a high added value,

because printed ink spoils the recycled product both visually and in its mechanical properties.



Cleaning chemicals with water-based formulations are used in the process. Neither solvents nor environmentally hazardous chemicals are included.

Moreover, the company has important know-how, not only in the removal of the ink, but also in the development of a water treatment system which makes the process both economical and environmentally viable. Both the deinking solution and the rinsing water are continually reused in the system, with the consequent savings in reagents and waste handling.

The deinking process is applicable to all kinds of plastics (LDPE, HDPE, PP, PET) and works with any kind of ink (water-based inks, solvent-based inks, UV inks, electron beam). The system provides reuses the water and biodegradable chemicals in a closed circuit, so consumptions are low and environmentally friendly.

More information at http://cadeldeinking.com/en/ and https://www.youtube.com/watch?v=wqjsQwZqE5s

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

No constraints have been identified.

This technology is unique in the world, and its patent has been extended to more than 20 countries. The companies that choose to install a deinking plant in their factories will see their competitiveness increasing, because they are going to offer their customers a high-quality recycled material.

- *Describe the results, achievements and typical failures*

The result of the process is an ink-free plastic with a quality very similar to that of new plastic. This advance will allow us to approach compliance with European legislation regarding recycling, which is increasingly demanding.

4. **Summarize what makes the case to a good practice**
    - 'Deinking' is a water-based technology, with no solvents or degasification involved. It converts printed scrap, flexible or rigid, into new valuable pellets (PE, PP, PET, etc.). Most inks, on the surface, and resins can be removed, and odours too.
    - The system Cadel Deinking provides reuses the water and biodegradable chemicals in a closed circuit, so consumptions are low and environmentally friendly.
    - The deinked plastics can be used several times.
    - It also opens an opportunity to treat post-consumer plastics, as it can also eliminate odours.
    - The deinked plastics can be used to make films, bags, containers or furniture, to name but a few options.
    - Several tests on food contact have been run, with positive results: one test was run by EFSA, based on European norms, and the other was run by FDA, based on the relevant American rules.

4.3.7. Elopak aseptic Pure-Pak® cartons made with Natural Brown Board

1. **Title of the case description:**

Elopak aseptic Pure-Pak® cartons made with Natural Brown Board

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label									
Food design				x		x	x		x

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page - 3 pages)**

- *Describe the specific need or problem being addressed by the case*

Over the last decades, the worldwide plastic production reached an output volume of up to 300 million tons annually. Plastic products are manifold and can be found in many shapes and forms, for example in plastic bottles, plastic dishes and cutlery, cosmetics and textiles and many different packaging materials. Customers are becoming increasingly aware of the consequences of excessive plastic use, like pollution of the oceans or methane emissions and thus are looking for fossil-free alternatives.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

Elopak is an international supplier of paper based packaging solutions for liquid food. Based in Norway, and wholly owned by the Ferd Group (one of Norway's largest privately owned industrial groups) Elopak is continually developing its expertise to match changing demands for packaged food.

Elopak's business is to break new ground at every level of packaging; processing standards, food science, logistics analysis and packaging concepts, all alongside a systems-based approach which uniquely characterizes Elopak's contribution to the world of packaging.

Over half a century of continuous expansion and growth, sees a truly global corporation operating on every continent. With in-depth penetration through a network of market units and associates in more than 40 countries plus customers in over 80, the Elopak Group seeks to bring its international expertise and product technology to new markets.

Elopak is preserving the world´s resources in a healthy, safe and sustainable manner, by providing liquid food paper packaging solutions.

- *Describe the method, procedure, solution implemented*

Elopak is taking a step forward with sustainable packaging and launching aseptic Pure-Pak® cartons made with Natural Brown Board.

The new Natural Brown Board Pure-Pak® cartons are carbon neutral and introduced only one year after Elopak launched its fresh gable top carton made from Natural Brown Board. Since its 2017 launch, the fresh carton has been successful on shelf across Europe for market-leading multinational and medium sized dairies.

The aseptic Pure-Pak® carton will be available in the sizes 1000 ml, 750 ml and 500 ml and runs on the E-PS120A aseptic filling machine. The new Pure-Pak® cartons are carbon neutral and 100 per cent recyclable.

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure , solution*

Information currently not available.

- *Describe the results, achievements and typical failures*

The aseptic Pure-Pak® cartons have one less layer and thereby retain the natural brown colour of the wood fibres which gives a visible fibre structure. This also results in reduced carbon footprint and reduced weight, providing a naturally different, sustainable and authentic package, designed to meet demands from growing trends in ethical, ecological and organic products.

