Direct Air Carbon Capture

AECOM's experience in point source CO_2 capture includes the breadth of technologies and development stages.

Areas of Expertise
- Technoeconomic assessments
- Laboratory and pilot scale studies
- Detailed design for full-scale commercial systems

Types of Projects
- Solvent
- Sorbent (electrochemical membrane)
- Oxy-combustion
- CO_2 polishing

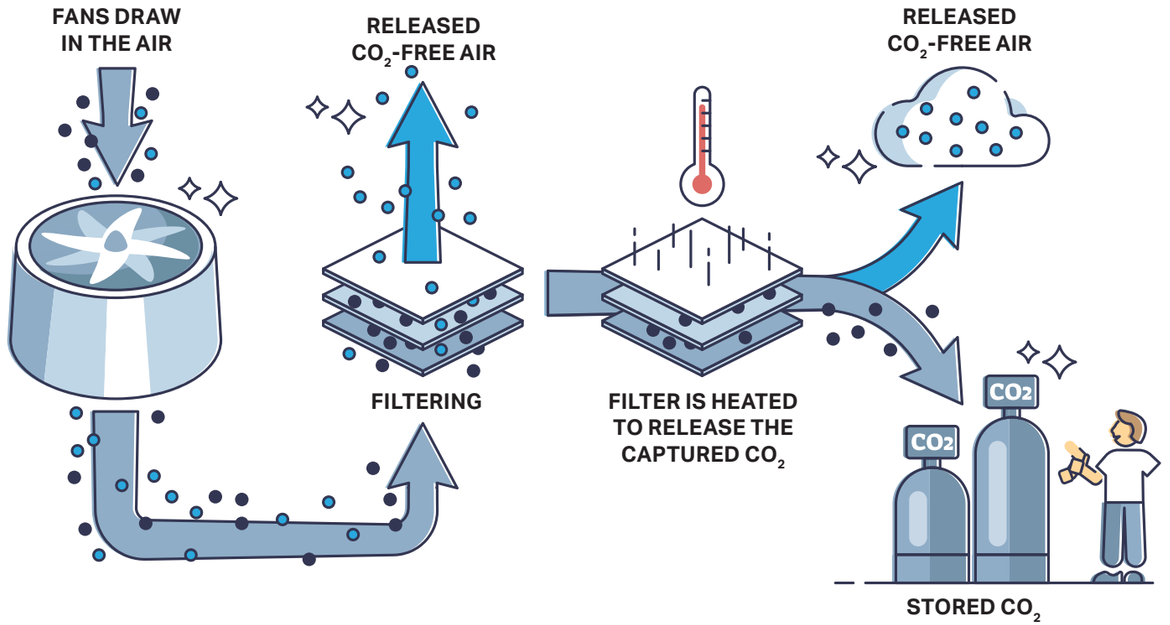
Overview
Direct Air Carbon Capture (DACC) is an emerging technology, growing from point source capture efforts and the need to dramatically reduce CO_2 in the atmosphere, and not just the carbon being actively emitted. AECOM has deep expertise in point source carbon capture, which is being logically applied to DACC.

Our Approach
AECOM's experience in point source CO_2 capture includes the breadth of technologies and development stages. AECOM has performed technoeconomic assessments, laboratory and pilot scale studies, and is currently executing the detailed design for a full-scale commercial system. Likewise, AECOM has performed projects in solvent, sorbent, (electrochemical) membrane, oxy-combustion, and CO_2 polishing (e.g., ethanol fermentation).

As specific examples, AECOM conducted lab-scale experiments for pre-combustion sorbent capture in a high pressure, high temperature reactor and is currently conducting a Front- End Engineering Design (FEED) for a full-scale solvent capture system at a Natural Gas Combined Cycle (NGCC).

Understanding of the DACC Market
AECOM's understanding of carbon capture technologies has been applied to assessing direct air carbon capture (DACC). The more developed DACC technologies feature sorbents and solvents with analogous properties to those of point capture systems. Some challenges are shared by both point and air capture (e.g., need to reduce parasitic load), while others are unique (carbon concentration in air is ~200x lower than flue gas). While point capture is dominated by temperature swing regeneration for solvents and sorbents, air capture uses some more novel regeneration schemes (water/humidity) in addition to temperature swings. DACC tends to be more passive, but the systems are still process-based and fundamental engineering principles apply. Improving the kinetics, thermodynamics, and capacity are well-understood for point capture, and though the priorities may differ for DACC, the principles remain unchanged.

The companies advancing DACC tend to be smaller, but many of these companies are partnering with larger corporations for the necessary capital. Still, the technology seems to be concentrated with start-ups, whereas in point capture some large corporations are advancing their own technologies (e.g., MHI). Start-ups, especially those that are unaffiliated, represent a unique opportunity for acceleration. A survey of the DACC landscape shows the technology to be in an analogous place to that of point capture 10-12 years ago; and where point capture had lessons learned and technological approaches from the oil and gas industry as benchmarks, DACC has the point capture market for reference. Start-ups at this phase tend to be heavily focused on messaging and marketing; partnering with our clients provides the opportunity for technical growth and accelerated maturation of the capture process rather than fund-raising, helping close the gap with point source capture technologies.



Investing in DACC represents a tremendous opportunity to stimulate this emerging market and help facilitate movement towards a net-zero emission future.

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