Design of experiment - exploring the boiling time of water with different parameters

Espen J. Velsvik and Anders O. Voldsund

March 28, 2014

Introduction

In a world where the electric kettles are in a dominant position for heating water for your daily afternoon tea, the amount of people using cooking pots are dropping, with good reason. The superiority of the electric kettles when it comes to time usage, is well established.

If you are one of those that still use a cooking pot for heating water, we aim to give you the answers for what can be done about the problem. Don't be one of those people wasting time heating water when you instead could have taken dance lessons or learned a new language. Sure it won't be the same as electric kettles, but still, time is valuable in today's society.

Although a lot of people heat the water without a lid, it is known that it heats faster with one. We think this will indeed affect the results. Besides that we feel there are few established "myths" when it comes to what affects the time for boiling water.

In this project we want to study how different parameters affects the boiling time of water when using a cooking pot. If we can figure out the best way of boiling water efficiently, we finally have time to complete the great works of Henrik Ibsen that we have been longing to do.

Selection of factors and levels

We have chosen four factors that we think will be relevant to the problem. The first factor is with or without a lid, while the second is with a small pot or a large pot. Notice that the size of the cooking plate is not the same for the pot sizes. The large pot was set on a large cooking plate, while the small pot was on a small cooking plate.

The third factor was with or without a pine oil based soap, while the fourth was with or without olive oil. We were unsure of how the two last factors would affect the boiling time individually, but we had a hope that the interaction between them would be significant. As olive oil is non polar, it doesn't mix with water. It will, however, mix if the soap is added. We suspected that the olive oil would increase the boiling time because it would affect the surface tension of the water, and maybe make it harder for the water to evaporate, hence delaying the boiling state.