

Industrial Solutions

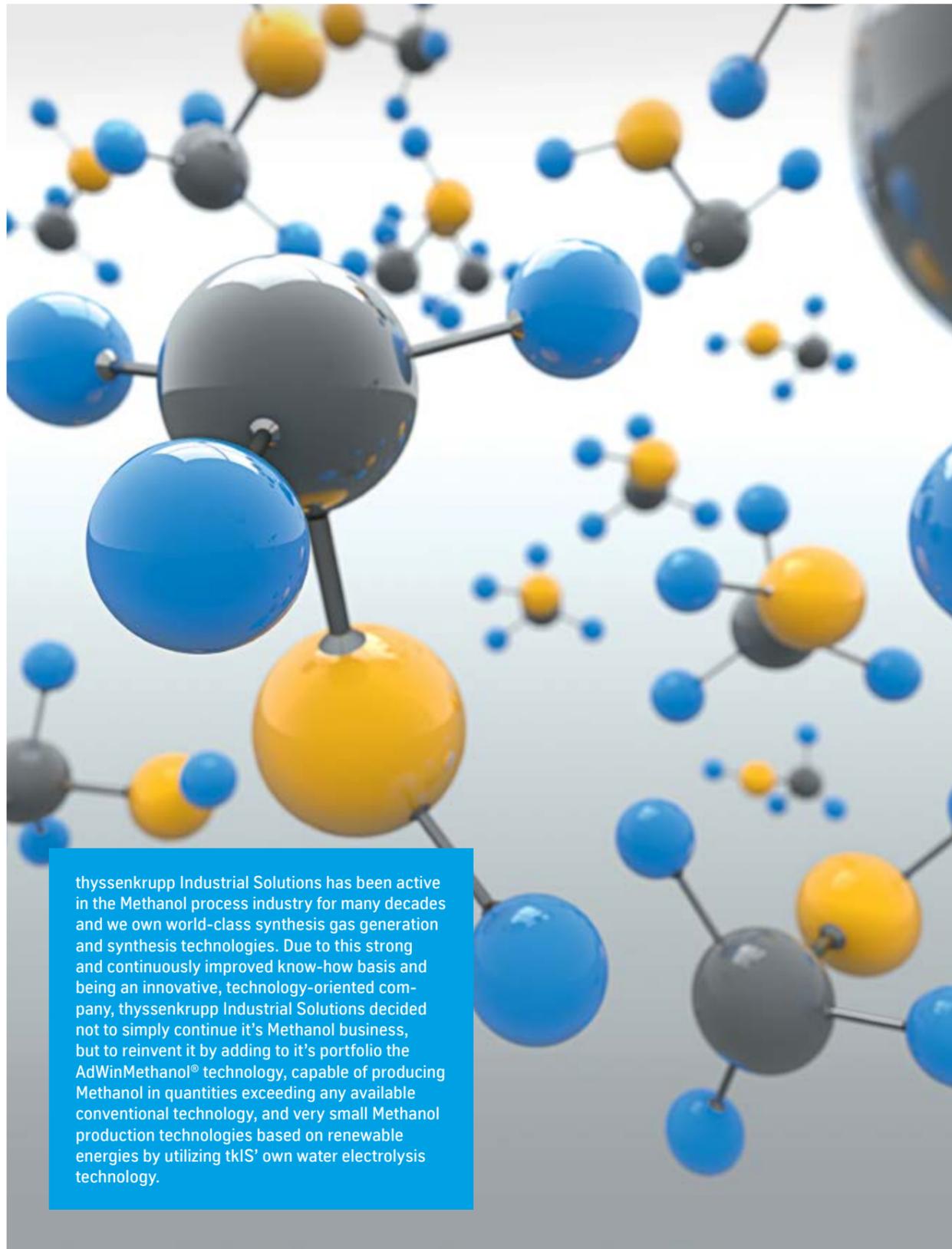
Methanol plants

How you profit from our one-stop shop



thyssenkrupp





thyssenkrupp Industrial Solutions has been active in the Methanol process industry for many decades and we own world-class synthesis gas generation and synthesis technologies. Due to this strong and continuously improved know-how basis and being an innovative, technology-oriented company, thyssenkrupp Industrial Solutions decided not to simply continue its Methanol business, but to reinvent it by adding to its portfolio the AdWinMethanol® technology, capable of producing Methanol in quantities exceeding any available conventional technology, and very small Methanol production technologies based on renewable energies by utilizing tkIS' own water electrolysis technology.

A portfolio to meet all your needs

Whatever your Methanol production requirements may be, we can meet them. Whether you need 10 or 10,000 metric tons per day (tpd), we can supply you with precisely the plant you want.

Whatever feedstock you want to use – anything from renewable raw materials, Hydrogen and Carbon Oxides containing gases in almost any combination, pure CO₂ to natural gas – we have the production technology you need.

Our Methanol plants come in three capacity categories:

- **10–200 tpd for Power to Methanol (PtM) projects:** produced in cooperation with Swiss Liquid Future (SLF) and the SLF/Uhde Methanol process using feedstocks from renewable energy sources, e.g. hydrogen produced by our own thyssenkrupp water electrolysis technology fueled by wind, solar, or water power
- **200–3,000 tpd:** produced as a rule in gas-powered plants with syngas production by means of Uhde steam reformers and a conventional or the AdWinMethanol® synthesis loop depending on the capacity
- **3,000–10,000 tpd:** produced by AdWinMethanol® technology without steam reformers

Due to the proximity of Syngases and its generation, thyssenkrupp can serve the needs of our clients with unique and integrated solutions for the combined production of Methanol and Ammonia.

