

Unit 3: Principles of Mechanical Engineering

LO3: Understanding levers, pulleys and gearing

Case study of a belt and pulley drive system

Instructions and answers for teachers

These instructions should accompany the OCR resource 'Understanding levers, pulleys and gearing – Case study of a belt and pulley drive system' activity which supports Cambridge Technicals in Engineering Level 3.



**CAMBRIDGE TECHNICALS IN
ENGINEERING
LESSON ELEMENT**

Unit 3: Principles of Mechanical Engineering
LO3: Understanding levers, pulleys and gearing
Case study of a belt and pulley drive system
Learner activity sheet

Activity 1



The pictures above show a pillar drill used in a home workshop. It has a pulley and belt drive system connecting the motor at the back of the machine to the chuck. Five ratios are available to give a range of chuck speeds to suit different drilling operations.

Why is a belt system suitable for the transmission of rotary motion for this machine?

Version 1

OCR
Oxford Cambridge and RSA

The Activity:

The learners will be presented with a belt drive system (in this case, images of the system) and asked a series of questions to prompt their thinking and understanding of the system.



This activity offers an opportunity for English skills development.



This activity offers an opportunity for maths skills development.

Suggested timings:

Activity 1 30 minutes

Activity 2 30 minutes

Activity 1

A belt system is appropriate for this type of machine because:

- it is simple (and so relatively inexpensive);
- quiet;
- needs little maintenance (and is simple to understand if maintenance becomes necessary);
- simple for the user to adjust the drive ratio;
- absorbs shocks between the chuck and motor;
- absorbs some misalignment between the driving and driven shafts allowing manufacturing tolerances to be relatively high (and therefore inexpensive).

Advantages of vee-belts include:

- high friction forces between belt and pulley are generated for relatively low belt tension so higher torques can be transmitted without the belt slipping;
- securely held onto pulleys so unlikely to slip off during use.

Activity 2

There is no single correct answer. Learners should first determine the velocity ratios needed to achieve the maximum and minimum output speeds and suitable ratios between these values. The maximum pulley diameter should be appropriate to the overall size of the machine and the minimum pulley diameter should not be less than 50mm to avoid damage to the belt.



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