

# OASE

## Gas Treating Excellence

**OASE<sup>®</sup>**  
GAS TREATING EXCELLENCE

**□ - BASF**  
We create chemistry

## **BASF – We create chemistry for a sustainable future**

At BASF, we create chemistry for a sustainable future. Our portfolio ranges from chemicals, plastics, performance products and agricultural products to oil and gas. BASF creates chemistry to help boost the performance of our customers in virtually all industries. With our high-value products and intelligent solutions, BASF plays an important role in finding answers to global challenges such as climate protection, energy efficiency, nutrition and mobility.

### **Top intermediates supplier**

The BASF Group's Intermediates operating division develops, produces and markets the world's largest range of intermediates. Of the division's about 700 products, the most important include amines, diols, polyalcohols, acids and specialties. Among other applications, intermediates are used as starting materials for coatings, plastics, pharmaceuticals, textile fibers, detergents and crop protectants. Innovative BASF intermediates help to improve both the properties of the final product and the efficiency of production processes. The Intermediates division is ISO 9001:2000 certified and operates plants in Europe, Asia and the Americas.

## Gas treatment solutions that put a smile on your face

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BASF first experimented with gas treatment solutions as far back as the early 1900s.

### BADISCHE ANILIN- & SODA-FABRIK LUDWIGSHAFEN AM RHEIN.



Gas treatment is a complex process. So the more reliable your partner and the simpler it is to work together, the better. As one of the leading companies in the field of gas treatment worldwide, BASF has a track record of around 400 successful projects across the globe, from North Africa to the Arctic Circle, including the world's largest gas treatment units.

Under the OASE® brand, BASF provides customized, high-performance gas treatment technologies for use in traditional applications like syngas and ammonia, sales gas and liquefied natural gas (LNG) facilities. BASF also has the expertise to support applications in developing markets for carbon capture, biogas and floating LNG. With production and storage facilities on three continents, BASF can consistently ensure dependable supply, optimized logistics and short lead times.

### Our expertise is your assurance of satisfaction

Inspired by the desire to optimize our own gas and ammonia plants, we first began developing gas treatment process technologies in the early 1970s. After a decade of experience and constant optimization, we felt the time was right to share this expertise with the gas treatment industry worldwide.

During the 1990s, we obtained our first application of our technology in the LNG market that was quickly recognized as the preferred technology of choice for LNG and sales gas applications. During this period and subsequent years, we developed and extended our technologies further into new fields.

Launched in 2011, the OASE brand was created to bring together our full range of customized gas treatment technologies, high-performance solvents and comprehensive support services. OASE specializes in application-specific, cutting-edge solutions to even the most complex gas treatment challenges.

## A comprehensive range of tailor-made services

We supply tailor-made solvent and service packages for gas treatment applications to keep your plant running smoothly at all times.

With over 40 years of experience in the industry, BASF's gas treatment team has unparalleled resources and service networks, as well as in-depth knowledge of the design and operation of gas treatment plants. Wherever you are in the world, we are here to help you optimize your production processes.

All our service packages can be flexibly tailored to your individual needs. Some of the most common services we provide include:

- Conceptual studies
- Basic design and Front-End Engineering Design (FEED) support
- Motion studies for floating applications
- De-bottlenecking and revamps, including solvent swaps
- Troubleshooting and operation optimization
- Training
- Solvent analyses

*customized*

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In addition, our team of in-house experts can support you in the following areas:

- Corrosion/leakage
- Disposal
- Eco-efficiency
- Emissions
- Environmental, Health and Safety (EHS)
- High-pressure equipment fabrication
- Process unit-operation design
- REACH (Registration, Evaluation, Authorization and Restriction of Chemicals)

### Responsible care and sustainable development

Our breadth of expertise in responsible care and sustainable development is unmatched in the chemical industry. We use this knowledge to help you enhance your competitiveness in the following areas:

- Emissions, ambient air concentrations, environmental analysis
- Soil and groundwater protection
- Wastewater
- Emergency response and emergency response planning
- Experimental toxicology and ecology
- Workplace health and safety



Our track record: over 300 successful projects worldwide. We provide local support wherever you are.

## Application areas



reliability

### Natural gas

#### Sales gas:

Our experience in offering a broad range of solutions allows us to tailor our designs to the needs of our customer. Our solutions portfolio ranges from bulk to selective removal. Our designs are customized to meet feed gas and product specifications while optimizing capital expenditures (CAPEX) and operating expenditures (OPEX) based on our customer's priorities.