At thyssenkrupp, we built our first Methanol plant as long ago as 1931. Our experience in high-pressure, high-temperature processes goes back even further – 95 years. Our engineering, procurement, and construction (EPC) know-how enables us to guarantee the punctual completion of your turnkey Methanol plant.

Take us at our word – and profit from our one-stop-shop solutions for your Methanol plant.

from
10 to
10,000 tpd
Methanol

Examples of use

- Base product for formaldehyde-based industries and many more commodity chemicals
- Methanol as energy storage for renewable power
- Blending with gasoline
- Methanol-to-gasoline or Methanol-to-olefins production for utilization of stranded gas

Features

- One-stop-shop solutions
- From licensing, engineering, and procurement through to full-fledged EPC execution, all from a single source
- thyssenkrupp, with annual sales of more than forty billion euro is a strong partner and is able to facilitate financing even for very large projects and to provide the necessary guarantees
- thyssenkrupp Industrial Solutions always delivers your Methanol project on time and within the budget.



350 mtpd Methanol plant (grade AA) using innovative synthesis gas generation from waste products such as: clarifier sludge, used light and heavy oil, rubber waste, contaminated wood, and shredded material from recycling plants of motor vehicles. SVZ GmbH, Schwarze Pumpe, Germany



600 mtpd two-column distillation (grade AA Methanol) for BASF AG Ludwigshafen, Germany

Small, smart, sustainable – from a single source

Small-scale Methanol plants

We offer one-stop-shop solutions for Methanol plants in the 10–200 tpd range. Not only can we point to decades of EPC experience and expertise, we can also organize your plant operation, train your staff, service your plant, deliver spare parts, and much more. Our full-service solutions from a single source ensure you have very little work and no worries.

