



DOW

Gas Treating Products and Services

- ▶ Gas Treating Technologies and Services
- ▶ UCARSOL and SELEXOL Solvents
- ▶ Alkyl Alkanolamines, Ethanolamines, and Isopropanolamines

WORLD CLASS PRODUCTS FROM THE WORLD'S LEADING SUPPLIER

Your Source for Innovative Solutions for More Than 60 Years

Dow Gas Treating Products and Services offers you the broadest and most in-depth portfolio of gas treating products, services, and technologies in the world. For more than 60 years, our innovations have led the way in gas treating. Today, our UCARSOL™ solvents, specialty amines, and specialized technologies — coupled with the unsurpassed knowledge and experience of Dow people — bring you the most advanced solutions available for gas treatment.



The Global Leader in Gas Treating

With the addition of the UCC gas treating business in 2001, Dow Gas Treating Products and Services became the global leader in the supply of products to meet all hydrogen sulfide (H₂S) and carbon dioxide (CO₂) treating requirements. Our manufacturing operations at South Charleston, West Virginia, and Freeport, Texas, produce Methyldiethanolamine (MDEA), a key raw material for servicing gas treating customers and applications globally – in Europe, North America, South America, Middle East, and Asia. We are your source for the industry's leading gas treating products and technologies, including...

- UCARSOL™ amine solvents for gas treating amine systems
- UCARKLEAN™ solutions for cleaning gas treatment systems
- SELEXOL™ physical solvents
- UCARSEP™ amine reclamation system...

as well as the Dow family of Specialty Amines, ethanolamines, and isopropanolamines for gas sweetening; gas treating chelates for redox technology; Amine ManagementSM services; and much more.

With Dow Gas Treating Products and Services, you benefit from our unsurpassed application knowledge that helps you meet your gas treating requirements, and reduce your capital investment and operating costs. We offer advanced technical service support with simulation capabilities to model your current and future gas treating needs, access to a state-of-the-art pilot plant that can mimic your process, on-going analytical support from a laboratory in your geographic region, along with experienced technical service engineers for consultation on your amine applications. You'll receive expert technical service as well as support from a dedicated gas treating team in your geographic area. Dow can help you add value at every level of your operation.

But there's more to Dow Gas Treating Products and Services than the world's leading business and market presence. We're applying global economies of scale to deliver high technology gas treating solutions at competitive cost.



H₂S

Products You Know From a Familiar Name in Gas Treatment

The merger of The Dow Chemical Company (Dow) with Union Carbide Corporation (UCC) in 2001 marked the beginning of a new era in gas treatment. Dow is now the largest manufacturer of ethanolamines, isopropanolamines, and alkyl alkanolamines in the world. And the new gas treatment business that was formed offers the broadest and most in-depth portfolio of gas treating products, services, and technology available... anywhere.



Total Gas Treating Capabilities Worldwide

Dow Gas Treating Products and Services, the recognized leader in gas treating technology, marries advanced gas treatment products and technology to the global power and products of Dow, one of the world's largest chemical companies.

Dow is a leading science and technology company with annual sales of approximately \$28 billion. Dow serves customers in more than 170 countries supplying innovative chemical, plastic, and agricultural products and services to a wide range of markets.

Dow's Gas Treating Products and Services group has been at the forefront of gas treating technology for the past 60 years. Our amine chemicals, UCARSOL solvents, Specialty Amines, and specialized technologies – including SELEXOL solvents and the UCARSEP process – are recognized as the most advanced solutions available for gas treatment.

Dow's financial strength – coupled with the longstanding Dow commitment to research and development and environment, health, and safety – contributes to the ongoing development of new generation products, technologies, and services to meet the emerging needs of the gas treating industry.

More than ever, we remain committed to working with customers individually to identify and implement cost-effective gas treating solutions tailored to meet specific requirements. This commitment starts with our portfolio of UCARSOL solvents and DOW Specialty Amine solvents.

A Portrait of Dow Gas Treating Products and Services

- *World leader in gas treating technologies, products, and services*
- *The industry's broadest line of gas treating solutions, including UCARSOL solvents*
- *Advanced gas treatment technology*
- *Expanded new product development and service capabilities*
- *Decades of experience solving gas treating challenges*
- *Global reach with dedicated local technical support teams*
- *Worldwide environment, health, and safety support*
- *Strong raw materials position to ensure reliable supply and availability*
- *Dedicated manufacturing facilities*



Your World-Class Source for Ethanolamines

Dow Ethanolamines is a global leader in its own right, offering you the broadest product portfolio, lowest cost products, most extensive customer service capabilities, and the broadest distribution network.

