



SNS COLLEGE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION



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DEPARTMENT OF AGRICULTURE ENGINEERING

COURSE CODE & NAME: 19AGT401 & Post Harvest Engineering

IV YEAR / VII SEMESTER

UNIT : II - PSYCHROMETRY AND DRYING

TOPIC 3 : Drying – principles and theory of drying



Drying - Principles

- Removal of moisture content to a safe level by the application of heat
- Dehydration refers to the removal of moisture until it is nearly bone dry
- To maintain the quality of grains during storage to prevent the growth of bacteria, fungi and the development of insects and mites
- Heat is supplied by heated air naturally or artificially
- Vapour pressure or concentration gradient causes the movement of moisture from inside of the kernel to the surface; moisture is evaporated
- Drying capacity of the air depends on air temp, m.c of grain, grain type and Relative humidity of the drying air
- Safe temp. for drying paddy is 45°C and 60°C for wheat
- Excessive high temp. causes both physical and chemical changes



Importance of drying



- Permits long time storage of grain without deterioration
- Permits continuous supply of product thro' out the year
- Permits early harvest which reduces field damage and shattering loss
- Permits the farmers to have better quality product
- Makes products available during off season



Drying theory

- Convection process in which moisture from a product is removed
- The water content of agricultural product is given in terms of moisture content
- They gain or loose moisture as per the atmospheric conditions
- Moisture migration into or from a product is dependent on the difference of vapour pressure between atmosphere and product
- If the vapour pressure of grain is greater than atmospheric vapour pressure, transfer of moisture from grain to atmosphere takes place
- If the atmospheric vapour pressure is greater than grain vapour pressure, grain absorbs moisture from atmosphere



Drying rate periods

- Divided into 3 periods
 - Constant rate period
 - First Falling rate period
 - Second falling rate period



Constant rate period

- Moisture migration rate from inside of product to its surface is equal to the rate of evaporation of water from surface
- This period continues till critical moisture content is reached
- Critical moisture content: Moisture content of a product where constant rate drying ceases and falling rate starts
- This period is very short for agricultural products
- Drying of sand and washed seeds takes place in constant rate period



Falling rate period

- Most of the agricultural products are dried in falling rate drying period
- Movement and diffusion of moisture in interior of grains controls the entire drying process
- Controlled by
 - Migration of moisture from interior of grains to upper surface due to water vapour diffusion
 - Removal of moisture from the surface
- Divided into two periods
 - First falling rate period
 - Second falling rate period



First falling rate

- Unsaturated surface drying
- Drying rate decreases because of the decrease in wet surface area
- Fraction of wet surface decreases to zero, where first falling rate ends

Second falling rate

- Sub surface evaporation takes place & it continues until the equilibrium moisture content is reached



Mechanism of drying process

- Movement of moisture takes place due to
 - Capillary flow – Liquid movement due to surface forces
 - Liquid diffusion – Liquid movement due to difference in moisture concentration
 - Surface diffusion - Liquid movement due to moisture diffusion of the pore spaces
 - Vapour diffusion – vapour movement due to moisture concentration difference
 - Thermal diffusion - vapour movement due to temperature difference
 - Hydro dynamic flow – water and vapour movement due to total pressure difference



THANK YOU..!!