

The Kaye Effect

Natalia Puczek

Supervisor: Urszula Woźnikowska-Bezak

II Liceum Ogólnokształcące im. Adama Mickiewicza in Racibórz

Creative Group QUARK, The Youth Palace in Katowice, Poland; email: puczeknatalia@icloud.com

1. Introduction

The Kaye Effect is a phenomenon which was first described by Alan Kaye in 1963. When a thin stream of shear-thinning fluid is poured onto a flat surface we can observe the stream occasionally leap out of the formed heap. It lasts no longer than a second, so in order to investigate it I used a slow motion camera. I have studied the phenomenon to see its dependence on different parameters using an appropriate experimental setup.

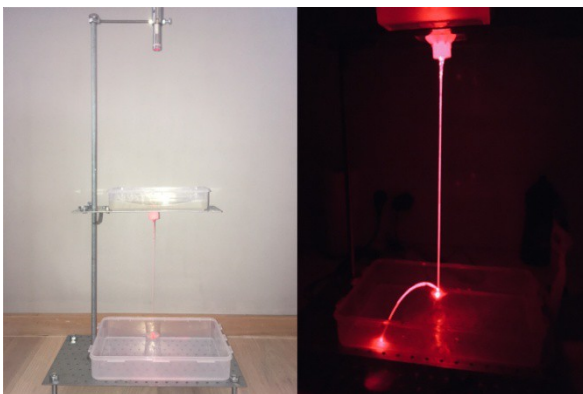
2. Theoretical part

I am using soap solutions which are shear-thinning. The Kaye effect occurs due to the differences in viscosities between a stream and a formed heap. When a stream hits a heap diagonally it jumps out of it due to great shearing forces. When the outgoing stream finally hits the ingoing one, it is disrupted and the phenomenon ends. Quantities used to describe this phenomenon are:

- viscosity and shear rate of fluid
- velocities of primary and secondary jets
- dependence of different parameters describing the phenomenon in regard to temperature etc.

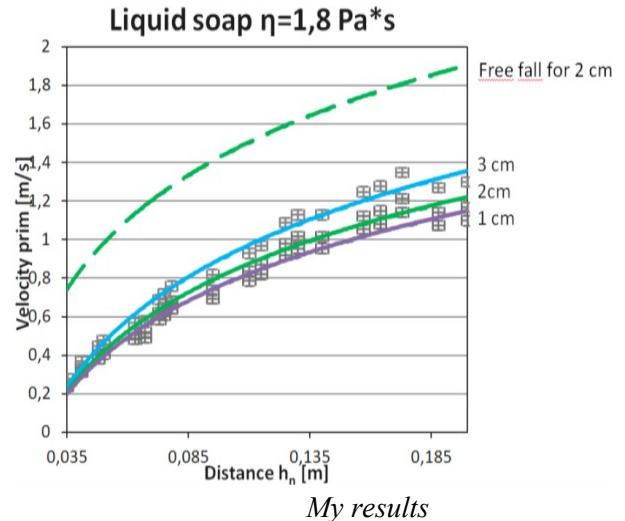
3. Experimental part

I have developed an appropriate setup which allowed me to investigate this effect for different parameters like distance from repository and temperature of fluid



My own measurements

I have shown my results in charts:



4. Conclusion

It was proved that velocity of primary jet increases with increasing fill height of repository, shampoo does not follow the rules of free fall and that the distance from repository has to be increased with increasing the temperature. Moreover, for fluids with higher viscosities distance has to be lowered. In further research I have proved that there is no change of mass between the stream and the heap and the jet reaches much further than it would with a classic inclined throw.

5. References

- [1] The Kaye Effect J M Binder and A J Landig 2009 Eur. J. Phys. 30 S115
- [2] Leaping shampoo and the stable Kaye effect Michel Versluis et al J. Stat. Mech. (2006) P07007
- [3] Rodeo in a Petrie dish Laurent Courbin et al J. Stat. Mech. (2006) N10001
- [4] https://en.wikipedia.org/wiki/Kaye_effect Kaye effect
- [5] <https://skullsinthestars.com/2013/03/29/physics-demonstrations-a-short-discussion-of-the-kaye-effect/>