Our ethanolamine products include:

- Monoethanolamine (MEA) – commonly used for treating synthesis gas streams formed in ammonia, hydrogen, carbon monoxide, and flue gas facilities. CO_2 is the principal contaminant removed.
- Diethanolamine (DEA) – primarily used for treating natural and refinery gas and for liquid streams.

CO_2 and H_2S are the principal contaminants removed.



UCARSOL Solvents for Acid Gas Removal

UCARSOL HS 101 Solvent for Acid Gas Treating

With a high capability for selective removal of H₂S from CO₂-H₂S mixtures, UCARSOL HS 101 Solvent has proved highly effective and economically attractive for a great many gas treating applications such as refinery treating, natural gas treating, and tail gas treating.

UCARSOL HS 102 Solvent for Selective H₂S Removal

UCARSOL HS 102 Solvent selectively removes H₂S in preference to CO₂. The product has been specifically formulated for use in treating both low-pressure and high-pressure gas streams where high selectivity is desired. Of particular importance, UCARSOL HS 102 Solvent can be used in systems operating at pressures that are too low for most commonly used solvents. UCARSOL HS 102 Solvent also offers the opportunity for treating gases at higher temperatures than is possible with other solvents.

UCARSOL HS 103 Solvent for Selective H₂S Removal

Designed specifically for use in tail gas treating processes, UCARSOL HS 103 Solvent is another of our high-performance gas treating solvents, selectively removing H₂S in preference to CO₂. This product has been specifically formulated to achieve very low levels (less than 10 ppm) of H₂S in the low pressure tail gas treating environment, which can eliminate the incineration operation associated with tail gas clean-up units.

UCARSOL HS 104 Solvent for Acid Gas Treating

UCARSOL HS 104 Solvent is specifically designed for the selective removal of H₂S from hydrocarbon streams containing both CO₂ and H₂S. Additionally, it has the specialized ability to remove significant quantities of carbonyl sulfide (COS) from both liquid hydrocarbon and natural gas streams.

UCARSOL HS 115 Solvent for Super Selectivity and Low Hydrocarbon Solubility

Representing a significant advance in acid gas treating, UCARSOL HS 115 Solvent is specifically designed to reduce amine losses in the treating of liquid hydrocarbons, while allowing for enhanced CO₂ selectivity in gas treating. Even at 50 percent concentration, UCARSOL HS 115 Solvent can reduce amine losses in comparison to traditional amines such as diisopropanolamine (DIPA), monoethanolamine (MEA), diethanolamine (DEA), methyldiethanolamine (MDEA), or other performance solvents used at optimum concentrations.

UCARSOL LE 713 Solvent for Refinery Gas and LPG Treating

UCARSOL LE 713 Solvent is a high capacity solvent designed to remove H₂S and COS down to low levels. The product has been specifically formulated for applications in refinery primary systems treating fuel gases, recycle gases, and/or cracked LPG feeds.

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2





Methyldiethanolamine for Gas Treating

Methyldiethanolamine has a unique capability of selectively absorbing H_2S from $\text{CO}_2\text{-H}_2\text{S}$ mixtures.

Its high selectivity makes it superior in this respect to the current widely used traditional gas treating amines such as monoethanolamine, diethanolamine, triethanolamine, and diisopropanolamine.



UCARSOL Solvents for Acid Gas Removal

UCARSOL CR 301, 302, 303 Solvents for Bulk CO₂ Removal

These three members of our series of high-performance gas treating solvents are designed specifically for bulk CO₂ removal in gas processing. UCARSOL 301, 302, and 303 Solvents are effective in both sweet and sour gas streams and are ideally suited for treating natural gas.

UCARSOL CR 402 Solvent for Total CO₂ and H₂S Removal

UCARSOL CR 402 Solvent is specifically designed for both total CO₂ and H₂S removal in natural gas processing and is another of our high-performance gas treating solvents.

UCARSOL AP 802 Solvent for Bulk CO₂ Removal

UCARSOL AP 802 Solvent allows for energy efficient bulk removal of CO₂ from gas streams, especially when coupled with enhanced flow schemes.

