

## **Passive Thermal Control Systems on Heat Pipes for Space Application and Terrestrial Technology**

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The basic properties of heat pipes, loop heat pipes, thermal diodes and variable conductance heat pipes, which are intended for passive thermal control system design, are stated briefly. Among them there are thermal resistance as the function of power transferred and the sink temperature, heat flux input density, orientation relative to gravity, size limitations, montage flexibility, complexity of fabrication.

The technical problems of the heat pipe implementation in autonomous cooling and thermostabilisation systems for electronic equipment of non-hermetic non-piloted satellites for near-earth orbits are considered:

- choice of the thermocontrol system design;
- simulation of heat transfer in the system;
- results of thermal tests and flight experiments.

Main attention is devoted to description of the following modifications of thermocontrol systems with heat pipes:

- systems for cooling of separate elements of electronic equipment (e.g., thermal receivers, powerful transistors and microcircuits);
- systems for cooling of device case surfaces (such as cold wall of device, cases of gyroscopic devices);
- systems integrated in the electronic block array (cooled electronic boards - heat pipes, isothermal substrates for microelectronics);
- systems for providing of isothermal mounting faces for the devices installed (e.g., honeycomb panels, all metal surfaces with heat pipes).

For systems being considered the main parameters of the estimation are presented in steady and non-steady regimes with utilisation of worked out programs for the heat pipe computation, for the computation of a device or block as a whole.

Experimental data are presented for real systems, and these data are obtained both in conditions of ground testing in vacuum chambers, and, partially, from the results of direct telemetric control.

The part of this lecture is devoted to consideration of the passive thermal control systems on heat pipes for energy saving, solar power engineering, electronics and PC cooling, technological processes. In energy saving technology as examples the gas/gas heat pipe heat exchangers are considered, in the solar power engineering – dish solar receivers on heat pipes, in electronics cooling – heat pipes for cooling of power components and PC microprocessors, in technology - isothermal plates, capsules, soldering tools.