

Small scale extrusion solution for meat analogs

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Executive summary

Reducing the carbon footprint by producing “meat-like“ structures from vegetal proteins has been a processing challenge until now. Taste, flavor and structure are all three needed to mimic the “meat-like“ characteristics of analog meat.

With Thermo Scientific™ compounding solutions combined with a new cooled sheet die for meat analogs, fibrous “meat-like“ structures can be successfully made from vegetable proteins.

The compact design of the Thermo Scientific™ Process 11 Hygienic extruder allows you to optimize the process and develop new meat analog formulations on a lab scale. This is due significantly reduced test time, sample size and waste from small sample volume of grams versus the kilograms of sample that are required by larger extruders.

The challenge with meat analogs

The increasing population and development in the world has caused a growing demand for meat. The resulting increased meat production from animal proteins has a significantly high impact on the carbon footprint (i.e., producing 1 kg of beef produces about the same amount of CO₂ emission as driving 100 km or over 63 miles in a car).

It also takes about 15 kg of vegetable feed to produce just 1 kg of animal protein. That means plant-based proteins are an essential component in feeding the earth’s growing population and reducing the carbon footprint at the same time.



Figure 1: Thermo Scientific Process 11 Hygienic Extruder with cooled slit die.

To get consumers to accept meat analogs based on vegetable proteins, it is necessary to improve the mouth-feel of such products. Meat analogs need to have a certain texture and appearance to feel like real meat in the mouth, and to ensure a similar eating experience.

Challenge solved

The ideal solution for the mouth-feel challenge is a twin-screw extruder process combined with a special die head that can cool the extruded protein down in a long flow channel to generate a fibrous, structure similar to real meat.



Figure 2: Special die for the extrusion of plant-based proteins samples.



Figure 3: Wheat gluten samples with different textures. From top to bottom: The samples develop the fibrous characteristic of meat by optimizing the extrusion conditions.

Process 11 Hygienic Extruder:

Special features and benefits for food products

- Compact bench-top extruder with small footprint
- Intuitive process control via touch screen with data logging
- Allows setting up, performing test and cleaning by a single user in laboratory environment
- Eight electrical heated & actively cooled temperature zones for exact temperature control and temperature profiles. Cooking and cooling of the product as it goes through the system
- Seven positions along the process to feed multiple components like plant proteins, water, flavors, spices, oils, as well as minerals and vitamins. (Additives like powders, pellets and liquids can be accurately dosed)
- Possibility for PAT (like NIR measurement) to monitor parameters such as product moisture
- Flexible screw design with interchangeable mixing and conveying elements, to optimize the compounding of ingredients and structuring of the products
- Process adjustments for customization of meat structure for final target group
- Suitable for scale-up to industrial sizes

Further information

We invite you to get in contact with us and discuss how we can support you at thermofisher.com/foodextrusion.

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