Does a tea cosy keep the tea hot longer?

QUESTION: In our lunchroom we usually put a tea cosy over the teapot to keep it warm. Does the tea cosy really do any good or are we just imagining it?

Olov L

ANSWER: The easiest way to find this out is to take the specific teapot and measure the tea's temperature drop after a specified time with and without the tea cosy. Just before taking the reading you must stir the liquid so that you measure an average temperature.

Most of the heat transfer from the liquid to the teapot's surroundings occurs via the teapot wall where there is liquid inside. Here natural convection occurs between the liquid and the teapot wall and then there is thermal conduction inside the wall. On the outside surface of the teapot there is natural convection in the air and radiation into the room. The thermal resistance between the liquid and the wall, and the resistance inside the teapot wall are small compared with the thermal resistance between the teapot's outside surface and the surroundings. The result is that the teapot wall in this area and the liquid have about the same temperature.

Some heat transfer also happens via the teapot lid to the surroundings and from the teapot bottom to the table. The heat flow from the liquid to the inside of the lid occurs by natural convection and radiation in the layer of air above the liquid. The thermal resistance between the liquid and surroundings via the air inside the teapot and lid is higher than the resistance between the liquid and surroundings via the teapot wall. The result is a lower heat flow per unit area.

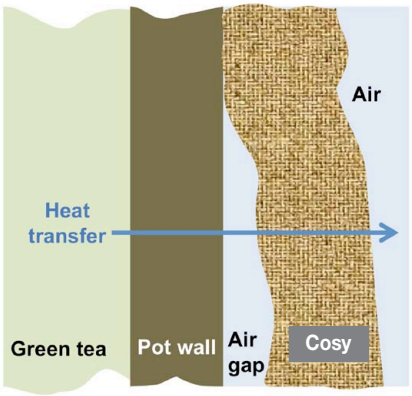
The tea cosy's wall contains a fluffy material with low thermal conductivity. When you put the tea cosy onto the teapot, this increases the thermal resistance on the outside of the teapot, reduces the heat flow, and thereby also reduces the cooling-off speed. When there is an air layer between the teapot and the inside of the tea cosy, the thermal resistance is increased further. Within this air layer, the heat transfer occurs mainly via radiation and thermal conduction in the air.

Questions should be of general interest and be about temperature measurement techniques and/or heat transfer.

QUESTIONS ANSWERS

From the bottom of the teapot to the table, the heat transfer occurs via conduction. Normally the teapot bottom is not entirely flat and an air gap exists between most of the teapot bottom and the table. In this space, the heat transfer occurs via radiation and thermal conduction in the air. By putting the teapot on a heat-insulated mat, for instance made of cork, you can further reduce the heat flow.

An example: For a small pottery teapot that contains 0.8 litres and stands on an insulated mat at a room temperature of 22 °C, the tea temperature falls in 15 minutes from 90 °C to 78 °C with a tea cosy. Without a tea cosy, the liquid becomes 4 °C cooler.



Heat transfer from the tea to the surroundings of a teapot with a tea cosy.

Tests using Pentronic's 0.8 litre teapot with tea cosy reveal that the temperature drops from 90 °C to 78 °C in 15 minutes. Without the tea cosy the temperature drops a further 4 °C.

Dirty thermowell

A dirty protection tube with the associated temperature sensor behaves in thermal terms in the same way as a teapot with a tea cosy. The temperature sensor and the tea respectively acquire a longer response time. In the case of the teapot this is desirable but for temperature sensors normally the reverse is true.

If you have questions or comments, contact Dan Loyd, LiTH, dan.loyd@liu.se