shapes is often performed by many producers of meat analogues using machines designed for animal meat. However, this simple cutting does not allow to well preserve or transform the fibrous structure of the texturized products.

Additionally, the smooth cut does not remind of meat-like products as it fails to highlight the fibrosity and is thus perceived more “unnatural” and “processed” by the consumer. This perception is further supported by the generally smooth surfaces and angular shapes of texturized protein products, owning to the well-defined geometrical shapes in the formative steps of the texturization processes.

## Summary

In one aspect, the present disclosure refers to a method of producing a slaughter-free fibrous protein product (12), the method comprising the steps of:

(a) providing a wet textured product material (11), wherein the wet textured product material (11) comprises

- at least 10wt% of proteins possessing a fibrous structure
- at least 35wt% water; and

(b) elastic-plastically deforming the wet textured product material (11) by rolling at least once, thereby changing the fibrous structure, to obtain a slaughter-free fibrous protein product (12), wherein the slaughter-free fibrous protein product (12), is a deformed product (12a).

In another aspect, the present disclosure refers to a use of a device comprising a rolling means (2) for elastic-plastically deforming the wet textured product material (11), and a feed-ing mechanism (21) for feeding the wet textured product material (11) into the rolling means (2) in a method as disclosed herein.

## Claims

1. A method of producing a slaughter-free fibrous protein product (12), the method comprising the steps of:

(a) providing a wet textured product material (11), wherein the wet textured product material (11) comprises

- at least 10wt% of proteins possessing a fibrous structure
- at least 35wt% water; and

(b) elastic-plastically deforming the wet textured product material (11) by rolling at least once, thereby changing the fibrous structure, to obtain a slaughter-free fibrous protein product (12), wherein the slaughter-free fibrous protein product (12), is a deformed product (12a).

2. The method according to claim 1, wherein the method comprises at least one further step of processing the deformed product (12a) to a product selected from the group consisting of: an initial pulled product (12b), a block product (12c) and a final pulled product (12d).

3. The method according to any one of the preceding claims, wherein the wet textured product material (11) is textured by means of high moisture extrusion cooking, printing, shear cell processing, kneading and/or fibre spinning.

4. The method according to claim 3, wherein the wet textured product material (11) is textured by means of high moisture extrusion cooking, preferably wherein the wet textured product material (11) is an extrudate.

5. The method according to any one of the preceding claims, wherein elastic-plastically deforming comprises rolling at least twice.

6. The method according to claim 1, wherein elastic-plastically deforming comprises rolling at least once and wherein the wet textured product material (11) is textured by means of high moisture extrusion cooking.

7. The method according to any one of the preceding claims, wherein the textured product material comprises an anisotropic fibrous structure and wherein rolling comprises rolling in a direction (r1) parallel to a fibre orientation of the anisotropic fibrous structure.

8. The method according to any one of the preceding claims, wherein the textured product material comprises an anisotropic fibrous structure and wherein the rolling comprises rolling in a direction (r2) normal to a fibre orientation of the anisotropic fibrous structure.

9. The method according to any one of the preceding claims, wherein rolling at least once comprises rolling by means of at least two rolls.

10. The method according to claim 9, wherein the wet textured product material (11) is elastic-plastically deformed by means of at least one pair of rolls, wherein there is a roller gap size rg1 between the two rolls with rg1 ≤ 0.8 of the height h of the wet textured product material, in particular with a roller gap size of rg1 ≤ 0.4 of height h, in particular with a roller gap size rg1 of 0.1 mm ≤ rg1 ≤ 3.6 mm.

11. The method according to claim 9 or 10, wherein elastic-plastically deforming the wet textured product material results in the deformed product with a thickness $t_{dp}$ smaller than the height h of the wet textured product material and a thickness $t_{dp}$ larger than the roller gap size rg1 or than the thickness at maximum compression $h_{comp}$, in particular the thickness $t_{dp}$ is ≥ 2.5 times the roller gap size rg1 or the thickness at maximum compression $h_{comp}$, in very particular the thickness $t_{dp}$ is ≥ 2.5 and ≤ 7 times the roller gap size rg1 or the thickness at maximum compression $h_{comp}$.

12. The method according to any one of claims 9 to 11, wherein elastic-plastically deforming the wet textured product material (11) by means of at least one pair of rolls results in a thickness $t_{dp}$ of the deformed fibrous

protein product of below the height h of the wet textured product material but above the roller gap size rg1, in particular wherein 0.7mm ≤ $t_{dp}$ ≤ 9mm.

13. The method according to claims 2 to 12, wherein the further step of processing the deformed product comprises pulling or cutting apart the deformed product (12a) to obtain the initial pulled product (12b).

14. The method according to claim 13, wherein the further step of processing the deformed product comprises additionally a step of further forming the initial pulled product (12b) to a block product (12c),
preferably forming a mixture of the initial pulled product (12b) and an adhesive matrix material to obtain the block product (12c), more preferably, forming the block product (12c) from the initial pulled product (12b) by means of a vacuum or pressing procedure.

15. The method according to claim 14, wherein the further step of processing the deformed product comprises additionally a step of pulling the block product (12c) to obtain a finished pulled product (12d).

16. The method according to any one of the preceding claims, wherein a protein component of the wet textured product material (11) is selected from the group consisting of pea, soy, wheat, sunflower, pumpkin, rice, cereals, pulses, oil seeds, algae, single cells, fungi, and fermented components.

17. The method according to any one of the preceding claims, wherein a component of the wet textured product material (11) is selected from the group consisting of further plant cells, starch, flavours, spices, dietary fibres, hydrocolloids, salt, fat, oil, and fungal component, optionally muscle cells.

18. The method according to any one of the preceding claims, wherein the wet textured product material (11) comprises 10-65wt% of protein, in particular comprises 10-40wt% of protein.

19. The method according to any one of the preceding claims, wherein the wet textured product material (11) has an anisotropic structure.

20. The method according to any one of the preceding claims, wherein the wet textured product material temperature is within the range of 10°-100°C, in particular within the range of 30-90°C, during the deforming step a).

21. Use of a device comprising a rolling means (2) for elastic-plastically deforming the wet textured product material (11), and a feeding mechanism (21) for feeding the wet textured product material (11) into the rolling means (2) in a method according to any one of claims 1 to 20.

22. The use of the device according to claim 21, wherein the rolling means comprise at least one pair of rolls (2), in particular two pairs of rolls (2), with a roller gap (rg1) with $rg1 \leq 0.8$ of the thickness h of the product material (11), in particular with $rg1 \leq 0.4$ of the thickness h of the product material (11).

23. The use of the device according to claim 21 or 22, the device comprising pulling means (3), preferably for pulling apart the deformed product (12a) to obtain a pulled product (12b), preferably wherein the pulling means (3) are arranged in series with the rolling means (2), preferably wherein the pulling means (3) comprise a pair of pin-rolls (3).

24. The use of the device according to any one of claims 21 to 23, wherein more than one device is connected in sequence.