PALM OIL BASED TRANS FREE SOLUTIONS FOR OIL INDUSTRY

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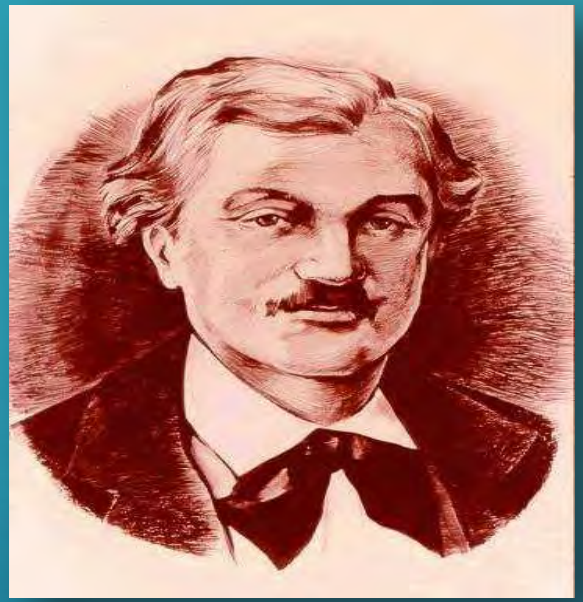
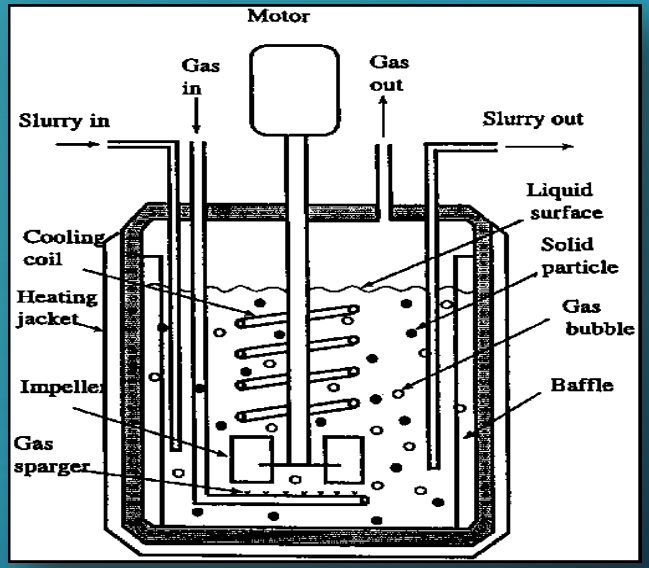
- *Each problem includes its solutions within. Each solution yields in new problems.*

NAPOLEON THE THIRD
EMPEROR OF FRANCE (1848-1852)



HIPPOLYTE MÈGE-MOURIÈS
INVENTOR OF MARGARINE (1869)



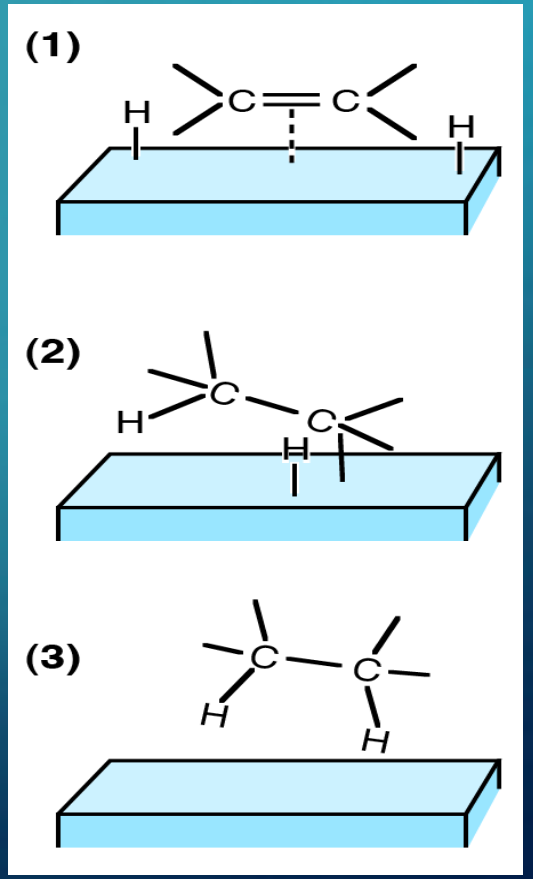
WILHELM NORMAN
DEAD END HYDROGENATION (1909)

