ANALYTICAL CRITERIA for QUALITY CONTROL of MARGARINES in TURKEY

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AGENDA

Fats and Oils business in Turkey
– Introduction of Besler/ÜLKER company

Quality Criteria
– Raw Material – Crude Fats & Oils
– Processing – Refining - Modification
– Product Properties
  • Margarine Quality
  • Fat Blend
  • Ingredients
  • Processing
  • Sensory Evaluation & Performance Test

Conclusion
• One of the biggest food company in TURKEY

• Established in 1944 (Biscuit Factory)

• Chocolate, Biscuit, Cake, Flour, Powder Products (soups, deserts, etc.), Dairy (milk, yoghurt, etc.) Coffee (Cafe Crown), Baby food, Starch, Cola (Cola Turka) & Soft Drinks, Ice Cream (Golf) Margarine & Fats

• Total turnover, 2006: 7 billion USD

• 30,000 employees
• 1900 product, 200 brands
• 200,000 distribution points
Production capacity: ~350,000 tonnes/year
Total open area: 237,000 m²
Total Oil Storage capacity: 37,000 tons
278 SKU, 315 employee
TOTAL TURNOVER, 2006: 395 mio USD
TOTAL CONSUMPTION of FATS & OILS in TURKEY 2006

- Liquid Oil: 850,000 t (64%)
- Wrapper & Tub Margarines: 230,000 t (17%)
- Bakery & Ind. Fats & Marg.: 258,000 t (19%)
Liquid Oils
% 20
(1st or 2nd)

Bakery Fats & Marg.
% 20
(2nd)

Industrial Fats
% 50
(1st)

Tub Margarines
% 30
(2nd)

Wrapper Margarines
% 40
(Market leader)
Improve products
Customers satisfaction
Save money

ISO 9001
ISO 14001
OHSAS
HACCP
BRC
IMPACT ON THE BUSINESS

- Production - No defects
- Distribution - On time
- Third party & Suppliers - Quality audits
- Development - Formulate faults out of products
- Operations - Consistent
- Customer Service - Handle issues smoothly
QUALITY CONTROL

RAW MATERIAL CONTROL
- Oils & Fats
- Emulsifiers
- Ingredients
- Salt
- Acids
- Preservatives
- Antioxidants
- Whey/SMP
- Flavours

PROCESS CONTROL
- Refining
- Oil Modification
- Blending
- Composition
- Making
- Votator Process
- Packaging
- Temp. at transport
- Temp. at storage
- Temp. At Distr.

PRODUCT CONTROL
- Hardness
- Spreadability
- Plasticity
- Homogeneity
- Creaming
- Thinnes, Melt
- Coolness, Frying
- Antispattering
- Baking, Health
- Taste, Gloss
Consumer quality parameters

Specifications of the margarines

Specification of the fatblend

Refined oils and fat components

Crude oils and fats
QUALITY CRITERIA for RAW MATERIAL

CRUDE FATS and OILS
MAIN IMPORTED OILS in TURKEY

- Palm
- Palm Olein
- Palm Stearin
- Palm Kernel

- Soybean Oil
- Sunflower
- Rape Seed

In 2006, 1,120,000 tonnes Oil imported
### TRANSPORT and STORAGE of CRUDE OIL

<table>
<thead>
<tr>
<th>Previous cargo</th>
<th>Kosher/Fosfa (Int.list of previous cargos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tropical oils</td>
<td>crude PO</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dfPOs(53)</td>
</tr>
<tr>
<td>Seed oils</td>
<td>crude BO</td>
</tr>
</tbody>
</table>
## CRUDE OIL IMPURITIES & ANALYSES

<table>
<thead>
<tr>
<th>IMPURITY</th>
<th>SOURCE</th>
<th>ANALYSES</th>
<th>TYPICAL LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>From fruit</td>
<td>Moisture</td>
<td>% 0,2</td>
</tr>
<tr>
<td>Waxes</td>
<td>Seed coat</td>
<td>Wax</td>
<td></td>
</tr>
<tr>
<td>Free Fatty Acids</td>
<td>Hydrolised oil molecules</td>
<td>ffa</td>
<td>%0,5-5</td>
</tr>
<tr>
<td>Coloured Compounds</td>
<td>Chlorophyll, carotene in seed/fruit</td>
<td>Lovibond</td>
<td></td>
</tr>
<tr>
<td>Oxidised triacylglycerols</td>
<td>Oxidation during processing, storage, transport</td>
<td>POV</td>
<td>10 meq/kg</td>
</tr>
<tr>
<td>Trace metals</td>
<td>Naturally occurring&amp;from tanks &amp; processing</td>
<td>Fe, Cu, Ni</td>
<td>10 mg/kg</td>
</tr>
<tr>
<td>Gums/Lecithin</td>
<td>Phospholipids from cell membrane</td>
<td>P</td>
<td>10-500 mg/kg</td>
</tr>
<tr>
<td>Off Flavours</td>
<td>Flavour comp. from seed or fruit</td>
<td>Taste</td>
<td>Strong</td>
</tr>
</tbody>
</table>
IODINE VALUE (IV)
Iodine value is the quantity (g) of iodine fixed per a 100 gr. fat under lab. Conditions

PK: 14-19; PKS: 6-9; SF: 125–140; PO: 50-55; BO: 123-139; CS: 98-118
Pos: 48 max., Pof: 56 min.

SAPONIFICATION VALUE
Saponification value is the quantity (mg) of potassium hydroxide required for saponification of 1 gr. fat.

