Abstract
The enormous global challenge for the future refining and petro-/chemical industries is a dual one: the need to meet rising global energy demand while at the same time significantly reducing carbon emissions to prevent further increase in global warming. The real task is to shape an economically tolerable transformation process that paves the way from an almost exclusively fossil-based to a low-emission energy concept. Measures for decarbonization by avoidance of emission of greenhouse gas-relevant molecules are manifold, but differ in their sustainability and the way they are integrated. However, due to close interdependencies of the refinery, petrochemical and chemical industry, in several cases they will increasingly influence the complex processing sequences and strategic planning of refineries as well as for downstream petrochemical and chemical processing.

Starting with renewable electricity/power, water-electrolyzed hydrogen in combination with carbon from recovered CO2 is of particular importance for the production of dedicated “building components” as feedstock for sustainable transportation fuels and petrochemical/chemical products.

Corresponding pathways are based on the supply of synthetic crudes from Fischer-Tropsch synthesis with associated product upgrades, or the use of methanol-based processing routes, such as sustainable methanol to olefin synthesis, including product-specific downstream processing.

The presentation reflects on the numerous possibilities of both, MeOH- and FT-based processes and discusses major pathways in terms of their technical maturity, CO2 reduction potential and required infrastructure.

Beside that, a further focus is set on general remarks regarding economic aspects and costs, in particular against the backdrop of CO2 avoiding costs (CO2 taxation) as well as on a comparative analysis of different sustainable product portfolios and yield structure that can be achieved.
The lecture ends with a short, exemplary compilation of individual technologies and current efforts for sector coupling that thyssenkrupp intends to effective counter the further increase in carbon dioxide emission.

About the lecturer

Thomas Streich is Global Head of Green Technologies & Decarbonization Portfolio. He has almost 30 years of experience in different professional and management positions in the fields of process development, strategic technology assessment and commercialization, as well as all kinds of EP/EPC executions for the segments of refinery, hydrocarbon processing and petrochemicals industries. He holds two diplomas (Dipl.-Ing.) in Constructional Design and Process Engineering as well as a doctorate in Chemical Engineering from the Ruhr-University of Bochum, Germany.