Essex County Council

Interreg North Sea Region EMPOWER 2.0 European Regional Development Fund

EUROPEAN UNION

ypte young people's trust for the environment

Learning about solar power

Make solar thermal heated bottles

Learning objectives:
Children will understand that energy from the sun can be used to heat liquids.
Children will understand that darker surfaces absorb more heat from the sun than light coloured surfaces (the 'Albedo effect')
Some learners will use this knowledge to suggest practical uses of the Albedo effect.

Start learners off

Discuss (and, ideally, demonstrate) the fact that we feel warmer if we sit in a sunny place than we do in a shady place. Why is that? The heat from the sun is warming our body up when we sit in a sunny place. Make links to people sitting on a beach on a sunny day and using a parasol to keep the sun's rays off them to avoid getting too hot. If we left our drinks bottles outside on a sunny day, what would happen to our drink? It would begin to heat up.

Move learners on

Explain that the sun's rays are absorbed more by dark surfaces, while more of the rays are reflected off light surfaces. This is called the Albedo effect.

You can explore this by taking two bottles of water (or use any sealed container). Cover one with white paper and one with dark black paper. The dark paper will absorb more heat from the sun than the white paper, which will reflect it away from the water.

Leave the bottles in a sunny spot for an hour or two. The longer you leave them in the sun, the greater the effect will be. You should be able to feel the difference in temperature with your hand, but if you have a thermometer, you can measure how much warmer the black paper covered water is.

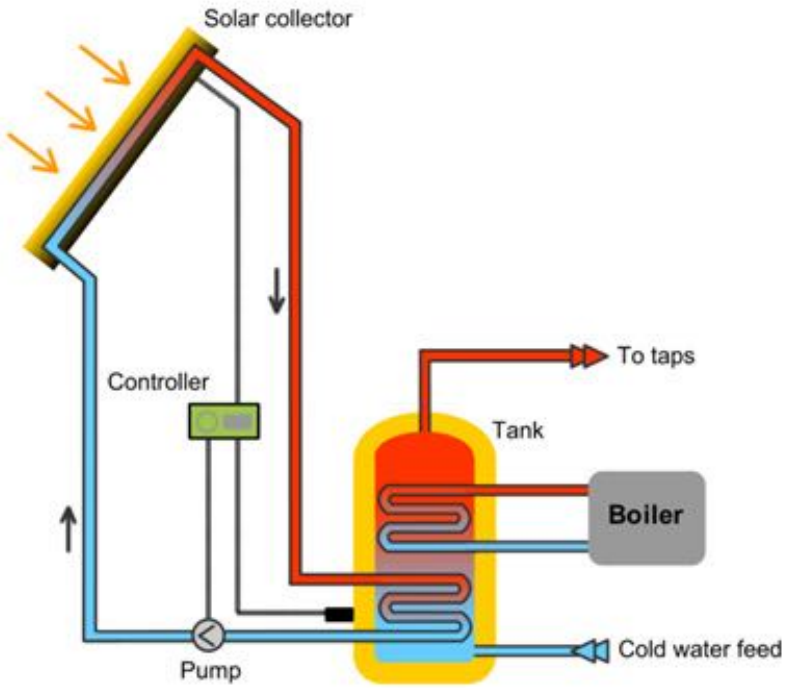
Challenge learners further by:

Having demonstrated the albedo effect using the bottles above, check understanding and embed learning by asking the children to use this knowledge in real life situations.

Challenge children to invent a solar powered shower - how would they heat up the water using only their understanding of solar thermal energy?

Ask children how they would choose from a range of paddling pool covers if they wanted the water in the pool to heat up quickly on a sunny day. You could provide images of three covers and ask the children to explain their choice using reference to the Albedo effect.

Ask children how they could use their understanding of the Albedo effect to select a T-shirt that would help keep them cool on a sunny day. Would they prefer a dark blue T-shirt or a white T-shirt? Why?



Some children may be interested in researching the way that solar thermal energy is used in real life to heat water for people's homes.

Solar thermal cells are not the same as solar PV cells - they use the heat energy from the sun to warm water (or other liquids) directly. This heated fluid is then piped into homes to be used for washing or in radiators to keep the air warm.

At the end of this activity:

All children will be able to explain that the suns rays produce heat and the heat can be used to warm up liquids such as water
Most children will be able to explain that heat energy from the sun is absorbed by darker surfaces, so that water in a dark coloured container will heat up faster than water in alight coloured container. This is called the Albedo effect.
Some children will be able to use this information to devise practical applications for heating water using the Albedo effect.