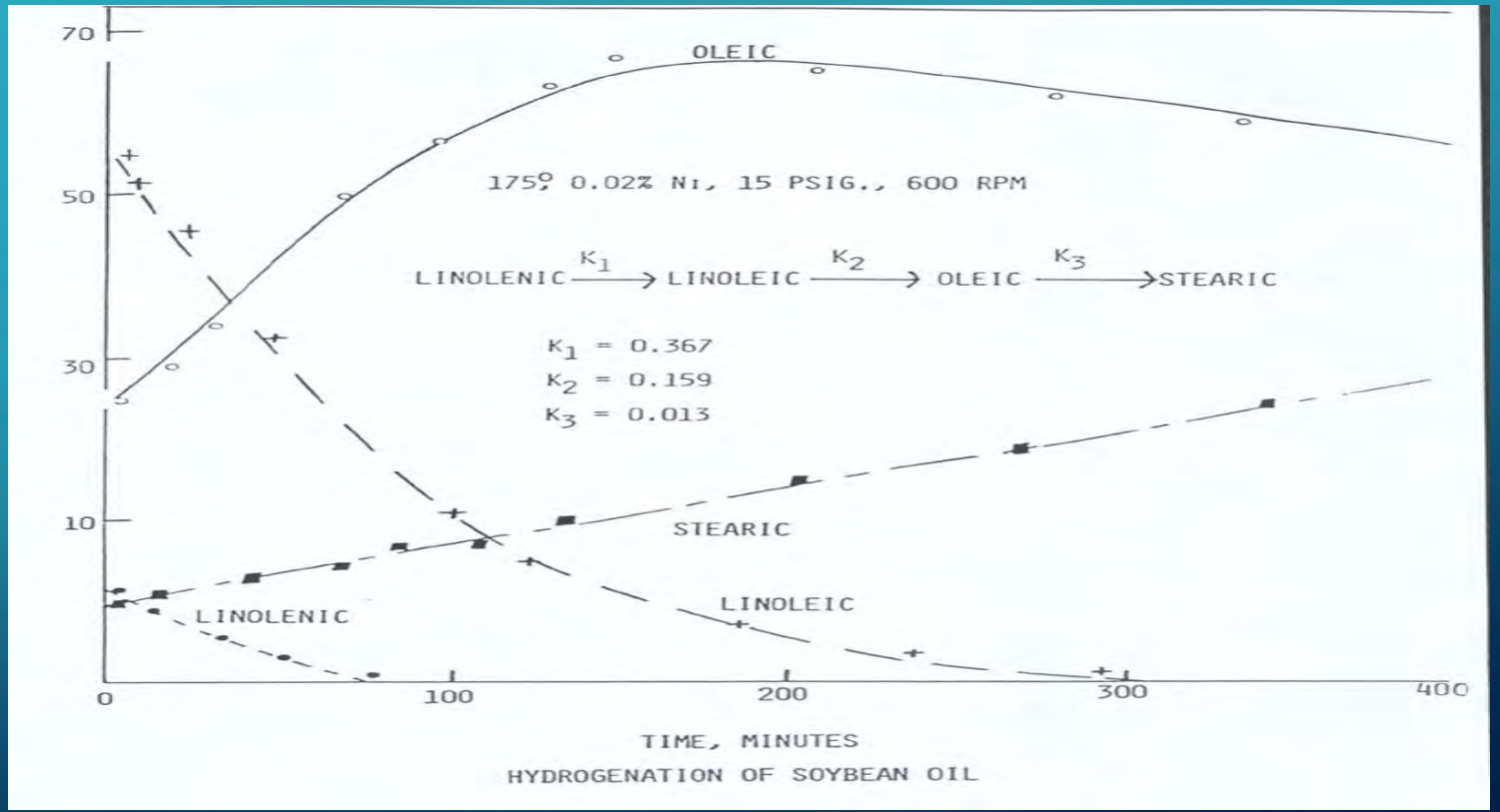
BEŞİKTAŞ JİMNASTİK KULÜBÜ

- CONGRATULATIONS FOR
- TURKISH FOOTBALL LEAGUE CHAMPION
- 2015-2016 SOCCER SEASON

HYDROGENATION

- Transfer and/or diffusion
- Adsorption
- Hydrogenation/isomerization
- Desorption
- Transfer





HYDROGENATION OF SOYBEAN OIL

HOW HYDROGENATION WORKS!

HYDROGENATION DEPLETES UNSATURATED FATTY ACIDS TO DESIRED SATURATION LEVEL FOLLOWED BY IODINE VALUE OR REFRACTIVE INDEX.

PARTIAL HYDROGENATION ALWAYS YIELDS IN TRANS FATTY ACIDS. ACTUALLY THIS IS THE WAY OF ACHIEVING THE DESIRED MELTING CHARACTERISTICS OF SPECIFIC FUNCTIONALTIY.

PARTIAL HYDROGENATION MEANS TRANS FATTY ACIDS !!!

PROBLEM 1: TRANS FATTY ACIDS

- Trans fats can contribute to obesity, high blood pressure, and a greater risk for heart diseases.