#### Liquefied natural gas (LNG):

Our extensive technical experience with reference plants in this field allows BASF to offer solutions that meet deep CO<sub>2</sub> removal requirements for a wide range of feed acid gas compositions. Additionally, BASF can go beyond the acid gas removal unit (AGRU) and offer technologies such as total sulfur management systems.

#### Floating LNG:

We adapt on-shore LNG expertise by applying our research in motion studies and Computational Fluid Dynamics (CFD) to ensure a high reliability, low maintenance design which meets our customer's stringent off-shore specifications and challenges.

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**OASE purple**

**Natural Gas, LNG**

**OASE white**

**Ammonia, Syngas**

**OASE yellow**

**Selective Treatment**

**OASE green**

**Biogas**

**OASE blue**

**Flue Gas**

**OASE secco**

**Dehydration**

### Syngas / Ammonia / HYCO (Hydrogen/Carbon Monoxide)

For these applications, BASF offers its state-of-the-art proven amine based gas treatment technology of choice for treatment of gasses containing hydrogen (H<sub>2</sub>) and/or carbon monoxide (CO). Since BASF's own production facilities worldwide operate using in-house technology, we can offer invaluable input and experience that is unmatched in this industry.

### Flue gas/Industrial CO<sub>2</sub>

BASF can supply customers with a technology package along with a solvent solution customized for specific applications. Our solutions support applications that range from large scale post-combustion capture (PCC) for power plants to small food grade CO<sub>2</sub> production facilities. We offer highly stable, low-maintenance innovative solvents customized to meet the needs of our customer.

### Refineries

For the refinery market, BASF offers the broadest portfolio of amines in the gas treatment industry. In addition, BASF technologies can offer innovative solutions that minimize operational costs with increased flexibility for the refinery operator in meeting strict environmental specifications. With production and storage facilities in the Americas, Europe and Asia, we provide reliable and cost-effective solvents that address the immediate needs of our customer.

### Biogas

Based on the needs of this emerging industry, BASF developed a solution that provides for superior gas treatment performance. BASF can also provide customized process design packages.

### Special applications

With the broadest portfolio in the industry, BASF can draw from a wide range of technologies to provide customized solutions for applications such as iron ore reduction, hydrogen production, ethylene treating, Integrated Gasification Combined Cycle (IGCC), etc. Our extensive complementary businesses from adsorbent catalysts to oil-field chemicals can also assist in providing complete solutions for our customer.



Top:  
Heat exchanger operating with  
OASE: Corrosion completely avoided  
Below:  
Not using OASE

# Leading gas treatment technologies

## OASE purple

Utilized in the removal of acid gases such as carbon dioxide (CO<sub>2</sub>) and hydrogen sulfide (H<sub>2</sub>S), the OASE purple technology has proven its versatility and reliability in natural-gas applications. Our solutions portfolio ranges from selective removal of sulfur components for sales gas to bulk removal of acid gasses for LNG applications. This highly efficient and environmentally friendly technology offers both flexibility and reduced capital expenditure (CAPEX), while the low energy demand of the process and its non-corrosive solvent minimize operating and maintenance costs (OPEX). The process also provides a high level of gas purity and product gas recovery while keeping solvent losses to a minimum.

## OASE white

The state-of-the-art amine technology for synthesis gas, OASE white has long been established by the market as the technology of choice for treatment of gasses containing hydrogen (H<sub>2</sub>) and/or carbon monoxide (CO). OASE white's broad application scope, the continuous optimization based on hundreds of references including BASF's own facilities, and the flexible operability of this process makes it the leading choice for applications such as ammonia production, iron-ore reduction and many more.

## OASE yellow

Developed to enable selective removal of sulfur components from natural gas, as well as acid-gas enrichment (AGE) or tail-gas treatment (TGT) units, BASF's OASE yellow technology offers a full range of customizable solutions.

## OASE green

OASE green technology is based on chemical absorption solvents, primarily targeted at biogas applications. It is characterized by exceptionally robust performance on gas streams containing oxygen and/or olefins.

## OASE blue

BASF has developed an innovative post-combustion capture (PCC) technology for applications from carbon capture for power plants to beverage carbonators. OASE blue was developed from the very beginning specifically as an optimized large-scale PCC technology. It offers low energy consumption, low solvent losses and an exceptionally flexible operating range.

## HiPACT

In partnership with JGC, BASF has developed a unique high-pressure gas treatment technology for high-pressure regeneration to allow for energy-efficient carbon capture and storage (CCS) applications, which is marketed under the HiPACT brand.