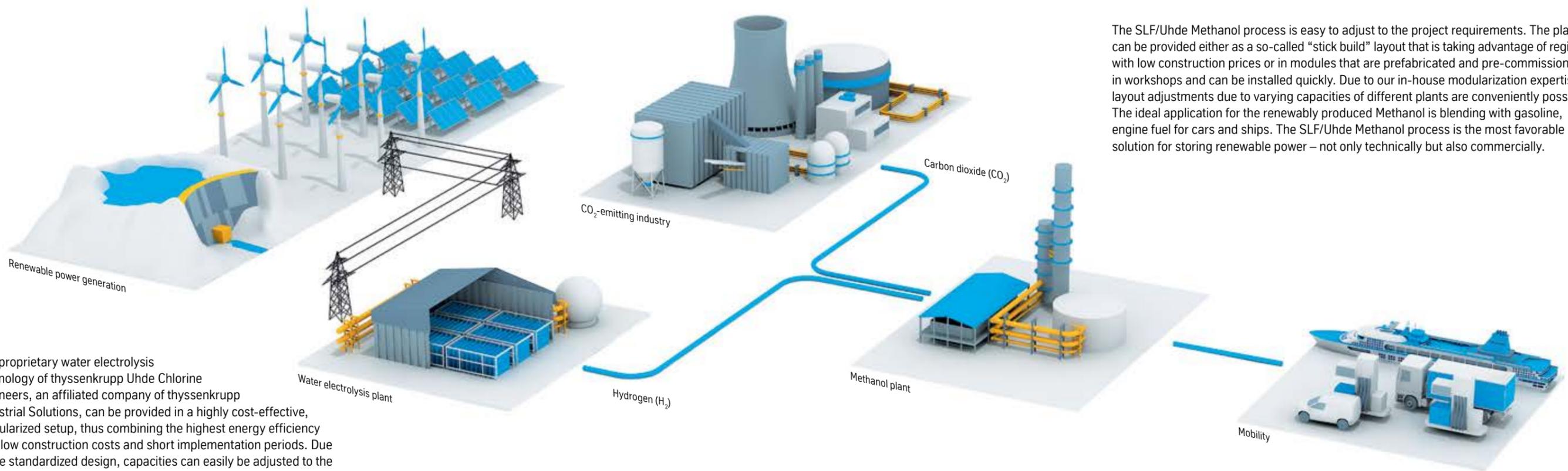
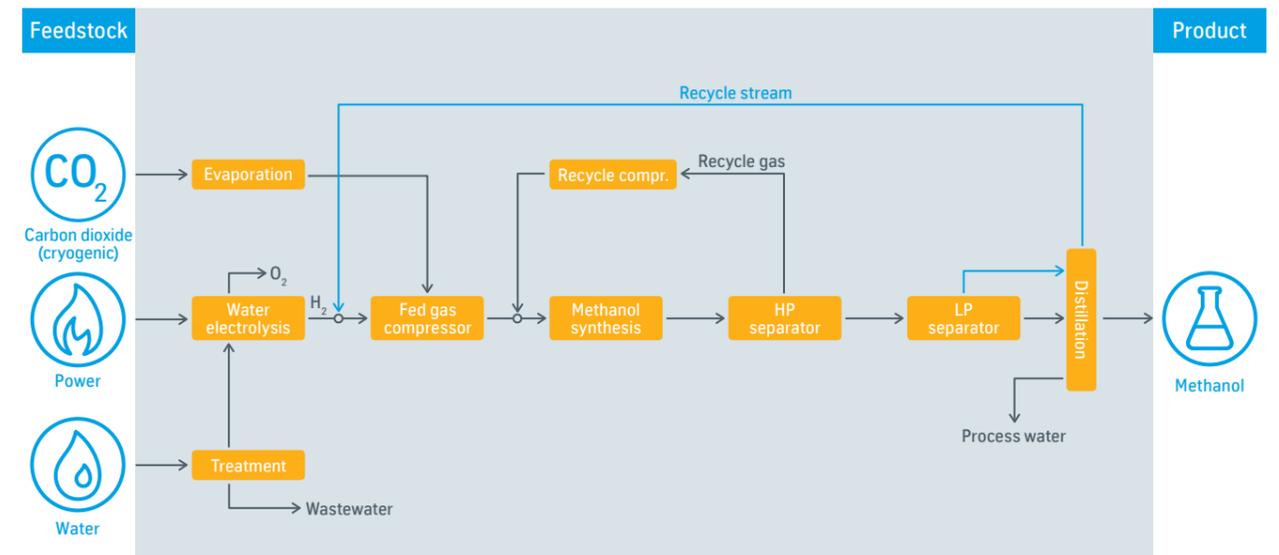
Producing Methanol in our small-scale plants is also a sustainable process. The power comes from renewable sources such as wind, solar, or hydroelectric energy. The hydrogen required for the next stage of the production process is generated by means of our own water electrolysis technology and CO₂ obtained from biogas plants, flue gas, or waste gas. In close cooperation with Swiss Liquid Future

