

Cattle Climate Challenge

What's the farmer's problem?

"I want to reduce the methane emissions from my dairy farm to protect the planet and wonder if I can capture the gas to use as a fuel and save money."

Available resources:

- Paper
- Pens
- Laptops/tablets for research



What is the design brief?

Use drawings and/or 3D models to imagine and design a device that will capture the methane from cows breath so that it can be used as a fuel on the dairy farm.

Your device will need to meet the following criteria:

- Prevent methane being released into the air.
- Collect methane gas so that it can be used as a fuel for cooking or heating on the farm.
- Not cause any discomfort to cows.
- Use sustainable and or recycled materials.
- Not have any detrimental effect on the health or wellbeing of cows.

The engineering design task

Can you think of a way that methane could be captured from dairy cows so that it could be used for energy?

Chemical changes in the digestive system of cows lead to the production of carbon dioxide and methane gases that enter the air when the cows burp. These gases are greenhouse gases that absorb heat from the Sun and lead to global warming. there are 1.4 billion cows on the planet which contribute to 9.4% of the worlds greenhouse gas emissions. Methane is also flammable gas which can be used as a fuel.

Top tips to get started:

Think about the features and functions of the device:

- Will your device be used when cows are in a barn or grazing in the field?
- How will you ensure that the cows can still behave in a normal way in terms of moving, eating, drinking, sleeping and interacting?
- How will you collect and store the gas so that it can be used as a fuel?
- How will you ensure you device is safe?
- What materials will you use to ensure the cows comfort? Are these materials sustainable?

Background Information:



Scientists and engineers have worked together to develop different ways of collecting gases from cow burps to test and measure them. Some collect the gases when the cows are eating and others are attached to the cows as they move around the fields.

Engineers successfully designed and built a mask for cows that collects methane and converts it into carbon dioxide and water vapour.

Animal protection organisations object strongly to cows being fitted with face coverings from the age of six months.



One engineering company has started imagining and developing huge transparent domes up to three acres in size where gas, water and temperature can be easily controlled. They think this could be the future of dairy farming but their bio domes might also be used for farms beyond Earth when humans build settlements on the Moon and Mars.



Glossary:

Greenhouse gas - a gas in the atmosphere that absorbs heat radiation.

Methane - methane is a colourless gas, lighter than air, that burns easily in air.

Greenhouse effect - the trapping of heat from the Sun on the Earth's atmosphere, increasing temperatures on the planet.

Fuel - a material that can be burnt to release energy.

Fermentation - a chemical change that happens when microorganisms such as yeasts or bacteria breakdown different substances.

Chemical change - a process when one material is altered into one or more new and different materials.

Rumination - the action of a cow chewing the cud (partly digested food returned from the first stomach for further chewing).

livestock - domesticated animals raised in an agricultural setting that are kept for use of profit.

More information and inspiration!

Get some inspiration from finding out how [Ben and Jerry's](#) capture methane from dairy cow manure.

Want to take it further?

Research how to separate mixtures of gases to help develop your ideas to show how the methane would be isolated from other gases so that it could be used as a fuel.

How well did you do?

Use the table below to evaluate how well your idea meets the design brief.

Success Criteria	Score /5
Prevents methane being released into the air.	
Collects methane gas so that it can be used as a fuel.	
Keep cows comfortable.	
Uses sustainable and or recycled materials.	
Maintains cow wellbeing	