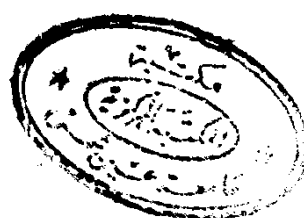


Farag

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



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APPROVAL SHEET

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...ooOoo...



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...ooOoo...

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 .

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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.
d _i	Internal diameter, in.
d _o	External diameter, in.
D	Diameter, ft.
D _H	Hydraulic diameter, ft.
F _a	Arrangement factor, depending upon geometry.
F _d	Depth factor.
F _c	Correction factor.
F _{pp}	Physical properties factor.
F _s	Surface factor.
F _T	Temperature factor.
g	Gravitational acceleration, 32.2 ft./sec ² .
G	Mass flow, lb/sq ft, hr.
h _c	Heat transfer coefficient, Btu/sq ft,hr , °F.
h _{c_L}	Heat transfer coefficient, for the tube of finite length, Btu/sq ft, hr, °F.

h_{c_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.
R_d	Thermal resistance of the scale, Btu/sq ft, hr, °F.
S_n	Tube spacing between centers normal to the flow direction, in.
S_p	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.
t_m	Mean film temperature, °F
Δt_m	Mean temperature difference, °F.
Δt_{L_m}	Log. mean temperature 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.
U_m	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, $\rho V D / \mu = G D_i / \mu$
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, $UA / (MCp)_{min}$.

- v -

GREEK LETTERS :

β	Beta	Coefficient of thermal expansion, $1/^{\circ}\text{R}$
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