

Formulation and Production of Fats for Bakery Applications

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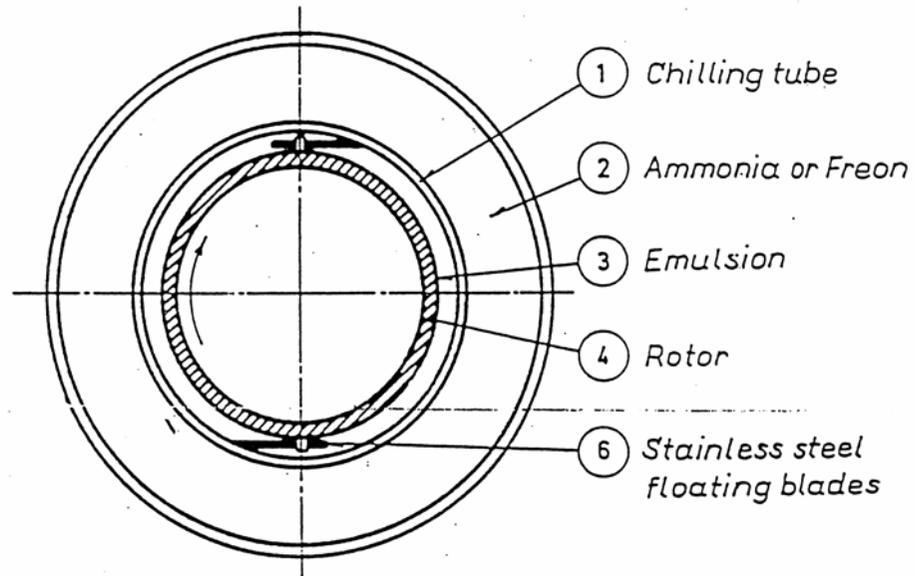
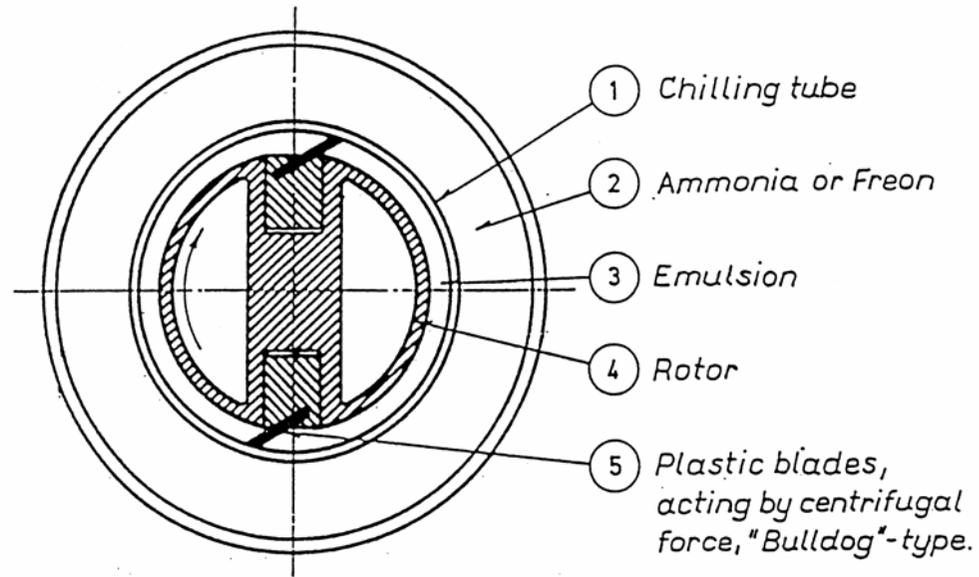
Functions of Fat in Baking

