

AMFT15 UNIT OPERATIONS FOR FOOD INDUSTRIES

UNIT-1 EVAPORATION AND CONCENTRATION

- 1.1 Unit operations in food processing
- 1.2 Conservation of mass and energy- overall view of an engineering process
- 1.3 Dimensions and units- dimensional and unit consistency- dimensionless ratios
- 1.4 Evaporation- definition- liquid characteristics- single and multiple effect evaporation performance of evaporators and boiling point elevation
- 1.5 Capacity- economy and heat balance types of evaporators-once through and circulation evaporators
- 1.6 Short tube evaporators and long tube evaporators- agitated film evaporator

UNIT-2 MECHANICAL SEPARATION

- 2.1 Filtration- definition- filter media- types and requirements-constant rate filtration
- 2.2 Constant pressure filtration- filter cake resistance- filtration equipment
- 2.3 Rotary vacuum filter- filter press sedimentation
- 2.4 Gravitational sedimentation of particles in a fluid
- 2.5 Stoke's law, sedimentation of particles in gas-cyclones
- 2.6 Settling under sedimentation and gravitational sedimentation-centrifugal separations
- 2.7 Rate of separations- liquid- liquid separation- centrifuge equipment.

UNIT-3 SIZE REDUCTION

- 3.1 Size reduction- grinding and cutting
- 3.2 Principles of comminuting- characteristics of comminuted products
- 3.3 Particle size distribution in comminuted products- energy and power requirements in comminuting
- 3.4 Crushing efficiency- Rittinger's, Bond's and Kick's laws for crushing
- 3.5 Size reduction equipments- crushers- jaw crusher,
- 3.6 Gyratory crusher- crushing rolls- grinders- hammer mills
- 3.7 Rolling compression mills- attrition, rod, ball and tube mills- construction and operation.

UNIT-4 CONTACT EQUILIBRIUM SEPARATION

- 4.1 Contact equilibrium separation processes- concentrations
- 4.2 Gas-liquid and solid-liquid equilibrium- equilibrium concentration relationships
- 4.3 Operating conditions-calculation of separation in contact- equilibrium processes-
- 4.4 Gas absorption- rate of gas absorption- stage- equilibrium gas- absorption equipment
- 4.5 Properties of tower packing- types- construction- flow through packed towers
- 4.6 Extraction- rate of extraction- stage equilibrium extraction
- 4.7 Equipment for leaching coarse solids- intermediate solids- basket extractor-extraction of fine material
- 4.8 Dorr agitator-continuous leaching- decantation systems-extraction towers-washing equipments

UNIT-5 CRYSTALLIZATION AND DISTILLATION

- 5.1 Crystallization- equilibrium- solubility and equilibrium diagram
- 5.2 Rate of crystal growth- equilibrium crystallization- crystallization equipment- classification
- 5.3 Construction and operation tank, agitated batch, Swenson-Walker vacuum crystallizers
- 5.4 Distillation- binary mixtures
- 5.5 Flash and differential distillation steam distillation- theory- consumption- continuous distillation with rectification- vacuum distillation- batch distillation
- 5.6 Operation and process- advantages and limitations- distillation equipments
- 5.7 Construction and operation- factors influencing the operation.

Reference Books

- 1 Richardson, J.E. Etal. “Coulson & Richardson’s Chemical Engineering” Vol.2 (Particle Technology & Separation Processes”) 5th Edition, Butterworth – Heinemann / Elsevier, 2003.
- 2 McCabe, W.L., J.C.Smith and P.Harriot, “Unit Operations of Chemical Engineering”. McGrawHill. Inc. Kosaido Printing Ltd. Tokyo, Japan, 2001

