Steam cracker of the future: Path towards net zero emissions and improved energy efficiency

Michael Reitz
BASF SE

Abstract

Climate change is the greatest challenge of the 21st century. Swift and resolute action of all energy- and emission-intensive industries is needed to achieve the targets agreed in the Paris Climate Agreement. In many areas, products and innovations based on chemistry are the key to a climate-neutral future – from insulation foams for energy-efficient buildings, lightweight construction components and battery materials for electromobility to more sustainable agriculture.

Steam cracker plants are crucial in the petrochemical value chains by providing a wide range of base chemicals for downstream processes, but also causing a significant share of the overall emissions in the petrochemical industry. Therefore, a profound transformation of steam cracker plants is required to head towards net zero emissions.

Cracking furnaces are the largest greenhouse gas emissions source in steam cracker plants and are therefore particularly in focus. Extensive emission reductions can be achieved by utilization of alternative fuels such as hydrogen, carbon capture and storage technologies or converting the heat generation from fossil fuel firing to electric heating using renewable power. The suitability and cost-effectiveness of the various emission reduction technologies is highly dependent on site-specific factors, so all technologies have a role to play in the steam cracker of the future.

The required adaptations of steam cracker plants to achieve net zero emissions facilitate a further improvement of steam crackers energy efficiency. Energy optimization can be accomplished, for example, by electrification measures in the field of drives and steam generation or by innovative heat integration concepts in the cracking furnace area, e.g., by means of feed effluent exchangers.

The conference contribution provides an overview of potential emission reduction technologies for the path towards net zero emissions and detailed information on the eFurnace, world’s first demonstration plant for large-scale electrically heated steam cracking furnaces developed by BASF, SABIC and Linde. Furthermore, energy optimization measures are presented that will support the transition to steam crackers of the future.