(SLF), we have developed the SLF/Uhde Methanol production technology that is ideally suited to plants in the 10–200 tpd range.

Our engineers developed this “Green Methanol” plant concept on a highly modularized basis for easy application almost everywhere to complete your project on time and in budget. That is something you can bank on – quite literally because by choosing thyssenkrupp, you entrust your project to a global giant with the economic clout to convince the bank or financial institution that you may ask for a loan or other financing tools to implement your plant. What is more, the high degree of modularization and customization that characterizes our plant solutions ensure all the architectural demands of sites in sensitive, protected landscapes can be met.

Swiss liquid future line – small scale Methanol plants

Swiss Liquid Future/Uhde technology for small-scale Methanol plants as well as for renewable Methanol



The SLF/Uhde Methanol process is easy to adjust to the project requirements. The plant can be provided either as a so-called “stick build” layout that is taking advantage of regions with low construction prices or in modules that are prefabricated and pre-commissioned in workshops and can be installed quickly. Due to our in-house modularization expertise, layout adjustments due to varying capacities of different plants are conveniently possible. The ideal application for the renewably produced Methanol is blending with gasoline, engine fuel for cars and ships. The SLF/Uhde Methanol process is the most favorable solution for storing renewable power – not only technically but also commercially.

The proprietary water electrolysis technology of thyssenkrupp Uhde Chlorine Engineers, an affiliated company of thyssenkrupp Industrial Solutions, can be provided in a highly cost-effective, modularized setup, thus combining the highest energy efficiency with low construction costs and short implementation periods. Due to the standardized design, capacities can easily be adjusted to the project requirements. For more information, please visit <https://www.thyssenkrupp-uhde-chlorine-engineers.com>.

Bigger and better – the most advanced Methanol technology

Large-scale Methanol plants

We offer the world's leading technology for large scale Methanol plants with a capacity range from 3,000 to 10,000 tpd. AdWinMethanol® is not only the most efficient Methanol technology, it is also the most cost-efficient in investment terms. Whatever your needs, we have the right solution – with nearly a century of engineering experience in high-pressure and high-temperature systems as well as numerous references to prove the efficiency and efficacy of the tried-and-tested technology we employ.

If capacities in excess of 3,000 tpd are required, the AdWinMethanol® technology produces syngas via catalytic partial oxidation (ATR) – instead of in the steam reformer – and the syngas will be converted to Methanol in two sequential isothermal reactor stages. In such large-scale plants you enjoy a great deal of flexibility in your choice of feedstock, e.g. natural gas, naphtha, LPG, etc.

Whatever your Methanol will be used for – e.g. as an intermediate in gasoline production (MTG), in olefin production (MTO), or as an end product – we can offer you precisely the right plant as a one-stop-shop supplier. What is more, the completion guarantee made possible by our expertise and experience is a key factor in financing your project, as such a guarantee is typically a mandatory cornerstone for financing banks or export credit agencies. For plants up to 3,000 tpd, the syngas is generated by means of an Uhde steam reformer in combination with a conventional synthesis loop or an AdWinMethanol® synthesis loop, depending on the capacity.

