FDE 401
Process Design

DRYING

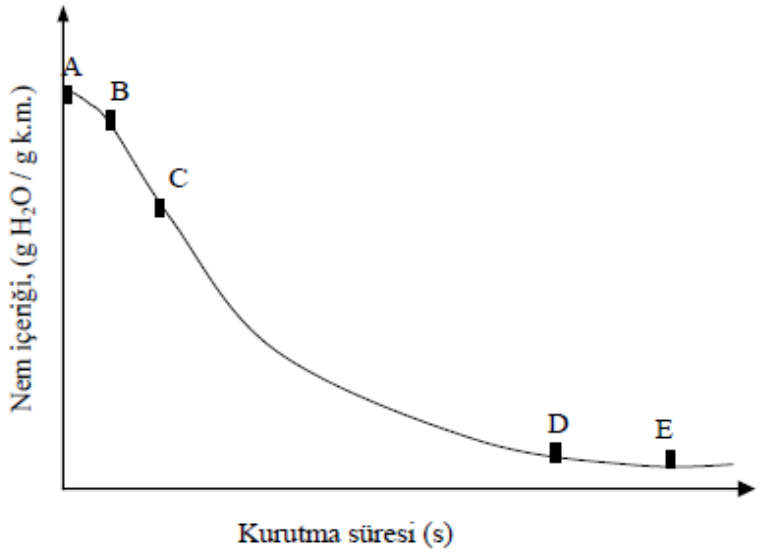
Introduction

- It is the oldest preservation method used for foods.
- The moisture content of the food can be decreased from 80-90% to 10-20%.

- Purpose
  - To decrease the enzyme and microbiological activity
  - To increase the shelf life
  - To produce food products that can be stored easily.

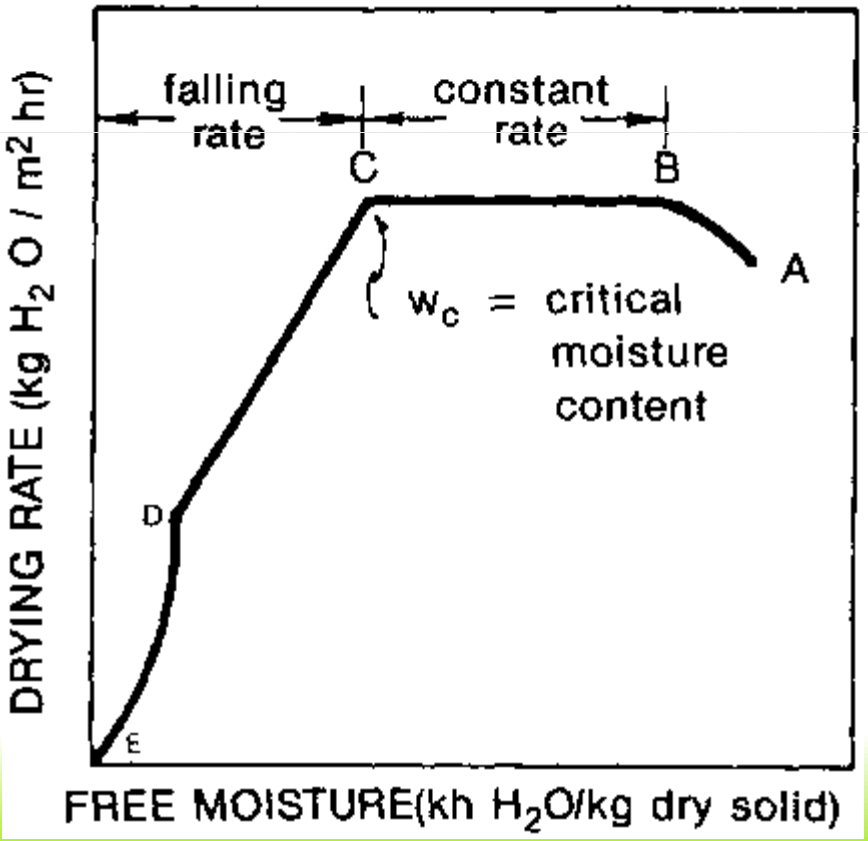
Drying Mechanism

- The moisture content of the food decreases during drying and reaches to a constant value (equilibrium moisture) at the end of the process.



Drying Rate

- There are two major periods on a drying rate curve; Constant Rate Period and Falling Rate Period



Mathematical Models

- Mathematical models of drying are based on heat and mass transfer.
- The models predict the change of moisture ratio of the food during drying.
- Mt: moisture content at time t (kg water/kg dry solid)
- Mo: initial moisture content (kg water/kg dry solid)

$$MR = \frac{M_t}{M_0}$$

Models Used in Drying

Model	Name of Model
$ANO=\exp(-kt)$	Newton
$ANO=\exp(-kt^n)$	Page
$ANO=\exp[(-kt)^n]$	Geliştirilmiş Page I
$ANO=\exp[-(kt)^n]$	Geliştirilmiş Page II
$ANO=a\exp(-kt)$	Henderson ve Papis
$ANO=a\exp(-kt)+c$	Logaritmik
$ANO=a\exp(-k_ot)+b\exp(-k_1t)$	İki terimli
$ANO=aexp(-kt)+(1-a)exp(-kat)$	İki terimli exponansiyel
$ANO= 1+at+bt^2$	Wang ve Sing
$t=a\ln(ANO)+b(\ln(ANO))^2$	Thompson
$ANO= a\exp(-kt)+(1-a)exp(-kbt)$	Difuzyon yaklaşım
$ANO= a\exp(-kt)+(1-a)exp(-gt)$	Verma ve ark.
$ANO= a\exp(-kt)+b\exp(-gt)+c\exp(-ht)$	Geliştirilmiş Henderson ve Papis
$ANO= a\exp(-kt^n)+bt$	Midilli ve ark.

- In this project your are required to design
  - Dimensions of a tray
  - Number of trays
  - Dimensions of the drier