- *Trans* fats raise your bad (LDL) cholesterol levels and lower your good (HDL) cholesterol levels. Consuming *trans* fats increases your risk of developing heart disease and stroke. It's also associated with a higher risk of developing type 2 diabetes (*American Hearth Association*).

PROLEM 2: HIGH DEMAND FOR WIDE RANGE MODIFIED FATS VEGETABLE OIL

75% of world edible oil is vegetable oil

- **Shortening**
- **Margarine**
- **Confectionary fat**
- **Frying Fats**
- **Cocoa Butter Alternatives/Replacers**

MODIFIED FATS SPECIFICATIONS

IODINE VALUE/REFRACTIVE INDEX

SLIP MELTING POINT

SOLID FAT CONTENT LEVELS AT SPECIFIC TEMPERATURE(S)

STABLE CRYSTALS FOR SPECIFIC COMMODITIES

PROBLEM 3: LIMITED SUPPLY OF VEGETABLE OILS WITH INSUFFICCIENT PHYSICAL PROPERTIES

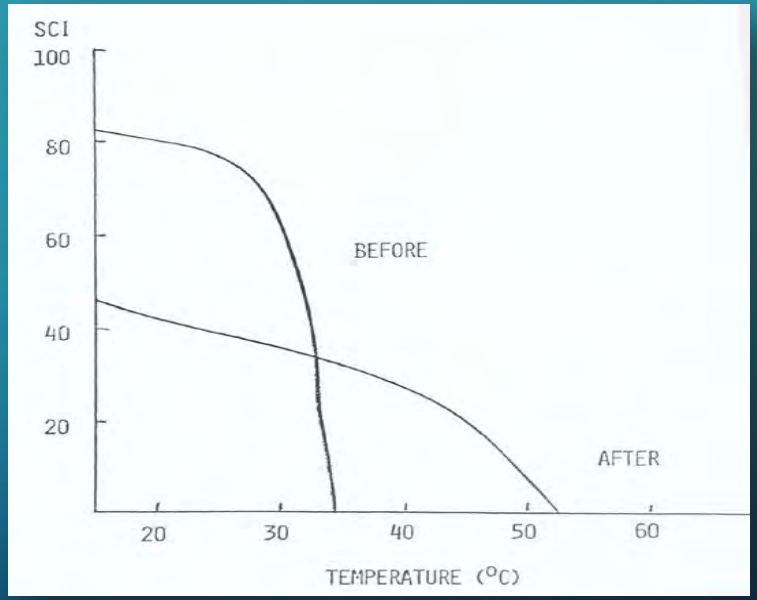
- Soybean oil
- Canola Oil
- Sunflower oil
- Cottonseed oil
- Corn oil
- Peanut oil
- Sesame oil
- Hazelnut oil
- Olive Oil

