

# Thermal Simulation of a Heat Pipe Tempered Injection Mould

S. Kartelmeyer<sup>1</sup>, L. Fromme<sup>1</sup>, V. Hüttemann<sup>1</sup>, E. Moritzer<sup>2</sup>, C. Jaroschek<sup>1</sup>

<sup>1</sup>University of Applied Sciences Bielefeld, Faculty of Engineering and Mathematics, Bielefeld, Germany

<sup>2</sup>Paderborn University, Department of Plastics Engineering (KTP), Paderborn, Germany

**Introduction:** A heat pipe tempered injection-mould [Fig.1] is simulated in COMSOL<sup>®</sup> and validated through a real life experiment. The heat pipes are measured in a specific test-stand and implemented as “black-boxes” [1]

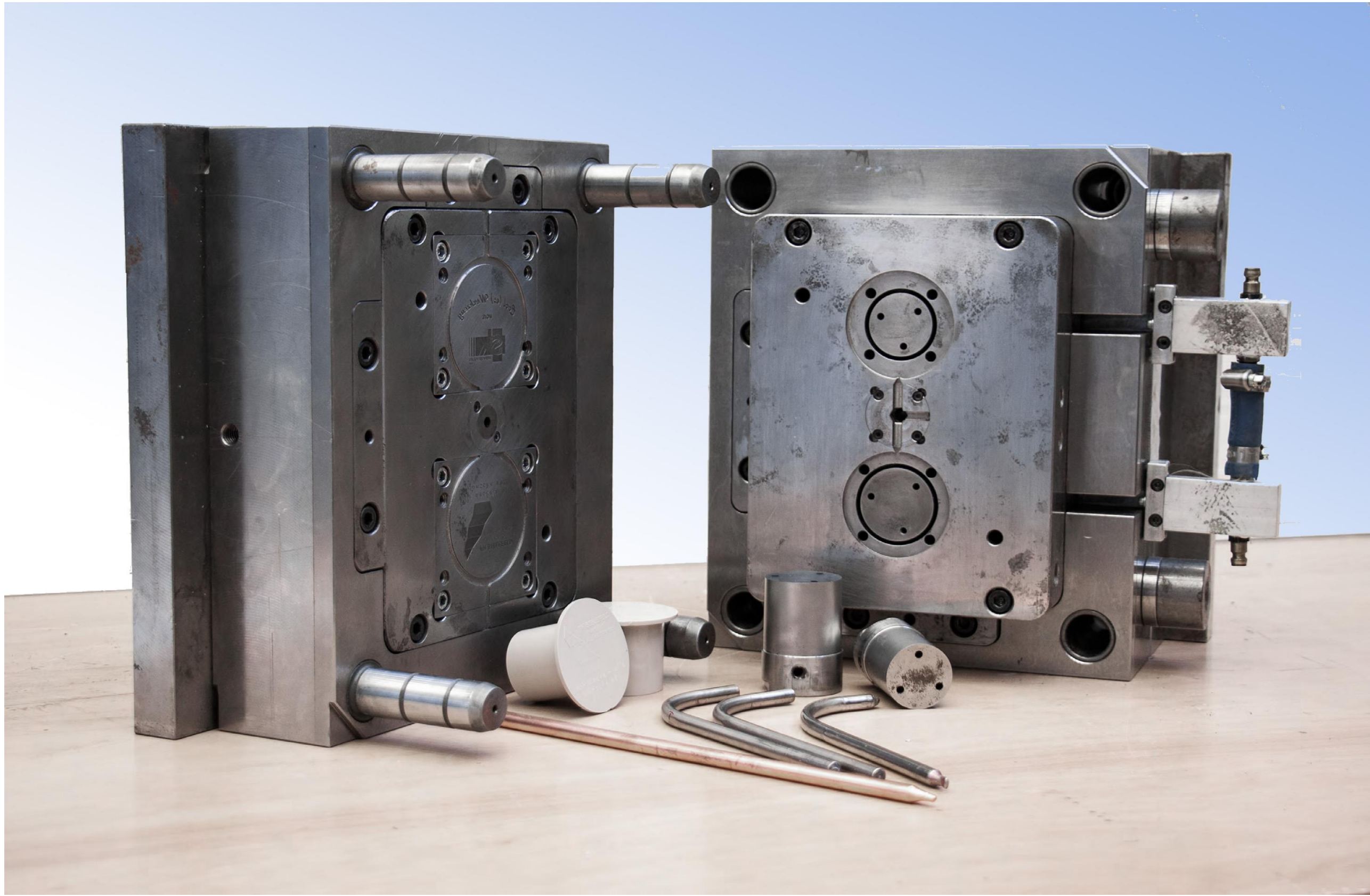


Figure 1. heat pipe injection-mould

**Computational Methods:** Heat pipes transferring energy through latent heat of evaporation and condensation. The FH Bielefeld uses a own designed test-stand to measure the heat transfer capacity of each heat pipe and put them out in a 3D plot [Fig.2]. The function behind the plot is implemented in COMSOL<sup>®</sup> and simulate the effects a heat pipe would have on its surroundings [2].