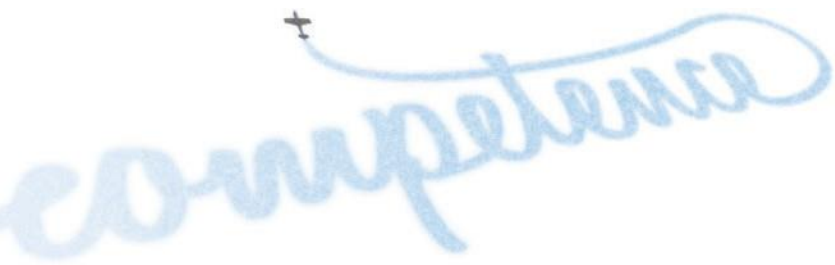
## FLEXSORB™

In 2014 BASF and ExxonMobil Research and Engineering Company (EMRE) have concluded an agreement on FLEXSORB™ technology. It provides BASF with the rights to license the technology to third parties and supply the related solvents to licensees. FLEXSORB™ technology allows deep selective removal of sulfur components at low feed gas pressures. The technology can be applied for Tail Gas Clean up and Acid Gas Enrichment units. BASF offers the technology, solvents and services for grassroots facilities as well as all kinds of studies (troubleshooting, debottlenecking, etc.) for existing units.

