



A FUTURE FORWARD ALLIANCE IN ADVANCED CARBON CAPTURE

Advanced Solvent Carbon Capture Technology for the Power Industry

Honeywell

SAMSUNG E&A

ADVANCED SOLVENT CARBON CAPTURE FOR POWER PLANTS

With a global focus on energy transition and reducing carbon impact, power sector leaders are aggressively seeking technology solutions that limit greenhouse gas emissions.

Challenges in reducing the environmental impact of carbon-intensive industrial markets, like power, remain difficult. Modern combined cycle gas turbine (CCGT) power plants are known for their higher efficiency and lower emissions compared to traditional coal-fired power plants. However, they still produce significant amounts of CO₂ due to the combustion of natural gas.

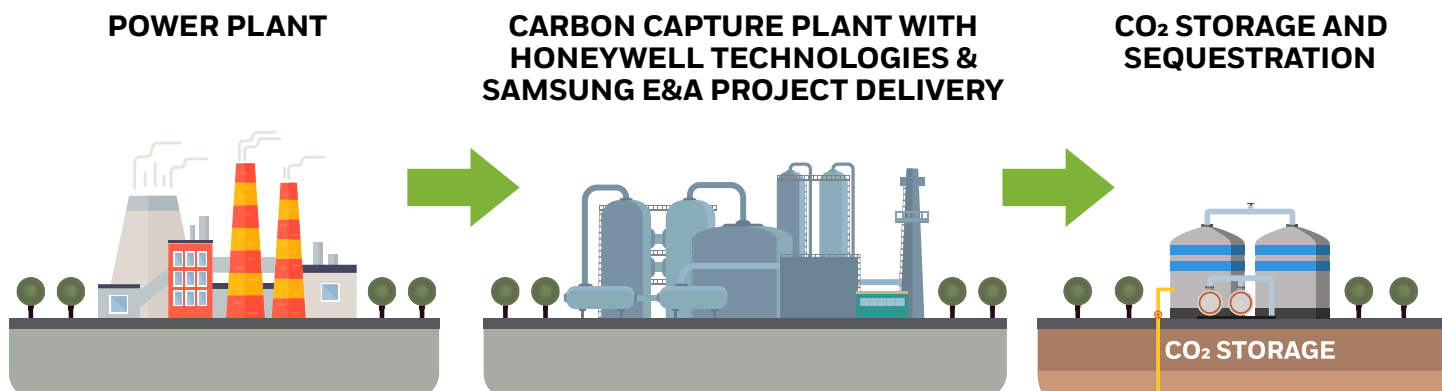
There are many avenues a company can take to meet sustainability goals, and a push towards carbon neutrality is becoming a key driver in meeting those commitments. While many companies have taken the first steps with more energy-efficient machinery and processes, supporting technologies for working toward the goal of carbon neutrality are continuously advancing, and companies need to keep up.

Energy-transition leaders **Honeywell** and **SAMSUNG E&A** have aligned together to design an integrated carbon-capture solution package that helps power plants reduce carbon emissions and meet stringent regulations.

At the heart of this collaborative initiative is Honeywell's **Advanced Solvent Carbon-Capture (ASCC)** technology, which captures CO₂ from flue gas, so it can be utilized or stored instead of entering the environment. The patented, innovative design enables lower-cost capture of CO₂ emissions for power plants.

CHALLENGES FOR THE POWER SECTOR:

- National and corporate net-zero policy ambitions
- Progressing legal, regulatory and financial frameworks
- Significant energy requirements for large-scale projects
- Lack of a complete system for all elements of carbon capture to support fast-moving projects





IMPORTANCE OF ADVANCED SOLVENT CARBON CAPTURE FOR CCGT POWER PLANTS

Despite the improvement in processing efficiency of combined cycle gas turbine power plants over traditional coal-fired facilities, CCGT plants still generate large volumes of low concentration flue gas emissions. The challenge of carbon capture for CCGT power is to cost-effectively separate the low concentration of CO₂ from the other flue gas constituents that can harm the system and plant efficiency.

ASCC systems solve this issue by reducing parasitic energy loads using a patented heat exchange design that leads to lower energy consumption for solvent regeneration, which enables a lower cost of capture.

