STUDIES ON THE EFFECT OF HEAT TREATMENTS ON THE BIOCHEMICAL CONSTITUENTS OF COTTONSEEDS

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APPROVAL SHEET

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A C K N O W L E D G M E N T

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This dissertation has not previously been submitted for a degree at this or at any other university.

The refernces in the text will show the extent to which I have availed myself of the work of the other authors.

Signed

C O N T E N T S

PART 1

PART 2

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N O M E N C L A T U R E

NOMENCLATURE

Except where noted otherwise, the following nomenclature is used in this work

SYMBOLS:

A	Total area of the finite surface, Sq ft
C_p	Specific heat, Btu/lb, °F - at constant pressure
d	Diameter, in, depth of duct, in.
di	Internal diameter, in.
do	External diameter, in.
D	Diameter, ft.
D_H	Hydraylic diameter, ft.
Fa	Arrangement factor, depending upon geometry.
Fd	Depth factor.
Fc	Correction factor.
F_{pp}	Physical properties factor.
Fs	Surface factor.
F_T	Temperature factor.
g	Gravitational acceleration, 32.2 ft./sec^2.
G	Mass flow, Lb/sq ft, hr.
hc	Heat transfer coefficient, Btu/sq ft,hr , °F.
hc_L	Heat transfer coefficient, for the tube of finite length, Btu/sq ft, hr, °F.

hc_s	Steam film coefficient, Btu/sq ft, hr, °F.
h_{12}	Inside surface film coefficient, Btu/sq ft,hr,°F.
h_{34}	Outside surface film coefficient, Btu/sq ft,hr,°F.
k	Thermal conductivity, Btu/hr, ft °F.
L	Length, ft.
M	Flow rate, lb (mass)/hr.
q	Rate of heat flow, Btu/hr.
r	Radius, in.
r_2	Inside tube radius, in.
r_3	Outside tube radius, in.
Rd	Thermal resistance of the scale, Btu/sq ft,hr,°F.
Sn	Tube spacing between centers normal to the flow direction, in.
Sp	Tube spacing between centers parallel to the flow direction, in.
S_1	Center to center distance between adjacent transverse rows of tubes or pipes, in.
S_T	The distance between centers of the tubes in adjacent longitudinal rows, in.
t	Temperature, °F.
Δt	Temperature difference, °F.
t_{ci}	Inlet temperature of the cold fluid, °F.
t_{co}	Outlet temperature of the cold fluid, °F.
t_f	Fluid temperature, °F.

t_{hi}	Inlet temperature of the hot fluid, °F.
t_{ho}	Outlet temperature of the hot fluid, °F.
tm	Mean film temperature, °F
Δtm	Mean temperature difference, °F.
Δt_{L_m}	Log. mean temperture difference, °F
t_s	Surface temperature, °F
T	Absolute temperature, °R = °F + 460
T_b	Average bulk absolute temperature, °R.
T_f	Average film absolute temperature, °R.
Um	Mean over-all heat transfer coefficient for the heat exchanger as a whole, Btu/sq ft, hr, °f.
U_3	Over-all heat transfer coefficient based on the outside tube surface, Btu/sq ft, hr, °f.
v	Velocity, ft/sec, ft/min, or ft/hr.

DIMENSIONLESS TERMS :

N_{Gr_D}	Grashof number refer to the diameter $(\Delta t)\left(\frac{D^3 \rho^2 g}{\mu^2}\right)$
N_{Nu_D}	Nusselt number refer to the diameter, hcD/k.
N_{pr}	Prandtl number, $\mu C_p/k$
N_{Re_D}	Reynolds number refer to the diameter, $pVD/\mu = GD_i/U$
N_{St_D}	Stanton number, refer to the diameter, hc/GC_p
C_R	Capacity ratio, $(MCp)_{min}/(MCp)_{max}$.
NTU	Number of transfer units, $UA/(MCp)_{min}$.

GREEK LETTERS :

β	Beta	Coefficient of thermal expansion, 1/°R
Δ	Delta	The difference in value
ϵ	Episton	Effectiveness of the heat exchanger
μ	Mu	Absolute viscosity of fluid, lbm/ft,hr
π	Pi	Geometric ratio of circumference to diameter of circle, 3.1416
ρ	Rho	Mass density, lbm/ft, hr,
ϕ	Phi	Function of
ψ	Psi	Total

ABBREVIATIONS :

A.O.C.S.	American Oil Chemist's Society
A.O.V.	Analysis of variance
Ass.	Association
avg.	Average.
Btu	British thermal unit.
B.P.	Boiling point
°C	Centigrade degrees
Cont.	Content
e.g.	For example
°F	Fahrenheit degrees
F.F.A.	Free fatty acids
ft	Feet
ft-lb	Foot-pound
hp	Horsepower
hr	Hour
In	Natural logarithm (Base e = 2.7183)
Int.	International
i.e.	That is
in.	Inch
L.M.T.D.	Logarithm mean temperature difference