

## Press Release

### Linde develops a new production process for synthesis gas

- EUR 5 million investment to expand research and development facilities at Pullach near Munich – Linde’s largest location worldwide
- Innovative dry reforming process developed in cooperation with Linde partners
- New process enables energy-efficient, low-emission synthesis gas production with economical industrial-scale use of CO<sub>2</sub> as feedstock
- Dr Büchele commented: “The official opening of the pilot reformer is further proof of our customer-centric approach to development.”

Munich, 15 October 2015 – Today, technology company The Linde Group officially opened the new Linde Pilot Reformer research facility at Pullach near Munich – Linde’s largest location worldwide. The event was attended by customers, partners and employees.

Linde has invested approximately EUR 5 million in total to expand Pullach’s research and development capacity. The Linde Pilot Reformer will be used to refine steam reforming technology for the production of synthesis gas – a mixture consisting of hydrogen (H<sub>2</sub>) and carbon monoxide (CO). The carbon feedstock for synthesis gas can be in the form of natural gas, liquid petroleum gas (LPG), naphtha or even carbon dioxide (CO<sub>2</sub>).

“Inventiveness and innovation are ingrained in Linde’s DNA. The official opening of the pilot reformer provides further proof of our customer-centric approach to development and sends a strong signal confirming Germany’s role as an innovation hub,” commented Dr Wolfgang Büchele, Chief Executive Officer of Linde AG.

“Linde intends to use this pilot facility to test and optimise all kinds of approaches to reforming. The insights we gain will help us further improve reforming processes and concepts for our customers,” adds Dr Christian Bruch, Member of the Executive Board of Linde AG and responsible for Technology and Innovation as well as the Engineering Division.

Tests in the pilot reformer are currently focused on the dry reforming. This innovative process was developed by Linde in cooperation with its partners BASF and hte (responsible for catalyst development), Karlsruhe Institute of Technology / KIT (responsible for simulations) and DECHEMA (supplier of materials). The pilot project has been awarded funding by the German Ministry for Economic Affairs and Energy (BMWi) of just under one EUR million<sup>1</sup>.

The production of synthesis gas (a mixture of H<sub>2</sub> and CO) through dry reforming of natural gas means that carbon dioxide (CO<sub>2</sub>) can be used on an industrial scale as an economical feedstock. The process is also significantly more energy efficient than the conventional method of reforming. The synthesis gas can be used to produce valuable downstream products such as base chemicals or fuels.

One such example is dimethyl ether (DME). The DME produced through dry reforming offers an improved energy balance and lower CO<sub>2</sub> emissions.

The dry reforming process also offers cost efficiencies relative to partial oxidation – the conventional method used up to now to produce CO-rich synthesis gases. These would be of particular interest to small and medium-sized plants.

If the dry reforming pilot proves successful, there are plans to commercialise the process when the funded project comes to an end in 2017 and build a reference plant for a Linde customer.

<sup>1</sup>Funded by the Federal Republic of Germany, awarding authority: Federal Ministry for Economic Affairs and Energy based on a decision by the German Parliament, funding No. 03ET1282.

In the 2014 financial year, The Linde Group generated revenue of EUR 17.047 bn, making it the largest gases and engineering company in the world with approximately 65,500 employees working in more than 100 countries worldwide. The strategy of The Linde Group is geared towards long-term, profitable growth and focuses on the expansion of its international business with forward-looking products and services. Linde acts responsibly towards its shareholders, business partners, employees, society and the environment – in every one of its business areas, regions and locations across the globe. The company is committed to technologies and products that unite the goals of customer value and sustainable development.

For more information about The Linde Group, go to [www.linde.com](http://www.linde.com)

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