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## Sonic Limitations and Startup Problems of Heat Pipes

A heat pipe is a thermal conductance device capable of high heat transfer rates with essentially isothermal operation. The operating characteristics of a pipe with a given geometry may vary from excellent to nonfunctional; axial temperature drops of several hundred degrees have occurred in some cases.

The performance of a heat pipe depends on the type of wick, working fluid, and the external conditions imposed on it. The dynamics of the fluid flow are very complicated. Under certain operational conditions the vapor flow may be molecular or continuum, compressible or incompressible; vapor velocities may be sonic or supersonic; countercurrent flow of vapor and liquid, with communication between flow paths, may result. In designing heat pipes for high heat transfer rates these factors must be taken into account.

A series of tests has been conducted to determine the effects of sonic vapor velocities on the operational and startup characteristics of heat pipes. It was found that the introduction of small amounts of inert, noncombustible gas aids startup in certain types of heat pipes. Also, when the heat pipe is closely coupled to the heat sink, the startup system must be designed to bring the heat sink on-line slowly.

### Notes:

1. The following documentation may be obtained from:  
National Technical Information Service  
Springfield, Virginia 22151  
Single document price: \$3.00  
(or microfiche \$0.95)

Reference: LA-4518 (N71-18944), Sonic Limitations and Startup Problems of Heat Pipes

2. Technical questions may be directed to:  
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U.S. Atomic Energy Commission  
Washington, D.C. 20545  
Reference: TSP72-10368

### Patent status:

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Los Alamos Scientific Laboratory  
under contract to  
Atomic Energy Commission  
(AEC-10036)

Category 03