CHARACTERISTICS AND PRODUCTION OF VANASPATI, GHEE, BUTTER AND OTHER SOLID FATS

Mike Willson

LipoLogic Food Technology Consultancy
Cary, North Carolina, USA
E-mail : mwillson@nc.rr.com

LipoLogic

CHARACTERISTICS AND PRODUCTION OF VANASPATI, GHEE, BUTTER AND OTHER SOLID FATS

PRODUCT TYPES

- Vanaspati (or Vegetable Ghee)
- Ghee
- Butter/Butter blends
- Other solid fats

TOPICS FOR DISCUSSION

1) Key product characteristics
2) Product development criteria
3) Production methods and process regimes
4) Future trends

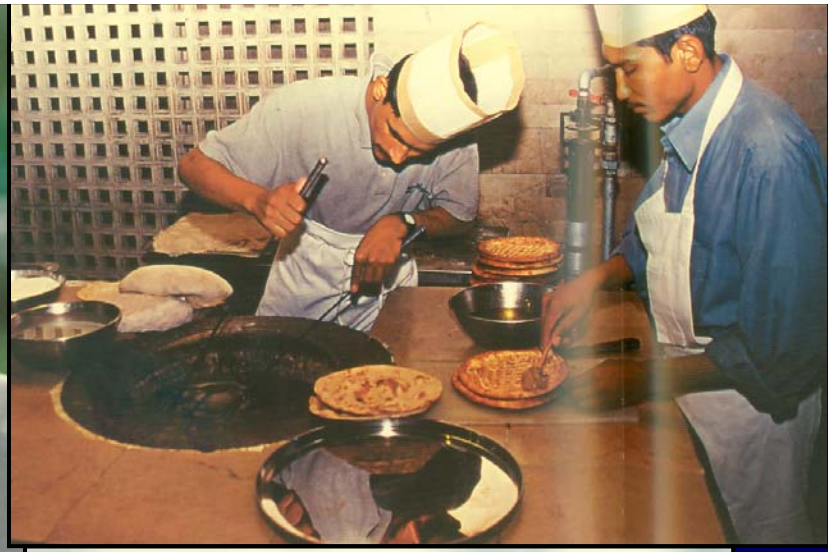
LipoLogic

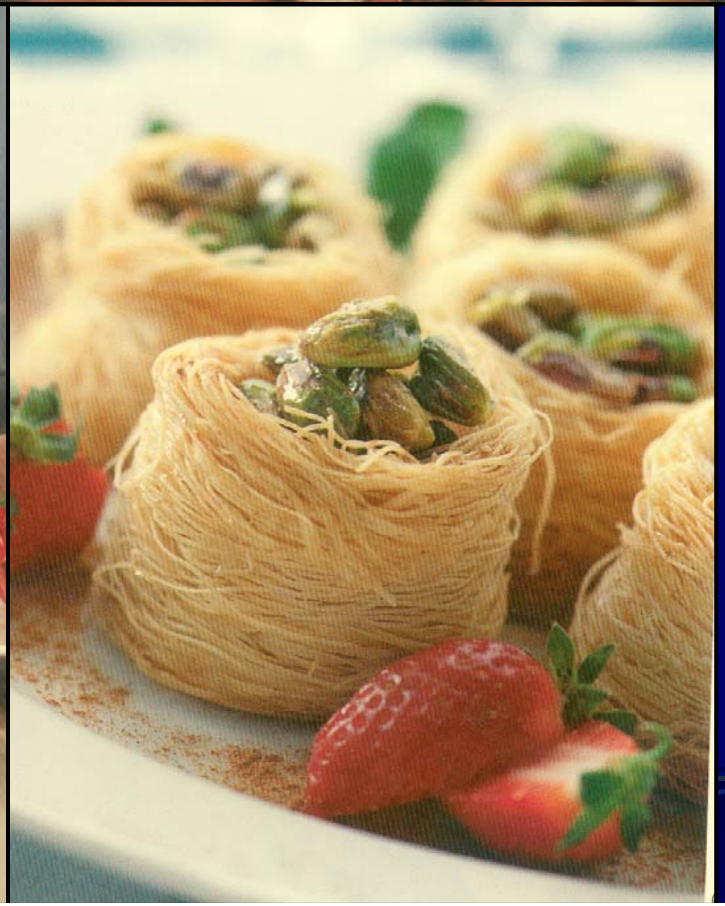
VANASPATI

KEY PRODUCT CHARACTERISTICS

- All purpose cooking fat
- Substitute for ghee
- Cost & availability
- Generally all vegetable
- Granular or grainy texture
- Degree of oil separation
- Melting point