ASCC MARKET INSIGHTS

The market for ASCC technology for CCGT power plants is experiencing significant growth, driven by the urgent need to reduce CO₂ emissions and meet climate goals. Here are some key quantifying numbers that highlight market insights:

Projected Growth: The global carbon capture and storage market is expected to grow from 6 billion USD in 2024 to 40 billion USD by 2031, at a CAGR of 21.9%.²

Emission Reduction Targets: To meet government and corporate emission goals, carbon capture capacity must increase more than 20 times, enabling the capture of 840 million metric tons of CO₂ per year by 2030.³

CCUS Contribution: Carbon capture, utilization, and storage (CCUS) is projected to account for 15% of overall emissions reductions in the IEA Sustainable Development Scenario.³

POWER GENERATION ACCOUNTS FOR ROUGHLY 40% OF GLOBAL CO₂ EMISSIONS⁴

This post-combustion carbon capture separates CO₂ emissions from a power plant's flue gas stream to prevent its release into the atmosphere. The captured carbon dioxide can then be stored or converted into a lasting product, resulting in an overall reduction in CO₂ emissions.

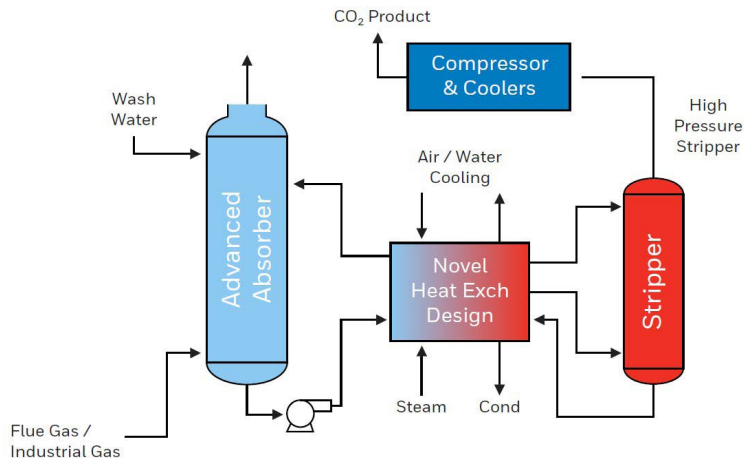
Investment in R&D: Honeywell directs approximately 60% of its R&D spend towards ESG-oriented outcomes,⁵ supporting the development of advanced carbon capture technologies.

Sustainability Projects: Honeywell has implemented more than 6,500 sustainability projects since 2010 with an estimated annualized savings of more than \$100 million.^{5,6}

These quantifying numbers underscore the growing importance and market potential of ASCC in CCGT power plants, highlighting the significant investments, technological advancements and emission reduction targets that are shaping the future of cleaner sustainable power generation.

EFFICIENT CAPTURE OF POST COMBUSTION CO₂ EMISSIONS

Advanced Solvent Carbon-Capture technology combines decades of Honeywell UOP engineering expertise and over 20 years of research in amine-based scrubbing to help reduce CO₂ emissions, developed at the University of Texas at Austin.



In the ASCC process, a gaseous stream containing CO₂ is mixed with a proprietary amine-based solvent, and the CO₂ is absorbed into it.

That CO₂-rich solvent is sent to a stripper where the CO₂ is separated from the solvent, and the carbon dioxide gas stream is then compressed and transported to be utilized or stored geologically.

Honeywell UOP's ASCC solutions are specifically designed for post-combustion flue gas applications, enabling greater than 95% CO₂ capture.⁷ The patented solvent enables a system design with a lower-cost capture of CO₂ emissions, benefitting power plants and other heavy emitters.

This is a point source carbon dioxide removal technology which can be retrofitted to existing plant installations or designed into new ones, and multiple emissions sources from one facility can be combined and fed to one ASCC unit.

By integrating carbon capture systems into CCGT operations, Honeywell's ASCC technology helps power producers meet stringent emission regulations and contribute to global efforts to combat climate change.

ASCC FEATURES AND BENEFITS:

- High stability that enables higher pressure stripper and lower solvent makeup rates
- High mass transfer rate from a smaller, more advanced absorber with proprietary internals
- Novel heat exchange customized to solvent and its properties
- High stripper pressure leads to reduced CO₂ compression
- Demonstrated at pilot scale

**GREATER THAN 95%
CO₂ CAPTURE FOR POST-COMBUSTION FLUE GAS⁷**

To accelerate deployment and ensure reliable operations, Honeywell embeds its automation and digital intelligence directly into the ASCC solution through Experion Solution Suites. This modular platform includes pre-engineered control logic, safety systems, and operator interfaces developed from Honeywell UOP's process IP, along with dynamic simulation models that enable operator training and virtual commissioning. Integrated alarm management, real-time diagnostics, and optimization software support stable, efficient operations—helping plants reduce energy use, minimize solvent loss, and meet CO₂ capture targets with confidence.

