

DT Knowledge Organiser – Mechanical Systems

Upper KS2: Year 6

Opportunities for teaching Diversity, Equality & Cultural Capital:
 Visit the Visit the model of Ugthorpe windmill at St. Anne's hall in Ugthorpe.
 Visit Redcar to see the off-shore wind farm.

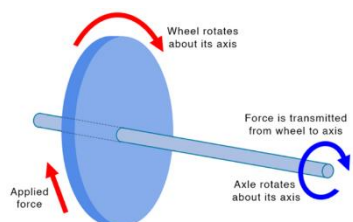


Key Knowledge about Mechanisms

You should already know that mechanisms are the parts that make something work. A set of related mechanisms used to create movement is called a mechanical system.

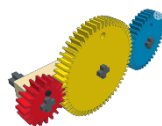
Machines where force is applied to the wheel

In these types of machines, the force applied to the wheel causes it to rotate. The motion begun by the wheel then transfers to the axle. Machines such as pizza cutters, door knobs, wheel chairs, skateboards, windmills and drills are examples of this mechanism.



The axle other end of the axle can be attached to a different mechanism to carry out a specific task.

In many cases the axle is attached to gears which are used to transfer the energy from the axle and change the direction, speed or force of the movement.



What you will have learnt by the end of this unit.

- ❖ To apply their understanding of structure and materials, to monitor and control products
- ❖ To produce detailed designs which have developed through a range of ideas, including cross-sectional and exploded diagrams
- ❖ To work with a range of tools, materials and equipment, showing an understanding of functional properties and aesthetic qualities
- ❖ To identify and solve design problems

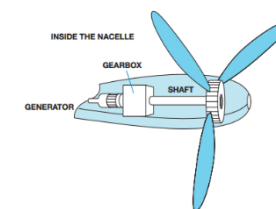
What you have already learnt in Yr5.

- To use prototypes and pattern pieces to communicate their ideas
- To select from a wide range of materials based on their appropriateness for the purpose and their aesthetic qualities
- To investigate and analyse a range of existing products
- To assemble components to make a working model.
- To use different tools and equipment safely.
- To understand and use mechanical systems in their products.

Recall and Remember:

Wind turbines:

Wind power is a renewable source of energy, which means that it will not run out. The wind blows turbine blades, which then turn. This turning motion is transferred to a generator to produce electricity so wind turbines convert the mechanical kinetic energy of wind into electrical energy.



How does a wind turbine create electricity?

When the blades of the turbine catch the wind, they turn the rotor. The rotor turns a shaft that is connected to a set of cogs called a gearbox. The gearbox is connected to a generator, which makes electricity when the gears inside turn.

Quick Quiz

What is kinetic energy?

What practical uses does a mechanical windmill have?

Why does a wind turbine need gears to generate electricity?

Can you explain how gears are used to change the direction of rotation?

Key Designing Skills I will learn/use

Think about the design criteria – what are you aiming to build? What is its purpose?

Wheels, Axles & Gears: You will need to draw on your prior knowledge of wheel, axle and gear systems. Remember that you are working on a design where the force is applied to the wheel, not the axle like it is for a bike, Ferris wheel or fan.

Wind Power: Think about the material for your sails and how to attach the sail wheel to your framework so the kinetic energy generated from the blades can be effectively transferred along the axle to carry out a new function. The horizontal axle may need supporting in some way, so you will need to consider if your support is creating friction and reducing the amount of energy being transferred.

As part of the design process, you should be able to sketch and annotate different ideas. You should also be able to plan the main stages of making, using either a checklist or a flowchart.

Key Building & Evaluating Skills I will learn/use

Building:

Consider the shape and weight of the different component parts and how this may affect how well the windmill or turbine functions.

How can you ensure the main structure is appropriate?

Do you need to reduce friction on the horizontal axle?

In order for the windmill or turbine to transfer the wind's kinetic energy to the mechanical parts, it is essential that the mechanical system is planned and constructed effectively. Consider the sizes and shapes of the axles and gears.

Evaluating:

How well does your mechanism work? Does it meet its purpose?

Which materials did you use? Why did you make these choices?

What have you learnt about force applied to wheel mechanics whilst building your windmill or turbine?

What could you still improve about your product?

How would you do things differently next time?

Key Vocabulary

| | |
|----------------|--|
| Mechanism | The moving parts that make an object function |
| Wheel | A circular object that revolves on an axle |
| Axle | A rod or spindle passing through the centre of a wheel |
| Gear | Wheels with cogs on which can change the direction, speed or force (power) of energy. |
| Transfer | To move energy from one part of a machine to another |
| Kinetic energy | The energy an object has due to its motion/movement |
| Turbine | A rotating machine that transfers kinetic energy from the wind into mechanical energy. |
| Design | To plan a project to make a new structure or product. |
| Experiment | Try out new ideas and methods. |
| Technique | Use a particular method or skill. |
| Refine | Make changes which improve the structure or function of the final product. |
| Critique | Express an analysis of the merits and faults of a product |
| Exhibit | Demonstrate the final product so it can be understood and appreciated by an audience. |

My skills and Knowledge that I may use from other subjects

- Apply Scientific knowledge of Forces & Electricity to DT products.
- Develop understanding of weather, environmental needs and climate change – Geography and Citizenship.

What you will have you learnt by the end of UKS2

To consider a range of ideas or alternative plans after collecting information from different sources.

To produce and/or follow a detailed, step-by-step plan.

To draw technical labelled diagrams of my design or product.

To evaluate appearance and function against original criteria.

To use a range of tools and equipment competently.

To make both prototypes and final versions of my product.

To suggest improvements to my own work and that of others.