- PROBLEM: EACH FOOD COMMODITY NEEDS VARIABLE MELTING CHARACTERISTIS.
- SOLUTION: HYDROGENATION TO A SPECIFIC SATURATE AND TRANS CONTENT
- PROBLEM: TRANS FATTY ACIDS ARE HAZARDOUS TO HEALTH.
- SOLUTION: FIND NEW PROCESSING TECHNIQUE WHICH DOES NOT ALTER FAC BUT CHANGES TGC.

ALTERNATIVE TECHNIQUES FOR FAT MODIFICATION

- Interesterification
  - Acyl migration occurs between triglycerides.
  - High temperature catalysts:KOH and NaOH
  - Low temperature catalysts: Sodium Methoxide ($NaOCH_3$)

EFFECT OF INTERESTERIFICATION ON SOLID FAT CONTENT



Solid Fat Content of Cocoa Butter before and after Interesterification

INTERESTERIFICATION (RANDOMISATION)

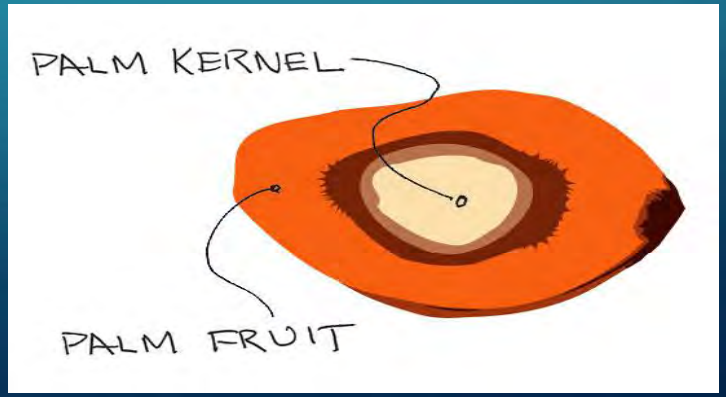
INTERESTERIFICATION MODIFIES TRIGLYCERIDE COMPOSITION BY DISTRIBUTING FATTY ACIDS RANDOMLY THROUGH OUT BRANCHES OF GLYCEROL.

RESULT IS MINIMIZED TRISATURATED GLYCERIDES OF SOLID FAT SOURCE.

INTERESTERIFICATION OS ADVANTAGEOUS BUT STILL INSUFFICIENT TO SATISFY SOPHISTICATED MELTING PROFILES.