LipoLogic





VANASPATI

PRODUCT DEVELOPMENT CRITERIA

- Texture
- Oil separation
- Types of vegetable oil
- Melting point
  - Higher melting points used in Gulf countries ; 40-46 deg C
  - Lower melting points used in India, Pakistan, Egypt, & North Africa
    eg :- 31-40 deg C

LipoLogic

VANASPATI

EXAMPLES OF TYPICAL FORMULATIONS

GULF COUNTRIES

- Commonly marketed as Vegetable Ghee
- Generally, blends of palm oil & palm fractions
- Melting points usually in the range 40-46 deg C
- Often contain added colour & flavours

COMPONENT	**AMOUNT**
Palm oil	40-60%
Palm stearin	60-40%
Antioxidant	0.1-0.2%
Colour (Beta Carotene)	200 ppm
Butter flavour	qs

VANASPATI

PRODUCTION METHODS AND PROCESS REGIMES

General points :-

- 1) Processed in much the same way as other types of shortening and bakery fats.
- 2) Process conditions dependent on :-
  - a. Formulation type
  - b. Degree of granular/grainy texture required
- 3) Packaging used usually either :-
  - a. Cartons with plastic liners
  - b. Tins ; sizes ranging from 500 gms to 10 Kg

Typical process line configuration :-

DAY TANK – A – A – C – C – PACKING M/C

TYPICAL PROCESS LINE FOR MANUFACTURE OF VANASPATI

LipoLogic

VANASPATI

FUTURE TRENDS

1) Sales volumes likely to increase in future years due to :-
   a) Price
   b) Health considerations
2) Scope for improved product quality :-
   a) Interesterified oils becoming cheaper and more readily available
   b) Improvements in hydrogenation technology
   c) Greater choice in palm fractions
3) Packaging innovations?

GHEE

KEY PRODUCT CHARACTERISTICS

- All purpose cooking fat ; widely used in India, Pakistan, Middle East & SE Asia
- Granular or grainy texture ; required extent of graininess dependent on geographical location
- Large scale production requirements :-
  - Simulation of traditional methods
  - Control of quality
- Health & nutrition aspects

LipoLogic

GHEE

PRODUCT DEVELOPMENT CRITERIA

- Source of the anhydrous milk fat
- Control of the degree of graininess
  - Grain size
  - Number of grains
- Degree of oiling-off
- Post-production storage regime
- Flavour & aroma characteristics

LipoLogic

GHEE

PRODUCTION METHODS AND PROCESS REGIMES

General points :-

- AMF in liquid form
- Filling into tins
- Controlled cooling regime :-
  - Gradual cooling ; grainy texture
  - Rapid cooling ; smooth texture
- Storage & delivery

BULK STORAGE – FILLING - COOLING – STORAGE

GHEE

FUTURE TRENDS

- Useage will continue to decline due to :-
  - Higher cost
  - Health implications
- Development of ‘healthier’ versions
- Blends of AMF and vegetable oils
- Packaging improvements

BUTTER

KEY PRODUCT CHARACTERISTICS

- Used for cooking primarily ; useage as a table spread increasing
- Generally in recombined form ; based on AMF
- Sweet cream or lactic types available
- Regional preferences :-
  - Sweet cream ; North Africa, Southern CIS countries
  - Lactic ; Gulf countries, Egypt
- Shipped in frozen form due to high ambient temperatures
- Pack sizes usually either :-
  - 250 gms & 500 gms (or ½ lb & 1 lb) – Retail
  - 25 Kg bag-in box carton/block - Bulk

LipoLogic

BUTTER

PRODUCT DEVELOPMENT CRITERIA

- Source of the AMF
- Use of reconstituted milk powders
- Sweet cream type :-
  - Buttermilk
  - pH close to neutral
- Lactic type :-
  - Skim milk
  - Use of lactic cultures in the aqueous phase
  - Lower pH (~4.6)
- Control of texture & consistency via selection of process regime

BUTTER

EXAMPLES OF TYPICAL FORMULATIONS

GULF COUNTRIES

- Lactic-type butter is preferred
- Paler colour/milder flavour
- Use of decolourised/deoderised AMF
- Packaging used usually either :-
  a. 25 Kg cartons with plastic liners
  b. Packets ; sizes ranging from 250/500 gms to ½ lb/1 lb

