

OBJECTIVES

1. Demonstrate the effects of changing a liquid to a gas
2. Understand effects of changing air pressure

BACKGROUND INFORMATION

There are many ways you can crush a can, with your foot, your hand etc. This experiment shows how you can crush a can without even touching it, just using the science of liquid, gases and air pressure. Once you have crushed the can so if you can remove the dents using dry ice.

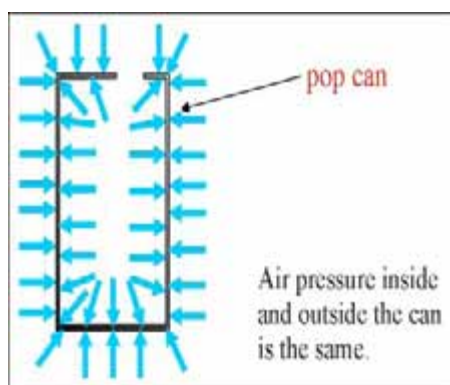


Diagram: pressure exerted inside and outside the can².

An open can contains air at the same temperature and pressure as the atmosphere. That is, air molecules collide with the inside and the outside walls of the can and exert equal amounts of pressure there.

By boiling the water in the bottom of the can the water changes from a state of liquid to one of gas called water vapor. At this stage, the hole in the top of the can keeps the pressure balanced with the atmospheric pressure.

When the can is turned upside down into the cool water the water vapor condenses turning back into water. Water molecules in the liquid state are much closer together than those in the gas state.

Therefore when the gas converted back to liquid the liquid no

longer occupied as much space in the can and had little force exerted on the inside of the can. Instead the air pressure from the outside exerted pressure on the outside of the can and the can imploded.

WHAT YOU NEED

- Empty soft drink can
- Stove or hot plate
- Metal tongs
- Gloves
- A bowl of cold water with ice

EXTENSION

- Dry ice
- Gloves

WHAT TO DO

1. Rinse the soft drink can of any left over soft drink.
2. Have the bowl of water ready and in the vicinity of the hot plate.
3. Place enough water in the can to cover the bottom (~2 tablespoons)
4. Put the can on the hot plate and stove and wait for the water to boil.
5. Once the water has boiled hold the tongs in your hand so that you palm is facing upwards, this will make it easier to submerge the can more quickly.

THE IMPLODING CAN

6. Place the tongs at the bottom of the can and remove from the heat, and as quickly and safely as you can turn the can upside down and plunge into the bowl of cold water.
7. Observe what happens to the can.
8. Slightly moisten the inside of the bottle with water or a little vegetable oil to help the egg glide in.
9. Light a strip of the paper and place flame down into the bottle.
10. Now quickly place the egg smaller side down on the top of the bottle sealing the air inside the bottle.
11. Watch what and listen to what happens.
12. Now to get the egg to come back out. Put on your oven gloves or use a tea towel to protect your hands as you are going to be heating the bottle with the heating gun.
13. Hold the bottle upside down and heat the bottle until the egg is less than half way out the opening of the bottle.
14. Now place the bottle right side up on the bench and see the egg push itself out of the bottle.

QUESTIONS

1. What happened to the water when you boiled it in the can? *The water turned from a liquid into a gas – water vapour.*
2. How did the can implode? *The sudden reduction in air pressure within the can caused the air pressure on the outside to crush the can.*

REAL WORLD APPLICATIONS OF AIR PRESSURE

Predicting weather: Atmospheric air pressure is measured to help forecast changes in weather.

Inflating tyres: Pressurised air is used to inflate tyres.

Paintball sport: Pressurised air is used to propel the paint pellets used in paintball.

CURRICULUM CONCEPTS ADDRESSED

Essential Learnings: Natural and processed materials

End of year 5

-Properties of materials are affected by processes of change.

End of year 7

-Physical change produces no new substances.

End of year 9

-Changes in physical properties of substances can be explained using the particle model.

RESOURCES USED TO DEVELOP THIS ACTIVITY

1. Gratton, L.M. and Oss, S. An Extension of the Imploding Can Demonstration. *The Physics Teacher*. 44, May 2006.
2. *Imploding pop can*. (n.d.) Retrieved November 11, 2008, from http://www.ap.smu.ca/demos/content/thermodynamics/imploding_pop_can/imploding_pop_can.html.