



Brabender® Protein Texturization Technology

TwinLab-F 20/40 with Modular
Cooling Die and Round Die



... where quality is measured.

Extrude meat-like food from vegetable proteins

Protein Texturization Technology



Would you like to enjoy Chili con Carne, Burgers, Spaghetti Bolognese or Chicken Nuggets without meat?

The ultimate solutions are Texturized Vegetable Proteins (TVP). The thermo-mechanical treatment inside food extruders allows you to texture vegetable proteins into chunks, flakes, nuggets, grains, and strips.

With its TwinLab-F 20/40 in combination with the modular cooling die or round die head, Brabender offers a versatile lab-scale solution for R&D on protein texturization.



Cooling die in application

Extrusion Process

„The food extruder is considered a high-temperature short-time bioreactor that transforms a variety of raw ingredients into modified intermediate and finished products.“ (J. M. Harper, 1979/1981)

The food extrusion process in its simplest form can be divided into a screw and a die section. A thermo-mechanical stress is applied in the screw section through the rotating screws as well as the tempered barrel.

Native vegetable proteins typically have a globular structure which has to be denatured in order to change their physical-chemical properties. The stress inside the extruder leads to a denaturation of the protein that can be described as an unfolding of the native structure. In the subsequent die section the final structural modification of the unfolded protein is achieved.

Generally, the type of protein texturization is differentiated between wet texturization by high-moisture extrusion using a long cooling die and dry texturization with a basic round die head and lower water contents.

Application

Texturized proteins enhance the nutritional value of food as e.g. fat and cholesterol are reduced compared to most fresh meat. Soy, wheat, barley and peas are the main raw material sources for texturized protein chunks, flakes and strips.

TVP are nowadays found in vegetarian and vegan versions of traditional meat-based dishes such as burger patties, stews, nuggets, pasta sauces, sausage rolls, burritos and many more.



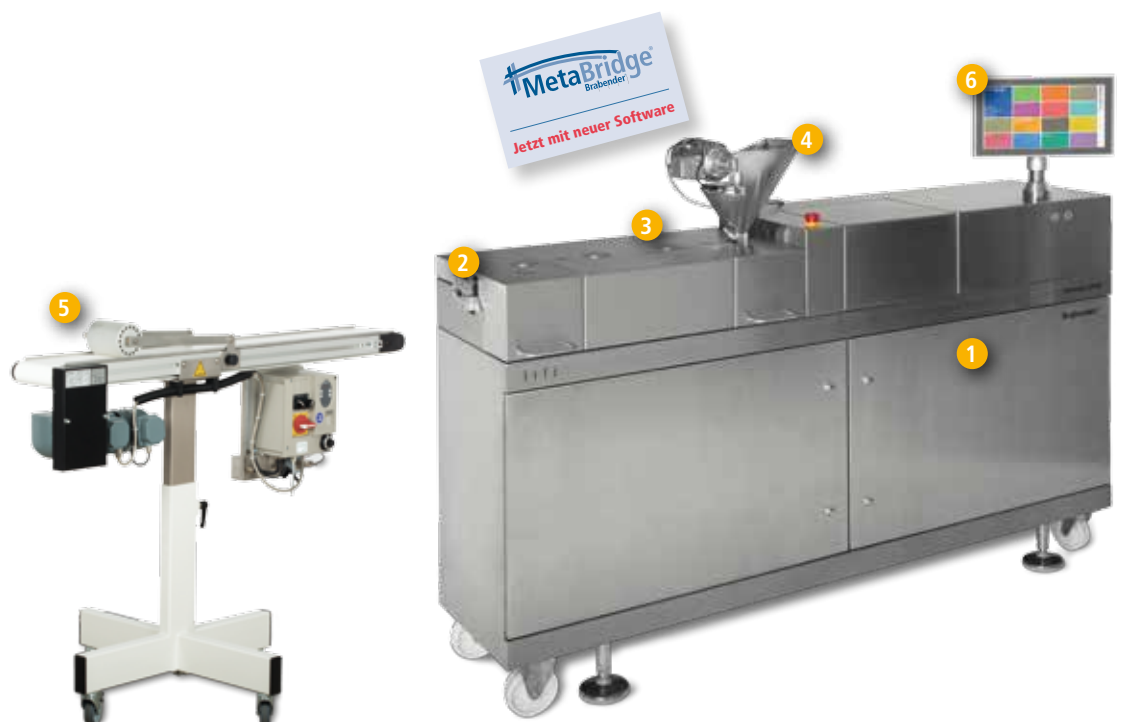
Meatless sausage, made from texturized proteins

Dry Texturization

After being denatured in the screw section of the TwinLab-F 20/40, the proteins are flash expanded in the die section.

The final product shape is of course dependent on the exact process conditions inside the extruder and the interchangeable nozzles of the die head. This gives further flexibility in the final product shape and size. The Brabender cutting device allows altering the product length, thus both thin flakes and larger chunks can be formed.

Dry extruded proteins are hydrated after extrusion and often optionally coated with flavors. An advantage of the rather tasteless product is that rehydrated dry texturized TVP absorbs water and other liquids and therefore tends to take on the flavors of other ingredients they are cooked with. Additionally, a dehydrated TVP has a very long shelf life and can be enjoyed after hydration within a couple of days similar to fresh meat.



High Moisture Texturization

The long cooling section allows cooling of the cooked protein and directional shear in order to build a laminar structure. The anisotropic layers form a meat-like texture and bite-feel. With a high moisture content and no moisture loss through cooling down the product during the extrusion process, no rehydration is required.

