SOYBEAN EXTRACTION
BASIC INTRODUCTION

- First cultivated by Chinese farmers around 1100 BC
- In 1904 it was discovered that soybeans are a valuable source of protein and oil by American chemist.
- Soybean oil is produced by crushing soybean seeds.
Hulls are separated from meal after crushing.

Meal is further treated for extraction.
USES

- For Eating purposes
- Soy-based lubricants
- For bio-diesel production
- In cryons

- Soy-based lubricants
- Biodynamic production
EXTRACTION

PROCESSES
BASIC METHODS OF EXTRACTION

HYDROLIC OR SCREW PRESS

SOLVENT EXTRACTION
HYDROLYC PRESS
FOR
OIL EXTRACTION

- LOW EFFICIENCY
- FOR OIL RICH SEEDS
- 80-90% EXTRACTION
- LOT OF LUBRICATION AND POWER
SOLVENT EXTRACTION
BLOCK DIAGRAM FOR SOLVENT EXTRACTION
CLEANING...

- TWO-DECK VIBRATING SCREEN
- MEGNATIC SEPARATORS
- AIR BLOW
CRACKING AND DEHULLING

- DOUBLE ROLL CRUSHER
- HULLS ARE BREAKED
- BIGGER PARTICLES ARE CRUSHED DOWN TO SMALLER PARTICLES
- HULLS ARE REMOVED BY ASPIRATION
- 4 to 6 pieces
Crushed Beans Are Heated To 65-70°C directly Or Indirectly
To increase plasticity

MAKE CRUSHED BEANS SOFT

TO LOWER THE VISCOSITY OF OIL

TO INCREASE RATE OF EXTRACTION

TO ALLOW BEANS TO BE CONVERTED INTO FLAKES
FLAKING……

- NO SPACE BETWEEN ROLLS FOR FLAKING PROCESS
- VERY MUCH LIKE PAPER
- INCREASED SURFACE AREA FOR EXTRACTION
- MUCH SOFTER AND ALLOW LIQUID TO PENETRATE EASILY
Bucket extractor

Hexane as solvent

Process

✓ Flakes and solvent are introduces in moving buckets
✓ Solvent dissolves oil and then is separated from flakes
✓ Solvent is separated by evaporation
✓ Remaining solvent content is removed by vacuum stripping and flashing
EXTRACTION THEORY

Basic principles

- diffusion of solvent into solid
- diffusion of oil from the solid particle to the liquid

**Rate of extraction can be increased by**

- Increasing temperature
  1. Increases rate of diffusion
  2. Increases solubility of solvent
  3. Decreases viscosity of oil
  4. Agitation or giving free flow to solvent
SOLVENT PROPERTIES

- Good solubility
- Poor solubility for impurities
- High volatility
- Low viscosity
- Chemically inert to oil
- Low specific heat
- Absence of toxicity
- Commercially available in large quantities
MISELLA EVAPORATION

- Full misella contains typically 30% oil. Thus, for every ton of crude oil some 2.5 tons of solvent must be removed.

FLASHING PHENOMENON

- HEATED MISELLA IS ENTERED INTO FLASH CHAMBER AT HIGH PRESSURE
- VAPOURS OF HEXANE ARE SEPARATED
- MISELLA HAVING MORE OIL CONTENT IS SENT FOR VACUUM STRIPPING
VACUUM STRIPPING

- Feed is introduced at the $\frac{3}{4}$ height of stripper
- Super heated steam is introduced from the bottom of stripper
- Solvent vapors are gathered at the top
- Crude oil is obtained at the bottom of stripper
The spent flakes carry with them about 35% solvent

The removal and recovery of this portion of the solvent is also one of the most critical operations in oil mill practice, since it determines:

1. Quality of meal for animals
2. Economics of industry

Removal of solvent is so carried out in Desolvenizing toaster
**DESOVLVENIZING TOASTER**

- Consists of a vertical cylindrical stack of compartments or "pans".
- Each compartment is fitted with stirrers or racks attached to a central vertical shaft.
- Flakes are fed at the top of the desolventizer toaster.

**Two methods of heating**

- **Direct steam heating**: Transfer of heat to material, more efficient in this case.
- **Indirect steam heating**: Transfer from pan surface to material, less efficient.