Why not get in touch – you'll get all you need from thyssenkrupp Industrial Solutions!



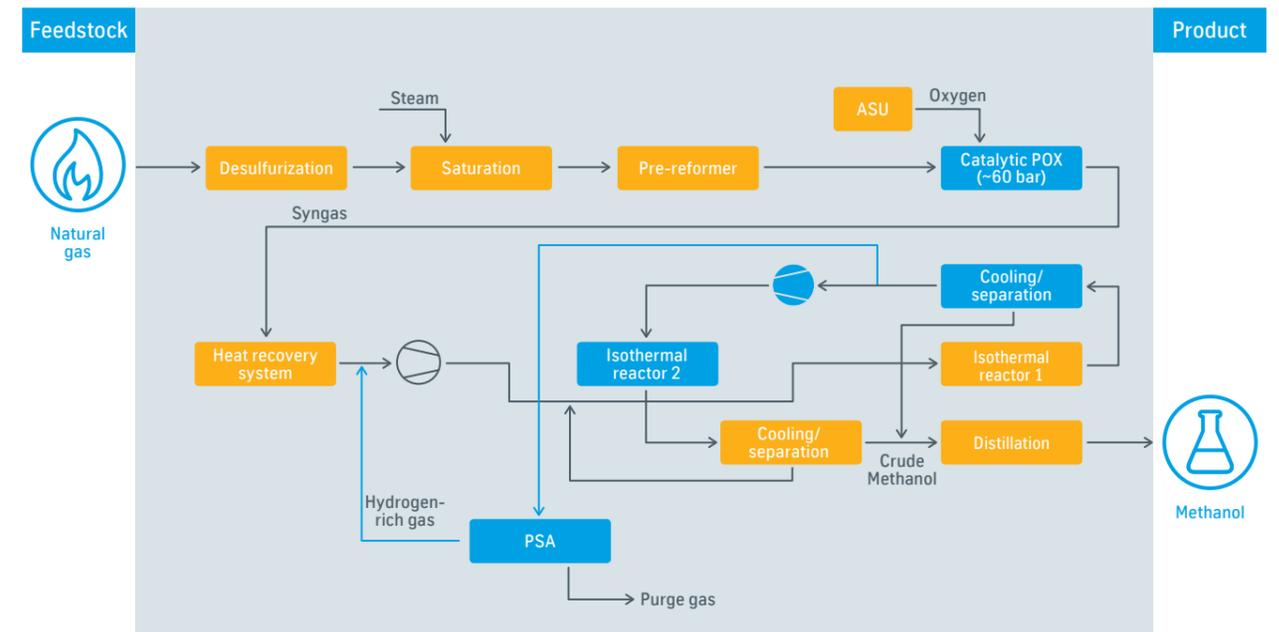
AdWinMethanol® Technology

The technological concept is based on proven technologies

- AdWinMethanol® technology (Advanced Integrated Methanol technology) is utilized for large-scale Methanol plants with a capacity starting at 3,000 tpd up to 10,000 tpd in a single train
- The basic concept is to process conventional and/or nonconventional short-chain hydrocarbon feedstock into syngas via catalytic partial oxidation (ATR) with high flexibility of the feedstock
- Conversion of the produced syngas to Methanol in two sequential isothermal reactor stages
- Conventional Methanol distillation
- Simplified process flow diagram:

