

The double-firing process (short version)

What does gas production actually involve?

Organic solids comprise carbon and hydrogen compounds. The application of heat to these compounds causes them to break up. Given sufficient thermal decomposition, the original solid will turn into a gas. For example, the burning of wood (thermal decomposition in an atmosphere of oxygen) will create, as well as ash, carbon dioxide (CO₂) and water vapour (H₂O).

In gas production, the solid undergoes pyrolysis (thermal decomposition in an atmosphere devoid of oxygen). The pyrolysis of wood will create, as well as ash, carbon monoxide (CO) and hydrogen (H₂). Carbon monoxide and hydrogen are flammable and together they are described as synthesis gas, or syngas. Various processes and facilities are used for the production of gas (e.g. rotary kilns and fluidised and packed beds). Synthesis gas usually contains not just carbon monoxide and hydrogen but also methane, tar, carbon dioxide and water vapour, the proportions of which can vary considerably according to the procedures and facilities used.

The double-firing process of gas production explained

Based on the research and development of the German engine manufacturer Klöckner Humboldt Deutz, we have patented the double-firing process and developed it within a packed bed gas generator, which is essentially a vertical combustion chamber to which organic solids are added from the top.

To ensure the correct temperature is reached for gas generation, part of the material is burned in the 'firing zone'. The remainder is subjected to the heat energy produced and, in the absence of oxygen, is thermally decomposed and converted into synthesis gas.

Depending on the point at which the synthesis gas is extracted from the gas generator, it contains relatively large amounts of either tar or ash. Here at AHT, we use a double-firing process for gas production. This involves two 'firing zones' and means that the synthesis gas can be extracted relatively ash-free. The tar produced is cracked in the packed bed, so that our synthesis gas contains only low levels of tar.