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DIRECT AIR CAPTURE TECHNOLOGY FOR CARBON REMOVAL

Abstract. Air pollution caused by harmful gases is a global problem. Direct Air Capture invention created by Carbon Engineering company is a promising method of cleaning air from toxic gas. The efficient DAC CO₂ recycling technology is presented.

Keywords: *poisonous gases, greenhouse effect, industrial processes, global warming, Direct Air Capture technology, carbon engineering, capturing emissions, CO₂ molecules.*

Introduction. Gases pollute the atmosphere because they are produced too quickly to be cleared away naturally by rain, winds, oceans or plants. These poisonous gases come from several sources such as oil producers, industries which burn fuel, and motor vehicles. Some gases are caught by rain clouds and fall as acid rain. Increasing amounts of carbon dioxide leads to a greenhouse effect. Humanity needs to protect the planet from harmful gases.

Scientists from over the world are trying to find the solution to the problem of greenhouse effect. They have already suggested the wide range of ideas, for example, using environmentally friendly resources or installing sewage treatment plants. The new way of air purification from toxic gases is proposed by the Canadian company Carbon Engineering.

It has developed a special Direct Air Capture technology, which removes CO₂ from the air at megaton-scale. Unlike capturing emissions from industrial flue stacks, this carbon removal technology captures carbon dioxide – the primary greenhouse gas responsible for climate change – directly out of the surrounding air. This can help

neutralize this harmful gas and reduce it in the atmosphere to a normal quantity that can be processed by natural plants (Fig. 1).

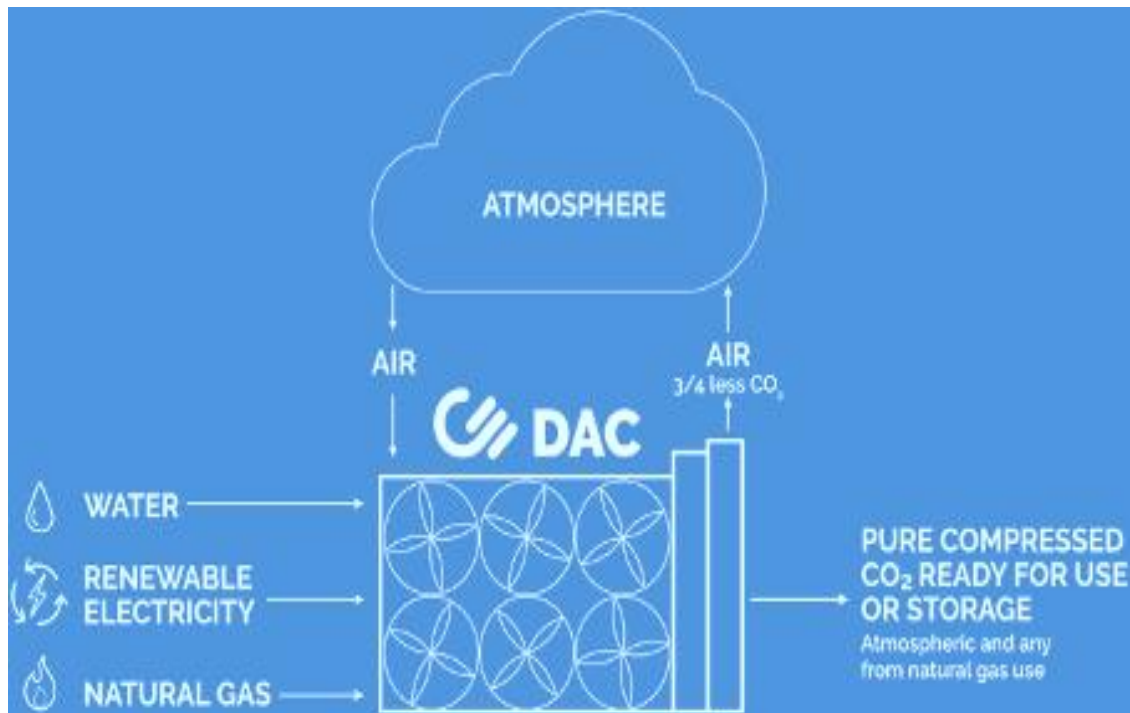
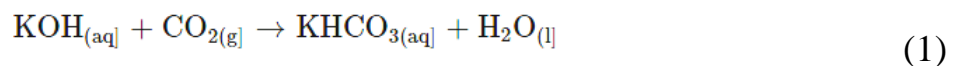


Fig. 3. The CE's Direct Air Capture process (inputs and outputs) [2]

Direct Air Capture by Carbon Engineering company includes different technologies: air contactor, pellet reactor, calciner and slaker. These technologies are applied in different fields of industry.

The process starts with the air contactor. The huge fan pulls the air inside of the construction. There are a lot of thin plastic surfaces with potassium hydroxide in the contactor. CO₂ molecules bind with this non-toxic solution that captures these molecules from the air. The carbonate salt in the liquid solution is produced. The balanced chemical equation for this reaction looks like this:



After that pellet reactor begins to work. It saturates salt out of liquid into small pellets. The invention was adapted by water-cleaning technology.

Calciner is used on the third stage of the process. It hits pellets to release CO₂ from them as a non-polluted gas. Calciner's technology is similar to ore processing, which is widely used in mining. Processed pellets are remained there. They are hydrated in a slaker and return into the system.

The end of the process is reproducing the capture of the chemical (Fig. 2).

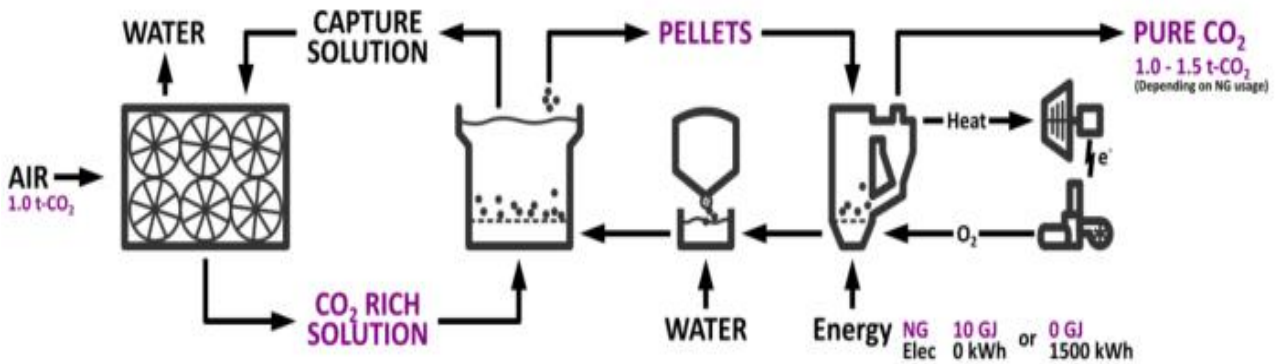


Fig. 2. The end of the process of Direct Air Capture [4]

This huge construction is very powerful. It is able to collect about 1 million tons of CO₂ per year, which is equal to annual emissions from 250 thousand cars.

Conclusion. Humanity must think of their future life, which can be interrupted by global warming. If big investors contribute to the development of the Carbon Engineering company, it will most likely move us a lot further in the solution of this problem.

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