

TATA CHEMICALS EUROPE (TCE)

TCE INVESTS IN UNITED KINGDOM'S FIRST CARBON CAPTURE AND UTILIZATION PROJECT¹



First industrial scale CCU plant in the UK. Image provided by Tata Chemicals Europe.

How can we reduce our carbon emissions? How can we lower carbon dioxide (CO₂) emissions and improve utilization of our own value stream? These are questions many industries and companies ask themselves, especially as taxes for emitting CO₂ inevitably trend upward. Tata Chemicals Europe (TCE) has taken a leading role in the United Kingdom by investing in a Carbon Capture Utilization (CCU) plant that will capture their combined heat and power (CHP) plant's CO₂ and use it in their production of sodium bicarbonate.

TCE appointed Pentair to handle this exciting carbon capture utilization initiative, which will open in the second quarter of 2022. TCE CCU Project Manager Stewart Prentice stated, "The project could help pave the way for other industrial applications of carbon dioxide capture and is an important step in decarbonizing industrial activity."

The captured carbon dioxide will not only reduce TCE's carbon emissions but will also be used to make sodium bicarbonate to be known as EcoKarb®. Carbon dioxide is a key ingredient in high-grade sodium bicarbonate, which is most often used in the pharmaceutical sector and for hemodialysis, a type of treatment for kidney failure.

INNOVATIVE AND WELL-PROVEN APPLICATION OF CARBON CAPTURE UTILIZATION TECHNOLOGY

In an innovative application of CCU Technology, the TCE plant will capture carbon dioxide from the flue gases of TCE's gas-fired 400 MW steam combined heat and power (CHP) plant, which supplies steam and electricity to the company's Northwich, England operations and other industrial businesses in the area.

The CCU plant extracts, purifies and liquefies the CO₂ contained in the flue gas for use in the manufacture of sodium bicarbonate. Deploying CCU technology will reduce emissions as the captured CO₂ is utilized in the manufacturing process versus being emitted into the atmosphere. CCU is based on Pentair Advanced Amine Technology (AAT).

ADVANCED AMINE TECHNOLOGY IS BOTH ROBUST AND FLEXIBLE

Pentair AAT is an industry-leading technology to capture carbon dioxide from any flue gas, including non-power generation sources such as limekilns. The process is designed for gas streams having low partial CO₂ pressure, as is the case for flue gases.

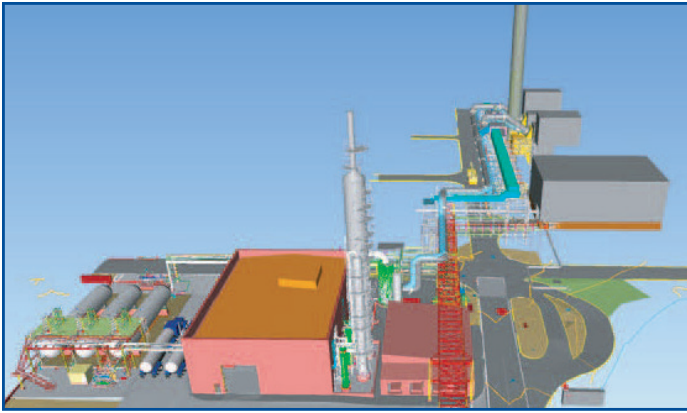
The design philosophy when creating an efficient CO₂ plant is crucial in obtaining a robust and flexible process. In-depth knowledge of butterfly effects of various process instabilities and offsets helps to ensure proper process control and a well-trimmed plant, which is key for helping ensure continued high CO₂ quality.

"We worked closely with Pentair to develop a unique solution to capture carbon dioxide emissions that are then recycled to produce sodium bicarbonate. The official opening of the plant celebrates a major milestone in Tata Chemicals Europe's journey to reducing carbon emissions from our operations with the carbon capture plant reducing our emissions by approximately 10% at our CHP plant. The solution we have created with Pentair demonstrates that innovation and technology can meet industrial challenges like our own."

Martin Ashcroft
Managing Director
Tata Chemicals Europe

TO LEARN MORE VISIT CARBONCAPTURE.PENTAIR.COM/TATA-CHEMICALS

¹The Ten Point Plan for a Green Industrial Revolution", HM Government, date accessed 24th May 2022, date published November 2020, Pg. 23
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf



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Initially, AAT technology was designed to meet the very strict quality needs put forth by the global food industry and the merchant gas market, but has now found its way to large industrial manufacturing companies using CO₂ as source material, requiring the same food-grade quality as food industry producers.

To support these significant industries, the technology is further developed to offer large-scale CCU and Carbon Capture Sequestration (CCS) projects.

Pentair has extensive experience and a deep understanding of amine technology, having installed more than 300 amine plants globally.

PENTAIR NOXFLASH ELIMINATES THE NEED FOR POTASSIUM PERMANGANATE

During the CO₂ capturing process, certain impurities like NO_x need to be efficiently eliminated. Patented Pentair NOxFlash Technology helps to remove the risk of contaminating the liquid CO₂ with NO_x. This approach provides an efficient alternative to the traditional method of removing NO_x from the CO₂ that entails scrubbing the gas with a potassium permanganate (PPM) solution. PPM is a strong oxidizing chemical that requires caution in handling of both the initial chemical solution and its waste by-products. Use of such substances could create additional plant resource burdens as they may entail more considerations such as worker safety due to exposure precautions, environmental concerns due to disposal procedures and other costs such as supply due to more regulated import/export. By avoiding the use of PPM in the process, plants may avoid these issues, thereby alleviating these potential costs and other resource factors.

Among other advantages, Pentair NOxFlash, in combination with the distillation column, also optimizes the process to yield better food-grade quality CO₂. The resulting product is a CO₂ liquid at approximately 18 barg and -25° C with a purity of more than 99.999% (according to European Industrial Gases Association (EIGA) specifications²), ready to be used as pharmaceutical grade sodium bicarbonate, as requested by TCE.

Pentair has installed more than 2,000 CO₂ plants globally meeting these specifications.



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ATTRACTIVE FOR MULTIPLE INDUSTRIES

The CCU plant will see TCE taking a leading role in helping prove that this technology can help the UK reach its net-zero goal in reducing 100% of greenhouse gas emissions by 2050 and ensuring ongoing emissions are balanced³.

According to TCE, the project is expected to be a springboard for TCE to help unlock further growth into their export markets. Examples like these can be an important source of inspiration for other industries, irrespective of the ability to utilize the captured CO₂ internally or the option to sell to third parties. Another potential option is sequestration of the capture CO₂, where the business case is strongly related to storage options.

²Minimum Specifications for Food Gas Applications", European Industrial Gases Association, date accessed 20th June 2022, published 2020, Pp. 2 & 4, <https://www.eiga.eu/uploads/documents/DOC167.pdf>

³Climate change targets: the road to net zero?", UK Parliament, House of Lords Library, date accessed 9th June, 2022, date published 24th May, 2021, <https://www.legislation.gov.uk/uksi/2019/1056/contents/made>



Scrubbing Tower at the TCE CCU plant in the UK. Image provided by Tata Chemicals Europe.

KEY FACTS



LOCATION:
UNITED KINGDOM



COMMISSIONING COMMENCED:
2021



CAPACITY:

- ◆ CAPTURING 40,000 TE OF CO₂ A YEAR
- ◆ RESULTING IN 10% CARBON REDUCTION



APPLICATION:
CARBON CAPTURE UTILIZATION

**FOR MORE INFORMATION:
CONTACT US OR VISIT [CARBONCAPTURE.PENTAIR.COM](https://www.carboncapture.pentair.com)**