NASA TECH BRIEF

Study Made of Heat Transfer and Pressure Drop Through Tubes with Internal Interrupted Fins

To increase the transfer of heat, extended surfaces are used in many applications. Among the most common types of extended surfaces are fins on the outside surfaces of tubes (such as on evaporators and condensers), and continuous and louvered fins in compact flat-plate heat exchangers. More recently, it has been shown that internal finning can be used to advantage. For example, recent designs in space-power-conversion systems indicate that the size of gas heat exchangers can be reduced within performance limits by the proper choice of internal finning. Further, it has been shown that, for particularly stringent pressure drop and size requirements, the internal extended surfaces must be staggered to frequently reform the boundary layer of the flowing fluid. However, very little data pertinent to internal, interrupted, finned tubes has been available, particularly at very low Reynolds numbers, i.e., under 2500. To obtain pertinent data, a test program was undertaken.

Argon gas flow through an internal interrupted finned tube was investigated to obtain heat transfer and frictional pressure drop data, with and without heat addition, for a range of Reynolds numbers from 350 to 2200. The results were plotted against the same data for corresponding louvered plate-finned surfaces.

The heat transfer values obtained had the same trend as those for louvered plate-finned surfaces over a range of Reynolds numbers from 800 to 1900, and the obtained data curve was displaced approximately 15 percent below the reference curve. For lower Reynolds numbers, there was a wider discrepancy.

The friction factor values obtained were no different between cold flow and heat addition. Comparison of the obtained data curve with the reference curve for louvered plate-finned surfaces revealed similar shapes and identical average slopes, with the obtained data curve displayed approximately 10 percent below the reference curve.

Note:

This investigation has been reported in NASA Technical Memorandum TM-X-1428, *Experimental Results of Heat Transfer and Pressure Drop of Argon Flowing Through Single Tube with Internal Interrupted Fins,* which may be obtained from:

Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B67-10555

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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Category 05