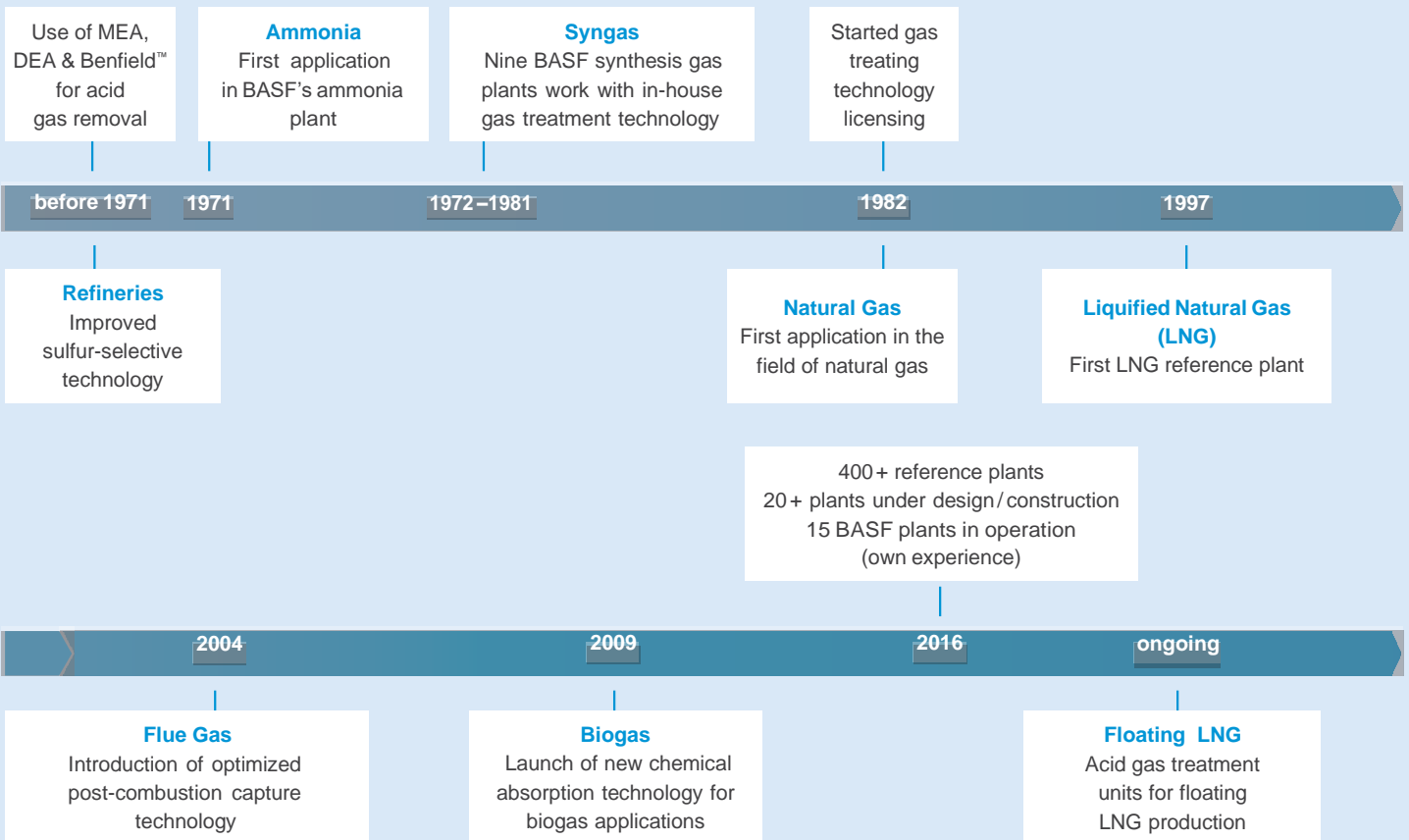
## OASE secco

Achieving cryogenic temperatures in LNG production requires the inlet gas to be dehydrated to ppm levels in order to avoid precipitation and scaling in the plant. OASE secco is an adsorption based technology for natural gas dehydration in LNG plants. It is applied downstream of the OASE purple acid gas removal unit. With its vast expertise of OASE purple applications in LNG units, BASF provides the design and delivers the adsorbents for a CAPEX and OPEX optimized dehydration plant.



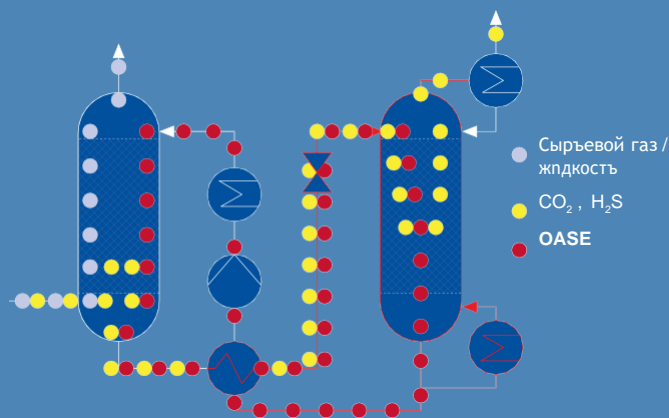


**Gas Treatment: almost 50 years of experience**



**Абсорбер:**  
высокое P, низкая T

**Регенератор:**  
низкое P, высокая T



Left: The chemical absorption of acid gases: the efficient process provides a high level of gas purity and product gas recovery while keeping solvent losses to a minimum. Under the OASE brand, BASF provides customized, high-performance gas treatment technologies.

Right: OASE – versatile and reliable in natural gas applications

## Formulations and solvents



BASF produces and delivers an extensive portfolio of quality amine and non-amine chemicals and formulations for use in gas treatment applications. Our extensive logistics, export and import experience, as well as production and storage facilities in Europe, North America and Asia, ensure very high reliability of delivery and of supply worldwide.

### OASE

Chemicals and formulations tailor-made to optimize the customized OASE technology for specific applications.

### PuraTreat®

Quality chemicals prepared to customer specifications.

### Solvents

Methyldiethanolamine (MDEA / MDEOA):

MDEA is primarily used in gas treating applications for the selective removal of H<sub>2</sub>S from acid gas streams. (CAS No.: 105-59-9)

Amino-Di-Ethylene-Glycol (ADEG®):

Also known as aminoethoxyethanol (AEE) or diglycolamine (DGA®), ADEG is primarily used in applications for removing H<sub>2</sub>S and CO<sub>2</sub> in acid gas removal applications at low partial pressures. (CAS No.: 929-06-6)

Monoethanolamine (MEA / MEOA):

MEA is a primary amine used for removal of CO<sub>2</sub> and H<sub>2</sub>S for generic acid-gas removal applications. (CAS No.: 141-43-5)

Diethanolamine (DEA / DEOA):

DEA is a secondary amine used for removal of CO<sub>2</sub> and H<sub>2</sub>S for generic acid-gas removal applications. (CAS No.: 111-42-2)

Diisopropanolamine (DIPA / DIPOA):

DIPA is a secondary amine used for acid gas removal in generic sulfur removal applications. (CAS No.: 110-97-4)

N-Formyl Morpholine (NFM):

NFM is used for the extractive distillation of aromatics and for acid-gas removal applications, for example in Uhde's Morphylane® technology. (CAS No.: 4394-85-8)

N-Acetyl Morpholine (NAM):

NAM is used in acid gas removal applications. (CAS No.: 1696-20-4)



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## OASE: your benefits

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Technological expertise

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Customized solutions

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Optimized capital and operating expenditure

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Reliability

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Around 400 reference plants worldwide

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On-site technical support

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Broad portfolio of chemicals

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