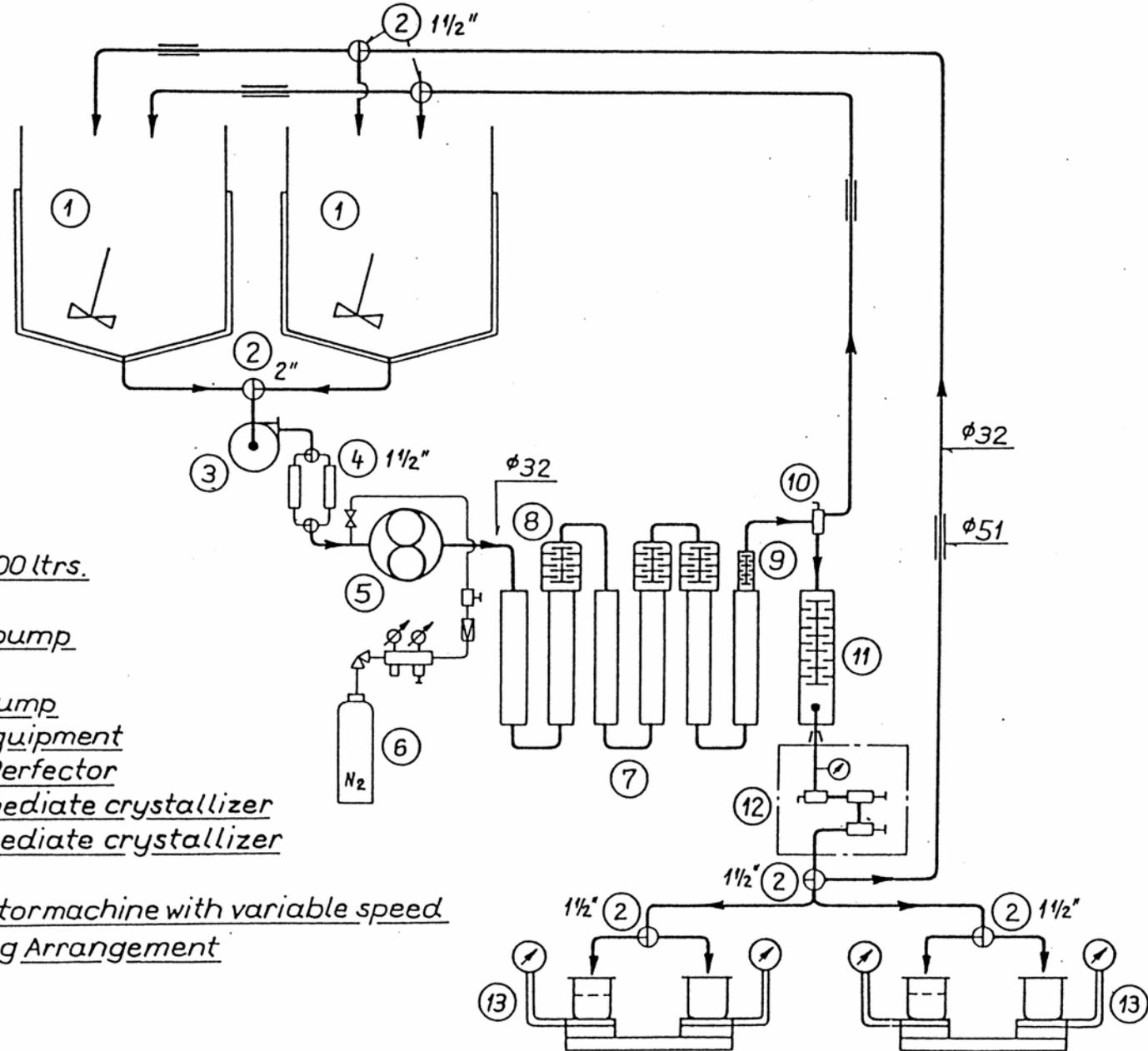
- Shortening Power
- Batter Aeration
- Emulsifying Properties
- Improved Keeping Properties
- Provide an Impervious Layer
- Provide Flavour

Features Defining the Texture in Processed Fats

- The proportion by weight of crystals
- The crystal geometry - size, shape and alignment
- The degree of formation of mixed crystals
- The melting point of the crystals
- The ability to form a crystal network - to increase firmness

