

## GEOTHERMAL ENERGY JUNIOR

The Earth's structure is similar to that of an egg. The yolk represents the core, the albumen is the mantle and the shell is the Earth's crust. The upper layer of the mantle, on which the Earth's crust rests, is composed of a hot fluid called magma. When magma rises and reaches the surface, it originates volcanoes and becomes lava.

Geothermal energy (from the Greek word "Geo", meaning "Earth") is the heat contained inside the Earth. In fact, our planet constantly releases energy, in the form of heat, which spreads out from the deeper regions towards the surface: it is the so-called heat flux or geothermal flux. The constant and continuous geothermal flux represents an important source of heating for our planet. That it gets hotter as we descend into the Earth is well known to miners: in some mines and deep galleries temperatures are at the limit of human survival. The geothermal gradient (i.e. the increase in temperature with depth) is not the same all over the Earth: on average, the temperature increases by 2-3° C every 100m in depth, but the increase can vary from 1 up to 5° C/100m.

Thermal waters, warm and rich in minerals, have been used for thousands of years to cure various kinds of sicknesses. The thermal uses of the geothermal flux were developed before its use as a source of energy. The first plant for the production of energy was built in Tuscany in 1827. From the '20s onwards, geothermal activities spread also to Japan, Iceland and Hungary and from the '50s to the rest of the world. Today geothermal energy can be converted into electricity in the modern geothermoelectric power plants, where the vapour coming from the subsoil powers the turbines which produce electrical energy. The geothermal systems can be divided into high temperature and medium/low temperature systems, depending on whether the temperature is greater or less than 140 degrees Celsius. High temperature systems can be "vapour-dominated", if the geothermal fluid is steam, or "water-dominated", if the geothermal fluid is in a liquid state. In the first case, geothermal energy is used mainly to produce electricity, while in the second case, it can be used either directly or to produce electricity. Medium/low temperature systems contain fluids at temperatures ranging from 160 to 90 degrees Celsius that are utilised only for direct uses.

The heat contained in geothermal fluids can be used to warm and cool buildings, for agricultural uses such as the dehydration of agricultural products and the heating of greenhouses, and to heat breeding farms.