

THE NEW HEAT TRANSFER

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"The New Heat Transfer" (TNHT) presents a new and better way to design/analyze heat transfer equipment, a new and better way to correlate/understand heat transfer phenomena. This new heat transfer is described in engineering language and its application is illustrated in numerous examples dealing with the design/analysis of real hardware. The most distinguishing feature of the new heat transfer is that it contains **no heat transfer coefficients**.

TNHT critically appraises the methods and conclusions of the old heat transfer. This appraisal leads to the rejection and replacement of much of the old heat transfer. For example,

TNHT notes that the heat transfer coefficient h or U is simply shorthand for writing "the ratio of q to ΔT ". Moreover, this ratio h is harmful because it prevents us from separating the variables we would most like to separate— q and ΔT . Therefore the ratio h is rejected.

In the new heat transfer, we deal with q and ΔT separately. We attach no significance to their ratio h and thus h 's play no part in the new heat transfer. We reject the old h equation

$$h = q/\Delta T = F(\text{system properties} \ \& \ \Delta T) \quad (1)$$

and replace it with the new equation

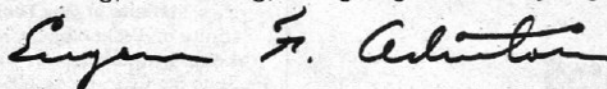
$$q = f(\text{system properties}) \ g(\Delta T) \quad (2)$$

where the function f in no way depends on ΔT and the function g depends only on ΔT .

TNHT notes that the solution of any problem is simpler with separated variables. The principal difference between eqs 1 & 2 is that q and ΔT are separated in eq 2 and are not separated in eq 1. Thus the solution of all design/analysis problems is simpler in the new heat transfer since all solutions are based on separated variables—ie are based on eq. 2.

The new heat transfer has little use for dimensional analysis, dimensionless numbers, log log paper, and so-called power laws. These are largely replaced by inductive reasoning, physical parameters, linear paper, varied math forms.

In summary, "The New Heat Transfer" presents an altogether new science of heat transfer. This new science is a simpler, clearer, more powerful way of thinking, correlating, designing, and analyzing—and it is the heat transfer of tomorrow.



Dimensionless heat transfer correlations are rejected—ie correlations such as

$$Nu = a Re^b Pr^c \quad (3)$$

have no place in the new heat transfer. They are replaced by dimensional correlations in the form of eq 2.

Forced convection boiling data are correlated in the form of eq 2, making it easily possible to optimize boiler designs. This is virtually impossible to do with the old heat transfer.

Many problems which require trial and error solutions in the old heat transfer are solved directly in the new heat transfer.

Many problems which have never been solved in the old heat transfer are easily solved in the new heat transfer. For instance, thermal stability is an integral part of the new heat transfer and the solution of the problem presents no particular difficulty.

The pool boiling curve (PBC) is radically different in the new heat transfer. The new PBC is obtained by rigorously defining PBC and requiring that boiling occur at all points on the PBC. (The old PBC is obtained in a purely phenomenological way and contains a non-boiling region.)

A monograph of Ch 1 of TNHT can be obtained for \$1.95 by circling 307 of the Reader Service Card

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