CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Lyra Alers

Project Number

J0301

Project Title

Reuse of Plastic Waste in Concrete Bricks

Abstract

Objectives

The point of this project is to see which type of plastic is best for replacing gravel in making concrete bricks. This can reduce the amount of plastic that ends up on in landfills. America has been transporting most of its waste plastic to China, but recently, China has stopped taking it. So we have no place to send our plastic trash other than landfills.

Methods

Standard concrete is a composite of portland cement, sand and gravel. This experiment replaced the gravel with different types of plastics chosen from the top 10 list of plastic trash. The five types of plastic trash tested were bottles, lids, straws, shopping bags and trash bags. Bricks were formed by mixing cement, sand and cut up plastic. The cured bricks were then tested for density, water adsorption, cracking-strength and drop-strength.

Results

The different type of plastic used changed the brick properties by a major amount. The control brick could hold the most amount of weight in the middle (85 pounds)relative to the plastic containing bricks where the bottle cap brick and the straw-made brick tied at 62 pounds. The least amount of water adsorption was the beverage bottle brick, gaining only 2.7 grams relative to the control brick, gaining 4.8 grams. The brick that got to the highest point in the drop test was the bottle caps brick, not breaking until it was dropped from 9 ft. The control brick and others broke with a 7 ft drop or less.

Conclusions

My experiment tested bricks made out of different plastics to see which would be the best relative to a standard concrete brick. Many different tests were performed including seeing how much weight it could handle, how much water is absorbed and how it can handle being dropped. My hypothesis was that bottle cap-made bricks will do the best in most tests because the bottle caps seemed the strongest plastic and when broken down seemed to mimic the gravel in the control brick the best. It ended up doing well in most tests. Out of the plastic-made bricks, the bottle cap made brick ended up being the best for strength in general, while the beverage bottle bricks were the best in absorbing the least amount of water and performed well in the drop test.

Summary Statement

Plastics waste can be used to replace gravel in concrete resulting in better concrete properties for some applications.

Help Received

I want to acknowledge my dad who helped with the cutting of the plastics and testing the bricks.