LipoLogic

BUTTER

PRODUCTION METHODS AND PROCESS REGIMES

General points :-

- 1) Process regime is dependent on type of packaging.
- 2) For packets & wrapped blocks, a chill-work-chill-rest tube configuration is required.
- 3) For bulk cartons, a chill-chill-work configuration is preferable

Typical process line configurations :-

DAY TANK – A – C – A –R/T-PACKING M/C; Packets & blocks

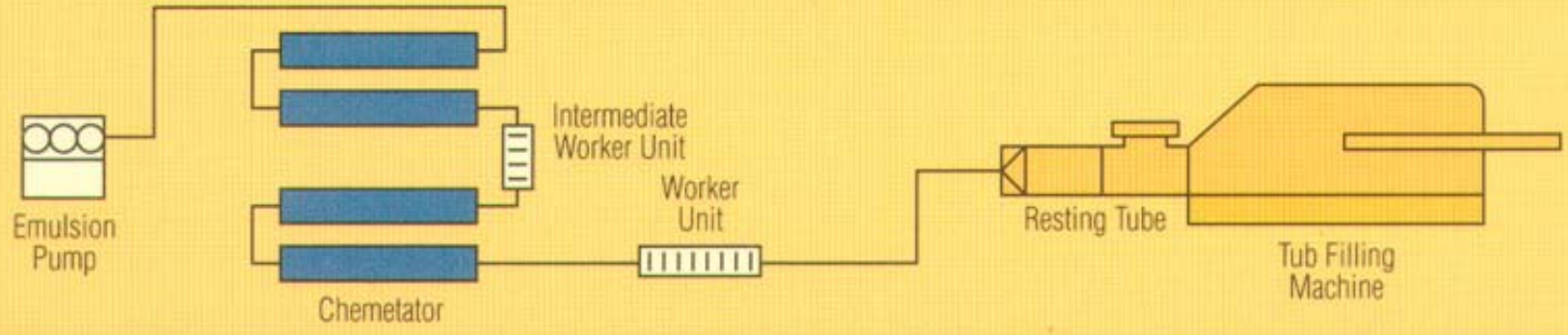
DAY TANK – A – A – C – PACKING M/C; Bulk cartons

LipoLogic

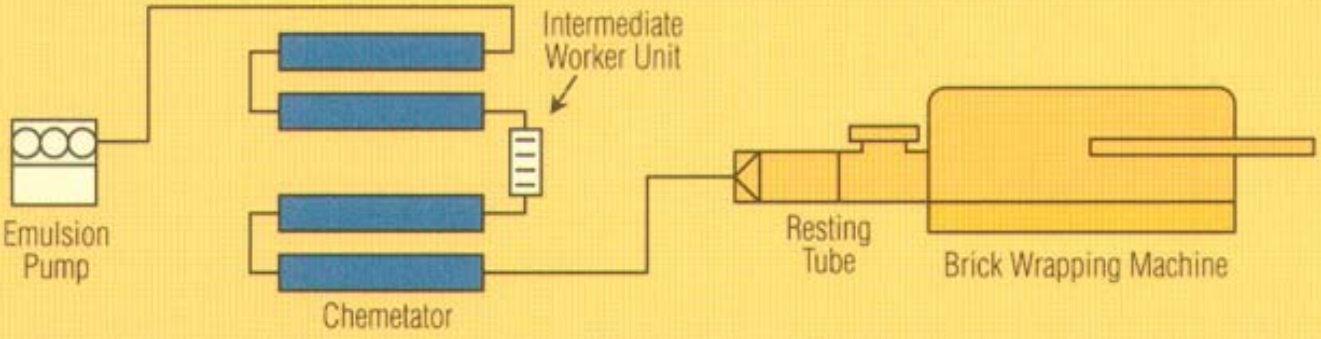
DAIRY FATS

High pressure Chemetator® chilling systems also offer high flexibility and hygienic processing when producing a range of products from milk based raw materials. Even very low fat content products can be formed with optimal crystal structure.

