

# TEAGASC FOOD INNOVATION GATEWAYS

## INNOVATIVE DRYING – TECHNOLOGIES AND ANALYTICS FOR HIGH QUALITY, SUSTAINABLE PRODUCTS

26th October 2021



# Welcome to Food Innovation Gateways

## Innovative Drying – Technologies and Analytics for High Quality, Sustainable Products

### 9:30am – 11:00am

#### Welcome Address

Frank O'Mara, Director, Teagasc and Declan Troy, Interim Director of Research, Teagasc

#### Supporting food businesses through innovative drying

Eoin Murphy, Teagasc

#### French drying research: from physical and biological mechanisms to breakthrough innovation

Romain Jeantet (Agrocampus Ouest) and Gaelle Tanguy (INRAE)

#### Advanced analytics supporting drying innovation

Seamus O'Mahoney, University College Cork

#### Polar Dry technology - electrostatic spray drying

Bogdan Zisu, Fluid Air

### 11.15am – 13.00pm

#### Innovative drying technology and analytics at Teagasc

Eoin Murphy, Research Officer at Teagasc Moorepark, introduces key Teagasc researchers. These experts will demonstrate the latest concepts and technologies, introducing new possibilities for ingredient and product development, improved consistency of products and increased opportunities for export in line with the European Green Deal.

This will be followed by a live Q&A session with the Teagasc panel.

#### VOMM Technology – Novel drying technology for manufacture of whey/permeate powders and more:

Fabio Talamo, VOMM

#### Enwave – radiant energy vacuum technology & the value of rapid dehydration:

Blake Inglis, Enwave

- Novel drying technologies
- Increased data capture for optimising processes
- Pilot plant drying capabilities
- Drying Facilities at Teagasc Food Research Centre Ashtown
- Analytical capabilities supporting drying innovation
- Optimising powder hydration
- Dairy Concepts Company Testimonial

## Novel Drying Technologies

**Eoin Murphy (eoin.murphy@teagasc.ie)**

Teagasc are engaged in a wide range of drying initiatives, supporting the industry with projects ranging from fundamental research through to industrial implementation. While spray drying is recognised as the gold standard for drying large volumes of high quality dairy ingredients, novel drying technologies can reduce high energy costs, allow for addition of heat sensitive materials and enhance the rehydration properties of high-end products. As part of Teagasc's Drying Platform Development Plan, three processes have been identified as promising: vacuum assisted microwave drying from Enwave, electrostatic spray drying from Polar Dry and tower-less turbo drying from VOMM. Current work is focused on developing a detailed understanding of each of these processes, which will be used to support food companies in determining process feasibility, energy requirements and product attributes.



## Increased Data Capture for Optimising Processes

**John Tobin (john.tobin@teagasc.ie) and Norah O'Shea (norah.oshea@teagasc.ie)**

Real time monitoring of classical process parameters such as temperature, pressure, flow rates and energy consumption form the basis of many process control strategies. However, in the future, these may be complemented by advances in emerging sensor technology, smart wireless sensors and industry 4.0 technologies which facilitate the capture of data from non-networked machines or semi-manual/manual processes. Teagasc and MTL are testing and validating the latest process analytical tools that can capture information pertaining to the chemical nature or composition of the product. Such tools provide greater insights into physico-chemical and structural changes within the process. Teagasc is currently investigating a variety of PAT and industry 4.0 technologies, including: acoustic sensors to monitor physical properties of dairy streams during production; in-line NIR spectrometry for in-process measurement of chemical composition, and; the SMARTFACTORY digital dashboard to capture, analyse and visualise key performance indicators from our pilot plant processes.



## Pilot Plant Capabilities

**Kieran Downey (kieran.downey@teagasc.ie)**

Moorepark Technology Limited is a modern, versatile pilot plant facility located on the Teagasc Moorepark campus. MTL supports Research and Development activities in the Irish Dairy Industry by providing specialist equipment, trial management and research services. Drying facilities at MTL include spray dryers ranging from 10-100kg water evaporation capacity, capable of producing powders to typical industrial specifications. In addition, novel drying technologies such as Enwave vacuum-microwave drying and VOMM turbo drying are available onsite, allowing customers to assess new and interesting manufacturing techniques. These processes are complemented by other state of the art unit processes such as reconstitution, separation technologies and concentration, as well as dry blending and canning facilities within a high care controlled environment. Furthermore, the expertise and research infrastructure available through Teagasc Food Research Centre also allows for extensive characterisation of materials both during and after processing, providing customers a detailed picture of powder production trials.



## Drying Technologies at Teagasc Food Research Centre, Ashtown

**Shay Hannon (shay.hannon@teagasc.ie)**

The National Prepared Consumer Food Centre is a state of the art food research and development facility established to support innovation and accelerate the development of new products and processes within the food sector. This includes a range of drying technologies, including Air Drying, Freeze Drying, Infrared and Dry Aging systems which have been used to dry and produce a variety of fruit and vegetable based powders, as well as fermented food products and dry aged meats. Drying can be an energy-intensive process and we are currently also working to improve yields and quality of dried food products, while contributing to a sustainable food system. Post- drying, the NPCFC has the facilities to perform a range of chemical and microbiological analyses, while the Packaging Suite can pack dried products in a variety of product formats. Furthermore, the NPCFC works with clients on the design of their processing and drying systems, to develop effective processes from harvest through to initial processing.



## Analytical Capabilities Supporting Drying Innovation

**Deirdre Kennedy (deirdre.kennedy@teagasc.ie)**

The Teagasc Technical Services team can offer a wide range of testing and services to support drying innovation across both research and commercial platforms. The Technical Services lab is accredited to ISO 17025 for wet chemistry methodologies, such as Kjeldahl and Rose Gottlieb, for the compositional analysis of protein, fat and total solids on milk and milk products, while powder functionality can be analysed using an array of standard IDF reference methods. For more detailed understanding of products, The National Food Imaging Centre at Teagasc Moorepark offers a suite of advanced microscopic techniques; our imaging tools are available for research and commercial use to study the functionality, composition and hydration characteristics of dried products. Additionally, Teagasc are also developing advanced methods for assessment of powder hydration through the use of Collaborative Robots (Cobots) and vision analysis to assess powder performance after rehydration. This approach has the benefit of standardising both the hydration process and the subsequent analysis, to ensure repeatability and reproducibility across testing sites.



## Optimising Powder Hydration

**Noel McCarthy (noel.mccarthy@teagasc.ie)**

Complex nutritional formulations and dairy-based ingredients are widely manufactured within Ireland with the majority of these products exported to global markets. Excellent nutritional and end-product functionality are among the main attributes underpinning the high export volume of these value-added products. Teagasc have a number of ongoing projects focusing on assessing and improving powder such functionalities, with a particular emphasis placed on rehydration properties of high protein powders. Through a combination of the research expertise and pilot plant processes available onsite, customers can perform detailed assessment of multiple processing options to ensure full dissolution of high protein powders. Teagasc is also equipped with state-of-the art analytical techniques such as an advanced microscopy suite which can be used to understand the effects of processing on powder solubility at a fundamental level.



