



Erupting Volcano

Completion time: 2 Lessons

Materials and Resources:

- Clay
- MDF baseboard, 1cm thickness
- Empty soda bottle
- Pillar drill and 2mm drill bit
- Baking soda
- Red food colouring
- Vinegar
- Formech vacuum forming machine
- Suitable plastic material (1.5mm ABS or HIPS recommended)
- <http://formech.com/case-studies/forming-lessons-oakland-high-school-illinois/>

Skills at a glance:

Mathematics

Measurement

Language

Listening skills, visual observation and asking questions

Thinking skills

Problem solving, independent thought

Science

Heating plastics and effects, plastic/polymer material knowledge, understanding chemical reactions

Project Outline:

As part of a Science, Geography, or a simple fun workshop based class, students can experience making their very own volcano that really erupts, spewing out red lava before their eyes. This eruption will be made using baking soda, vinegar, and food colouring. The volcano will be made by vacuum forming plastic over a large clay volcano mould, that is very quick and inexpensive to make. Students will explore vacuum forming basics, learn that making a mould doesn't always have to be a precise and meticulous task, as well as being able to explore the science behind the reaction that creates the eruption from inside. Most school projects that create erupting volcanos like this are made from papier-mâché and are only good for a small number of eruptions. This vacuum formed volcano will serve a class for as many eruptions as they want to create.

Method:

On an MDF baseboard that fits easily inside the forming area of the Formech vacuum forming machine, students can place a large block of clay, and mould it into a very rough cone shape. It will resemble a volcano shape right away.

Place an empty small soda bottle with its cap on, upside down at the rough peak of the clay, and push it down a third of the way into the clay material. Using both hands, continue to shape the clay to resemble a volcano, keeping the soda bottle just one third buried in the clay material. For a successful vacuum form, do not build the volcano higher than 6 inches tall.

When the volcano shape is complete, the soda bottle can be very gently twisted and removed from the clay material, leaving a crater in the middle. This crater can be neatened up by hand to smooth over where the bottle was removed. The clay mould can now be left to dry completely.

Having dried it is essential to apply a venting hole at the bottom of the crater, which pass all the way through both the clay material and the baseboard. This will allow adequate airflow through the mould during the vacuum forming process and encourage heated plastic material to form within the crater. This can be completed using a pillar drill and a 2mm drill bit.

Additional venting holes can be drilled through the baseboard, at the point where the clay meets the MDF material, at 3cm intervals

The vented mould can now be taken on its baseboard to the vacuum forming machine, and formed using suitable plastic material. HIPS or ABS is recommended.



Homework Tasks:

There are many ways to create an eruption from the volcano made in class, and baking soda and vinegar is just one of these. Students might be asked to research other ingredients that can be placed inside the crater of the volcano to create larger, slower, or even faster eruptions. They can treat this as a class wide experiment, with each student bringing new ideas to the table for what might work best. Together in class, they can test these approaches, and see which one they feel is the most impressive.

Optional Extras:

This project will give the class an interesting learning tool, which provides a classroom aid which is fun and engaging, and that opens up many discussions about both vacuum forming and the workings of volcanos. There is no reason why this plastic model can't be made to look even more realistic with the application of some acrylic paint, that truly represents a volcano's appearance. Using images online, students might paint the volcano to look as realistic as possible. Students may also be asked to research what it is about the combination of baking soda and vinegar that produces such a volatile eruption, combining elements of technology and science classes together.

Method: (Continued)

The clay material can now be removed carefully from the newly formed plastic volcano.

The vacuum formed volcano is now ready to be filled and readied to erupt. 3-4 teaspoons of baking soda and 8 drops of red food colouring can be added to the crater of the volcano. Students can watch as a half cup of vinegar is poured quickly into the crater, and as the volcano spews out red lava, just like the real thing.

Student Accomplishments:

- The production of an erupting model volcano
- Using clay as a principal mould material
- Use of a pillar drill
- Exploring and understanding chemical reactions
- Learning and discussions around volcanic activity
- Practical hands on experience using a vacuum forming machine, and understanding its wider application

Teachers notes:

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