

Engine Transformation Systems: Mechanical Engineering [Chapter 13]



<https://youtu.be/OGj8OneMjek>

- 1) a) Which one of the five types of motion transformation systems is represented by the piston in the cylinder of a car? Is it reversible?

Slider Crank (Reversible)

- b) What are its advantages and disadvantages?

Advantages	Disadvantages
-Reversibility -Translational motion is cyclical (it repeats)	-Short translational movement

- 2) What are the characteristics of the link between the piston and the crankshaft and why would those characteristics be beneficial for components of an engine?

Characteristic	Why?
Removable	-Easy to replace and maintain parts
Partial	-The connecting rod's ends both rotate slightly to allow the slider-crank to function. Otherwise the crank wouldn't make full turns.
Rigid	-A flexible link would cause wasted energy; a rigid link ensures efficient transfer of motion between the parts.
Indirect	-The connecting rod joining the crank to the piston is an intermediate component that allows for the transformation of rotational motion to translational.

- 3) The timing belt could be seen as combining the advantages of two motion transmission systems and eliminating some of their disadvantages. Which two system types are combined and which advantages and disadvantages of those systems were important to consider?

Motion Transmission Systems Combined	Advantages Combined	Disadvantages Removed
Chain and Sprocket & Belt and Pulley	-Less parts (B&P) -Interlocking teeth to avoid slippage (C&S) -Transmission of motion at a distance (Both)	-Need for Lubrication (C&S) -Slippage (B&P) -Rusting of metal parts (C&S)

- 4) a) The system that opens and closes the intake and exhaust valves in the cylinders is an example of a different motion transformation system. Which one is it and is it reversible?

Cam and Follower (Non-Reversible)

- b) Why is this system used instead of the others? What are its advantages and disadvantages?

Advantages	Disadvantages
-Non-Reversibility -Translational motion is cyclical (it repeats) -Variety in shapes of cams allows for many kinds of cycles	-Short range transformation

- 5) a) In the example of a four-stroke engine the piston moves up and down in two full cycles (2 up strokes and 2 down strokes). Only one of the down strokes is caused by the combustion of the fuel and air. What causes the other three strokes of the piston?

The other pistons turn the crank shaft for the other three strokes and the crank's turning moves the piston up and down

- b) What characteristic of this motion transformation system makes this possible?

Reversibility