

Event: RAPID 2016 Student Summit

Challenge: Volcano 1.0

Objective: Learn to control the baking soda / vinegar reaction

Overview:

Players will identify test configurations that consists of:

- Baking Soda
- Water
- Vinegar
- Nozzle type

Design Station (Computer)

- Players start at the “Design Station” that utilizes a computer to present the parameter options and then record their design decisions.
- Using a “Job Sheet”, they can record their selections and proceed to the “Lab”.

Lab (Chemical Mixing Table)

- At the “Lab” Players should be reminded to wear safety glasses while working with chemicals, “SAFETY FIRST”.
- Here they will measure and combine a baking soda and water mixture into a 50 ml centrifuge tube. Place in “Job Kit”
- Select the proper nozzle. Place in “Job Kit”
- Fill a syringe with their designated volume of vinegar. Place in “Job Kit”. Proceed to “Volcano” test station.

Volcano (Test Station)

- Test operator should transfer baking soda /water mixture to test chamber.
- Load selected nozzle into cap of test chamber and secure the cap.
- Pull 5-10ml of air into syringe and connect the syringe to test chamber with tip pointed down. This makes sure that all of the vinegar gets into the chamber.
- Get a group to stand back to judge the eruption height. Crowd average is the recorded value.
- Get LOUD, have a count down and inject contents of syringe into test chamber.
- Record crowd average on “Job Sheet” and provide to Competition Coordinator for entry into the website.

Repeat

- The goal is to control the reaction.
- Using the “Leaderboard” and their own “Job Table”, players should attempt to figure out which parameters should be changed to control the reaction and achieve the desired outcome.

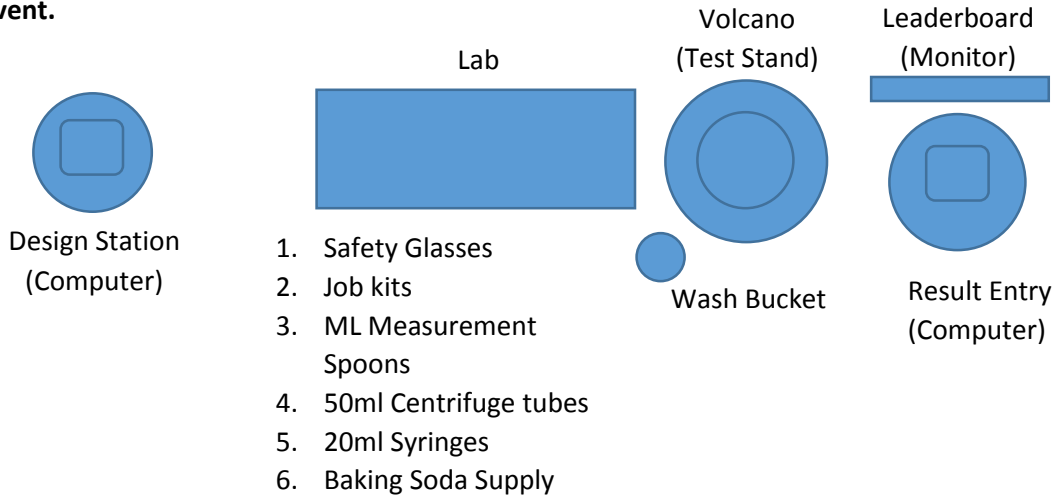


Detail Steps:

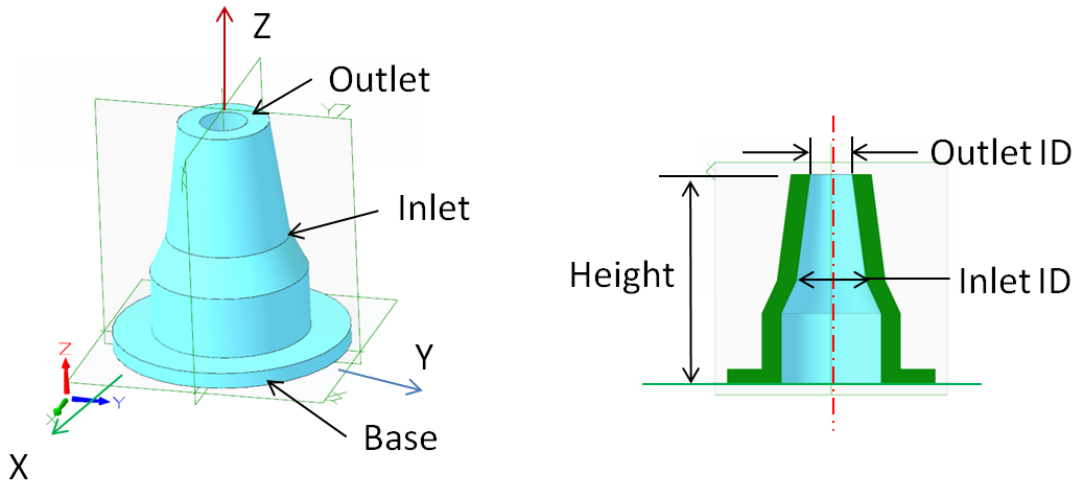
1. Log into Challenge Site – <https://challenge.ripppl3d.com>
 - i. On top menu bar go to “Register”
 - ii. Fill out registration form for the group.
 - iii. “Organization” should be the players School Name.
 - iv. “User Name” can only contain Letters and Numbers, spaces or special characters are not allowed.
 - v. “Display Name” will be used to present players results on the “Leaderboard”
 - vi. Only one person needs to register for their group. But everyone is welcome to register on the site and use it on their own time.
2. Join the Competition
 - a. From the Home Page, Select “Join Us” for the “RAPID 2016 Volcano Challenge” from the Competitions List.
3. Design Station
 - a. Input unique parameters into tables.
 - b. ML of Baking soda (notice limits set on challenge site).
 - c. ML of water (notice limits set on challenge site).
 - d. ML of vinegar (notice limits set on challenge site).
 - e. Nozzle – select one of four configurations.
 - i. Input a nozzle configuration number and select “Refresh” to see different nozzle geometries in the 3D Solid Model viewer.
 - f. Once the player is happy with their design, select “Save Design”.
 - g. A “JobID” will be added to the players “Attempt Table”.
 - h. Use a “Design Sheet” to record the “JobID” and selected parameters and proceed to the “Lab”.
4. Lab (Chemical Mixing Table)
 - a. Safety First – have the player that is mixing chemicals wear safety glasses.
 - b. Measure water amount into the 50ml centrifuge tube.
 - c. Measure the baking soda amount and add to the water. Cap centrifuge tube. Place in a “Job Kit”.
 - d. Select the desired nozzle and place into “Job Kit”.
 - e. Use a syringe to draw in the desired amount of vinegar from a centrifuge tube.
5. Volcano (Test Station)
 - a. Using the contents of the “Job Kit”.
 - b. Transfer contents of 50ml centrifuge tube into test chamber.
 - c. Insert nozzle into cap and secure cap.
 - d. Pull in 5-10ml of air into syringe containing vinegar.
 - e. Connect the syringe to the test chamber tube with the tip pointed down.
 - f. Position the crowd to monitor reaction height and begin the count down.
 - g. Inject contents of syringe into test chamber.
 - h. Record the average of the crowds observed height on the “Design Sheet” and provide to Competition Coordinator.
 - i. Coordinator enters results into website.
6. Complete!
7. Be sure to encourage players to try again!


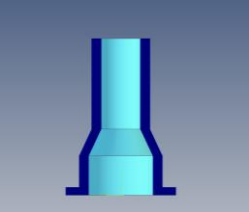

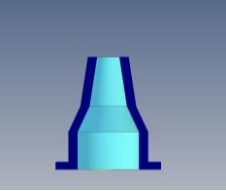
Setup:

Notice, this challenge does not require a 3D printer to run the competition. All parts can be printed prior to the event.



Nozzle Configurations:









Configurations	Nozzle 1	Nozzle 2	Nozzle 3	Nozzle 4
Cross-Section				
Inlet ID (in)	0.15	0.25	0.20	0.25
Outlet ID (in)	0.25	0.25	0.20	0.15
Height (in)	0.75	1.00	0.75	0.75

Find more information @ Rippl3D.com



Special Recognition to our Foundational Sponsors:

Supporting Components:

Item	Description	Image
Syringe	20 ml syringe	
Water Supply	16 oz squeeze bottle	
Vinegar Supply	16 oz squeeze bottle	
Centrifuge Tube	50 ml centrifuge tube	
Safety Glasses	Safety glasses	
Measurement Spoons	3D printed ml spoons (download STL's @ Rippl3D.com)	

Find more information @ Rippl3D.com

Special Recognition to our Foundational Sponsors:

Job Kit	3D printed Job Kit (download STL's @ Rippl3D.com)	
Volcano Test Stand	Download Parts List & STL's @ Rippl3D.com	
Test Stand Tower	Download Parts List & STL's @ Rippl3D.com	