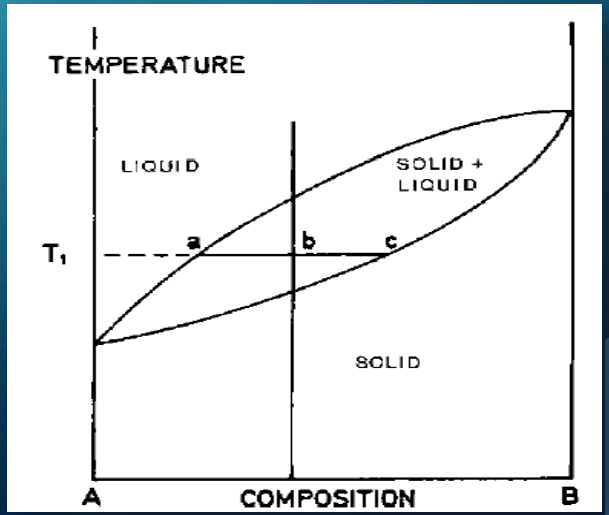
PALM OIL AND PALM KERNEL OIL

Name of the Oil	QUALITY ACPECTS					FATTY ACID COMPOSITION (PERCENTAGE)							
	% of oil	Specific Gravity	SV	IV	TITRE°C Melting point	Caprylic C8	Capric C10	Lauric C12	Myristic C14	Palmitic C16	Stearic C18	Oleic C18:1	Linoleic C18:2
Palm Kernel Oil	40-70	0.886-0.873/99°C	245-255	14-22	24-26	3.0-5.0	3.0-7.0	40.0-52.0	14.0-18.0	7.0-9.0	1.0-3.0	11.0-19.0	0.5-2.0
Palm Oil	30-60	0921-0.925/15°C	196-205	48-58	42-45	----	----	----	0.5-2.0	32.0-45.0	2.0-7.0	38.0-52.0	5.0-11.0

