Review of: "Cooling Beer With a Wet Paper Towel"

Navneet Kumar[1]

1 Indian Institute of Technology Jammu

Potential competing interests: No potential competing interests to declare.

The authors explore the use of a seemingly well-known practice, i.e., a wet paper towel wrapped around a beer bottle, at three different convection levels. The experiments were quite simple to construct and the manuscript is written in good sequence.

The following concerns are noted,

1. Which type of thermocouples were used in the study and how were they calibrated? Did authors use only 1 thermocouple (4 mm away from the bottle) for temperature measurement in air; that will not yield radial spatial distribution unless the thermocouple is traversed quickly? A convection-type constant temperature bath could have been used to figure out the accuracy. The authors have compared thermocouple measurements with their own average and the data show in the manuscript may mean that either all are acceptable or no one is.
2. A schematic showing the bottle geometry and the locations of the thermocouples can be added for better readability.
3. Temperature distribution on the cardboard measured by IR camera is due to heat that is conducted from the hotter beer bottle. Without the cardboard, IR camera can not any convective motion in air since air is mostly transparent to almost all the radiations. Yes, with water droplets in the freezer, the IR camera may see some surface where it can measure some temperature but that still is not trustworthy.
4. Numerical model : (a) grid spacing of 0.254cm is still not enough to resolve the thermal boundary layer in the air, it should have been one-tenth of what was used, (b) far from the bottle, constantly increasing grid spacing could have been used, (c) what was the time step chosen to solve the discretized equation?
5. The numerical model is not capturing an important physics. Imagine that the beer bottle is hotter and is put in the freezer. After some time, beer in contact with the glass bottle becomes relatively colder compared to the bulk beer. Due to this, now, there is a density contrast within beer (inside the bottle). Given the size of the bottle used, this density difference seems to be sufficient to induce free convection inside the bulk beer and that would reduce the time taken (in the model) to reach the desirable drinking temperature zone. The authors may include this missing physics in their model.

Apart from the above concerns, the study is quite nicely arranged and expectedly, high wind speed takes lesser time to cool a beer bottle to reach a desirable drinking temperature zone.