Elopak's Natural Brown Board, one of our most recent packaging innovations, driven by growing consumer demand for more local, authentic products and the market trend towards more sustainable and differentiating packaging solutions.

More information at http://www.elopak.com/products-and-services/cartons, http://elopak-natural-brown-board.com/ and https://vimeo.com/252669024

4. Summarize what makes the case to a good practice

- The aseptic Pure-Pak® cartons are:
  - different: Improved shelf appearance and higher attention at the Point of Sale
  - Authentic: Supports communication and credibility of natural and environmentally friendly product positioning
  - Sustainable: Clearly identifiable as environmentally friendly packaging and with a reduced carbon footprint
  - Flexible: Can be filled on existing filling lines without modifications or changes to the machine settings
- The aseptic Pure-Pak® cartons achieve the same natural feel and printing capabilities as the fresh carton, to enable the aseptic customers to maximise the branding and stand out possibilities in ever changing markets.

4.3.8. Water-based, grease-resistant coating for food packaging

1. **Title of the case description:**

Water-based, grease-resistant coating for food packaging

Author: UHOH

2. **Cross-reference table**

	1	2	3	4	5	6	7	8	9
Mechatronics									
Food safety, quality, label									
Food design					x		x	x	

1. Cost efficiency
2. Quality assurance
3. Risk assessment and risk management
4. Compliance to regulations
5. Product performance
6. Information for users
7. User's satisfaction
8. User's feedback and reaction
9. Others

3. **Short description of the case (from ½ page – 3 pages)**

- *Describe the specific need or problem being addressed by the case*

The EU produces a huge amount of plastic every year and accounts for roughly 20 percent (60 million tons) of the overall global plastic production (300 million tons). Forty percent of plastic are intended for packaging, while the rest is distributed among consumer & household goods, building & construction materials, cars and electronic equipment. Half of total plastic production is intended for single-use purposes and only a small share is effectively recycled (30 percent). The remainder of plastic waste is being incinerated or disposed of as landfill, potentially ending up as litter in the great oceans, where it poses major threats to the marine life.

- *Describe the business, which implemented the case (size, country, region, location, food sector, typical products, resources)*

The Sherwood Group was founded 1976 in Nottingham, UK. The company provides commercial and corporate print, social stationary, and packaging solutions in the United Kingdom and internationally. It offers commercial printing services to produce prospectuses, annual reports, catalogues and brochures, POS, small run digital print, and direct marketing products. The company also provides packaging solutions, such as printed folding box board cartons, collar cards, inserts, graphic promotional tickets, polyprop boxes/headers, mono and laminated bags, heat transfer labels, and bespoke hook developments.

The company currently has roughly 30 employees, however no accurate data could be found.

- *Describe the method, procedure, solution implemented*

The Sherwood group developed a water-based coating, which is organically biodegradable and used in conjunction with a biodegradable window film. Puracoat® has been tested for the use in extreme temperature applications and is suitable for microwave and oven temperatures of up to 220 °C, as well as freezing operations. The company claims that their product recudes turnaround time and improves speed-to-market.

(https://www.sherwoodgroupuk.com/wp-content/uploads/2018/03/Puracoat-The-Sherwood-Group-1000x450.jpg)

- *Describe the specific constraints of the business related to the implementation of the method and/or related to the location, method, procedure, solution*

Excessive moisture may penetrate ink and coating if the packaging is exposed to quick temperature changes.

- *Describe the results, achievements and typical failures*

The technology has successfully been implemented in different case studies. In total, four case studies have been mentioned, including a recyclable sandwich pack, a tortilla wrap, a dessert packaging and most recently a carton packaging for a Mexican restaurant chain. Besides being recyclable, implementation of Puracoat® resulted in a significant reduction in lead-times for materials, as well as a cost reduction In all case studies.

4. **Summarize what makes the case to a good practice**

Puracoat® is a completely water-based coating, which can be applied to several different biodegradable packaging materials. Several case studies showed that the solution is able to improve cost effectiveness and time efficiency.

5. Analysis of the case studies

One good practice may be relevant for more than one main discipline (Mechatronics, Food safety, quality and labelling and Food design). They may have several benefits which help SMEs to improve their technical competences, management and entrepreneur skills by showing successful ways to implement such tools. One good practice may be associated with more than one targeted benefit category out of the listed nine.