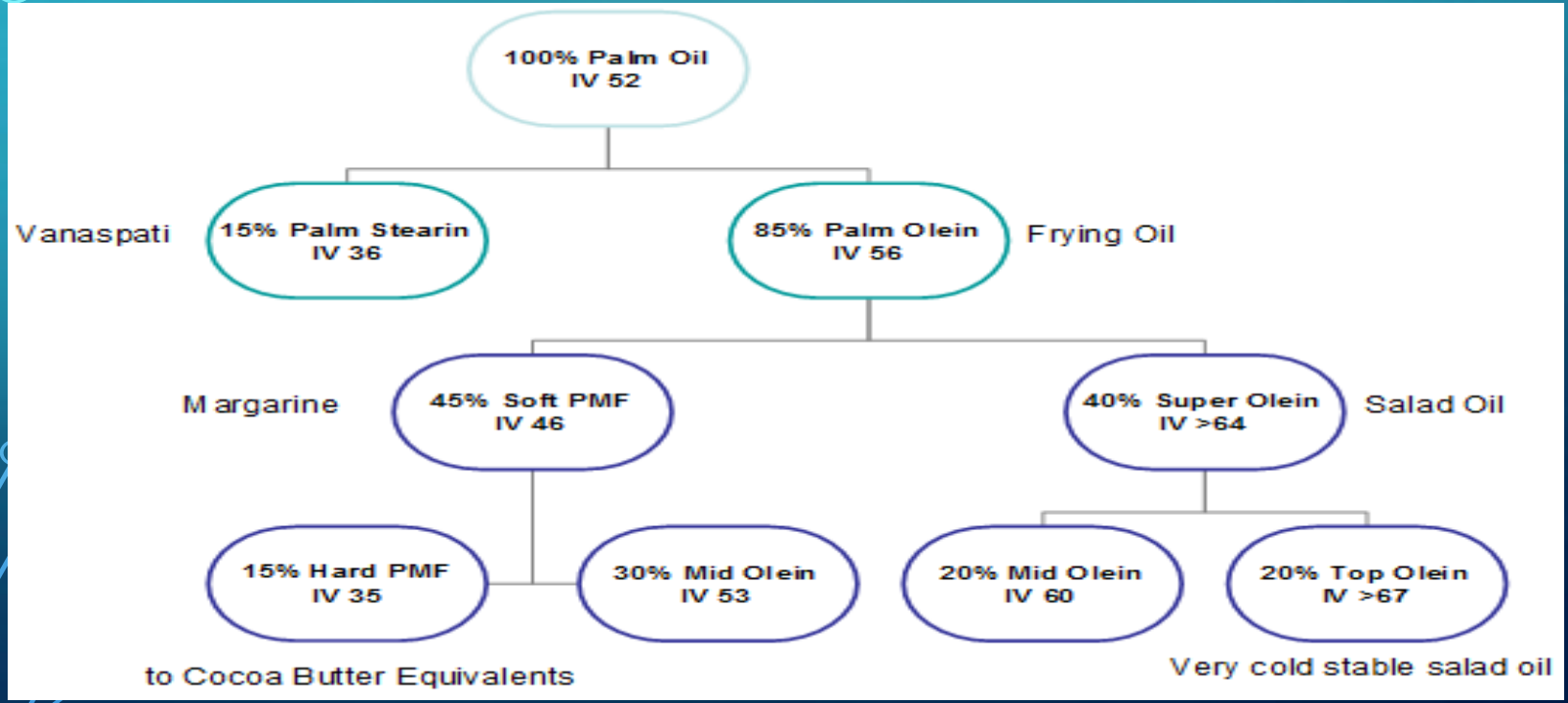


ALTERNATIVE TECHNIQUES FOR FAT MODIFICATION

- Fractional Crystallization
  - The fractionation process is carried out in two stages: firstly, a crystallisation stage; secondly, a separation stage.
- Types of Crystallization
  - Solvent fractionization
  - Dry fractionization



FRACTIONAL CRYSTALLIZATION OF PALM OIL



PALM OIL: A SOLUTION FOR TRANS-FREE INDUSTRIAL FATS

- FRYING OILS (LIQUID OR SEMI SOLID)
- VANASPATI
- MARGARINE FEED STOCKS AT ANY HARDNESS
- COCOA BUTTER EQUIVALENTS AND REPLACERS
- HARD FEED STOCKS AS SATURATES SOURCE FOR INTERESTERIFICATION
- CONFECTIONERY FATS

RECENT PROBLEMS OF OIL INDUSTRY

Increasing Demand for More Modified Fats;

-with various melting profiles

-without trans fatty acid content

Possible Solutions:

-Palm Oil and Fractions

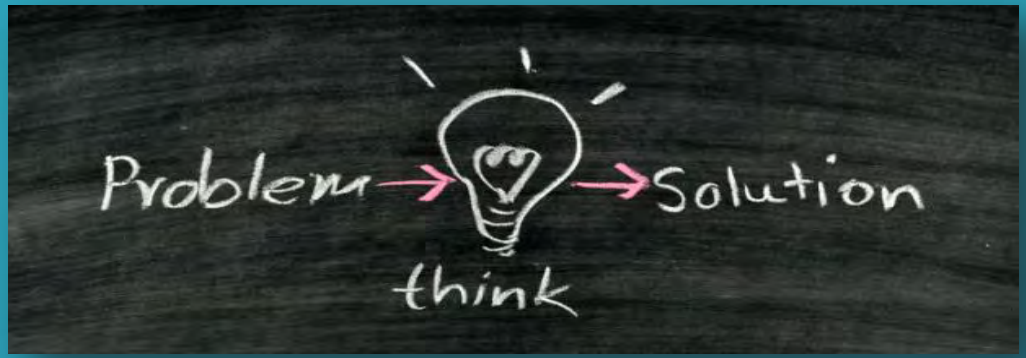
-Interesterification

UPCOMING PROBLEMS OF OIL INDUSTRY

- Negative Consumer Perception on Industrial Fats and Margarine
- Complete Understanding of Benefits of Palm Oil Use in Various Food Commodities
- Minimising Process Contaminants
- Reengineering Of Palm Oil Refining Waste
- Involving New Palm Oil Based Products to Food Industry (tocotrienols, carotenes)

NEW SOLUTIONS FOR NEW PROBLEMS

- New Trans Free Food Formulations
  (EG. Trans free Cocoa Butter Replacers)
- Improvement Of Palm Oil Refining Techniques
  (eg. Minimized refining losses, minimized loss of palm oil constituents with minimal refining)
- More Efficient Refining Technologies
  (eg. Involvement of ultrasound technology or membrane technology for palm oil refining)
- Minimization of Process Contaminants
  (eg. 3-MCPD)
- Improving Consumer Perception for Healthy Food Formulations with Palm Oil and Fractions
  (Conferences, Public Seminars, Radio or TV Broadcasts)



TO ACHIEVE THESE SOLUTIONS;

- Colloboration of Fat Modification Industry with University and Research Institutes
- Conducting or Supporting New Scientific Researches
- Conceeding the Need of Innovation.

ATATÜRK PRESIDENT OF MODERN AND SECULAR TURKISH REPUBLIC

THANK YOU FOR YOUR KIND INTEREST