Twin-screw extrusion

Feeding the Future: Can Insects Revolutionize Animal Nutrition?

Navigating extrusion challenges around insect-based foods with the Thermo Scientific™ Process 16 Twin-Screw Extruder

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What you'll learn

- Why insect protein is gaining ground in food production
- How fat content impacts extrusion and product performance
- How one extruder design adapts to evolving ingredient needs

There are many advantages to using insects as an alternative protein source, either for animal feed or direct food production. Insect farming has a lower environmental impact and generates much lower greenhouse gas emissions compared to the production of conventional livestock or feed proteins. Insects can grow and thrive on agricultural by-products and other organic waste, thus reducing waste production. Moreover, insects have a higher feed-to-protein conversion rate compared to larger farm animals.

An excellent example of an entomological edible is mealworms. Mealworms, the larval form of a darkling beetle, have a high fat content and are therefore a wonderful source of energy. Additionally, they are high in protein content, with protein comprising up to 77 wt% of their bodies' dry matter. The protein composition is very similar to any other animal protein, and thus it can be used to improve the protein profile of any food or feed applications that otherwise refrain from animal protein usage.

One technology that can help transform these critters into caloric goodness is extrusion. A common processing method used in feed and food production, extrusion is a continuous process that allows for the combination of several operations within one instrument. Dosing, mixing, cooking, evaporating, and shaping can all be handled by an extruder. These extrusion parameters can be controlled to generate different textures and structures within the extruded food product. This could mean incorporating high temperatures and high shear levels to create a porous "puff" structure, or limiting the expansion of an extruded snack to create a crispy sensation when it is consumed. Extrudate can even be manipulated to determine the sinking or floating behavior of aquatic feed, or to adjust the effective cooking time for a rehydrated high-protein/low-moisture food.

Although the incorporation of insects in extruded products has generated a sizeable amount of recent interest, insect processing is relatively new and there is still a lack of detailed knowledge about the optimal parameters required for it. For example, high oil contents, which some bugs have, can lubricate the screw section and dissipate part of the mechanical energy necessary for expansion; this would alter the effectiveness of the processing. Therefore, an attractive alternative to the use of whole insects is the use of defatted insect flour. However, the production of defatted insect flour requires a hydraulic press or a screw press, along with great pressure, to remove a significant amount of fat, avoid oxidation of the fatty insect matter, and control the fat content of the end product.

The case for insect protein in food production

- Mealworms contain up to **77% protein** (dry weight)
- They convert feed more efficiently than livestock
- They grow on food waste, reducing environmental impact

Designed for the future of feed

Thermo Scientific™ Process™ 16 Hygienic Twin-Screw Extruder

- Modular setup enables both extrusion and screw pressing
- Supports rapid testing of new protein formats, including defatted insect flour
- Scalable for prototyping high-protein, low-moisture products

The Thermo Scientific™ Process™ 16 Hygienic Twin-Screw Extruder is the perfect solution to this conundrum. Thanks to its modular design, the Process 16 extruder can be used as a screw press, like that required for a fat-removal process: By attaching the filtration barrel extension and using a longer shaft, the extruder is transformed into a mill-and-screw press that enables insect processing without the need for additional equipment. Additionally, the small but scalable size of the Process 16 extruder allows for rapid material testing and prototyping of expanded products and texturized proteins. All these features combine to make the Process 16 twin-screw extruder an exciting tool for the creation of new food and feed formulations.

Find out more at **thermofisher.com/foodextrusion**