

## TECHNICAL BULLETIN

# CARBON CAPTURE UTILIZATION

### Carbon Capture Utilization (CCU): A Pathway to Sustainable Architectural Coatings

Commercial and residential construction, whether new or improvements to existing structures, consumes building materials that contribute to global greenhouse gas emissions. However, one area where the coatings industry is making great strides to minimize impacts on greenhouse emissions is providing architectural paints that are produced with ingredients manufactured from carbon dioxide (CO<sub>2</sub>) emissions captured from industrial processes.

Carbon Capture and Utilization (CCU) involves capturing CO<sub>2</sub> emissions from various sources, such as industrial processes, to create feedstocks that are eventually used to manufacture products such as architectural paints. Celanese Corporation, a global specialty materials and chemical company, has pioneered CCU technology at its Clear Lake, Texas facility by using industrial CO<sub>2</sub> emissions as the carbon source to create a methanol building block. This methanol is then used in the production of vinyl acetate-based emulsions, a key ingredient in architectural paints. The resulting paint products offer a lower carbon footprint and contribute to a more sustainable building envelope.

A key element of this process, known as the Mass Balance Approach, enables conventional (fossil) and green (renewable) feedstocks to be mixed and utilized in production, but they are accounted for separately, similar to renewable electricity projects. A third-party certification process, ISCC Carbon Footprint Certification (CFC), is utilized to accurately account and track the feedstocks produced. This mass-balance certification establishes a structure and methodology to validate appropriate accounting for the CO<sub>2</sub> capture benefits of the CCU process as well as tracking sustainable feedstock quantities. Celanese achieved ISCC CFC Certification for low carbon CCU methanol in March



**Celanese Corporation - Clear Lake, Texas Facility**



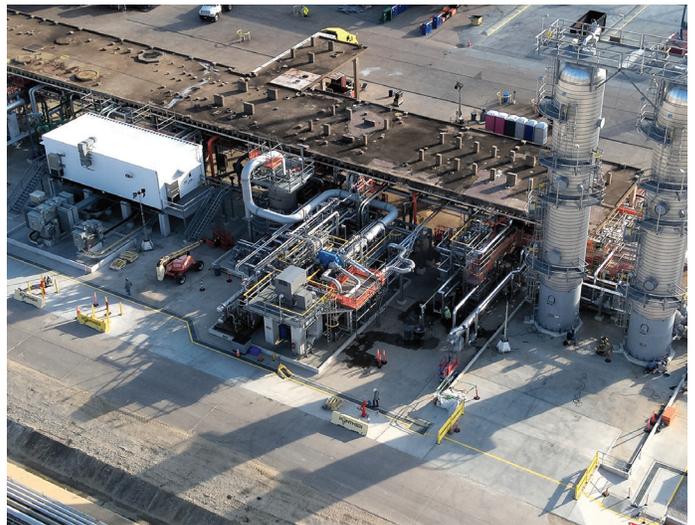
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2024. The feedstock demonstrated a greater than 70% reduction in carbon footprint relative to a global average benchmark for fossil-based methanol production.

In collaboration with Celanese, a wide range of paint products manufactured by **Dunn-Edwards** use emulsion systems produced with CCU technology. By embracing innovative technologies, **Dunn-Edwards** is working to provide professionals and consumers with products that utilize CCU technology, which aligns with the company's greener by design® principles of minimizing adverse impacts on material resources and environmental quality, while maintaining the same levels of performance and quality customers expect in coatings.



*Celanese Corporation - Clear Lake, Texas Facility*

## FAQs

**Q:** What is greenhouse gas or GHG?

**A:** These are gases in the Earth's atmosphere that trap heat. Some examples of greenhouse gases are carbon dioxide, methane, and nitrous oxide.

**Q:** What are greenhouse gas emissions?

**A:** Greenhouse emissions are a combination of gases from naturally occurring sources and human activities such as industrial processes that increase the concentration of greenhouse gases in the atmosphere.

**Q:** What is carbon capture utilization?

**A:** This is a process of capturing carbon dioxide (CO<sub>2</sub>) from various sources, such as industrial processes or directly from the atmosphere, and utilizing it to produce valuable products.

**Q:** What is a material feedstock?

**A:** A feedstock is a raw material used to produce intermediate materials or finished goods directly.

**Q:** What is carbon dioxide (CO<sub>2</sub>)?

**A:** Carbon dioxide is a colorless, odorless gas. CO<sub>2</sub> is naturally present in the Earth's atmosphere as part of the carbon cycle. It is also created through human activities such as burning fossil fuels for energy, transportation, and industrial processes.

**Q:** What is methanol and how is it used in a paint product?

**A:** Methanol is a chemical compound. It is a colorless alcohol that is naturally occurring in small amounts and can be made from fossil-based chemical processes or via CO<sub>2</sub> conversion (CCU). Methanol is used in the synthesis of acetic acid to make vinyl acetate monomer (VAM), which is a common ingredient that goes into water-based polymers used in adhesives, resins for coatings, and other applications.



APPLY A HIGHER STANDARD™

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**Q:** What is a vinyl acetate-based emulsion?

**A:** This is a type of water-based polymer used in various applications including paints and adhesives as a binder. The polymers are easier to handle and clean up, offer flexibility and adhesion, and generally have low levels of volatile organic compounds.

**Q:** What are volatile organic compounds (VOCs)?

**A:** VOCs are a group of chemicals that easily evaporate at room temperature. They are organic compounds which means they contain carbon. VOCs can be found in paint, cleaners, furniture, carpets, air fresheners, building materials, personal care products, gasoline, and diesel fuel.

**Q:** What is the concept of mass balance approach?

**A:** The mass balance approach is a system for tracking the flow of materials, particularly sustainable materials like recycled or bio-based feedstocks, through a production process. The amount of feedstock entering a production process is carefully tracked and recorded and then allocated to specific quantities of output material. The sustainable feedstock is typically mixed with other materials during the production process with produced product being chemically identical to conventional materials. This approach enables the efficiency benefits of large-scale production to be preserved while allowing for increase use of sustainable feedstocks. The concept is similar to renewable electricity where the actual electricity delivered is from the normal grid but power providers allocate specific customers electricity from renewable electricity projects, enabling them to recognize the reduced carbon footprint benefits of using renewable electricity.

**Q:** What's the difference between CCU and CCS?

**A:** Usually when people hear the term "carbon capture" it is referring to Carbon Capture and Sequestration or CCS. CCS involves capturing CO<sub>2</sub> emissions and injecting them into the ground with the goal of permanently storing them. CCU on the other hand, takes CO<sub>2</sub> emissions and uses them as a carbon source to create new products, turning the waste CO<sub>2</sub> into a valuable resource.

**Q:** What are the potential environmental benefits of using CCU resin technology in Dunn-Edwards manufactured paints?

**A:** Using CCU resin technology in Dunn-Edwards manufactured paints is projected to utilize over 2 million pounds of captured CO<sub>2</sub> annually. Based on the US EPA Greenhouse Gas Equivalencies Calculator, that is approximately equivalent to what over 800 acres of forest can consume in CO<sub>2</sub> in a year.

For a project requiring 10 gallons of paint that uses CCU emulsions, an estimated 4.5 to 7.9 lbs of captured CO<sub>2</sub> emissions are consumed. The amount of captured CO<sub>2</sub> emissions will vary based on the sheen levels of the products used.