UCARSOL AP 804 and AP 806 Solvents for Bulk CO₂ Removal

These two high performance solvents are ideally suited for processing natural gas to meet pipeline specifications, or for the bulk removal of CO₂ from gas streams, when energy and capacity are at a premium.

UCARSOL AP 810 Solvent for Total CO₂ Removal

UCARSOL AP 810 Solvent is specifically designed for CO₂ removal in natural and synthesis gas processing down to 50 ppm or less. This solvent offers significant energy and capacity benefits.

UCARSOL AP 814 Solvent for Total Acid Gas Removal

Specifically designed for total CO₂ removal in natural and synthesis gas processing, UCARSOL AP 814 Solvent is one of our series of advanced-performance gas treating solvents. Treated gas containing less than a 10 ppm CO₂ can be achieved with UCARSOL AP 814 Solvent making it also ideal for LNG applications. This solvent offers significant energy and capacity benefits and the flexibility to treat effectively under demanding conditions.

UCARSOL NH 608 Solvent for Ammonia Synthesis Gas Treating

Specifically designed for CO₂ removal in ammonia synthesis facilities, UCARSOL NH 608 Solvent provides significant operating cost benefits over solvents normally used in ammonia processing facilities. It is one of our series of advanced-performance gas treating solvents.

UCARSOL DHM Neutralizer

Specially designed for the safe and efficient neutralization of Heat Stable Amine Salts (HSAS).

UCARSOL GT-8715 and GT-10 Antifoams for Gas Treating

Although antifoams have a wide range of applications in industry, many formulations are not suitable for gas treating uses, and can actually aggravate the situation. UCARSOL GT-8715 Antifoam, however, is one of the specialized products in this series. It provides foam control in amine solvent and dehydration systems and improves overall performance with greater durability of foam resistance...improved foam control at low concentration...excellent mass transfer while controlling foam...and ease of use. UCARSOL GT-10 Antifoam, the latest addition to this series, is an effective agent in an even broader spectrum of foaming problems, and is also effective when used in physical solvent systems.



Gas Treating Chelates for Redox Technology

When hydrogen sulfide is removed from gas streams through the use of amines, chelates can be required to convert the resulting concentrated H₂S stream into elemental sulfur. This process for abatement of H₂S by direct conversion requires special chelates, which are supplied by Dow. Alternatively, chelates can be used for the direct removal of low levels of H₂S from varied gas streams – again converting to elemental sulfur. Dow's line of IC chelants and process conditioning agents is supported by the industry's only dedicated analytical lab and backed by technical service that only years of experience can create.

UCARKLEAN Solutions for Cleaning Gas Treating Systems

UCARKLEAN AC and DS Solutions have been developed to provide the gas treating plant operator a cost-effective means for removing foulants from an amine unit. These solutions effectively remove scale, grease, and the hydrocarbon-agglomerated iron sulfide foulant common to amine systems. The two solutions are used together in varying ratios, depending on the nature of the foulant.

These solutions offer important special advantages over other cleaning methods:

- Ease-of-use. The solutions are easy to handle; they are mixed together and diluted with water in the system
- Superior cleaning properties for scale, sludge, and grease contaminants
- Can be employed by plant operators or with Dow assistance, thus avoiding the cost of a “full service” chemical cleaning
- Non-flammable and non-caustic – unlike other cleaners
- Contain no heavy metals
- No need for neutralizing
- Equipment disassembly is not required
- After cleaning, system start-ups are smooth and uneventful

SELEXOL Solvents for Gas Treating

Particularly effective in high-pressure, low-temperature, high-acid gas systems, SELEXOL solvents are proven and well tested members of our family of physical solvents. These products are designed to provide effective and economical bulk CO₂ removal and selective absorption of H₂S, COS, mercaptans or BTEX from a variety of natural and synthesis gas streams. SELEXOL solvents have been proven effective and economical in a variety of gas treating applications, including:

- Purification of lean natural gas
- Low-energy ammonia/urea production
- Gasification
- Landfill gas purification
- Light hydrocarbon dew point control

