The Carbon Capture Technologies Leading the Industry

Carbon capture technology provides a ray of hope in the world's mission to achieve the Paris Agreement climate targets and limit the effects of global warming.

Global energy demand is taking its toll on the environment, and fossil fuels remain the most common energy source.

Renewable energy is a clean alternative, and while its use is rapidly increasing, the world is not yet at mass adoption. While this transition takes place, we need something to reduce the negative impact that fossil fuel energy has on our atmosphere.

Enter carbon capture technology. The ability to capture carbon emissions before they enter the atmosphere might help us put the lid on carbon emissions until renewables are ready to take over.

What is Carbon Capture Technology?

Burning fossil fuels for energy produces carbon dioxide as a byproduct. This CO_2 enters the atmosphere, contributing extensively to the overall warming of the Earth.

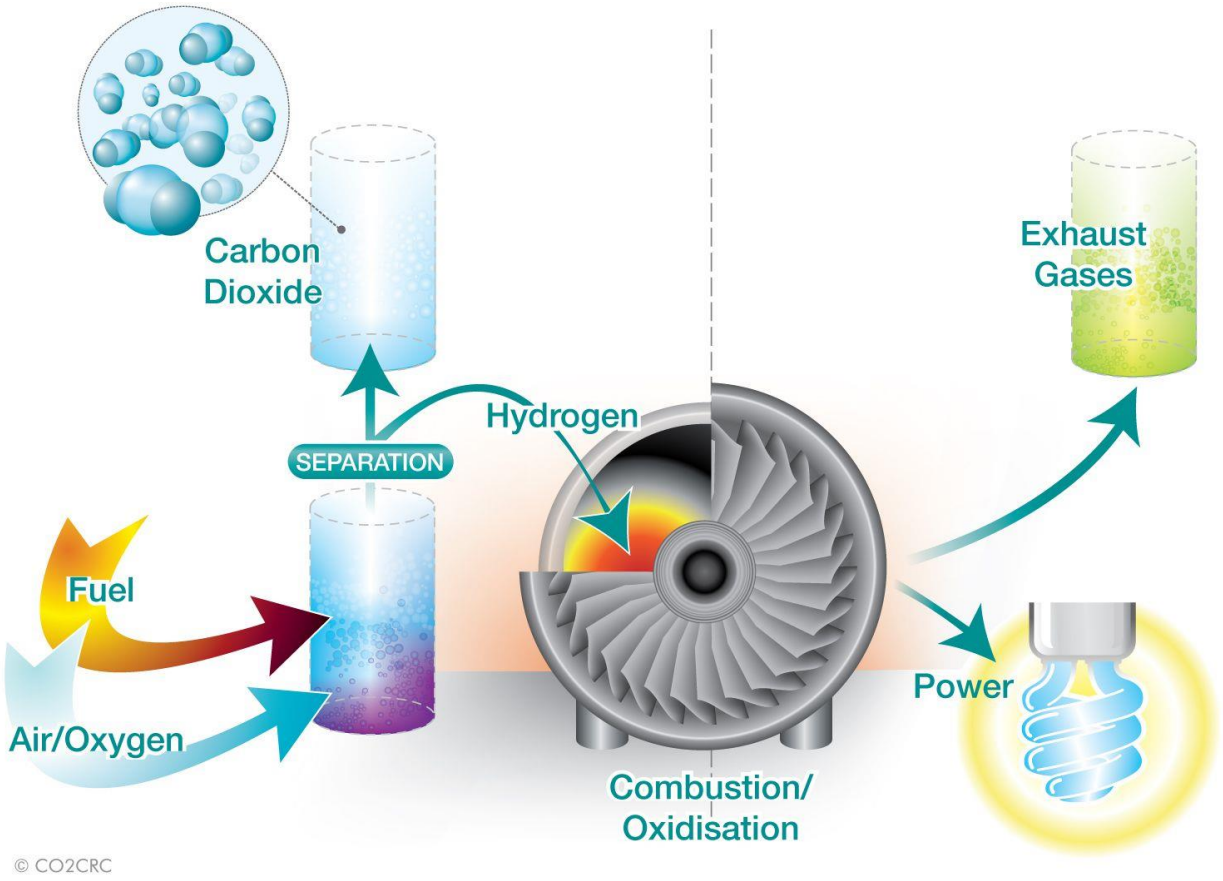
Carbon capture technology reduces CO_2 emissions during this process. It separates the carbon dioxide, which is then captured, transported, and stored. The process dramatically reduces the negative effect of burning fossil fuels, although it isn't possible to capture 100% of the carbon emissions in most cases.

There are three main types of carbon capture technology: pre-combustion capture, post-combustion capture, and oxyfuel combustion.

How Does Carbon Capture Technology Work?

Let's explore the ins and outs of the three main types of carbon capture technology.