1. **Cost efficiency**

48% of all the good practices described in this Deliverable focus on improving the cost efficiency in the food safety, quality and labelling area, such as 4.1.7- Guideline for Cleaning Suited equipment and 4.1.9- Biosensor system (lactate biosensor) and 4.1.11-Landpack – Green Packaging Solutions from Grain Fields.

34% of all identified good practices are related to cost efficiency in mechatronics such as 4.2.2-The FRISBEE tool and 4.1.8- Improvement of water consumption and implementation of a sustainable water cycle by sewage treatment plants in several dairy plants of FrieslandCampina.

9% of the good practices collected in D.T2.2.1 are related to design area such as 4.3.1-Automatic Milk Dispenser and 4.1.10-Innovative food packaging that extends shelf life and reduces footprint.

ID of the case studies improving cost efficiency can be seen in Table 1.

	Food safety, quality, labelling		**Mechatronics**		**Food design**
Improving cost efficiency	4.1.1 4.1.2 4.1.3 4.1.5 4.1.6 4.1.8 4.1.9 4.1.10 4.1.11 4.1.12 4.1.13 4.1.16	4.1.18 4.1.19 4.1.23 4.1.24 4.2.2 4.2.4 4.2.6 4.2.7 4.2.8	4.1.1 4.1.9 4.1.10 4.1.16 4.2.2 4.2.3 4.2.4	4.2.5 4.2.7 4.2.8 4.2.9 4.2.10 4.2.11 4.2.12 4.3.1	4.1.1 4.3.1 4.3.2 4.3.3

Table 1: ID of the case studies improving cost efficiency

2. **Quality assurance**

52% of all collected good practices focus on quality assurance in the food safety, quality and labelling area such as 4.1.2-Member interest Group of Campden BRI UK and 4.1.6-Airborne's TraceMe honey application.

32% of all good practices are related to quality assurance in the area of mechatronics such as 4.2.1- Green Biotech Cluster of Basilicata (BIOGREEN) and 4.2.4-The SAFE-BAG.

7% of all case studies is in food design which focuses on quality assurance, such as 4.3.2-Frutformas – reshape fruit.

ID of the case studies improving quality assessment can be seen in Table 2.

	Food safety, quality, labelling		Mechatronics		Food design
Improving quality assessment	4.1.1 4.1.2 4.1.3 4.1.4 4.1.5 4.1.9 4.1.10 4.1.11 4.1.12	4.1.13 4.1.15 4.1.16 4.1.18 4.1.19 4.1.22 4.1.23 4.1.24 4.2.2 4.2.4 4.2.5 4.2.6 4.2.7 4.2.8	4.1.1 4.1.9 4.1.10 4.1.16 4.2.1 4.2.2 4.2.4	4.2.7 4.2.8 4.2.9 4.2.10 4.2.11 4.2.12 4.3.1	4.1.1 4.3.1 4.3.2

Table 2 ID of the case studies improving quality assessment

3. Risk assessment and risk management

In the risk assessment and risk management benefit category, 41% of all identified European/global case studies are related to food safety, quality and labelling, such as 4.1.3-Platform of crossed internal audits and 4.1.8- Improvement of the environmental sustainability of spring water production industrial plants.

20% of all global/European case studies focus on mechatronics, such as 4.1.1-Food quality and safety animation clusters called clubs and 4.2.2-The FRISBEE tool.

5% of all good practice cases are related to risk assessment and risk management in the food design such as, 4.1.10-Innovative food packaging that extends shelf life and reduces footprint.

ID of the case studies improving risk assessment and risk management can be seen in Table 3.

	Food safety, quality, labelling		Mechatronics	Food design
Improving risk assessment and risk management	4.1.1 4.1.2 4.1.3 4.1.4 4.1.5 4.1.6 4.1.8	4.1.9 4.1.10 4.1.11 4.1.13 4.1.15 4.1.16 4.1.19 4.1.22	4.1.1 4.1.10 4.1.16 4.2.1 4.2.2 4.2.4 4.2.10 4.2.11	4.1.1 4.3.2

		4.1.24 4.2.2 4.2.4	4.2.12	

Table 3: ID of regional case studies improving risk assessment and risk management

4. Compliance to regulations

27% of all collected good practices are in food safety, quality and labelling area, such as 4.1.4- Introduction of Pain de Belledone as part of the Bio Solidaire® initiative and 4.1.6- Airborne's TraceMe honey application which are related to compliance to regulation.

