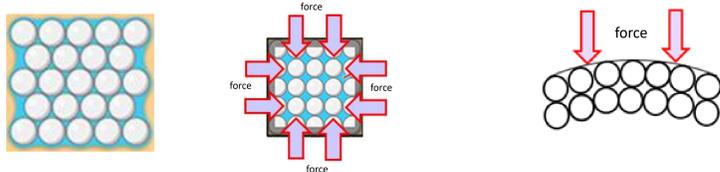


1. What is a dilatant fluid?

- Dilatancy refers to the property of a fluid behaving solidly for rapid deformation and behaving like a liquid for slow deformation. A common dilatant fluid is Oobleck, which can be made from water and potato starch, and also be described as a non-Newtonian fluid.
- The principle of dilatancy in Oobleck is that when a force is applied to starch particles from the outside, the gap between the particles increases and water on the surface moves inside. As a result, the starch particles are pressed together, and the medium solidifies to support the arch structure of starch particles.



2. Research objective

- Hit iron ball A against iron ball B while it is submerged in the solvent and look up how much of the impact was relieved by the solvent's resistance.

3. Hypothesis

- Less force would be detected when dropping the iron ball into dilatant fluid compared to dropping it into water.
- The higher you drop the iron ball, the smaller the effect the dilatant fluid will have on the ball.
- The longer the distance between iron ball B and top of water or fluid, the smaller the resultant impact will be in water or dilatant fluid.

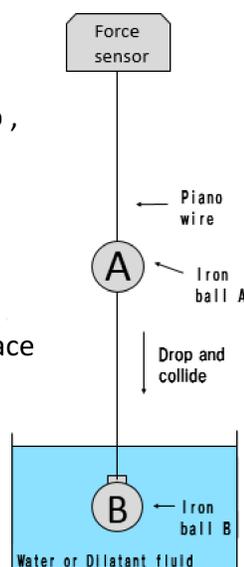
4. Experiment

<Apparatus>

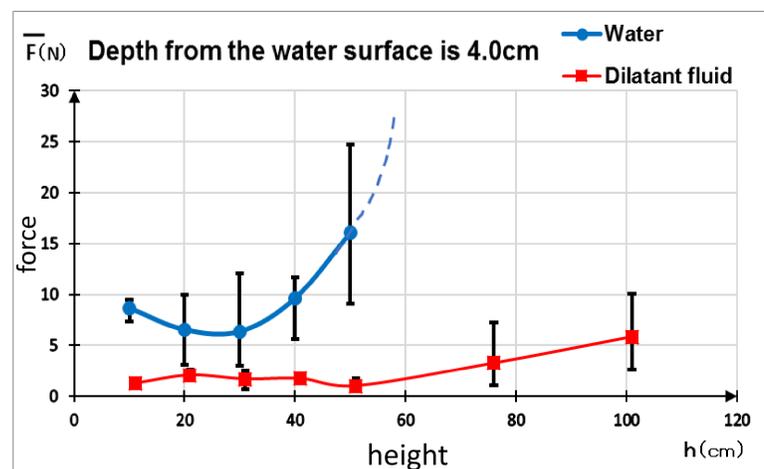
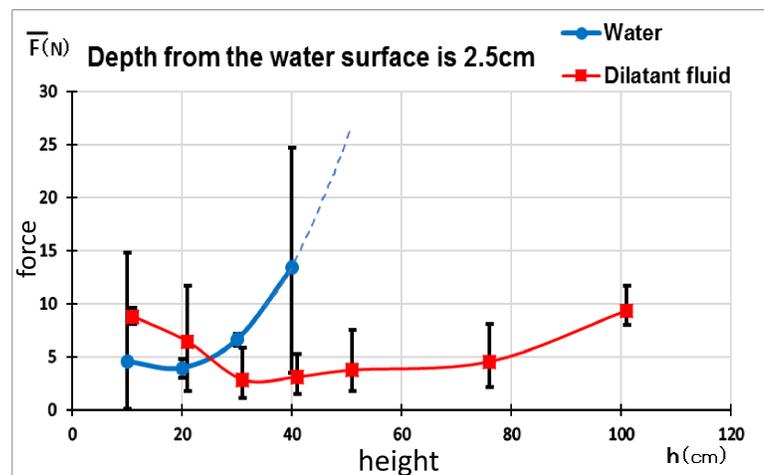
- Water • Potato starch • Container
- Two iron balls • Force sensor that can measure to 50 N
- Easy Sense • Piano wire

<Experiment method>

- The container was filled with 3 liters of water.
 - Sink iron ball B by 2.5 cm.
 - Drop iron ball A from different heights, namely 10cm, 20cm, 30cm, 40cm above the top, surface of the water and hit iron ball B.
 - The maximum force and average force were measured with the force sensor.
 - Set the depth of iron ball B from the water surface to 4.0 cm and repeat ③ and ④.
 - Change water to dilatant fluid and repeat ③, ④ and ⑤.
- ※ For dilatant fluid, drop iron ball A from 50 cm, 75 cm and 100 cm instead.



5. Result



6. Consideration

The magnitude of the force changes depending on where the iron ball A collided.

The error span of the dilatant fluid is relatively smaller than that of water.

<The graph of the results of 2.5 cm depth dilatant fluid>

The force decreases when you drop the ball from a height of 10 to 30 cm.

→ The dilatant fluid acts like a liquid because the ball's impact was small.

7. Summary

- The dilatant fluid absorbs more impact than the water.
- The higher you drop a ball, the greater the amount of absorbed impact by dilatant fluid.
- Impact becomes smaller when the depth of ball B is greater.

8. Future recommendations

- Increase the number of experiments.
- Use flour instead of potato starch.

References

- Chiba Prefectural Funabashi High School. (2016). https://www.chiba-c.ed.jp/funako/fttp_kousin/ssh/reserch/kaken.html
- Nakanishi, H. Kyushu University. (2011). *Dilatancy*. *Dilatancy Gensho no Himitsu*. <https://www.ctv.co.jp/hapiene/program/20180331/index.html>