Intel benchmarks CFD codes on new design

Accurate thermal predictions are critical during new product development because they impact product design, schedule, and cost. During an Intel benchmark of CFD codes, Coolit consistently delivered superior accuracy with predictions to within 5% of experiment.

Benchmarking was performed at an Intel lab and involved a confidential new product. Two cooling systems with different forced airflow patterns were evaluated. Both flow configurations were assumed laminar. Thermal parameters of the components and boards were taken from respective vendors. Only main heat dissipating components were assessed in this study: the main chip and DDRs.

The predicted DDR temperatures were fairly close for both CFD packages, with Coolit predicting somewhat cooler temperatures.

DDR	Predictions for Flow Pattern - 1		Predictions for Flow Pattern - 2	
	Coolit (deg C)	CFD#2 (deg C)	Coolit (deg C)	CFD#2 (deg C)
#1	88.4	90.2	74.0	80.0
#2	89.9	90.6	76.0	80.0
#3	90.5	90.8	77.3	79.8
#4	90.1	90.7	77.8	79.3
#5	88.8	90.4	77.7	78.6

Since the DDRs' predicted temperatures were close, initially only one measurement was done: DDR#4 for Flow Pattern 2 was measured at 73.9C vs. 77.8C predicted by Coolit and 79.3C predicted by the CFD code #2.

With the main chip dissipating much more heat than a DDR, CFD prediction discrepancies came to the fore. For Flow Pattern 1, Coolit predicted 109.4C and for Flow Pattern 2, 103.1C, both well within the main chip's temperature maximum of 115.0C. Meanwhile, the CFD#2 software forecasted a temperature of 115.0C and 139.7C, respectively. The actual (measured) temperature obtained for Flow Pattern 2 turned out to be 98.7 C – just a few degrees away from the Coolit prediction of 103.1C and 41C below the CFD#2's prediction of 139.7C.

The benchmark test not only confirmed the accuracy of Coolit's predictions, but also demonstrated the software's excellent performance in analyzing complex designs. The results identified the optimum airflow design and confirmed that both designs would not exceed their temperature limits.