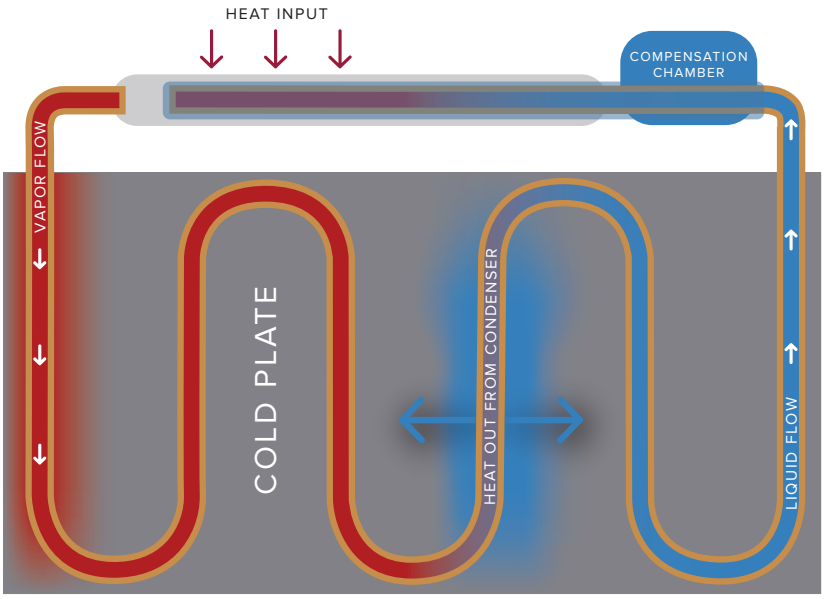
ADVANCED COOLING TECHNOLOGIES

The Thermal Management Experts | www.1-ACT.com

LOOP HEAT PIPES

The schematic shows the basic construction and operation of a Loop Heat Pipe (LHP). Heat input vaporizes the working fluid from the surface of the primary, or evaporator, wick. High vapor pressure in the evaporator drives fluid through vapor lines to the condenser where heat is rejected and the fluid returns to liquid phase. Fluid then flows to the compensation chamber, which is hydraulically coupled to the evaporator wick. This completes the circuit.



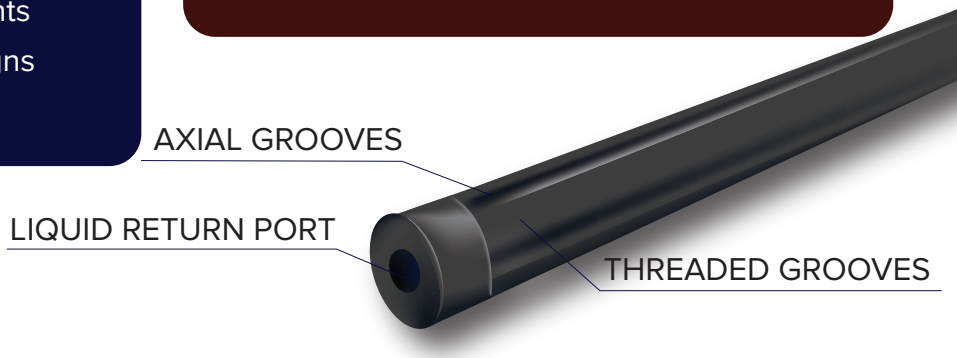
Loop Heat Pipes are used for thermal management in numerous applications, from satellite electronics payloads to high-g applications on jet aircraft. To reject heat from the LHP system, radiators are used in space applications and pumped liquid or forced air cooling in aircraft and ground-based systems.

LHP FEATURES

- Heat loads from 100 to over 1,000 watts
- Transport lengths over 10 meters are possible
- Flexible transport lines for deployable radiators and evaporator on pointable instrunments
- Fully passive operation with some designs
- Shock & vibration tolerant assemblies

APPLICATIONS AND MARKETS

- Satellite Payload Cooling
- Aviation Thermal Management
- Ground based power electronics



