



The National Food Institute develops technologies and models that are used to optimize the sustainable production of healthy, safe, cost-effective, and high-quality foods with minimal production of waste.

 Hygienic design test rig. National Food Institute

# Sustainable foods with less power consumption, less raw material use, and less waste

To make it possible to feed the growing world population, rethinking the food industry's production processes is imperative. The National Food Institute helps the industry make the processes more efficient and sustainable.

"By applying mathematical models, new production technologies, and 'out-of-the-box thinking', the National Food Institute finds new ways to produce healthy, safe, and sustainable foods of the highest quality with a minimal power consumption, less raw material use, and less waste," Associate Professor and Head of Research Group Amin Mohammadifar says.

For example, the National Food Institute is changing the way sour milk products are produced. This will make it possible for the industry to meet the consumers' demand for easy-to-eat, firm yoghurts made without thickeners.

In the new production process, the researchers use ohmic heating, which quickly and homogeneously heats a product by running electrical power through it.

With a lower power consumption, the method provides the sour milk products with a better texture than products made in a traditional way. In addition, they are made in a shorter time, and less amounts of added dry matter are required to reach the desired consistency.

## **Maths is an essential ingredient**

One of the researchers' essential tools is mathematical modelling, which they apply to understand the influence that production parameters such as temperature, humidity, and equipment have on the taste and safety of foods. With the models, they are able to predict e.g. how changes in temperature and cooking time can ensure a juicier piece of meat which does not contain any disease-causing microorganisms.

The researchers at the Institute also develop prediction models, which can e.g. replace the time-consuming manual inspection that fish manufacturers use to decide for which purposes fish is best suited.

The models apply different biochemical data and computer-generated pictures to calculate the structure and quality of the fish and to assess whether the fish should be sold as cut, fresh fillets, or as smoked products. The process should help to ensure that as much fish as possible is utilized in products of the highest quality.

“**The ambition is** for the National Food Institute to design foods with specific functional and nutritional properties that take the consumers’ different needs into account, based on age, sex, health, activity level, and food preferences. We will do that by intensifying the interaction between the Institute’s food technological knowledge and other relevant fields.”

**Amin Mohammadifar**

Associate Professor and Head of Research Group

The researchers' prediction models can also be applied to predict the shelf life of fish and thus help to reduce food waste.

### **From worthless to valuable**

Recycling the industry's residual products is essential in a sustainable food production. Therefore, several projects at the National Food Institute focus on how low-value side streams can become a source of income.

For example, the researchers have developed a process line where mussels that are too small to be sold as food for human consumption instead become chicken feed without having to undergo an expensive and energy-intensive boiling process.

In an innovation project, the Institute also contributes research, which will enable the production of biodegradable food packaging made with residual products from the food production. In another innovation project, the Institute's expertise is applied in order to turn chickpea brine into a vegan product that can replace egg whites.

### **DTU Centre for Hygienic Design identifies the causes of bad cleaning**

At the DTU Centre for Hygienic Design, manufacturers can have their equipment tested and assessed based on international guidelines for a cleaning-friendly design. Subsequently, the Centre can certify equipment so that the manufacturer can prove that the equipment can be cleaned safely.

The Centre combines research, teaching, and advice giving for the biotech and food industry in respect of hygienic design. The Centre is the only test centre in Denmark for EHEDG (The European Hygienic Engineering & Design Group) with a DANAK accreditation to issue hygienic certificates for production equipment in Denmark.

The Centre uses methods that visualize bad design solutions which can make it difficult to clean equipment properly and thus generate a risk of microbial contamination of the equipment.

### **Pilot Plant - a food technological test facility**

The Pilot Plant at the National Food Institute is built as a test facility where the researchers can work with production processes on the type of machines used by the industry - only on a smaller scale.

Testing ideas in the Pilot Plant can provide the answer to whether a process which works in the laboratory can also work in large scale within an industrial production line.

Companies can collaborate with the Pilot Plant on process and product development of foods, equipment, and technologies.

Pilot Plant is also used for teaching purposes, and the students use the test facility for different projects.

Pilot Plant has various permanent machines at its disposal such as an autoclave and a test oven that simulates the conditions in a tunnel oven. Moreover, the Pilot Plant has heat exchangers and pumps at its disposal, which can be combined in different ways to study a range of production processes.

DTU Centre for Hygienic Design and DTU Brewery are both integrated in Pilot Plant.



The National Food Institute develops technologies and techniques that promote food safety and quality, including hygienic design of production equipment and methods to rapidly identify disease-causing microorganisms.

📍 Lab-on-a-chip. Anders Wolff

## **PROVIDES THE FOOD INDUSTRY WITH SOLUTIONS IN RESPECT OF CLIMATE, SUSTAINABILITY, AND HEALTH**

"At the Confederation of Danish Industry, we really appreciate our long-running and strategically close cooperation with the National Food Institute.

The food industry is a central part of the national economy and the solution to the societal challenges in respect of climate, sustainability, and health. However, the industry is far from having all the answers to how we can meet the ambitious global goals. There are many dilemmas and nuances in our work with sustainability and health, so we invite everybody around us to contribute good ideas and suggestions for solutions, which the industry can test in partnerships with strong Danish research institutes, such as the National Food Institute.

Our sincerest congratulations on your 60th anniversary. We look forward to continuing our close cooperation with the Institute," says Industry Director Leif Nielsen from the Confederation of Danish Industry (DI), who is also a member of the Advisory Board at the National Food Institute.



Confederation of Danish Industry

Leif Nielsen  
Confederation of Danish Industry