Pre-Combustion Capture



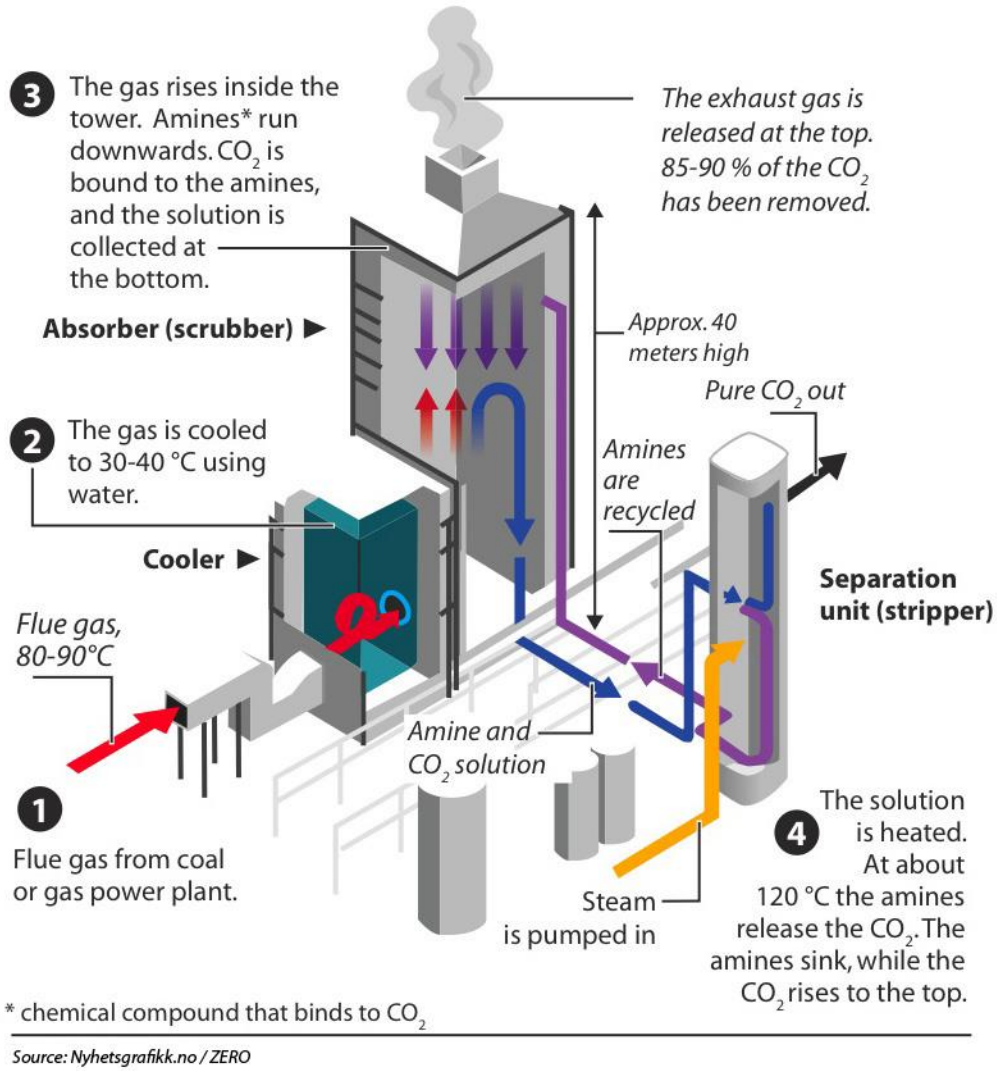
Source: CO2CRC

In pre-combustion capture, heat splits the fuel before combustion into a mixture of hydrogen gas and carbon dioxide. The hydrogen can be isolated and burned to produce energy without releasing any CO_2.

This allows the capture, compression, and transport of the remaining CO_2.

This process is a bit more complicated than post-combustion capture, making it difficult to retrofit existing power plants. Pre-combustion capture requires installation during the construction of new plants. Pre-combustion capture is, however, less energy-intensive than post-combustion.