Sun Flower Oil (linoleic & oleic acids in large proportion)  SV = 190
Coconut oil (lauric acid in large proportion)  SV = 260
FREE FATTY ACID (FFA)

Acidity is the % of FFA, expressed according to the nature of fats:

- oleic acid, in case of the majority of fats,
- palmitic acid in case of palm oil
- lauric acid in case of lauric fats (CN, PK)

PEROXIDE VALUE (POV)

POV is the number of micrograms of active Oxygen of the peroxide contained in a gr. of fat and capable of oxidising potassium iodide to iodine.
ANALYSES of WAX

**COLD TEST (AOCS, method C.C. 11-53):** By cooling the oil it aims to bring about the crystallisation of waxes & hence the cloud Formation. The time taken for its appearance at 0°C; provides information about the wax content.

For a concentration exceeding 100 ppm of wax, an oil clouds over 1hr.

**SEPERATION of WAXES by GAS CHROMOTOGRAPHY**
# BUYING SPECIFICATIONS

<table>
<thead>
<tr>
<th>RBD OIL</th>
<th>FFA Max (%)</th>
<th>M&amp;I Max (%)</th>
<th>Colour</th>
<th>Melting Point</th>
<th>IV Max (%)</th>
<th>P Max (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO</td>
<td>0.75 (oleic)</td>
<td>0.3</td>
<td></td>
<td>1,5 R max.</td>
<td></td>
<td>56 min.</td>
</tr>
<tr>
<td>MZ</td>
<td>5</td>
<td>1</td>
<td></td>
<td>1,5 R max.</td>
<td>15-19.5</td>
<td>300</td>
</tr>
<tr>
<td>SF</td>
<td>3.0</td>
<td>0.5</td>
<td></td>
<td>3-6 R max.</td>
<td></td>
<td>56 min.</td>
</tr>
<tr>
<td>PK</td>
<td>5.5</td>
<td>0.5</td>
<td></td>
<td>1,5 R max.</td>
<td>15-19.5</td>
<td>31-34</td>
</tr>
<tr>
<td>Pof</td>
<td>0.1</td>
<td>0.1</td>
<td>3-6 R max.</td>
<td></td>
<td>56 min.</td>
<td>48</td>
</tr>
<tr>
<td>PKO</td>
<td>0.1</td>
<td>0.1</td>
<td>1,5 R max.</td>
<td>31-34</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>PKS</td>
<td>0.1 (lauric)</td>
<td>0.15</td>
<td>1,5 R max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POS</td>
<td>0.2</td>
<td>0.15</td>
<td>3-6 R max.</td>
<td>44 min.</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>
QUALITY CRITERIA in PROCESSING

REFINING – MODIFICATION - BLENDING
PROCESSING of OILS

Raw material

<table>
<thead>
<tr>
<th>Refining</th>
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<tbody>
<tr>
<td>Bleaching</td>
</tr>
<tr>
<td>Neutralisation</td>
</tr>
</tbody>
</table>

Modification

<table>
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<tr>
<th>Deodorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Product</td>
</tr>
</tbody>
</table>

FAT BLEND in Margarine form.
PROCESSING of OILS

Raw material

Bleaching

Soap ffa

max. 0.2

Neutralisation

SFC sMp ffa

Modification

sM, IV SFC

Deodorisation

End Product

FAT BLEND in Margarine form.

taste, ffa POV

max. 0.1

ffa POV colour

Colour soap

0

0

max. 0.1

ffa

0

0

SFC sMp ffa

SFC sMp IV

0
FATS AND OILS PROCESSING

OIL MODIFICATION

Physical
DRY FRACTIONATION
Fractional crystallization

Chemical
INTERESTERIFICATION
Fatty acid redistribution

Chemical
HYDROGENATION
Saturation / Isomeration
FULLY REFINED OILS

**FFA**: 0.05 - 0.10%  
**Peroxide value**: max. 0.8 meq/kg  
**Moisture**: max. 0.05%  
**Dirt**: neg. paper test  
**PAH**: max. 25/5 ppb  
**Phosphorous**: max. 5 ppm  
**Fe/Cu/Ni**: max. 0.5/0.01/0.1 ppm  
**Soap**: max. 10 ppm  
**Colour**: Bland  
**Tocopherols**:  
**Taste**: Bland
QUALITY CRITERIA for PRODUCT PROPERTIES

MARGARINE QUALITY
MARGARINE

Performance in use
- Spreadability
- Baking, frying, melting
- Taste and smell of prepared foods

Sensoric Experience
- Taste and smell of prepared foods
- Melting
- Odor
- Taste
- After taste

Appearance
- Clean packaging material
- Pack type/size
- Gloss colour

Origin
- Milk
- Lecithin
- Vegetable
- Fatlevel
- Safa/trans
- Pufa/mufa
- Cholesterol
- Lactose free

Homogeneity
- Hardness
- Plasticity
- Spreading
- Flavour

Pack type/size
- Gloss colour

MARGARINE
CONSUMER PERCEIVED QUALITY

- Taste
- Spreadability
- Clean tub or wrapper
  - no free oil
- Good kitchen performance
  - baking
  - shallow frying
- Healthy
CONSUMER PERCEIVED QUALITY

- Wrapper
  - kitchen performance
  - hardness
  - no oil exudation

- Tubmargarine
  - taste - oral melt
  - spreadability from fridge

- Healthy tubmargarine
  - no hardened components
  - pufa - safa
  - ratio C18.2/C18.3

- Bakery and Industrial Fats and Marg.
  - Performance
MARGARINE QUALITY DEPENDS ON....

INGREDIENTS

FAT BLEND

PROCESSING