**Results:** The 3D plots represent the behavior of the heat pipes very well. The heat flux can even be used to heat the mold in the beginning as well as to cool. The temperature plot [Fig.3] shows a heating process for 1300s and a cyclical injection process of 150 parts with the heat pipes as cooling elements. The comparison to experimentally evaluated temperatures show only a slight deviation.

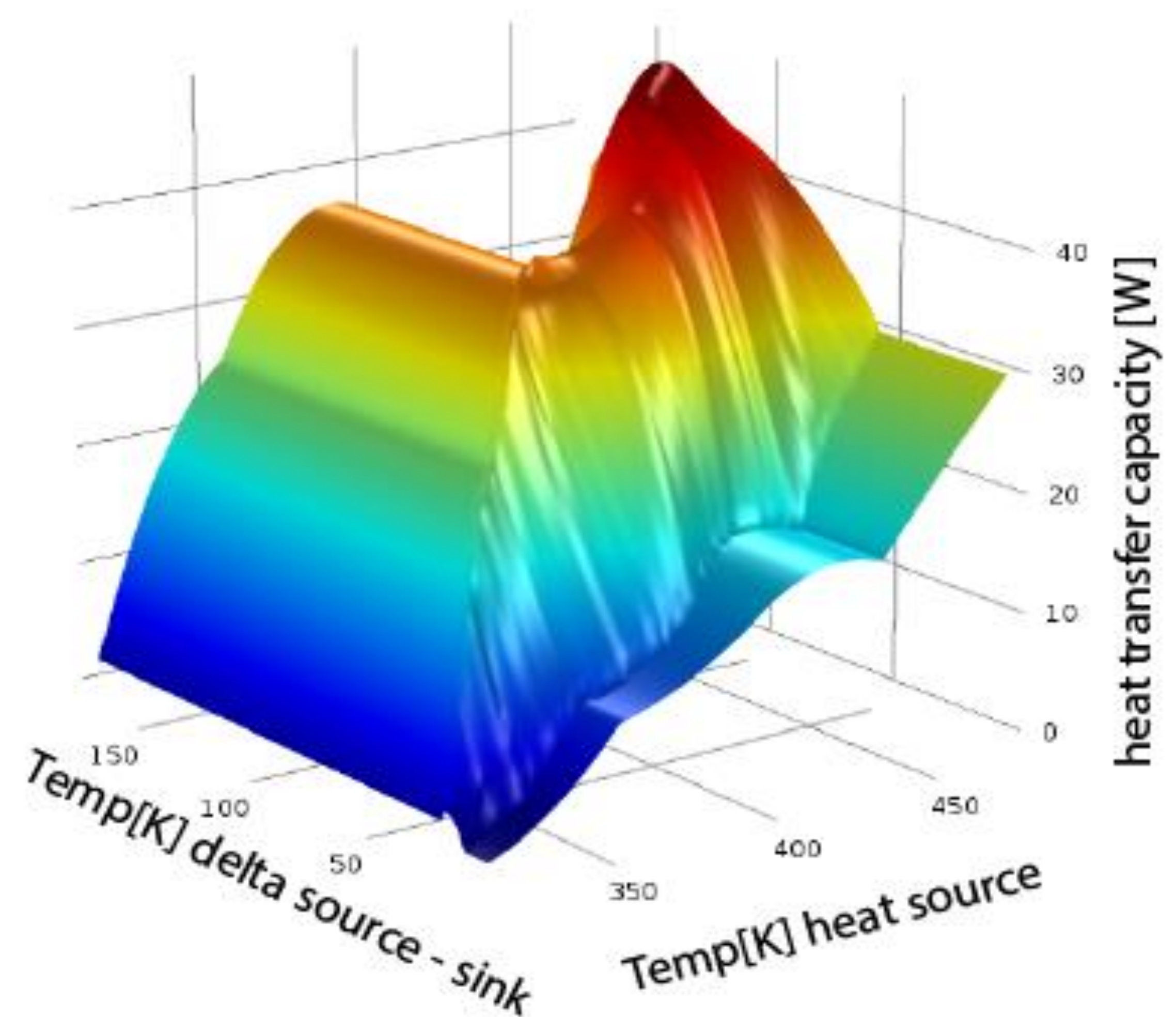


Figure 2. heat pipe 3D plot

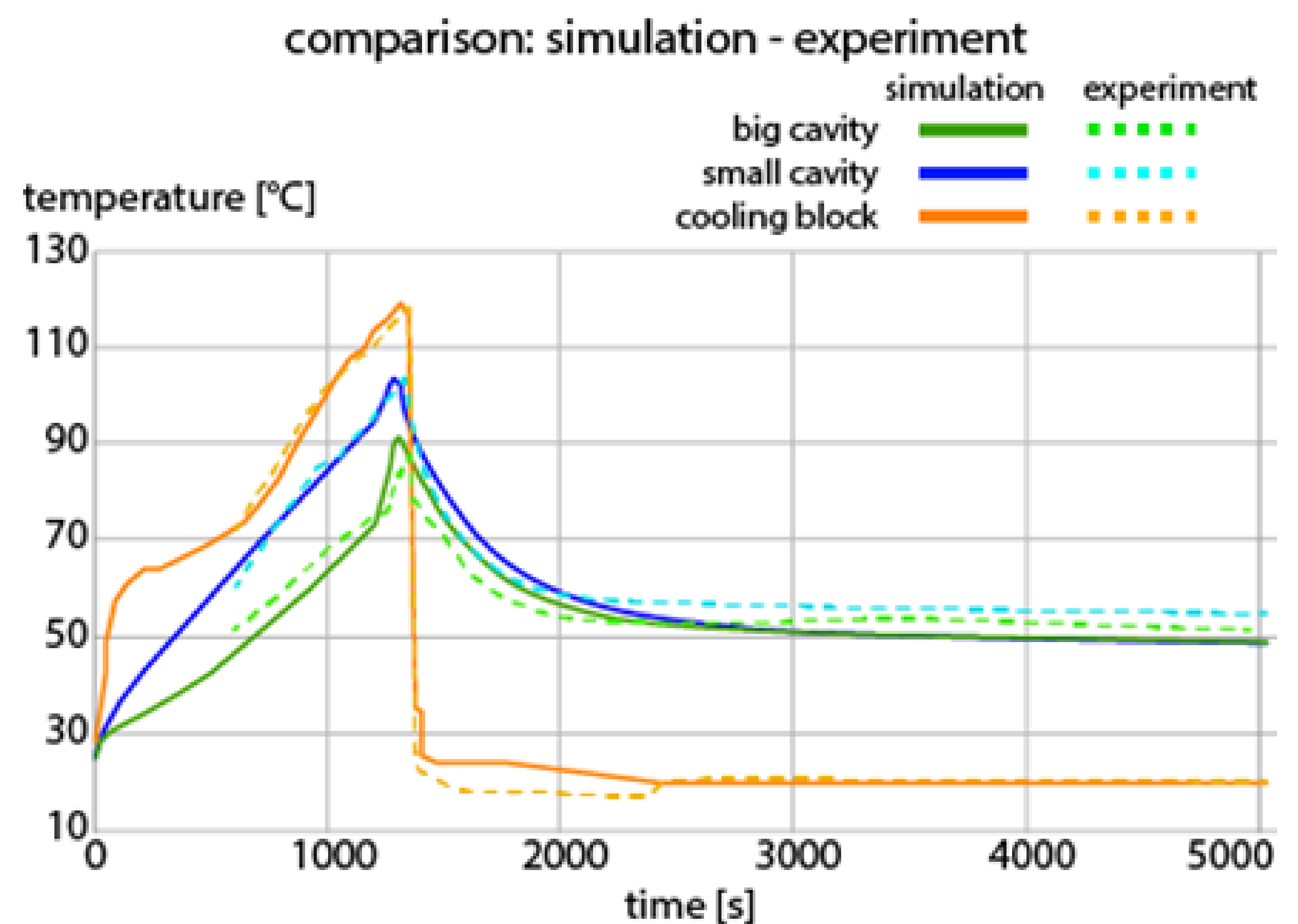


Figure 3. temperature-time diagram

**Conclusions:** By simulating the heat pipes as “black-boxes” its much easier to work with heat pipes in heat transfer simulations. Thermal management scenarios with heat pipes can now be simulated more efficient as no vapour processes need to be calculated. Bringing heat pipes to a wider audience.

## References:

1. S. Kartelmeyer, C. Jaroschek und E. Moritzer, „Temperieren ohne Wasser - Einsatz von Heatpipes in Spritzgießwerkzeugen,“ *VDWF im Dialog* , pp. 20-25, 04 (2018)
2. C. Jaroschek, S. Kartelmeyer und V. Hüttemann, „No Cool Molds - Properly Simulated,“ *Kunststoffe*, pp. 30-33, 08 (2017)