Post-Combustion Capture

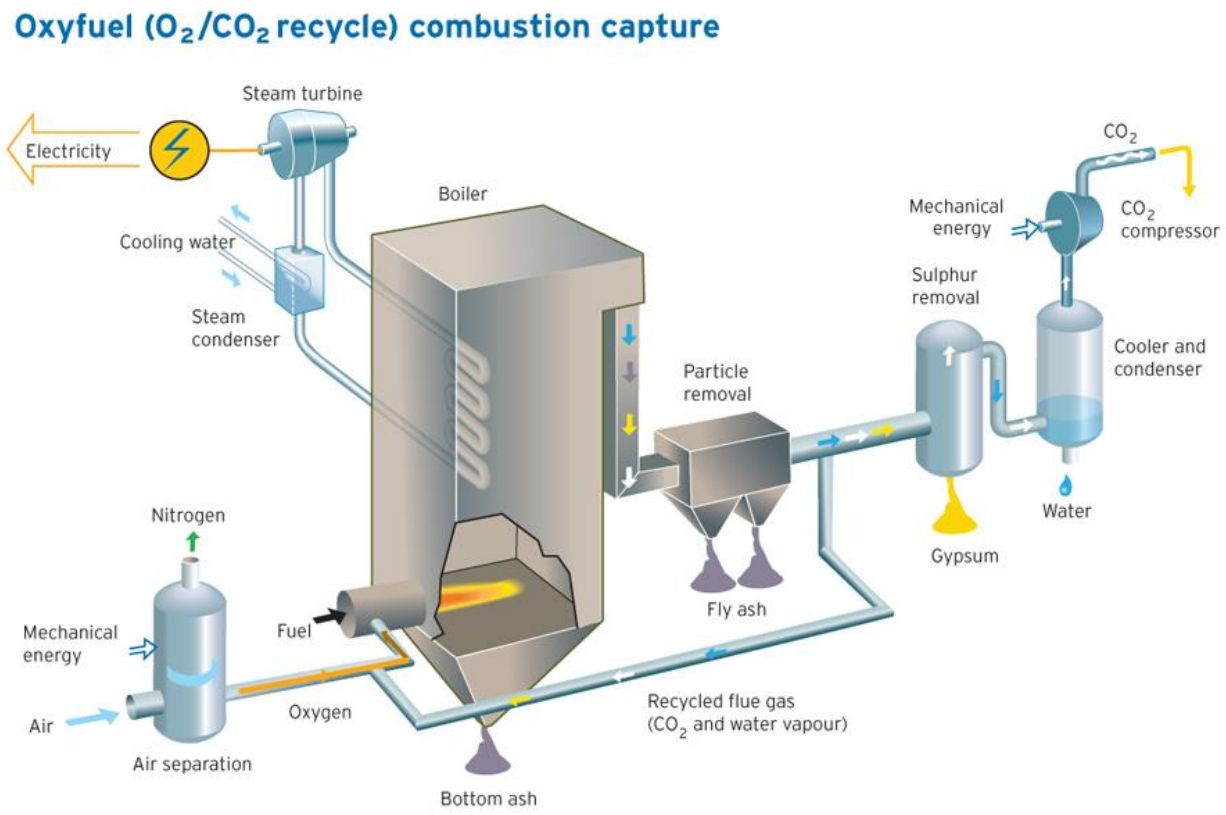


Source: Zero CO2

As the name suggests, post-combustion capture sequesters carbon after the combustion process. The exhaust gases from fuel combustion are captured, and the CO_2 is separated using a liquid solvent. The CO2 binds with the solvent, and the solvent-carbon dioxide mixture goes into the separation unit. In the separation unit, the CO_2 and solvent split. The allows the transportation and storage/utilization of the remaining CO_2.

This is the most common carbon capture method, and it allows for retrofitting onto existing power plants. As with pre-combustion capture, this method can capture about 90% of carbon dioxide emissions. Post-combustion capture is more energy-intensive than pre-combustion capture, reducing overall emission reduction.

Oxyfuel Combustion Capture



Source: [Zero CO2]

[Oxyfuel combustion capture] is the most efficient form of carbon capture technology, with the ability to capture 100% of carbon emissions. The efficiency comes with a price, however. Oxyfuel capture is the most expensive method of carbon capture and is very energy-intensive.

In oxyfuel combustion capture, pure oxygen is first separated from the air. The pure oxygen is then used to burn the fuel, generating carbon dioxide and water byproducts. Through a condensation unit, the water separates, allowing for capturing the remaining CO_2.

What Are Some of the Largest Carbon Capture Technology Companies?

With the urgency of our climate crisis, several companies are taking advantage of the presented opportunity to help our planet and make a profit along the way.

Some of the largest carbon capture companies include:

- Carbfix - Iceland
- Global Thermostat - USA
- CO2 Solutions by SAIPEM - Canada
- Net Power - USA
- Quest by Shell – Canada

Who is the leader in carbon capture technology?

The leader of the carbon capture debate might be a matter of opinion. Many companies want the title, but only a couple can lay legitimate claims.

Quest by Shell captures more carbon than any project of its kind. Lessons learned from the Quest project led Shell Canada president Michael Crothers to suggest that a similar project built today would cost about 20-30% less to operate.

Carbfix has an intuitive, natural weathering process to permanently store CO_2 as rock beneath the Earth's surface. They have demonstrated their strategy to be secure, cost-effective, and all without harming the environment.

Global Thermostat (GT) finds its competitive advantage in how long it takes them to retrofit an existing plant with carbon capture technology. GT's low-cost solutions are retrofittable for most facilities with as little as one day of plant inactivity.

Carbon Capture is a Potential Short-Term Solution

Renewable energy still needs time to develop and be embraced globally. Some costs still remain high (especially with the current supply chain issues) in comparison to fossil fuels, and while decreasing, the market needs some time to stabilise. The advancement of technology, government subsidies, and carbon taxes on dirty energy are speeding renewable energy along its path to full-scale implementation. In the meantime, carbon capture technology is a potentially viable way to reduce the adverse effects of fossil fuel energy generation.