9% of all good practices focus on compliance to regulations in the field of mechatronics, such as 4.3.1- Automatic Milk Dispenser and 4.2.4-The SAFE-BAG.

14% of all good practices focus on food design in the benefit category of compliance to regulations such as, 4.3.2- Frutformas – reshape fruit and 4.3.4- Sensory Analysis of plastic bottles.

ID of the case studies improving regulations compliance and its assessment can be seen in Table 4.

	Food safety, quality, labelling	**Mechatronics**	**Food design**
Regulations compliance and its assessment	4.1.1 4.1.2 4.1.3 4.1.4 4.1.6 4.1.8 4.1.15 4.1.17 4.1.20 4.1.21 4.1.23 4.1.24	4.1.1 4.2.4 4.2.10 4.3.1	4.1.1 4.3.1 4.3.2 4.3.4 4.3.6 4.3.7

Table 4: ID of case studies improving regulations compliance and its assessment

5. Product performance and its assessment

45% of all good practice cases are related to food safety, quality and labelling, such as 4.1.3- Platform of crossed internal audits and 4.1.9- Biosensor system (lactate biosensor).

27% of all good practices which focus on product performance and its assessment are related to mechatronics, such as 4.1.8- Improvement of water consumption and implementation of a sustainable water cycle by sewage treatment plants in several dairy plants of FrieslandCampina and 4.2.4-The SAFE-BAG.

11% of all collected good practices related to product performance and its assessment are in food design, such as 4.3.3- Design for Details: DOPLA's and 4.3.4- Sensory Analysis of plastic bottles.

ID of the case studies improving product performance and its assessment can be seen in Table 5.

	Food safety, quality, labelling		Mechatronics	Food design
Product performance	4.1.1 4.1.2 4.1.3 4.1.4 4.1.8 4.1.9 4.1.10 4.1.11	4.1.14 4.1.17 4.1.18 4.1.19 4.1.21 4.1.22 4.1.23 4.1.24 4.2.4 4.2.6 4.2.7 4.2.8	4.1.1 4.1.10 4.2.1 4.2.3 4.2.4 4.2.5 4.2.7 4.2.8 4.2.9 4.2.10 4.2.11 4.2.12	4.1.1 4.3.3 4.3.4 4.3.5 4.3.8

Table 5: ID of case studies improving product performance and its assessment

6. Information for users

36% of all case study are in the food safety, quality and labelling area, such as 4.1.4- Introduction of Pain de Belledone as part of the Bio Solidaire® initiative and 4.1.7- Guideline for Cleaning Suited equipment.

9% of all collected case studies focus on mechatronics in the category of information for users such as 4.2.1-Green Biotech Cluster of Basilicata (BIOGREEN).

7% of all collected good practice cases focus on food design, such as 4.3.1- Automatic Milk Dispensers and 4.3.3- Design for Details: DOPLA's.

ID of the case studies ID of the case studies providing information for users can be seen in Table 6.

	Food safety, quality, labelling		Mechatronics	Food design
Information for users	4.1.1 4.1.2 4.1.3 4.1.4 4.1.6 4.1.8 4.1.13	4.1.14 4.1.19 4.1.22 4.2.2 4.2.6 4.2.7 4.2.8 4.3.4	4.2.1 4.2.2 4.2.7 4.2.8	4.3.1 4.3.2 4.3.7

Table 6: ID of the case studies providing information for users

7. User's satisfaction

43% of the identified good practices focus on the area of food safety, quality and labelling, such as 4.1.2-Member interest Groups of Campden BRI UK and 4.1.10- Innovative food packaging that extends shelf life and reduces footprint.

9% of all good practices related to user's satisfaction are related to mechatronics, such as 4.2.1- Green Biotech Cluster of Basilicata (BIOGREEN) and 4.3.1- Automatic Milk Dispensers.

16% of all collected good practice cases are in the area of food design which focus on user's satisfaction, such as 4.3.2- Frutformas – reshape fruit and 4.3.3- Design for Details: DOPLA's.

ID of the case studies ID of the case studies improving user's satisfaction can be seen in Table 7.

