

# Numerical Analysis of Copper Heat Sink with Different Micro Pin Fins

S. V. Jadhav<sup>1</sup>, Dr. P. M. Pawar<sup>1</sup>

1. SVERI's College of Engineering, Pandharpur, Maharashtra, India

**Introduction:** Micro heat sink is the solution for cooling of the modern high heat flux microelectronic components.. Different microstructures in form of micro pin fins, when introduced into the channels of the heat sink, enhance their heat transfer performance.

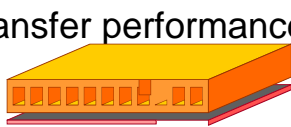


Figure 1. Heat sink



Figure 2. copper heat sink

**Computational Methods:** A Numerical analysis is done for the copper heat sinks with square, circular and elliptical pin fins in their channels and compared with heat sink without fins in terms of their heat transfer and pressure drops performance.

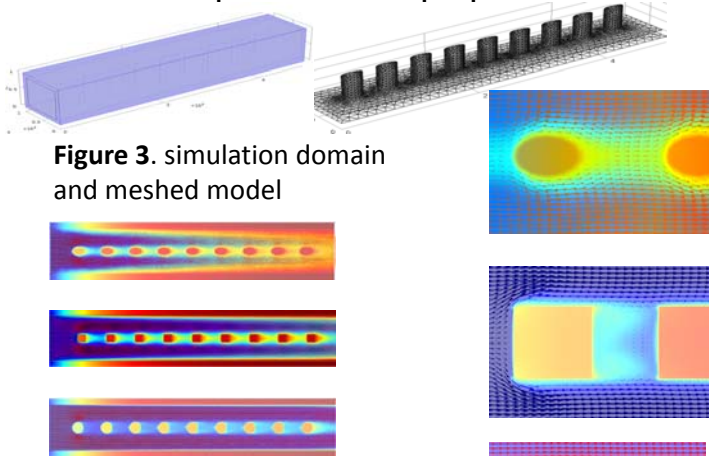


Figure 3. simulation domain and meshed model

**Figure 4.** Temperature colour change and arrow velocity fields in the channel for Elliptic, square and circular fins.

**Results:** Here the effect of fin height and shapes are studied. Simulation done using same heat transfer area in channels.

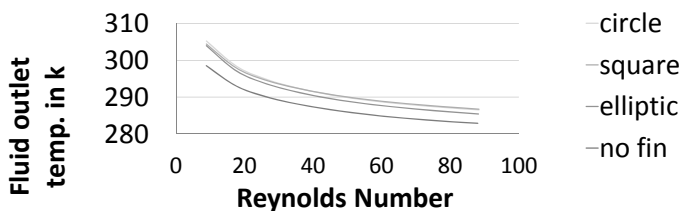


Figure 5. Outlet Temp. with different type of fins

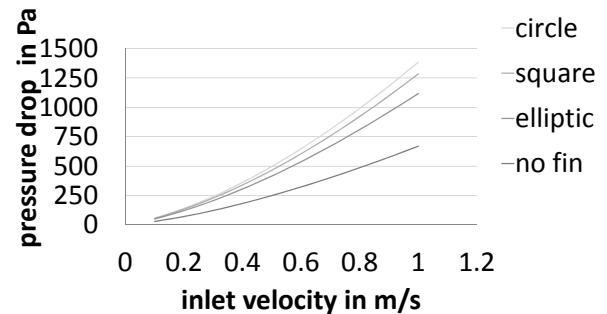


Figure 6. Pressure drop with different type of fins

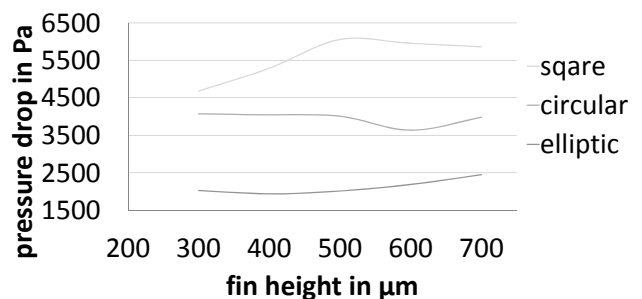


Figure 7. Effect of height on outlet temperature

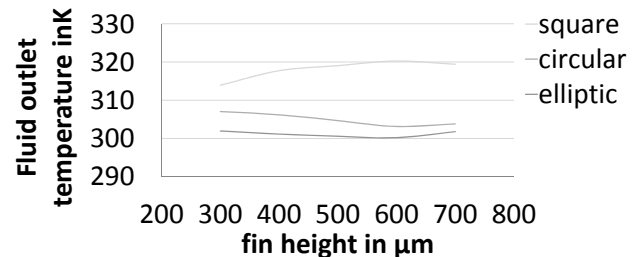


Figure 8. Effect of height on outlet temperature

**Conclusions:** Finned heat sink perform better than unfinned one, but with pressure drop penalty. Elliptical fins perform better than other types with respect to pressure drop but lags in heat transfer. Fin size and fin shapes effect the performance.

## References:

- 1) Peng et al., "Convective heat transfer and flow friction for water flow in microchannel structure", I. J. M. T. (1996), pp.2599–2608.
- 2) Kandlikar et.al. "Evaluation of single phase flow in microchannels for high flux chip cooling- thermohydraulic performance enhancement and fabrication tech.", ASME conference, New York(2004),pp.67–76