These advanced solutions ensure that CCGT plants can operate with minimal environmental impact while maintaining high efficiency.

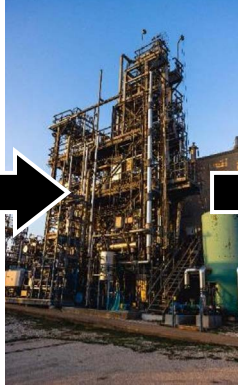
HONEYWELL ASCC SECOND GENERATION AMINE AND TECHNOLOGY SCALE UP

Honeywell UOP's ASCC solutions are adaptable and can be applied to many different plant configurations, allowing power plants to apply the technology in stages and scale up to the most efficient configuration. The sequence below demonstrates actual system configurations and the feasible progression of scaling up.

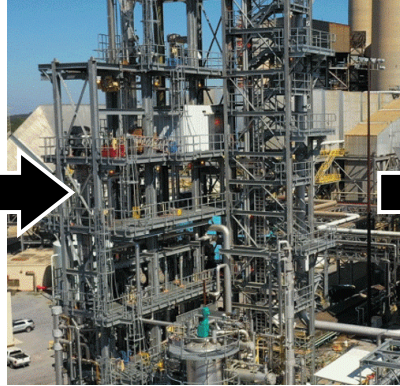
BENCH SCALE



SRP PILOT



NATIONAL CARBON CAPTURE CENTER



TECHNOLOGY CENTER MONGSTAD (TCM)



Image provide by TCM: www.tcmda.com

- Considered 100+ solvents
- Fast Mass Transfer Rate
- Robust against oxidation

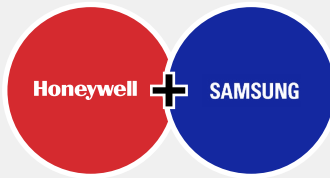
- >17+ Years of Pilot Plant Operation
- CO₂ Concentrations 3-20%
- Flue Gas flow rates of 350-600 CFM

- 0.5 MW coal-fired flue gas, with 8 TPD CO₂
- CO₂ Concentrations tested 4% & 12%
- Total of over 8500 hours to date
- Oxygen content tested up to 15%
- Emissions measurements for permitting

- Testing completed between Oct 2024 and Feb 2025
- 12 MWe RFCC flue gas, with average of 100 TPD CO₂ up to max of 200 TPD CO₂
- Further Advancing Oxidation Mitigation
- Emissions measurement for permitting
- Secondary Emissions Control Testing



"CARBON CAPTURE AND HYDROGEN SOLUTIONS"



"ACCELERATING EMISSIONS REDUCTION"

A FUTURE-FORWARD ALLIANCE DRIVING SUSTAINABILITY

Honeywell and SAMSUNG E&A have joined forces to drive sustainability through innovative carbon capture solutions. The collaboration focuses on accelerating emission reduction and promoting sustainable energy practices across multiple industries.

By leveraging decades of combined expertise in energy transition, Honeywell and SAMSUNG E&A are committed to providing end-to-end solutions that meet the specific needs of their customers, helping ensure a cleaner future.



CUSTOMER FOCUSED COLLABORATION



END-TO-END SOLUTIONS



SUSTAINABLE ENERGY



SERVING MULTIPLE INDUSTRIES

SHORTEN THE CONSTRUCTION PHASE AND MINIMIZE RISKS

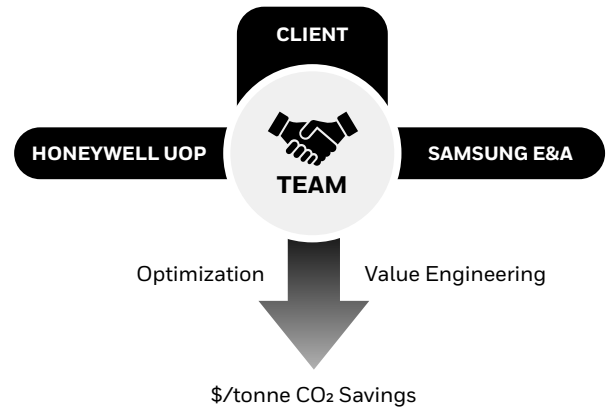
Connecting all the elements of an ASCC plant configuration is **SAMSUNG E&A's AHEAD project delivery model**, an innovative redesign of the conventional project execution method. This model is based on the Engineering Data Platform (EDP) and brings intelligence and automation to all areas of engineering, procurement and construction (EPC). This cutting-edge project delivery model features three main components:

Design AHEAD: Enables preemptive schedule management by finalizing the design early on using design automation and special procurement and engineering package strategies.

