

Project Results

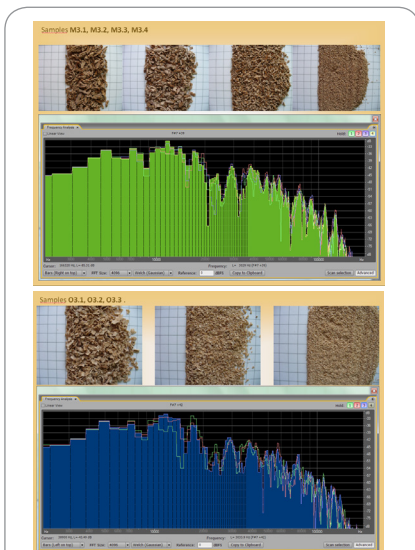
ACOUSTICS

Sounding out food quality and safety

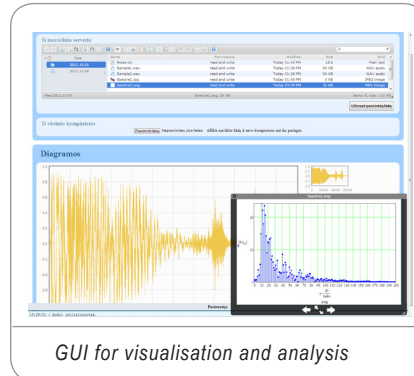
The ITEA 2 ACOUSTICS project set out to respond to demand from food producers for in- and on-line equipment to monitor the quality and safety of food, meet regulatory requirements and reduce production costs as well as increase throughput. The solution came in the form of a rapid, non-invasive acoustic testing method of food quality and safety controls, using tools and algorithms based on the propagation and reflection of acoustic waves to characterise, determine and monitor changes in microstructure through advanced acoustic spectrometers. Among the application areas were quantitative determination of certain mycotoxins in cereal grains, structural/texture changes in bakery and extruded products and particle size in chocolate, coffee and porosity of tea and defects in non-food products such as textiles, paper and building materials.

EFFICIENT QUALITY AND SAFETY CONTROL

A key to the success of the ACOUSTICS project was the development of relevant processing algorithms and sampling and analysis techniques for acoustic spectrometers



ACOUSTICS Analyses of calibrated chocolate granules



GUI for visualisation and analysis

that are excellent tools for different applications in food quality and safety, particularly in cereals where there is a close correlation between the texture and structure of porous and aerated products and the quality of the foods produced. The main innovation was the introduction of a new non-invasive acoustic technique whereby porosity in material can be measured in order to detect certain mycotoxins in food – altogether faster and cheaper per analysis than analysis measurements to date. This approach eases the sampling and analysis of certain (DON, AFT) mycotoxins – fungal metabolites that are poisonous to man and animal – in cereal grains, estimated to be responsible for the contamination of over 25% of the world's cereals commodity cereal crops, has been eased. Extrapolated to costs, mycotoxin contamination could run into €1 billion a year in the EU alone.

RELIABLE, FAST AND FLEXIBLE

The small consortium of academic partners and SMEs from Lithuania and a University and Institute from Ukraine collaborated closely in this unique project to develop an objective tool for laboratory and on-line instrument analysis and in-line high-throughput analysis of consignments of cereal grains to quantitatively determine certain mycotoxins. The monitoring of cereals in-line, increases food safety at a substantial lower cost than has been possible to date. Importantly, the speed at which the food, feed and agriculture industries are able to monitor processing streams not only boosts efficiency and effectiveness but also enables compliance with legislation and logistical and operational targets to be met.

ACOUSTICS (ITEA 2 ~ 09041)

Partners

Ivan Franko National University of L'viv
Kaunas University of Technology KTU
Kaunas University of Technology UI
State Scientific-Research Control
Institute of Veterinary DNDKI in L'viv
UAB USTUKIŲ MALŪNAS
Vilnius University

Countries involved

Lithuania
Ukraine

Project start

April 2011

Project end

April 2014

Contact

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Project Results

This ITEA 2 project built one acoustic prototype spectrometer that forms the basis and knowhow to construct an integrated automatic in-line model with a sound penetration/reflection acquisition system. Food and non-food samples were analysed using both traditional and acoustic methods of analysis to calculate the correlation characteristics and assess the precision and validation of the acoustics method. This resulted in the development of two new systems: a prototype acoustic measurement system for penetration designed and assembled by the Ultrasound Institute of Kaunas University of Technology and a prototype acoustic measurement system for penetration and reflection designed and assembled by Vilnius University. The software that was developed included algorithms for spectral analysis and evaluation of product quality level based on a comparison of measured parameters with values stored in the databases designed by both Universities in Lithuania.

A WIDER CONTEXT OF APPLICATION

While the results of this project are primarily intended for use in industrial applications in the food industry, where quality and food safety are required, and in food product development, the potential impact of implementing the physical principles of non-destructive testing for the quality and safety of porous food with fast, non-invasive acoustics is enormous. This is a powerful versatile tool in product development, sensory sciences, material characterisation in the non-food sector and in- and on-line control and monitoring of certain mycotoxins (DON, AFT) in cereal grains. This technique can easily be extended into the qualitative structural and textural aspects of food such as the shelf-life of bread, the infusion/extraction speed of tea, extruded and foam products and in the non-food area such as in the building, textile and paper industries.

AT THE THRESHOLD OF MARKET IMPACT

Commercialisation of the equipment still has to take root; there is interest in this early stage from Dutch and French SMEs. Of the consortium partners, the results of the project have already been put to good use with the Ultrasound Institute of Kaunas University of Technology and Vilnius University along with the Ukrainian Scientific-Research Control Institute of Veterinary Medical Products and Feed Additives from L'viv among those that have developed a new acoustic spectrometer methodology for use in the food and non-food industry. There is a huge market potential for the sound/acoustic generator to be used as a new "unit operation" in the food, feed and non-food market. The future could see iPad-size, hand-held units. The unique selling points of the product are that it is the fastest in the market, it is extremely flexible, especially in the portable version, and it has the cheapest analysis costs.



Acoustic spectrometer

Major project outcomes

DISSEMINATION

- Several publications in the World Mycotoxin Journal, ICC Handbook of Cereals, Flour, Dough & Product Testing
- Several International Congresses (e.g. Flour-Bread in Croatia, ICC Congresses in EU and China)
- Lectures at TU- Berlin and Weihenstephan University-Freising

EXPLOITATION (SO FAR)

- New products:
 - Acoustic spectrometers (penetration and reflection).

SPIN-OFFS

- Co-operation connections are looked for to robotise an assembling for monitoring

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■ ITEA 2 – Information Technology for European Advancement – is Europe's premier co-operative R&D programme driving pre-competitive research on embedded and distributed software-intensive systems and services.

As a EUREKA strategic Cluster, we support co-ordinated national funding submissions and provide the link between those who provide finance, technology and software engineering. Our aim is to mobilise a total of 20,000 person-years over the full eight-year period of our programme from 2006 to 2013.

■ ITEA 2-labelled projects are industry-driven initiatives building vital middleware and preparing standards to lay the foundations for the next generation of products, systems, appliances and services. Our programme results in real product innovation that boosts European competitiveness in a wide range of industries. Specifically, we play a key role in crucial application domains where software dominates, such as aerospace, automotive, consumer electronics, healthcare/medical systems and telecommunications.

■ ITEA 2 projects involve complementary R&D from at least two companies in two countries. We issue annual Calls for Projects, evaluate projects and help bring research partners together. Our projects are open to partners from large industrial companies and small and medium-sized enterprises (SMEs) as well as public research institutes and universities.

