# English for Mechanical Engineering

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# INTRODUCTION

So far I've learnt that an interactive teaching/ learning activity that will value my students' interventions should focus on creating a scientific context that would stimulate the debates within my ESP seminars and lectures.

One of the aims of these projects has been to develop materials both for testing the second language competence of mechanical and maritime engineers and for teaching them the language that they require for their professional certification. I do not assume that my users will have an in-depth knowledge of mechanical and maritime engineering matters. Therefore, the units have been devised to help students improve their knowledge and use of English in an engineering environment. Each unit covers vocabulary related to a certain topic area- ranging from basic maritime and mechanical engineering vocabulary to conversations on board, safety at work, types of ships and so on- and is designed to reinforce the grammar knowledge of students and improve their communicative skills.

I come to realize that the more realistic situations and contexts I'll be using, the more realistic my teaching materials and methods will become. My lectures are addressed to pre-intermediate and intermediate students that already have a basic knowledge of English grammar and, therefore, they are thematically-centered on developing the reading, writing, speaking and listening abilities that they need to communicate in their studying field. In other words, the lectures aim to help them:

- Increase their knowledge of technical English.
- Discuss familiar things, key engineering concepts and principles.
- Communicate with fellow students and engineers in other countries.
- And, nevertheless, become more fluent and accurate in a wide range of technical fields.

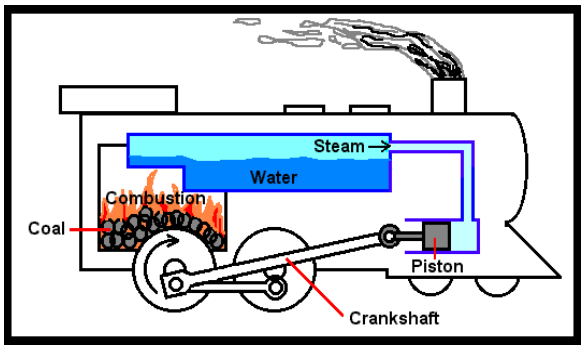
# CONTENTS

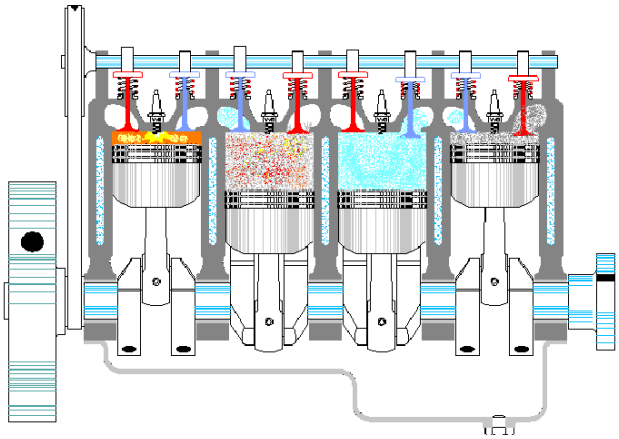
# INTERNAL VS EXTERNAL COMBUSTION ENGINES

## Warming up/ Pre-reading activities

**Task 1**

Look at the pictures below and state the difference between them.



**Task 2**

What do you think will be different about cars in the next ten years? Take into account the following aspects:

| | | | |
|---|---|---|---|
| materials | design | power | fuel |

**Vocabulary practice**

| | | | | |
|---|---|---|---|---|
| External combustion engine | internal combustion engine | piston | crankshaft | Heat pump |

**Reading activities**

**I. Read the text below and complete the following tasks**

An ***external combustion engine*** is a reciprocating engine for which combustion takes place outside the cylinders. An early example is the steam engine, which typically burned coal outside of the engine to turn water into steam. The Stirling engine is an external combustion engine that uses a working fluid to move pistons in cylinders. In an ***internal combustion engine***, on the other hand, a fuel is burned inside engine cylinders. Though steam engines have largely been replaced, Stirling engines have many potential applications.

While combustion gases do not enter the cylinders of an external combustion engine, they must be in thermal contact with the engine for it to function. In a steam engine, the heat from burning coal is transferred to water through the walls of a boiler. This heat turns water into steam, which is directed into the cylinders of the engine. At the appropriate time, the steam pushes on a ***piston*** that turns a ***crankshaft***. In this way, a steam engine transforms the chemical energy stored in coal into the mechanical energy of a rotating crankshaft.

