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Net-zero carbon ethylene production via recovery of CO_2 from cracking furnace flue gas

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Abstract

Steam cracking of hydrocarbons is one of the largest carbon dioxide (CO_2) emitting processes in the chemicals industry. Conventional cracking generates approximately 0.85–1.8 metric tons (mt) of CO_2 for every metric ton of ethylene produced. Globally, that amounts to more than 260 million metric tons (MMt) of CO_2 emissions per year.

At the United Nations Climate Change Conference (COP26, Glasgow 2021), all the participating countries agreed to revisit and strengthen their emission targets. It appears inevitable that there will be an increased focus on the development of net-zero carbon emission ethylene production processes; either by using redesigned net-zero-emission technologies or by capturing and sequestering the CO_2 produced in conventional processes.

This review focuses on capture of CO_2 from flue gases in an ethane cracker facility.

The facility is a conventional steam cracker designed to produce 1.5 million metric tons per annum (MMtpa) of polymer-grade (PG) ethylene. A carbon-capture section is added, which recovers 90% of the CO_2 in the flue gas and compresses it for delivery to pipeline. Atmospheric emission of CO_2 is reduced by approximately 1.15 MMtpa (over the conventional process).

This review is the first in a series that IHS Markit plans to publish on ethylene technologies with the potential to reduce carbon emissions by 90% or more. This set of reviews will be a valuable resource for planners, producers, and designers who are looking for an authentic comparison of capital and production costs for different strategies of deep carbon emission reduction for ethylene production.

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