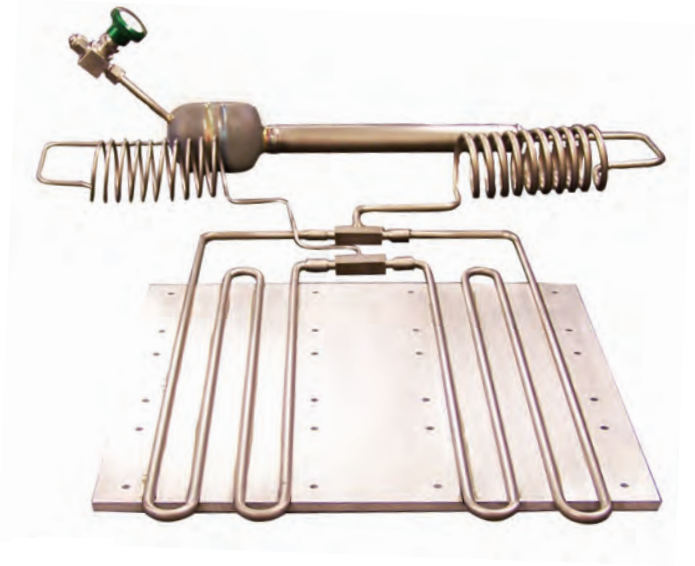
CAPILLARY WICKS

LHP wicks are made from fine powders to form bulk structures with micron-sized pore radii. Pore radius and capillary pressure are inversely related; high capillary pressures are key to LHP design and operation. ACT has manufactured wicks of numerous materials including nickel, stainless steel, titanium and Monel. Intricate features like cirucumferential and axial grooves (see picture) are machined into the wick, creating evaporating surfaces and vapor transport passages.

DESIGN

ACT has developed the capacity to fully predict and analyze LHP performance. Capabilities of our in-house loop heat pipe design program include:

- Transient and Steady-State Heat Loads
- Non-adiabatic conditions including heat leak and gain
- Liquid Subcooling

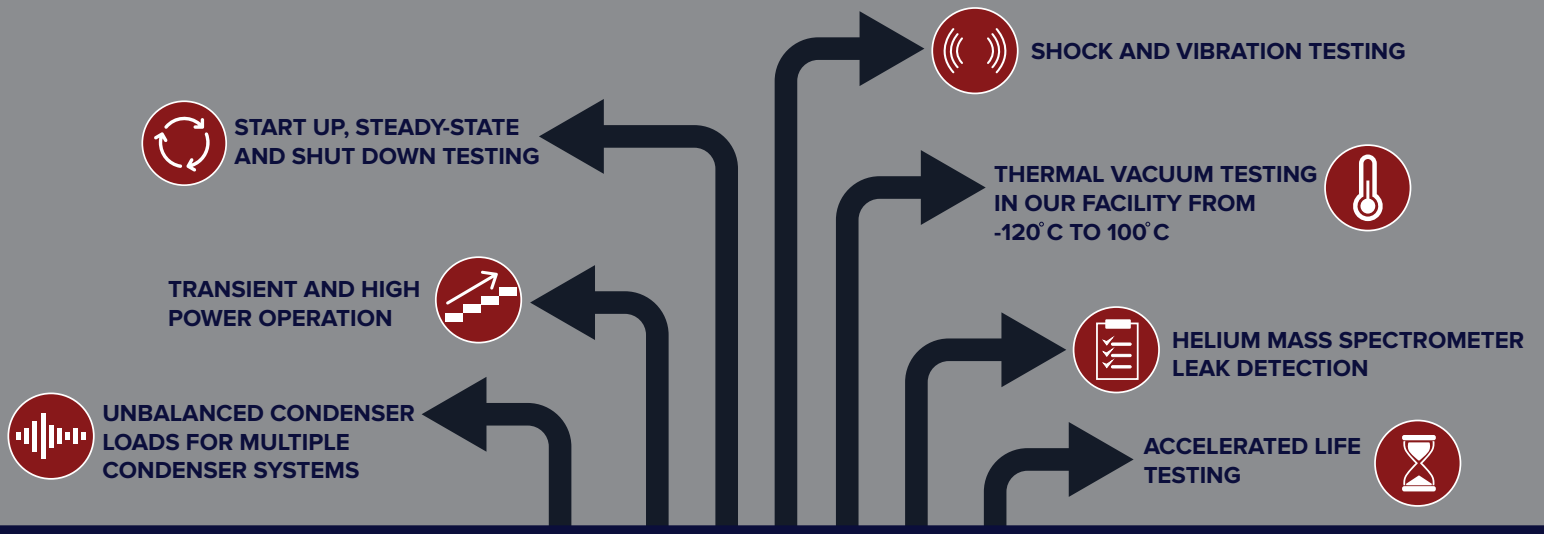


Commercial software packages are also used in the design process, performing:

- Stress analysis for launch and acceleration stresses
- Computational fluid dynamics for complex fluid flows
- Finite element analysis for full thermal analysis

TESTING AND QUALIFICATION

Flight hardware is tested and qualified throughout production and prior to delivery to ensure the highest possible quality.



PRODUCTION FACILITY AND PROCESSES

Complete U.S. based testing, production and delivery

Specialized processes to test LHP evaporators and condensers before final assembly, meeting production milestones and ensuring on-time delivery of completed hardware.

ACT routinely delivers thermal control hardware for space, aviation and ground-based applications.

COMMITMENT TO QUALITY

- AS9100 & ISO 9001 Certified Quality Systems
- AWS D17.1 Fusion Welding Certified Personnel for Aerospace Applications
- In-House Radiography Weld Inspection
- Full Material Certification & Documentation
- On-Time Delivery