



# TEXTURED PLANT-BASED PROTEIN

Leveraging its core expertise in twin-screw technology, Clextral provides its customers with complete processing lines that integrate extruders, dryers and ancillary equipment. Its reliable and innovative systems are quality and excellence benchmarks in its three key markets: Food & Feed, Green Industries and Powder Industries. Clextral is also designing and manufacturing high-precision industrial pumps for the energy and chemical markets. Its global offering includes upstream design and testing of industrial solutions, equipment manufacturing, on-site installation and full maintenance and continuous process improvement services. Based in Firminy (France), Clextral is present on all five continents, providing local support to its customers all over the World.



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# TEXTURED PLANT-BASED PROTEIN

## PROCESS TRENDY TEXTURED VEGETABLE PROTEINS (TVP) FROM A VARIETY OF RAW MATERIALS

TVP is a dry, expanded product used as an ingredient or directly re-hydrated and consumed as a meat substitute. It is also used in many vegetarian and vegan dishes.

The product is an environmentally-friendly source of protein, sustainable, and offers a long shelf-life.

Clextral's continuous and flexible extrusion process gives processors multiple options to create healthy and premium foods from an extended range of raw materials.

- low-fat soy flour, defatted soy flour, soy concentrate, soy isolate
- pea isolate, pea concentrate
- wheat gluten
- other protein raw materials : fava bean, lentils, sunflower...
- for some products, starch, cereal flour, salt, flavours & colouring are added



## FLEXIBLE TECHNOLOGY & PROCESS

Clextral twin-screw extrusion systems enable processors to produce textured protein efficiently and economically.

- ⊕ **Variable output capacities**, from 20 kg/h to 4000 kg/h (depending on raw material)
- ⊕ **Wide range of finished products**: from commodities to sophisticated foods
- ⊕ **Dies and cutter** to easily make various shapes
- ⊕ **Control of water holding capacity** of extruded textured proteins is guaranteed through strict parameter control
- ⊕ **Precise process control** ensures consistent results and traceability
- ⊕ **Expert advice and testing facilities** to design new products and recipes



## A LOW MOISTURE EXTRUSION PROCESS DESIGNED TO TEXTURIZE DRY VEGETABLE PROTEINS

The majority of textured vegetable foods are produced by low moisture extrusion cooking:

- Raw materials, die and screw designs, and operating conditions are adjusted to achieve desired quality and properties, such as: bulk density, water holding capacity, texture, aspect & shape.
- Textures can be expanded, fibrous or soft and flexible.
- TVP extrusion processing enables a range of shapes: chunks, slices, granules...
- Dry protein-based ingredients are typically processed at low moisture content (18 to 27%) and cooked in the extruder using a combination of thermal and mechanical energy.
- Die design determines the shape of the product.
- TVP is cut at the die. A wet milling step can be added to further reduce the product size. After extrusion, the product is dried to reach a moisture content of 10% or less.



## TVP MANUFACTURING PROCESS

Preconditioner may be required in some cases (for example, to increase production capacity when processing soy flour)