Hybrid Solvents for Gas Treating

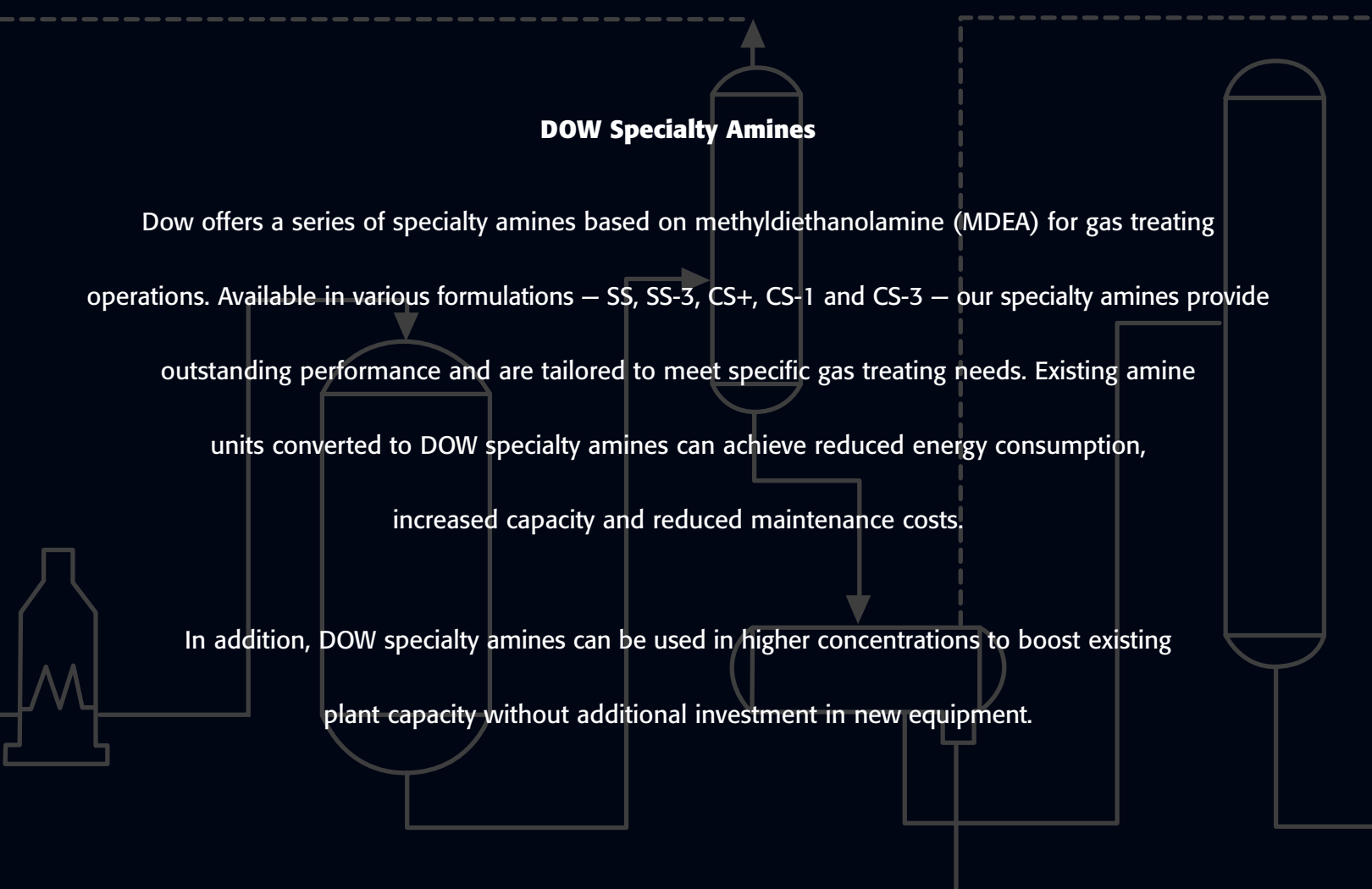
When the gas treating demands are such that neither an amine solvent nor a physical solvent alone can provide the optimum solution, Dow has developed the UCARSOL LE 701, 702 and 703 family of hybrid solvents. These have been proven to be very effective for natural gas treating and offer distinct advantages over other hybrid solvents available.



DOW Specialty Amines

Dow offers a series of specialty amines based on methyldiethanolamine (MDEA) for gas treating operations. Available in various formulations – SS, SS-3, CS+, CS-1 and CS-3 – our specialty amines provide outstanding performance and are tailored to meet specific gas treating needs. Existing amine units converted to DOW specialty amines can achieve reduced energy consumption, increased capacity and reduced maintenance costs.

