



Joint News Release

September 9, 2019

Novel process developed to recover high value products from natural gas

- **New process successfully combines treatment of natural gas for pipeline transportation with the simultaneous recovery of valuable helium, liquid hydrocarbons, and purified CO₂**
- **Customers benefit from purified natural gas for pipeline transportation and additional value streams from their process**
- **Access to a new highly profitable helium source, employing a non-cryogenic process**
- **Joint presentation by Linde and BASF during Gastech conference from September 17-19 in Houston**

Ludwigshafen, Germany and Pullach, Germany, September 9, 2019 – Linde developed a novel process to recover high value products from natural gas successfully combining leading technologies of BASF and Linde.

The process simultaneously recovers valuable helium, liquid hydrocarbons, and purified CO₂ in addition to conditioning natural gas for pipeline transportation adjusting the water and heavy hydrocarbon dew point, as well as the CO₂ concentration.

Helium is commonly recovered from natural gas when a cryogenic separation is employed. The hybrid process eliminates the need for cryogenic conditions, giving access to a new highly profitable helium source.

The process consists of two stages of Linde's HISELECT® Powered by Evonik membranes, an upstream BASF Durasorb™ hydrocarbon removal unit (HRU), an integrated BASF OASE® acid gas removal unit (AGRU) and an integrated Linde Helium PSA unit. The two HISELECT® membrane stages are simultaneously used for helium enrichment and adjustment of CO₂ to pipeline specification. The Linde Helium PSA purifies the enriched helium up to 99.999% with highest yield. BASF's OASE® AGRU is used to selectively remove the CO₂ from an internal recycle without any helium or methane loss. BASF's Durasorb™ HRU removes heavy hydrocarbons and water to meet pipeline dew point, produce liquid hydrocarbons as valuable byproduct and to ensure high membrane performance.

The combination of these technologies and the expertise of the companies allows for optimization of performance and the generation of additional value streams from the gas treating process. A project utilizing this approach will generate additional revenue, resulting in a high ROI and short payback period.

"The newly developed process changes project economics and helps our customers to generate additional value. As an additional high value stream can be generated, we'll see more projects move forward," says Detlef Ruff, Senior Vice President Process Catalysts at BASF.

"It is exciting to see how the combination of technology from three leading companies result in such a unique, efficient and sustainable process," says Tobias Keller, Head of Linde Engineering's Adsorption and Membrane Plants.

Media Contacts

BASF SE

Media Relations
Kerstin Hoffmann
Phone: +49 621 60-29875
Kerstin.Hoffmann@basf.com

BASF SE
67056 Ludwigshafen
<http://www.basf.com>
presse.kontakt@basf.com

Linde

Marketing Communications
Susan Scheidler
Phone: +49 89 7445 4727
susan.scheidler@linde.com

Linde
82049 Pullach/Germany
<http://www.linde-engineering.com>

About BASF's Catalysts Division

BASF's Catalysts division is the world's leading supplier of environmental and process catalysts. The group offers exceptional expertise in the development of technologies that protect the air we breathe, produce the fuels that power our world and ensure efficient production of a wide variety of chemicals, plastics and other products, including advanced battery materials. By leveraging our industry-leading R&D platforms, passion for innovation and deep knowledge of precious and base metals, BASF's Catalysts division develops unique, proprietary solutions that drive customer success. Further information on BASF's Catalysts division is available on the Internet at www.catalysts.basf.com.

About BASF

At BASF, we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The approximately 122,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of around €63 billion in 2018. BASF shares are traded on the stock exchange in Frankfurt (BAS) and as American Depositary Receipts (BASFY) in the U.S. Further information at www.basf.com.

About Linde

Linde is a leading industrial gases and engineering company with 2018 pro forma sales of USD 28 billion (EUR 24 billion). The company employs approximately 80,000 people globally and serves customers in more than 100 countries worldwide. Linde delivers innovative and sustainable solutions to its customers and creates long-term value for all stakeholders. The company is making our world more productive by providing products, technologies and services that help customers improve their economic and environmental performance in a connected world.

For more information about the company, please visit www.linde.com