	Food safety, quality, labelling		**Mechatronics**	**Food design**
User's satisfaction	4.1.1 4.1.2 4.1.3 4.1.4 4.1.8 4.1.10 4.1.11 4.1.12	4.1.14 4.1.17 4.1.18 4.1.19 4.1.22 4.1.23 4.1.24 4.2.6 4.2.7 4.2.8 4.3.4	4.2.1 4.2.7 4.2.8 4.3.1	4.3.1 4.3.2 4.3.3 4.3.4 4.3.5 4.3.7 4.3.8

Table 7: ID of the case studies improving user's satisfaction

8. User's feedback and reaction

23% of all good practices related to user's feedback and reaction are in the area of food safety, quality and labelling, such as 4.1.3- Platform of crossed internal audits.

5% of all collected case studies are related to mechatronics such as 4.2.7- Migration of existing Control Systems.

9% of the good practice cases focus on user's feedback and reaction which are in the food design area, such as 4.3.2- Frutformas – reshape fruit and 4.3.4- Sensory Analysis of plastic bottles.

ID of the case studies collecting user's feedback and reaction can be seen in Table 8.

	Food safety, quality, labelling	Mechatronics	Food design
User's feedback and reaction	4.1.1 4.1.2 4.1.3 4.1.19 4.1.20 4.1.23 4.2.6 4.2.7 4.2.8 4.3.4	4.2.7 4.2.8	4.3.2 4.3.4 4.3.5 4.3.8

Table 8: ID of regional case studies collecting user's feedback and reaction

9. Other

3 good practices (7% of the total) are connected to food safety, quality and labelling, one of them was the 4.1.5- Standards of Marine Stewardship Council for sustainable fishery.

Just one case focuses on mechatronics (4.1.8- Improvement of water consumption and implementation of a sustainable water cycle by sewage treatment plants in several dairy plants of FrieslandCampina).

9% of the good practices are related to food design, these are the 4.3.1-Automatic Milk Dispensers and the 4.3.3- Design for Details: DOPLA's.

Table 9 Analysis of case studies (numbers)

Number of case studies	Novelties, benefits and added value								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	Improving cost efficiency	**Improving quality assessment**	**Improving risk assessment and risk management**	**Regulations compliance and its assessment**	**Product performance and its assessment**	**Information for users**	**User satisfaction and its assessment**	**User's feedback and reaction**	**Other**
Food safety, quality and labelling	21	23	18	12	20	16	19	10	3
Mechatronics	15	14	9	4	12	4	4	2	1
Food design	4	3	2	6	5	3	7	4	4

Table 10 Analysis of case studies (%)

Percent of case studies	Novelties, benefits and added value								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	Improving cost efficiency	**Improving quality assessment**	**Improving risk assessment and risk management**	**Regulations compliance and its assessment**	**Product performance and its assessment**	**Information for users**	**User satisfaction and its assessment**	**User's feedback and reaction**	**Other**
Food safety, quality and labelling	48	52	41	27	45	36	43	23	7
Mechatronics	34	32	20	9	27	9	9	5	2
Food design	9	7	5	14	11	7	16	9	9

6. Summary

Aim of the Deliverable *D.T2.2.1-Good practice guidelines* was to present European /global good practices on successful use of tools described in previous sub-task of I-CON project or describe best practices from the daily operation of I-CON partners. The documents aims to be an extension of Deliverable D.T.2.2.2- Regional good practice case reports which identify relevant technologies and techniques that can be used under sustainable principles where significant savings or quality improvements were made in regions representing by I-CON project partners.

The Deliverable collects 44 good practices from countries like France, Italy, United Kingdom, Australia, Portugal, Germany, Hungary, Spain, Norway, Finland USA, and Slovenia. Some of these best practices are not focusing on one specific company.

Some of the collected good practices focus on knowledge transfer, training opportunities and networking possibilities. These working groups, clusters, and clubs are either topic or discipline specific ones and the common point is all provide opportunity to learn and engage with other company representatives. The main aim of these meetings is to improve the competitiveness and the entrepreneurship of companies.

Others aim to present actions towards increasing the consumer's trust/expectations by implementing different initiatives towards sustainable production or by developing traceability tools, software and databases.

Good practices towards cost efficient production are also listed in this document, either they focus on reducing the used amount of water or reduce the amount of waste or implementing recycling processes where it is possible.

Solutions on new packaging ideas (green, safer) are also listed in this Deliverables.

The next task of I-CON project is to develop the Handbook tool and answers to questions related to transferability and sustainability of the elaborated good practice reports and tested methods presented. Handbook will identify best cases described in regional reports.

The Handbook toll will be reported in the Deliverable D.T2.2.3.