Coal knowledge

What is it

Coal is a fossil fuel just like oil and natural gas. Unlike them, coal is a solid fuel and as such it is the most exploited solid fuel for the production of electric energy in the world.
Their different state is explained by the different origin of such three fuels. Whereas oil and natural gas come from the rests of microscopic organisms living in water (plankton, seashells, coral, etc.) deposited at the bottom of ancient seas, coal formed from the rests of plants of the past, the structure and form of which, albeit modified, can still be identified by means of a microscope.
Carbon is the main component of coal after the other basic components of the original living matter (hydrogen, oxygen and nitrogen) progressively decayed during chemical and physical processes transforming it. The combustion of coal frees the energy of the sun stored in plants thanks to the photosynthesis millions of years ago: therefore it is an invaluable container of “fossil” solar energy.

Where is it

The favourable environment for the formation of coal includes the vast coastal, lagoon or swampy plains where in the past the hot and humid climate developed a rich vegetation. The low sinking of the soil led the vegetal organisms to be quickly buried by sand and clay carried by rivers. Underground, in the absence of oxygen, the vegetal matter pressed by the weight of sediments and owing to the heat undergoes a process of compression and slow transformation into materials progressively poorer in water and rich in carbon.
Peat is the first result, i.e. an accumulation of partially decomposed vegetal organism full of water. Then lignite, a brown and soft type of coal containing 70% carbon. Then lythanthrax, the most commonly coal used to produce electric energy containing the highest carbon percentage (from 93% to 98%). It is the best and less polluting coal (with a high calorific value), but is not widely used because it is hard to find and consequently very expensive.
The formation of coal fields required from millions to hundreds of million years, according to the final product.
95% of coal fields are in the northern hemisphere (almost 60% shared between China, USA and former USSR). In Europe, the belt of large fields covers central-northern countries: Great Britain, northern France, Belgium, Holland, Germany, Poland and Russia. Italy has small quantities of “poor coal” (lignite).
That unequal distribution depends on the fact the formation of great masses of vegetal rests calls for dry land and ad hoc climate. In the Palaeozoic age (from 530 to 245 million years ago), the regions of today’s central Europe were occasionally invaded by shallow seas: the optimum condition to develop abundant vegetation and slowly transform it into coal. On the contrary, today’s regions of southern Europe date back to the Mesozoic age (from 245 to 65 million years ago) or are more recent, and formed in the sea far away from the coats: that is why they contain small unimportant coal fields.

What is for

Coal is a widely used energy source and it is the main fuel source for the production of electric energy. Many countries strongly depend on electricity deriving from coal: in 2017 China consumed 1892.6 million toe, India 424 million toe and USA 332.1 million toe (*Source: BP Statistical Review of World Energy 2018*). In electric energy plants the coal is burnt to heat water until it turns into steam that, under pressure, turns a turbine, which is connected to a generator. The mechanic energy of rotation is then transformed into electric energy.
Moreover, in developing countries the use of coal is still important for household tasks: heating and food cooking.
The steel and metal industry uses coke: it is a solid and hard fuel obtained by heating the coal at high temperature. Coke is the raw material to produce steel.
Other industrial processes use coal gases to produce fertilisers, pharmaceuticals, pesticides, etc. Tar is also obtained

from coal through distillation. The natural dislike of its colour and smell did not prevent the chemistry experts of the 1700s from discovering its virtues: wood painted with tar becomes water proof and resilient against microbes.
Moreover, in developing countries coal is still used for household tasks: heating and food cooking.

A bit of history

The age of coal starts towards the mid 1600s, stimulated by the need for finding an alternative energy source to wood. Up to then, wood had been the most commonly used energy source, and also a good building material; however, the excessive exploitation of woods led many European countries to progressively destroy their forests, and wood started to be rare.
Pit coal emerged as the best available alternative. It was present underground in many countries of central Europe and was a very suitable energy source for the first steam engines.
In a few decades the demand for coal increased remarkably to provide energy to the increasingly flourishing European industry. In particular, England, thanks to its large coal fields, took an economic advantage and consolidated its technological and industrial supremacy.
Starting from 1750 the Industrial Revolution began in England, leading to radical changes in the economic and social systems. Then it spread to the other European countries and reached the U.S. too.
The enthusiasm for the “coal rush” led to an increasingly intensive exploitation of coal fields especially in England, Russia, Germany and France. During that period the world coal output passed from a little more than 10 million tonnes in 1700 to approximately 70 million tonnes in 1850 and 800 million tonnes in 1900. Up to 1960 coal was the most widely used fossil fuel, then is suffered from the competition of oil, the extraction and transportation of which were easier.
The role of coal is still important as an alternative fuel to oil. The size of its ascertained reserves in 2017 (i.e. the reserves known at present which can be exploited with an economic advantage) world-wide is remarkable: approximately 1,035 billion tonnes of coal as compared to 239,3 billion tonnes of oil.
The current consumption rate (in the absence of new discoveries or the opening of new fields currently not exploited because they are too expensive) the ascertained reserves of coal will last for 134 years, i.e. a longer time than that forecast for other hydrocarbons (57 years for natural gas and 50 for oil) but still a finite period (*Fonte: eni, World Oil & Gas Review 2017; BP Statistical Review of World Energy 2018*).