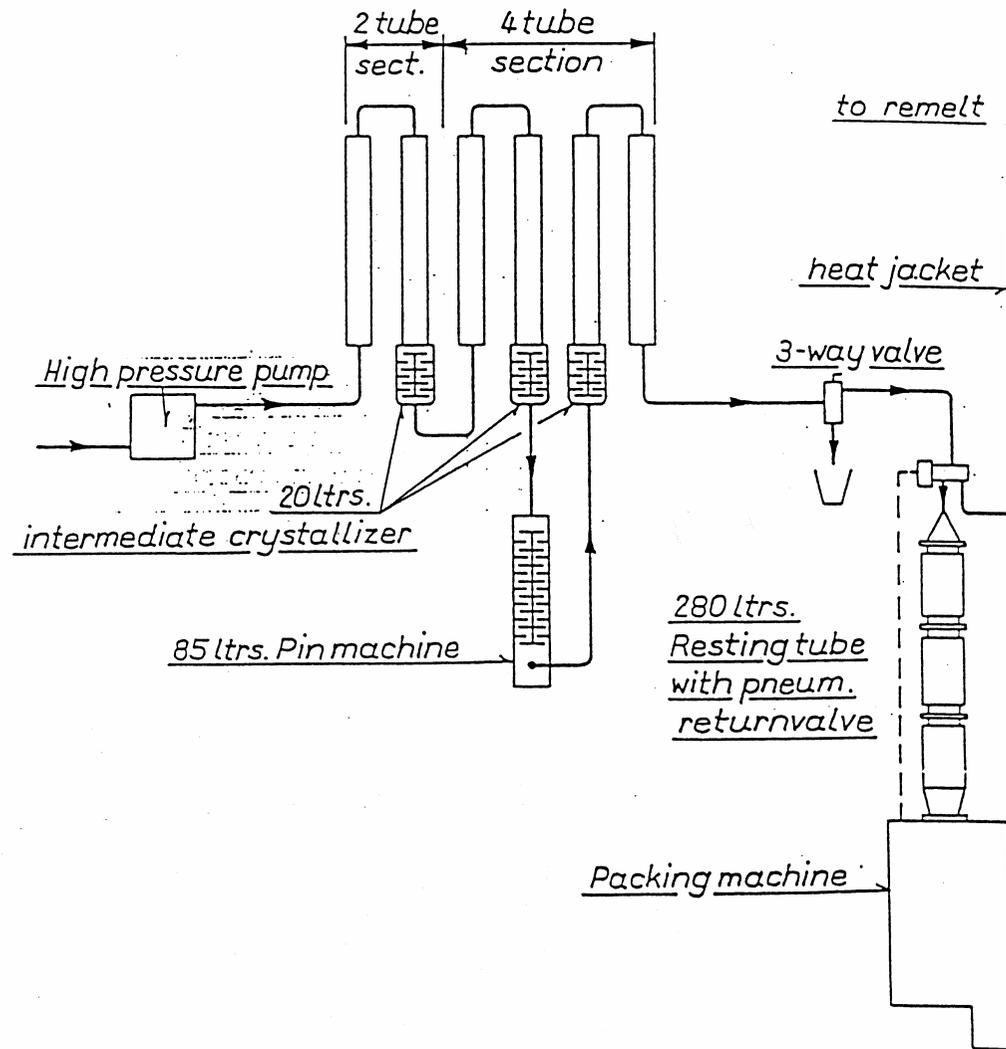
Processing





- 1. Premixer - 6000 ltrs.
- 2. 3-way cock
- 3. Centrifugal pump
- 4. Duplex-filter
- 5. Gear wheel pump
- 6. N₂-supply-equipment
- 7. (2+4) × 105 φ Perfector
- 8. 20 ltrs. intermediate crystallizer
- 9. 7 ltrs. intermediate crystallizer
- 10. 3-way valve
- 11. 110 ltrs. pin rotomachine with variable speed
- 12. Homogenizing Arrangement
- 13. Scales

(2+4) × 105φ Perfector



Physical Properties to be Considered when an Oil Blend is Formulated

The factors to be considered when formulating a blend:

Structure

Consistency

Plasticity

Structure and Consistency

Depend on:

- Crystal polymorphic form
- Solid Fat Content
- Melting point of the component triglycerides
- The effect of external work

Plasticity

Depends on:

- The presence of a solid and liquid phase
- A proper proportion of the solid to liquid phase
- The dispersion of the solid phase in the product

Typical Margarine and Shortening Oil Blends

	Shortening	Cake Margarine	Pastry Margarine
Oil Blends	30% PS 30% H.Rp36 40% Rp	50% H.Rp 36 25% PO 25% Rp	14% H.PO 50 36% HPO 42 40% PO 10% Rp
% SFC 20° C	23 - 27	22 - 26	43 - 47
% SFC 35° C	4 - 8	1 - 3	13 - 16

Palm Oil and its Fractions

	Palm Oil	Olein	Stearin
SFC @10°C	42 - 54	33 - 44	68 - 76
@20°C	20 - 28	4 - 11	45 - 54
@30°C	6 - 10	0 - 2	31 - 36
@40°C	2 - 6		16 - 17
Slip MP (c)	35 - 39.5	25 - 28	46 - 50
SSS	8	1	25
SSU	48	49	41
SUU	37	41	27.5
UUU	7	9	6.5

Melting Profiles of some Randomised Hardstocks

	1	2	3	4
Blend	60%POS 40%PK olein	80% PO 20% PKO	40% POS 60% SBO	55% POS 45% PKO
% SFC				
10° C	52.7	57.5	17.5	73.0
20° C	30.0	37.1	5.9	47.0
30° C	11.4	17.4	2.5	18.0
40° C	-	2.6	-	0.5
Slip Point C	35.5	35.5	32.3	36.0

Blends Based on Palm Oil and Palm Fractions

	Cake Magarine	Shortening	Low Melting Pastry	High Melting Pastry
	30% IE 40% PO 30%Rp	5% FH.PO 20% IE 40% PO 35% Rp	35% POS 52% PO 13% Rp	55% POS 10% IE 15% PO 20% Rp
% SFC				
10° C	37.0	34.0	53.0	55.0
20° C	19.0	21.0	35.0	40.0
30° C	7.0	7.0	19.0	25.0
40° C	2.0	1.0	9.0	13.0

IE - randomised blend of 55% Palm Stearin and 45% Palm Kernel Oil

Techniques to Avoid Post Hardening

- Reduce plant throughput or increase plant chilling and working capacity
- Introduce 2-3% of fully hardened fat to promote crystallisation
- Add a crystal promoter
- Adjust the level of diglyceride in palm oil

Pumpable Shortenings

- Conventional oil blend processed and stored to remain semi-solid
- Fluid shortening, pourable at ambient temperatures. Opaque, and can contain high melting component
- Liquid shortening, based on liquid vegetable oil and relies on added emulsifiers for its functionality

Fluid Shortening Formulations

	1	2	3
% FH Rp	5	5	-
% FH PO	-	-	5
% PS	10	-	5
% PO	-	20	15
% Rp	85	75	75
% SFC			
10° C	10	11	17
20° C	7.5	7.5	11
30° C	6.2	5.6	6
% TFA	< 1	< 1	< 1
% SAFA	21	25	21