FoamPipe

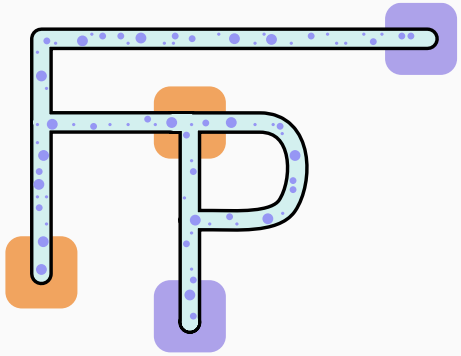
Foam-based heat pipes for cooling electronic components in space

STATUS QUO

Heat pipes are used worldwide as efficient and passive heat transport systems. Their performance relies on an internal capillary structure, which, however, only allows simple geometries without branching, since any interruption of the structure causes the transport mechanism to fail. For applications with more complex geometries in space, only elaborate pumped systems have been available so far.

OUR TECHNOLOGY

With FoamPipe, we have developed a novel thermal management system that replaces the conventional capillary structure of a heat pipe with a self-forming liquid foam. This foam is generated inside the pipe by adding surfactants and, for the first time, enables complex, branched geometries with multiple heat sources and sinks. As a result, heat transport becomes more flexible, lighter, and more reliable – especially in microgravity. In addition, FoamPipe offers potential for more cost-efficient manufacturing and for use in terrestrial applications.



BENEFITS

- ► Branched heat transport systems possible
- ► Use without complex manufacturing structures
- ► Reliable even in microgravity

APPLICATION POSSIBILITIES

The approach can be used to realize thermal management systems with complex geometries that efficiently connect multiple heat sources and sinks, and can be applied both in space applications and in the cooling of high-performance electronics.

COMMERCIALIZATION OPPORTUNITIES

There are various possibilities for cooperation between the industrial partner and TU Darmstadt: from an exchange with the know-how carriers of the technology up to a close cooperation in case of further development needs. The technology is protected by intellectual property rights and can be used by the industry partner after a sale or licensing agreement.

CURRENT STAGE OF DEVELOPMENT TECHNOLOGY READINESS LEVEL (TRL)

9	Product ready to launch
8	
7	Prototype
6	
5	
4	
3	**Proof of Concept**
2	
1	Idea

The development is at Level 3:
The physical process has already been demonstrated. A test rig for performance diagnostics under different conditions is currently being set up

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