LOW FAT SPREADS/LOW CALORIE BUTTER



RECOMBINED BUTTER



TYPICAL PROCESS LINE FOR MANUFACTURE OF RECOMBINED BUTTER

LipoLogic

BUTTER

FUTURE TRENDS

- Volumes are likely to decrease significantly due to
  - High costs relative to other products
  - Availability of cheaper alternatives eg:- butter blends
- Increased production in the Middle East region using imported AMF
- Introduction of spreadable butters based on AMF blended with liquid vegetable oils such as rape/canola :-
  - Convenience
  - Healthier fatty acid profile ; lower sats/higher omega-3 content
- Different packaging options ; plastic tubs with tamper-proof seals

BUTTER BLENDS

KEY PRODUCT CHARACTERISTICS

- Used for cooking primarily, but useage as a table spread increasing
- Substitute for butter ; cheaper alternative & more readily available
- Based on AMF blended with hydrogenated vegetable oils and/or vegetable oils
- Similar physical and organoleptic properties to butter
- Flavour & colour enhancement used to simulate quality of butter
- Tailored to regional preferences for either sweet cream or lactic butter types

BUTTER BLENDS

PRODUCT DEVELOPMENT CRITERIA

- Use of hydrogenated oils blended with AMF
- Use of reconstituted milk powders
- Sweet cream type :-
  - Buttermilk (reconstituted buttermilk powder)
  - pH close to neutral
- Lactic type :-
  - Skim milk (reconstituted skim milk powder)
  - Use of lactic cultures/flavour in the aqueous phase
  - Lower pH (~4.5)
- Control of texture & consistency via selection of process regime
- Selection of flavours to mimic organoleptic properties of butter is critical

LipoLogic

BUTTER BLENDS

FORMULATIONS – GENERAL POINTS

- Minimum butter content can be as low as 15%
- Melting points of butter blend products tend to be slightly higher than butter - usually in the range 35-39 deg C
- Generally use a steep-melting hydrogenated oil
- Palm & palm fractions also incorporated in blends with lower content of butter
- Fat levels can be reduced as low as 40%
- Usually contain added colour & natural butter flavours
- Reduced level of added colour in lactic-type products

BUTTER BLENDS

PRODUCTION METHODS AND PROCESS REGIMES

General points :-

- 1) Processed in much the same way as butter.
- 2) Different process conditions used for reduced fat formulations

Typical process line configurations :-

DAY TANK – A – C – A – R/T - PACKING M/C; Packets & blocks

DAY TANK – A – A – C – PACKING M/C ; Bulk cartons

LipoLogic

TYPICAL PROCESS SYSTEM FOR MANUFACTURE OF BUTTER BLENDS

LipoLogic

BUTTER BLENDS

FUTURE TRENDS

- Significant increase in sales volumes over the last 10 years
- Excellent alternative to butter :-
  - Lower cost
  - Comparable quality
- Further improvements likely as a result of :-
  - Better control of hydrogenation conditions
  - Use of more effective selective catalysts
  - Availability of steep-melting palm fractions
- Increased production in the Middle East region using imported AMF

SOLID VEGETABLE FATS

KEY PRODUCT CHARACTERISTICS

- Primarily used for baking applications rather than frying
- Usually based on combinations of palm oil & palm fractions due to :-
  - Increasing availability
  - Lower cost compared to blends containing hydrogenated fats
  - Good functionality in baking applications
  - Reduced levels of trans fats
- Tendency for melting points to be higher due to high ambient temperatures in the region
- Largely sold in bulk packaging to wholesale/catering markets

SOLID VEGETABLE FATS

PRODUCT DEVELOPMENT CRITERIA

- Typical end-product applications include :-
  - Frying
  - Biscuits/cookies
  - Cakes, pies etc.
  - Bread
  - Pastries
- Melting point tends to be application-dependent
- Content of hydrogenated fats generally kept to a minimum to keep costs down

LipoLogic

SOLID VEGETABLE FATS

EXAMPLES OF TYPICAL FORMULATIONS

- Generally use blends of palm oil and palm stearin
- Emulsifiers can be added to enhance product functionality

COMPONENT	**AMOUNT**
Palm oil	80-20%
Palm stearin	20-80%
Antioxidant (BHA/BHT)	0.005%
Lecithin	0.1-0.2% (if required)