In addition, DOW specialty amines can be used in higher concentrations to boost existing plant capacity without additional investment in new equipment.





A Complete Line of Amine Management Services

Amine Management services from Dow combine UCARSOL solvents and specialty amine products, technologies, and services to achieve your specific plant and amine system objectives. Economic and performance benefits include:

- Increased reliability with reduced operating and maintenance costs
- Increased throughput – the system performs economically at the optimum operating concentration
- Lowest cost reclaiming technology without operating interruptions (the UCARSEP process)
- Reduced amine disposal, emission, and environmental costs
- Reduced solvent losses, costs, and contamination of downstream processes
- Reduced capital costs via use of existing equipment for capacity expansions
- And more

Global Field Technical Services

Customers who use UCARSOL, SELEXOL, and DOW Specialty Amines take advantage of routine technical service visits to check on operations and make recommendations to further improve performance. New evaluations are provided if conditions change. Solvent analyses are performed on a routine basis and the data are trended against past solvent analyses. With ongoing services, problems often can be identified and corrected before they become serious. Troubleshooting services are also provided. Periodic comprehensive amine unit surveys are performed, resulting in recommendations to reduce amine consumption, reduce contaminants and corrosion, improve operating reliability, minimize energy consumption, maximize treating capacity, and generally optimize the system.



Troubleshooting and Analytical Services

We have developed state-of-the-art analytical procedures and technology and dedicated gas treating analytical laboratories around the world. To ensure good ongoing performance of the amine system, solvent analyses are conducted on a regular basis. These analyses include amine concentration, acid gas loadings, heat-stable salt concentration, foaming tendency, ion chromatography for heat-stable salt anions, ICP and atomic absorption metals analyses, and gas chromatography. Other specialized analyses, such as corrosion monitoring, can also be performed. Reports are made with recommendations for improvement and results are historically trended. Often minor problems are detected before they become serious.



UCARSEP Heat Stable Salt Management

Amine-based gas treating systems can have problems with heat stable amine salts (HSAS) that cause corrosion, reduced amine capacity, poor unit operations, reduced solvent life and solvent disposal problems.

We have developed a program—the Amine Management program—that minimizes the problems associated with HSAS, maximizes solvent life and restores operational reliability. Our electro dialysis-based UCARSEP process for heat stable salt removal is a core element of this program—a program that helps provide a low total cost approach to treating HSAS, helps reduce HSAS contamination and minimize the corrosion that can result from HSAS.

Ethanolamines for Gas Treating

Our versatile family of ethanolamines – including monoethanolamine (MEA), diethanolamine (DEA), and triethanolamine (TEA) – offers a broad spectrum of application opportunities.

MEA is primarily used in synthesis gas treating and in treating refinery and natural gas. CO_2 and H_2S are the primary contaminants removed.

DEA is principally used in refinery and natural gas treating to remove H_2S and CO_2 contaminants.

TEA is used to a limited extent in gas treating for bulk CO_2 removal in flash regeneration applications.

Supply of ethanolamines from Dow is assured by our high-output ethanolamines production facility at Seadrift, Texas. The world's largest ethanolamines plant, the Seadrift facility is capable of producing ethanolamines to meet the most demanding specifications of the marketplace. We also operate plants in Taft, Louisiana, and with our joint venture partner, OPTIMAL Chemicals, in Malaysia to meet global demand.



World's Largest Producer of Isopropanolamines

DOW isopropanolamines are intermediate alternatives of the same high quality as our ethanolamines.

Diisopropanolamine (DIPA) is a secondary amine. It is used in gas treating applications either alone or in physical-chemical solvent mixtures.

**Dow is not only the world's largest producer,
but we're also the only U.S. producer of isopropanolamines.**



Free Gas Treating Evaluations

If you wish to implement a new gas treating program in your operations, or want to fine-tune your existing program, we're standing by to help. Take advantage of the Dow Gas Treating Products and Services free evaluation service to obtain an analysis of your operation and our recommendations for gas treatment. Simply call the Dow location serving your area or visit our website at www.dowgastreating.com and request a copy of our Amine Process Evaluation Form. Complete and submit the form to us. Dow will conduct the analysis immediately and contact you with the results.

Learn more about other Dow products for the Oil & Gas Industry at www.dow.com

Dow Gas Treating Products and Services

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Improved daily.