The long cooling die with its rectangular opening creates larger products such as chunks and meatless steaks or cutlets.

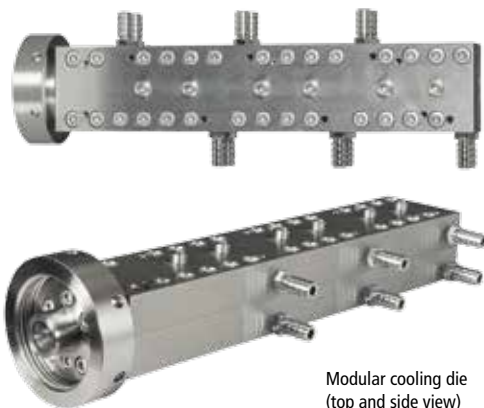
Wet texturized proteins can further be coated with flavors or bread-crumbs.

Modular Cooling Die

The Brabender modular cooling Die is specifically designed for high moisture texturization of vegetable proteins on a lab scale. Its flexible design allows you to alter the product size in terms of width and height. Full process control is achieved through six openings for material temperature and pressure measurement. The die consists of three tempering zones.

Would you like to have unique die dimensions?

Brabender tailors the complete die design to your specifications.



Modular cooling die (top and side view)

Brabender Protein Texturization Line

- 1 TwinLab-F 20/40
- 2 Die head
- 3 Dosing openings
- 4 Main feeder
- 5 Conveyor belt
- 6 Control panel (touch screen)

The advantages

- Allows small-scale production of wet texturized proteins for R&D purposes
- Full temperature and pressure control inside the die through six top openings for thermocouples and pressure transducers
- Greater flexibility in height and width of extruded products due to exchangeable die parts
- Independent cooling process through separate cooling thermostat. No interdependencies between die and extruder temperature
- Three cooling zones along the die for independent cooling
- Universal adaptation to further lab-scale extruders possible



Vegetable protein with meat-like texture

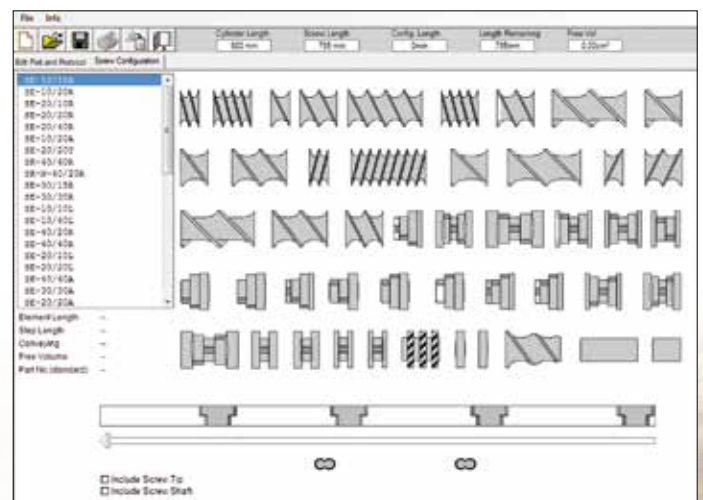
Screw Configuration Software

The screw design is an integral part of the extruder setup and highly influences the process environment and thus the final product properties. Different applications require different screw configurations. A large number of available screw elements increase the options for research and development.

The Brabender portfolio contains a variety of different element types and sizes such as conveyor elements, kneading blocks, inverse elements, and rupture blocks.

How can you record your screw design and provide for quick access?

With the screw configuration software, Brabender offers a useful tool to configure screws according to the application as well as to keep record of previously designed screws.



Screw configuration software

... where quality is measured.

Protein Texturization Technology

The Brabender support

Our state of the art application laboratory is always made available to our customers.

You can choose to send material to

us for testing or schedule a specific Lab Trial with our expert team. In our application laboratory, you will have access to our full product line to find the optimal extruder solution for your internal research and development.

The Brabender 5-Star Service

The Brabender 5-Star Service provides you with ongoing support for your Brabender equipment:

- On-site service – inspections, maintenance, repairs
- Spare parts service – spare parts, consumables, spare part logistics, upgrade kits
- Factory service – repairs, reconditioning
- Value added services – software update agreements, reference materials, inspection/maintenance agreements, emergency service, remote maintenance, mentoring, service-related training
- 24/7 service line – contacts, spare parts, technical answers, service appointments



Brabender Application Lab Food Extrusion

Modular Cooling Die	
Process length	300 mm
Typical product widths	20 - 30 mm
Typical product heights	5 - 9 mm
No. of top openings	6
No. of cooling zones	3
Typical product dimensions (H x W)	5 x 30 / 7 x 25 / 9 x 20 mm
Customized die design	Yes

TwinLab-F 20/40	
Temperature control	fully tempered or partially tempered
Screw diameter	20 mm
Screw length	800 mm
Max. L/D ratio	40
Drive power	10 kW 5.5 kW
Speed	1200 min ⁻¹ 600 min ⁻¹
Max. torque	2 x 40 Nm
Max. working temp.	400 °C 250 °C
Max. output	1 - 20 kg/h*
Segmented barrel/screw	No/Yes
Screw rotation/special features	Co-rotating horizontally split barrel
Dimensions (L x W x H)	2013 x 606.5 x 1566 mm
Weight	approx. 480 kg

*depending on raw material and application

Read the Bachelor's thesis

"Influence of process and system parameters on product properties resulting from high-moisture extrusion of soy protein concentrate".

Interested? Please get in touch with us.



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