Build AHEAD: Maximizes offsite construction to improve productivity and strengthen safety at the site, utilizing key elements of fabrication, modularization and construction-purpose 3D printing.

Integrate AHEAD: Enhances the productivity and quality at the site through proactive integrated management. It focuses on systemization, standardization and automation using AI to develop and optimize project schedules.

COMPETITIVE CARBON CAPTURE COST



INDUSTRY-LEADING CCUS AND MONITORING

Honeywell UOP and SAMSUNG E&A provide expert guidance and solutions to help businesses develop viable carbon reduction plans.

CCUS solutions are tailored for individual requirements and our experts work with you to determine the best solutions for meeting your specific CO₂ emission reduction goals.

Honeywell's automation architecture also enables real-time carbon accounting, ensuring transparency, auditability, and alignment with ESG and regulatory frameworks.



MEASURE

Automation and sensors to gather emissions data from your plant operations



MONITOR

Centralized software to provide near real-time emissions information



REDUCE

Quickly identify areas to take cation

ASCC CASE STUDY: CRESCENT

In collaboration with Honeywell and Samsung E&A, Crescent Midstream plans to develop and construct an integrated carbon capture and sequestration (CCS) project in Lake Charles, Louisiana capable of capturing, transporting and permanently storing CO₂ emitted from an Entergy-owned natural gas-fired power plant.

The approximately \$1 billion project would be one of the largest CCS projects in the United States. It is expected to capture up to three million tons of CO₂ per year⁸ that would otherwise be emitted on the Louisiana Gulf Coast.

As part of the project, Crescent would apply its extensive onshore and offshore pipeline construction and operations experience to facilitate the safe transportation of CO₂ from the power generation facilities to permanent underground storage facilities.



1. Honeywell and SAMSUNG E&A Plan Collaboration to Help Reduce Power Plant Emissions. 2024. Honeywell. <https://www.honeywell.com/us/en/press/2024/09/honeywell-and-samsung-e-and-a-plan-collaboration-to-help-reduce-power-plant-emissions>
2. Carbon Capture and Storage Market is expected to grow from 6 billion USD in 2024 to 40 billion USD by 2031, at a CAGR of 21.9%. 2024. Exactitude Consultancy. <https://www.globenewswire.com/news-release/2024/9/24/2952394/0/en/Carbon-Capture-and-Storage-Market-is-expected-to-grow-from-6-billion-USD-in-2024-to-40-billion-USD-by-2031-at-a-CAGR-of-21-9-Exactitude-Consultancy.html>
3. IEA (2020), CCUS in Clean Energy Transitions, IEA, Paris <https://www.iea.org/reports/ccus-in-clean-energy-transitions>. Licence: CC BY 4.0
4. Carbon Dioxide Emissions from Electricity. 2024. World Nuclear Association. <https://world-nuclear.org/information-library/energy-and-the-environment/carbon-dioxide-emissions-from-electricity#:~:text=Energy%2Drelated%20greenhouse%20gas%20emissions,and%20Health%20in%20Electricity%20Generation>
5. Sustainability-oriented offerings are solutions that help improve safety, environmental impact, health, security, resilience, and accountability. Methodology for identifying ESG-oriented solutions is available at investor.honeywell.com (see ESG/ESG Information/Identification of ESG-Oriented Offerings)
6. 2024 Impact Report. 2024. Honeywell. <https://www.honeywell.com/content/dam/honeywellbt/en/documents/downloads/hon-2024-impact-report.pdf>
7. Confirmed by testing at the National Carbon Capture Center (NCCC).
8. Crescent Midstream Selected to Develop an Integrated Carbon Capture Solution for Entergy Natural Gas Power Plant. 2024. PR Newswire. <https://www.prnewswire.com/news-releases/crescent-midstream-selected-to-develop-an-integrated-carboncapture-solution-for-entergy-natural-gas-power-plant-302254315.html>
9. From Fuel to Fertilizer: How Green Ammonia Could Help Curb Emissions. 2023. World Economic Forum. <https://www.weforum.org/stories/2023/11/green-ammonia-climate-change-energy-transition/>

TALK TO AN EXPERT

Want to know more about Advanced Solvent Carbon Capture for CCGT power plants?

Contact us at: HoneywellUOPCarbonCaptureSolutions@Honeywell.com

or visit us at <https://uop.honeywell.com/en/contact-us>

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