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## List of Symbols and Abbreviations

a = Amplitude

A = cross sectional area of drying bin

Ar = dimensionless number known as the Archimedes number

ANOVA= Analysis of variance

Bim= Biot mass transfer number

B<sub>ih</sub>= Biot heat transfer number

C= spring index i.e.  $D_h / d_h$ 

CCRD = Central Composite Rotatable Design

C.V. = Coefficient of Variation,

CI= confidence interval

db= Dry basis

 $d_e = Equivalent diameter of particle$ 

 $d_h =$  Wire diameter, mm

D = Internal diameter of the duct, m

D = diameter of drying bin

 $D_0$  = effective diffusion coefficient at  $M_o$ , m<sup>2</sup>/s

 $D_{AB}$  = diffusion of gas A into B (for water-air system, 0.288x10<sup>-4</sup> m<sup>2</sup>/s at 42°C),

 $m^2/s$ 

DC = Direct current

D<sub>eff</sub> = effective Moisture diffusivity

 $(D_{eff-)Avg} =$  average moisture diffusivity in m<sup>2</sup>/s.

 $D_h =$  Mean coil diameter, mm

DP = drying performance (g of water evaporated / J of supplied energy)

 $D_p =$  Equivalent diameter of the paddy grain,

DF= Degrees of freedom

EMC= Equilibrium moisture content

FAO =Food and Agricultural Organization

g = Acceleration due to gravity

 $G_a =$  Mass flow rate of the air, kg/s

G= Modulus of rigidity, N/mm<sup>2</sup>

h' = convective heat transfer coefficients, kcal  $m^{-2} \circ C^{-1} h^{-1}$ 

 $h_D$ =Convective mass transfer coefficient, kg h<sup>-1</sup>m<sup>-2</sup>

 $h_2$  = energy consumed by motor, kJ

H= Height of drying bin

ho= Bed depth

i = initial,

I= Specific vibration power or vibration intensity

 $k = drying constant, sec^{-1} or h^{-1}$ 

 $\dot{k_c}$  = Equimolar countercurrent mass transfer coefficient, m/s

L = Latent heat of vapourization, kJ/kg

L = Length of the grain bed (depth)

LSU =Louisiana State University

LOF Lack of fit.

M = moisture content, % wet basis

- M = moisture content, dry basis
- $M_0 =$  initial moisture content, dry basis

M<sub>d</sub> = equilibrium moisture content, dry basis

MR= moisture ratio

 $\overline{M}$  = moisture content of grain, % db

N = Revolution per minute of the motor

 $N_t$  =Number of turns

 $N_{Sc}$ = Schmidt number,  $\mu / \rho D_{AB}$  dimensionless

NMR Nuclear Magnetic Resonance

P = Axial force, N

P = vapour pressure, kg/cm<sup>2</sup>

 $P_m = power of the motor, kW$ 

 $P_{\rm v\,wb}$  = saturated vapour pressure at the wet bulb temperature

 $P_v$  = partial pre ssure of water vapour in ambient air, kPa

Prob = Probability

PRESS=Predicted Residual Error Sum of Squares

Q = power input

 $Q_a$  = Sensible heat gained by air,

 $Q_a$  = enthalpy of hot drying air, kJ/ s

r = particle co-ordinate,

 $r_o = particle diameter$ 

r = diffusion path or length,m

r = radius of a small cylindrical segment

r= radius of sphere, m

R = universal gas constant, 8.314 J/ mole

 $Re_{mf} = Reynolds$  number at incipient fluidization,

RH = Relative humidity

s = Specific surface area of the grain mass

 $S_{ut}$  =Ultimate tensile strength, N/mm<sup>2</sup>

Tc= Absolute temperature

 $T = Drying air temperature, {}^{0}C$ 

 $T_{wb}$  = wet bulb temperature

 $T_{abs} = Absolute temperature$ 

T = absolute temperature, K

 $\Delta T$  = Temperature rise of drying air

µm= micro meter

U<sub>mf=</sub> minimum fluidization velocity

 $U_{mvf}$  = velocity of incipient vibro- fluidization

V = volume of the body  $m^3$ 

V = Mean velocity of air, m/s

 $V_o =$  Superficial air velocity, m/s

VIF =Variance Inflation Factor

wb= wet basis

w = absolute humidity of air, kg water/ kg dry air

 $\theta$ = Time

Ø = Time

 $\Gamma$ = dimensionless trajectory parameter

 $\omega$  =Angular velocity

ΓVFB= extended trajectory parameter

 $\mu$  = viscosity of air, Pa.s

 $\rho$  = Density of air, Kg/m<sup>3</sup>

 $\eta$  = efficiency of electrical heaters

 $\eta$ =The energy efficiency

 $\eta_o$  = overall efficiency of blower and motor

 $\varepsilon$  = Porosity of the grain bed

 $\rho_f$  = density of drying fluid

 $\rho_p$  = Particle density of the parboiled paddy

 $\rho$  = Density of fluid (air) = 1.298 kg/m<sup>3</sup>

 $\phi_s$  = Sphericity of grain

 $\tau_1$  = Torsional shear stress, N/mm<sup>2</sup>

 $\tau_2$  = Direct shear stress, N/mm<sup>2</sup>

 $\tau =$  Resultant shear stress, N/mm<sup>2</sup>

 $\delta$  = Axial defection of the spring, mm

 $\tau_d$  = Standard the permissible shear stress =0.5S<sub>ut</sub>

 $\theta$  = product temperature, °C