The external combustion engine has had a variety of applications over the past two centuries. Steam power was used extensively in factories as well as on ships and trains during the Industrial Revolution, largely replacing water wheels and animal muscle as sources of energy. While steam engines were eventually overtaken by internal combustion engines, they remained the primary power source into the 20th century.

The Stirling engine has been applied even more flexibly. By converting rotational energy to electricity, it can take advantage of a heat source for combined heat and power generation. It can also be used in reverse as a ***heat pump*** – taking in electrical energy and pumping away heat.

Since the Stirling engine only transfers heat, not matter, into its cylinders, it does not require combustion to be the heat source. Other non-combustion forms of heat, such as nuclear power, could work equally well with this kind of engine. In fact, it has been suggested that future nuclear power plants may incorporate the Stirling external combustion engine to simplify the design and increase efficiency.

**1. Skim through the text in order to answer the following questions:**

a) What is the difference between external and internal combustion engines?
b) List some of the applications of external combustion engines.
c) What seems to be the future of combustion engines?

**2. Match the words in column A with their definitions in column B**

| | |
|---|---|
| 1. Internal combustion engine | a. a rotating shaft driven by (or driving) a crank |
| 2. External combustion engine | b. a mechanical device that moves heat by pressure or suction |
| 3. Crankshaft | c. a heat engine in which ignition occurs outside the chamber (cylinder or turbine) in which heat is converted to mechanical energy |
| 4. Piston | d. a heat engine in which combustion occurs inside the engine rather than in a separate furnace |
| 5. Heat pump | e. mechanical device that has a plunging or thrusting motion |

**II. Read the text below and complete the following tasks**.

It was like love, my fascination for those huge, noisy machines that were already near the

end of their golden age. They moved with such magnificent purpose. They were alive, they had steam, smoke and the smell of minerals; they burned energy without *concealment*, and you could see their fire. (1) … But there was something very human about the need to keep the fire going by hand, shovelling and watching, never for a second being able to forget responsibility for the journey and the work. Their waste didn't have to be buried in lead-lined coffins, it was *exhaled* as carbon, sulphur and nitrogen, or swept and scattered as ash, the unburnt particles of coal settling gently on our clothes and hair.

Some instruments, some things that humans make transcend their function. (2) … That explosive, rhythmic sound we call puffing says more to us about getting under way, about departure, than a petrol-driven snarl

can ever do; perhaps it has something close to the beat of our pulse. Even if we were using up and heating the earth too much, and no-one knew that at the time, it would have been worth making an exception for steam engines as they were stunning. (3) …

The honest power of a steam engine is *overwhelming* – most of its important parts are on display. You see the great cylinder with cranks (manivelă) and mechanisms outside it, you see the ingenious connection of levers (pârghie) and rods to the enormous wheels and you have already understood that this combination of things will work, and you might even see how. Unlike a motor car or a nuclear ship, there's no secrecy about a steam engine's force. What engineers call the 'motion', the linked shafts (arbore, ax, osie) and pistons and wheels that drive the engine, is as fascinating as the movement of a watch. And almost as jewel-like, for the couplings and connecting rods were often still chipped and filed smooth by hammer and chisel, after they came off the milling machine (masina de frezat). Hands still made parts of these engines, and it is no surprise that drivers spoke of them as individuals. (4) …

**1. Four sentences have been removed from the text. Select the appropriate sentence for each gap in the text. There is one extra sentence which you do not need to use.**

A. The idea that hordes of people and commodities could be carried.

B. Last but not least, the engine was essentially a boiler held in heavy frames on a set of steel wheels.

C. Being alive, they raced against themselves, losing more heat than they used, running by burning their own cargo of coal.

D. That way instruments can be magical.

E. They were beautiful machines; the most beautiful machines produced in the industrial revolution.

**2. Give synonyms for the underlined words.**

**3. For the following questions, choose the answer (A, B, C or D) which fits according to the text.**

1. What is one of the attractions of steam engines mentioned in the first paragraph?

A. their connection with a previous period of history.

B. the speed at which they were capable of travelling.

C. the fact they needed people to make sure they ran properly.

D. the smell of the waste that they produced.