



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

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Project Title Quick Stop: Shear Thickening Properties of Oobleck	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment was to test how the concentration of cornstarch and water, Oobleck affects its shear thickening properties. It was hypothesized that a 75% solution would prevent the penetration of a standard hammer head.</p> <p>Methods/Materials The hypothesis was tested using a constant force projectile, a "Hammer-Tron", impacting various concentrations of Oobleck, using various projectile heads. One cup samples were made between 0%-100% concentrations of cornstarch, Samples were tested multiple times at constant force and angle of impact. Preliminary results prompted additional focus samples at concentrations between 68%-74%.</p> <p>Results Testing results showed that as the concentration of cornstarch increased, projectile penetration decreased. The original hypothesis was disproved. At 68% concentration, shear thickening properties were limiting penetration. At 72%, there was no penetration by the hammer. The multiple impact heads changed the pressure but not the impact force, giving more visibility to the Oobleck's shear thickening properties.</p> <p>Conclusions/Discussion The results showed that as the concentration of cornstarch increased, projectile penetration decreased, with no penetration recorded 72%. Some of the challenges of Oobleck solutions are keeping the cornstarch suspended in solution as it falls out of solution easily (colloidal suspension). Future studies may be improved by the addition of an emulsifier. This would also require viscosity testing to measure effect of emulsifier addition. Shear thickening properties are rare, so studying Oobleck and it's properties may lead to improvements in technology. It is the ability of this fluid to respond proportionally to shear forces which could make it a good design option for safety applications. Possible applications may include power transmission media, military impact protection gear, vehicle safety equipment and/or breaking fluid.</p>	
Summary Statement The purpose of this experiment was to determine at what concentration of cornstarch, Oobleck's shear thickening properties would stop the penetration of a hammer.	
Help Received My mother helped assemble board, some typing and proof-reading report. My father helped with the photography and experiment materials. They both helping me practice being judged.	