

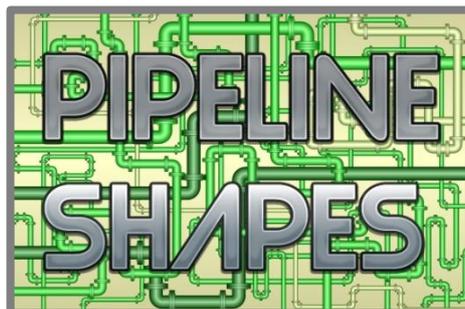
About this activity

In this activity you will investigate how the forces applied by gases under pressure affect the shape of pipelines. Just like engineers in industry, you will make careful observations and choose the best way to record your results.

Kit list

- Adhesive tape (e.g. Sellotape)
- 3 long (modelling) balloons
- Balloon pump
- 3 sheets of A4 paper
- Pipe templates PDF

Time: 1 hour

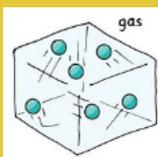


Important words to understand:

- | | |
|---------------|-------------|
| • cylindrical | • pipe |
| • engineer | • pipeline |
| • force | • pressure |
| • gas | • renewable |
| • industry | • seabed |
| • natural gas | • substance |

Not sure what they mean? You could use a dictionary to check (paper or online).

What is a gas?



Gases are all around us in the air that we breathe; they move around freely but we rarely notice that they are there. We can't feel them, except when it is windy, and we usually can't see them either. They have no fixed size and expand to fit the shape of any container.

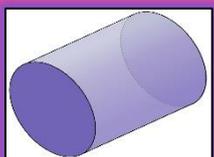
In industry, the natural locations of gases are found, then the gases are stored before being used for a surprising number of things including heating and cooling, packaging and preserving food, fuelling cars, making fizzy drinks, putting out fires, cleaning water and treating some medical conditions.

Natural gas is non-renewable, which means that after we have used it to warm our homes etc, it cannot be used again in this way. Lots of industries are researching and improving alternative ways of heating our homes, including wind power and solar power.

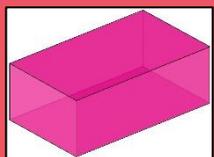
Watch out!

- Be aware of latex allergies when handling the balloons
- Take care not to over-inflate and burst the balloons

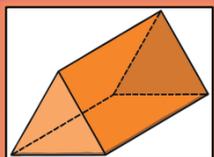
Paper pipeline shapes:



Cylinder



Cuboid



Triangular Prism

The Problem



The engineers at Seabed Engineering would like your help. The company lays pipelines on the seabed for other companies to collect natural gas from under the sea and send it back to shore inside the pipes. They often review their work to make sure they use the best materials in the best ways, and to save time and money. The long pipes which they lay along the seabed are cylindrical in shape, but they would like to know if there are any other shapes of pipes which might be better than cylinders. Can you help? It would be difficult to test your ideas using real pipes so you will need to use paper pipes and balloons to create a model of the real thing.

OUR METHOD

- Use A4 paper and the template as a guide to prepare three paper pipes of different shapes: cylinder, cuboid and triangular prism
- Place one balloon inside each pipe (not inflated)
- Connect the balloon to the pump and gradually inflate it
- Carefully observe what happens to each paper pipe shape
- Record your findings using one or more of the suggested methods on the next page



How you will solve the problem...?

Recording your results – Here are some ways you could record your results

Diagram

Shape	Sketch at start	Sketch at end	Other observations
Cylinder			
Cuboid			
Triangular prism			



Photograph



Video



Once you have completed your observations and recorded your results, it is time to advise the engineers at Seabed Engineering, which is the best shape for a pipeline.



THEY WILL WANT TO KNOW...

- How did you carry out your tests and make observations?
 - How did you test each pipeline shape?
 - What are your results?
 - Which pipeline shape would you recommend?
 - Why do you think this shape was the best?
- Which pipeline shape would you **not** recommend and why?

Write a short report or make a video to share your results with

Seabed Engineering
Share it with us 
[@ciecyork](https://twitter.com/ciecyork)

Did You Know?



The pipes which transport natural gas along the seabed are about 20 metres long, 1 metre wide and made of steel. They are quite heavy but would float when full of gas, so the outside is covered in concrete to make the pipes very heavy and keep them in place. Inside, the pipes have a protective coating added to stop them from rusting.



To lay the pipes on the seabed, they are loaded onto a specially designed ship. The lengths are joined together on the moving ship, gradually making one long pipe which is fed into the sea. It is then guided into the water by the 'stinger' at the rear of the ship. The pipes bend as they go under the water, but they do not break thanks to the flexibility of the type of steel they are made from.

TAKING IT FURTHER

Follow up activities:



- Continue the investigation with some different pipe shapes such as pentagonal or hexagonal
- Find out some more **interesting facts about gases**
- Discover how pipes are laid underwater with this interactive **Rough Guide to Gas** activity
- Capture gas in this fun **Fizz Inflator** activity
- Harness the power of air pressure and try out this **Balloon Rocket** investigation

Things to think or talk about:



- Where can you find pipes in your home?
- What shape are the pipes at home?
- What are these pipes used for?
- Are there any industries in your area which use pipes?
- Listen to plumber Hattie, share her knowledge of [water pressure](#) in homes and industry
- Can you think of any other jobs where you might work with pipes?