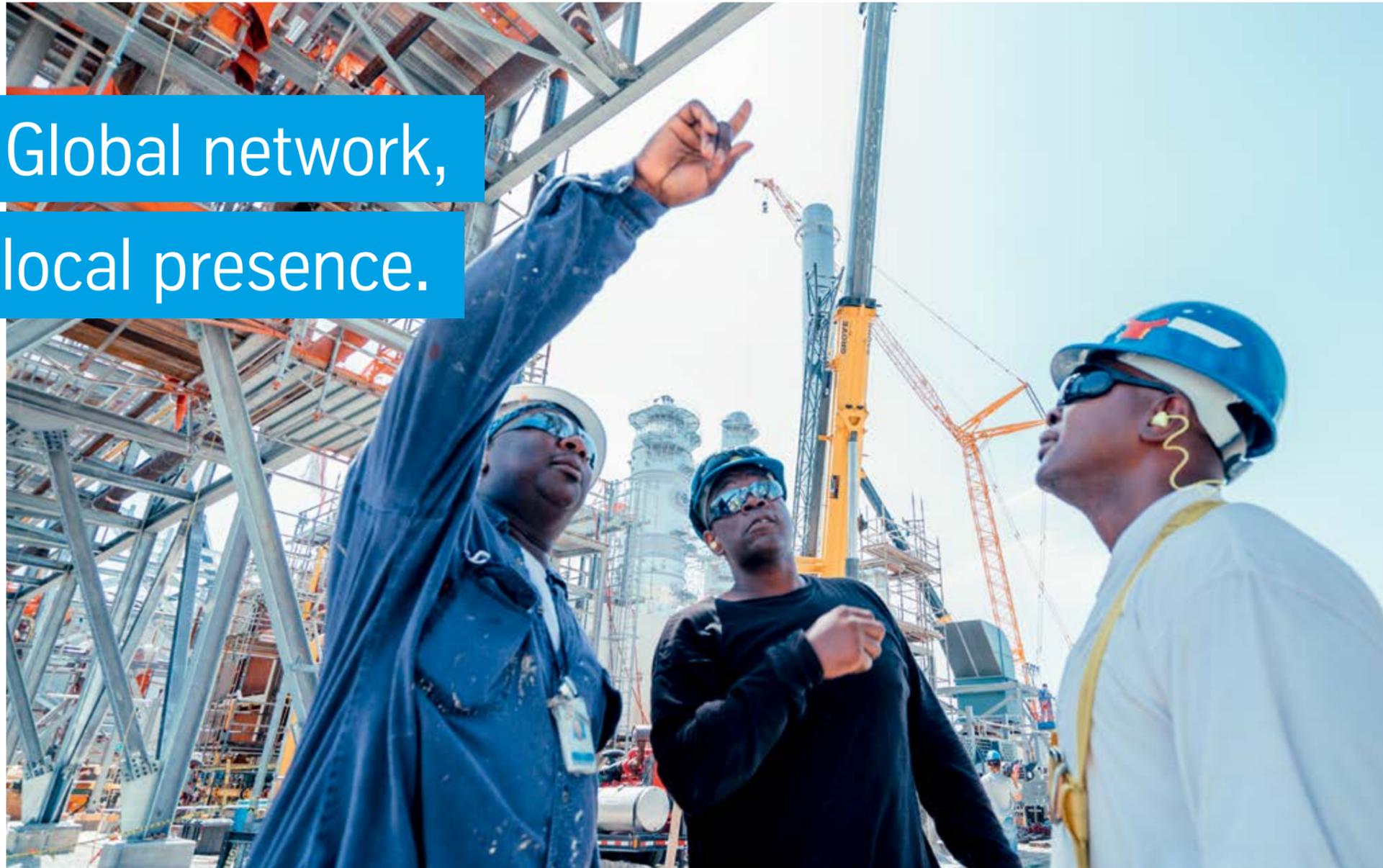


Syngas production is based on catalytic partial oxidation (ATR)



All components of this technology are proven and state of the art.

Global network,
local presence.



70 locations

We are present wherever
our customers need us –
anywhere in the world.

With decades of experience in the synthesis gas and Methanol market worldwide, thyssenkrupp Industrial Solutions has built up a worldwide network with powerful partners. This enables us to deliver the right solution for your plant and raw materials. You profit from a powerful globally operating company with a strong local presence.