SOLID VEGETABLE FATS

PRODUCTION METHODS AND PROCESS REGIMES

General points :-

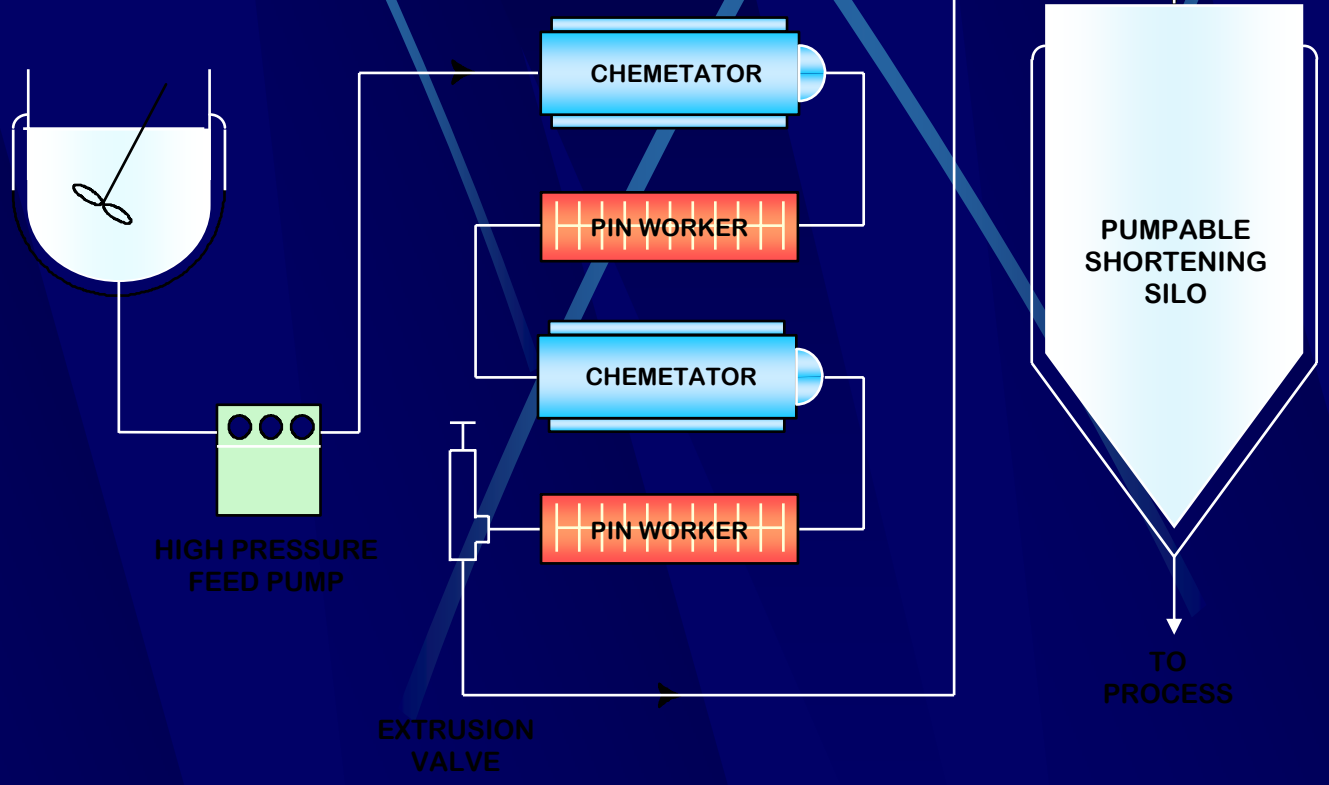
- 1) Processed in much the same way as vanaspati/vegetable ghee.
- 2) Usually packaged in cartons with plastic liners
- 3) Reduced throughput beneficial for product plasticity

Typical process line configuration :-

DAY TANK –HPP- A – A – C -C– PACKING M/C; Bulk cartons

LipoLogic

The Pumpable Shortening System



LipoLogic

SOLID VEGETABLE FATS

FUTURE TRENDS

- Further reduction in useage volumes
  - switch to liquid vegetable oils for frying applications
- Decreased use of hydrogenated fats – largely due to concerns over trans fats
- Interesterified blends & steep melting palm fractions could offer improved product functionality
- Increased use of specialty emulsifiers to obtain improvements in product performance

CONCLUSIONS

- Opportunities in this product sector will increase as the Middle East markets become more advanced.
- Volumes of imported products continue to decrease as the number of indigenous manufacturers continues to grow
- The growing product sectors – butter blends and vanaspati – will continue to flourish.
- Products in the commodity sectors facing threats from low cost imported versions from SE Asia
- Potential growth in exports of the more sophisticated products from the region.