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LETTER TO THE EDITORS

On the chronology of progress on thermal stability

THE PURPOSE of this letter is to point out that several thermal stability problems were first solved in refs. [1, 2], and later publications by other authors should respect the priority of those articles. Specifically, refs. [1, 2] present the original publication of the following.

- The generic criterion for thermal stability, and its derivation for an idealized system.
- The recognition that thermal stability is not assured in 'constant temperature' systems such as pool boilers in which the heat source is condensing vapor. Even in this type of boiler, thermal stability requires proper hardware design.
- The recognition that the thermal stability of constant temperature pool boilers is markedly improved by decreasing the thickness of the boiler plate and/or increasing the 'heat transfer coefficient' on the source side of the plate.
- The recognition that thermal instability in 'constant temperature' pool boilers results in hysteresis or undamped oscillatory behavior, depending on the shape of the pool boiling curve.

Quoting from ref. [1]: "The quantitative theory outlined in this article allows us to see that the following widely accepted conclusions are not always true: (1) In reactors and other 'fixed heat input' systems, burnout occurs (at the maximum in the boiling curve). (2) Systems in which the temperature of the heat source is controlled necessarily possess thermal stability. In such systems, there is no phenomenon similar to burnout. (3) Thermal instability leads to temperature discontinuities but does not lead to oscillatory performance."

Quoting from ref. [2]: "... Rohsenow states on p. 138 of ref. [4]: 'With condensing vapor as the heat source on one side of a wall, any point on the entire (pool boiling) curve can be reached under stable conditions.' My concept of thermal stability demonstrates that this conclusion is wrong and the experiments by Berenson [3] proved it.... In his experiments, Berenson built just such a boiler ... and he reported the results of 20 experiments. If the reader will plot Berenson's results on *linear* paper, he will find that there are essentially *no* data in the so-called transition region for 17 of the 20 experiments. The reason for this predominant lack of data was that his boiler was usually NOT thermally stable in the transition region. (This is important) for the following reasons: (1) Since nothing was known about thermal stability at that time, Berenson understandably did not look for thermal instability, and as a result he did not report it, even though it was there. (2) Owing to a lack of understanding of thermal stability, Berenson correlated the transition region 'results' of the 17 experiments which contained no such data. The 3 experiments which contained the desired data did not 'agree' with the majority and were (disregarded). (3) Since nothing was known about thermal stability at that time, Berenson understandably did not design his boiler with thermal stability in mind. As a result, he *intentionally* built in a very thick boiler plate, virtually guaranteeing that he would not get the desired data."

In short, my theory of thermal stability presented in refs. [1, 2] was new knowledge in 1964. The data Berenson was unable to obtain conclusively proved that the theory was valid, and that the conventional view was incorrect.

It is unfortunate that *Nucleonics* is not archived as generally as most journals. However, reprints of refs. [1, 2] may be obtained without charge from: Ventuno Press, 6792 Timberwood Drive, Cincinnati, OH 45069, U.S.A.

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