Local market knowledge

From over 70 locations in six regions of the world, we offer local engineering competencies and capacities for numerous processes. That gives us an in-depth knowledge of your local requirements in the context of national rules and regulations as well as health, safety, and environmental legislation. The fact that occupational health and safety is embedded in thyssenkrupp's mission statement reflects the top priority we give to this important issue.

German engineering

The German engineering skills on which our portfolio is grounded are realized in close collaboration with local partners who work hand in hand with our teams to deliver the required services and cost-efficient solutions. And if a customer wants specific processes or services to be sourced in the country in question, we are always happy to comply with their wishes. That is German engineering on a global scale.

Full-line supplier

thyssenkrupp Industrial Solutions covers the entire Methanol production capacity range from 10 to 10,000 tons per day with equipment, expertise, and decades of cutting-edge experience. Our one-stop-shop solutions offer customers an extensive portfolio from license packages to engineering and procurement (EP) arrangements through to turnkey engineering, procurement, and construction (EPC) solutions, including the facilitation of financing.

How we define service.



Professional support is vital if complex plants are to run with minimal downtime and generate added value. We make running a complex plant easier by providing 360° support, which starts with the engineering of a plant and continues through commissioning and the commencement of operations right up to the end of a plant's working life. Our service portfolio provides all the relevant service products over a plant's entire life cycle – all over the world. That is what we call 360° service.

Save time when looking for spare parts

thyssenkrupp Industrial Solutions provides high-quality spare parts and extensive after-sales services.

The Service Product Finder on www.thyssenkrupp-industrial-solutions.com offers an overview of all our products.



360° support

Hand in hand with our customers, we implement a wide variety of projects and, thanks to our expertise and decades of experience, can ensure the successful erection of the most complex plants, even in difficult environments. And we don't stop there. All our customers, wherever they are in the world, can rely on thorough, fast, and comprehensive support in operating and, if required, maintaining their plant – a service we also provide for plants from other manufacturers.

Tailored to your Methanol operation needs

Our revamps, spare parts, and asset management services are particularly relevant for our customers. As demands on your plant change over time, we can revamp it to improve uptime, optimize the use of raw materials, lower energy consumption, and ensure compliance with environmental standards. Forward-looking spare parts' management can also increase your plant's uptime and reduce operating expenses. Our asset management service is based on proactive maintenance, which helps reduce your total cost of ownership and boost plant performance. Our understanding of service is that we assume joint responsibility for your production – as true partners.

Globally networked infrastructure

In servicing and maintenance work, our customers can fall back on a wealth of technical and business know-how, supplied through our globally networked infrastructure. Our spare parts' management service ensures cost-effective parts and the fastest possible delivery – not least thanks to our online ordering system PSPN. The well-trained personnel at our local service centers have all the necessary know-how to lend a helping hand on-site. Our specialists define optimum operating and service intervals, enhance your cost efficiency and equipment life through modernization and maintenance, and even handle relocation and decommissioning. And we work closely with our customers to adapt automation technology to their specific requirements. That's how we define service.

Service from a single source



Asset Management



Revamps



Service Center & Field Services



Spare Parts Supply & Management

Industrial Solutions

thyssenkrupp Industrial Solutions AG
Friedrich-Uhde-Straße 15
44141 Dortmund, Germany
P: +49 231 547-0
F: +49 231 547-10
www.thyssenkrupp-industrial-solutions.com

Range of products and services

Synthesis gas generation

- Autothermal reforming
- Steam reforming
- Water electrolysis and CO₂ capture

Synthesis gas products

- Methanol (between 10 and 10,000 tons per day)
- Integrated Methanol/Ammonia coproduction
- Power to Methanol
- Methanol to gasoline
- Methanol to olefins

Facilitation of financing

Services

All involved technologies from a single source,
from license package and EP to EPC – globally.

engineering.tomorrow.together.