

Quantification of contact pressure at tamper of espresso-grind coffee

1 Introduction

While making espresso one may observe that there are external factors which may influence the extraction of the coffee. On the other hand such factors can be compensated. One well-known factors is the humidity - you can compensate it by either adjusting the grind or by changing the contact-pressure while compressing the coffee. The goal of this abstract is to quantify the contact-pressure dependent on the humidity of the air.

2 Theory

First of all, we will not directly measure the contact-pressure, but we will measure the peak-force F which is applied to the coffee while compressing. This carried out by using a simple kitchen-scale on which the compression takes place so that we will measure the change of mass through the compression. We will receive the applied force F by using

$$F = m \cdot g \tag{1}$$

Before the espresso is extracted, we will measure the air-humidity, and right after the coffee is extracted, it is rated with a score $Q \in \{1, 2, 3\}$, where 1 = "bad", 2 = "normal", 3 = "good". Further we will only use the data where $Q = 3$, since we want to only consume good espresso. The results will be plotted and thus a characteristic $f(h)$ is received, where h is the air-humidity $h \in [0; 1]$.

This characteristic will be normalized on a scale of 0 to 1 such that there is no direct link between the curve and the measured force. But the force can be calculated via

$$F_A = \varepsilon \cdot f(h) \tag{2}$$

ε is a factor dependent on the used machine M and grade $M \in [0; 1]$: $\varepsilon = f(E, M)$. This factor can be roughly approximated by the following equation, and needs to be evaluated for the desired grind and machine. With that the contact-pressure for a "good" espresso can be calculated for every machine.

$$\varepsilon = \frac{1}{100} \cdot M\rho \tag{3}$$

3 Measurements

The measurements will be taken and rated independently twice at the same time. This was done over a period of XXXX days where the minimal air-humidity was XXXX and the maximum XXXX. The results read the following:

tba

4 Evaluation

tba

5 Conclusion

tba