



Amine Optimization

Specializing in Amine Unit Performance

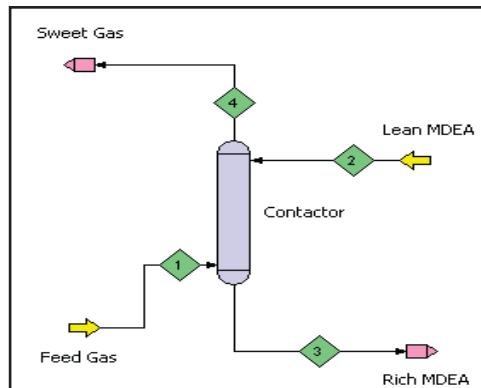


Technical Services & Customized Products. Comprehensive Solutions.

Consulting & Troubleshooting



Process Simulations



Foaming & Corrosion Control



Coalescence & Filtration



Chemical Additives



Activated Carbon



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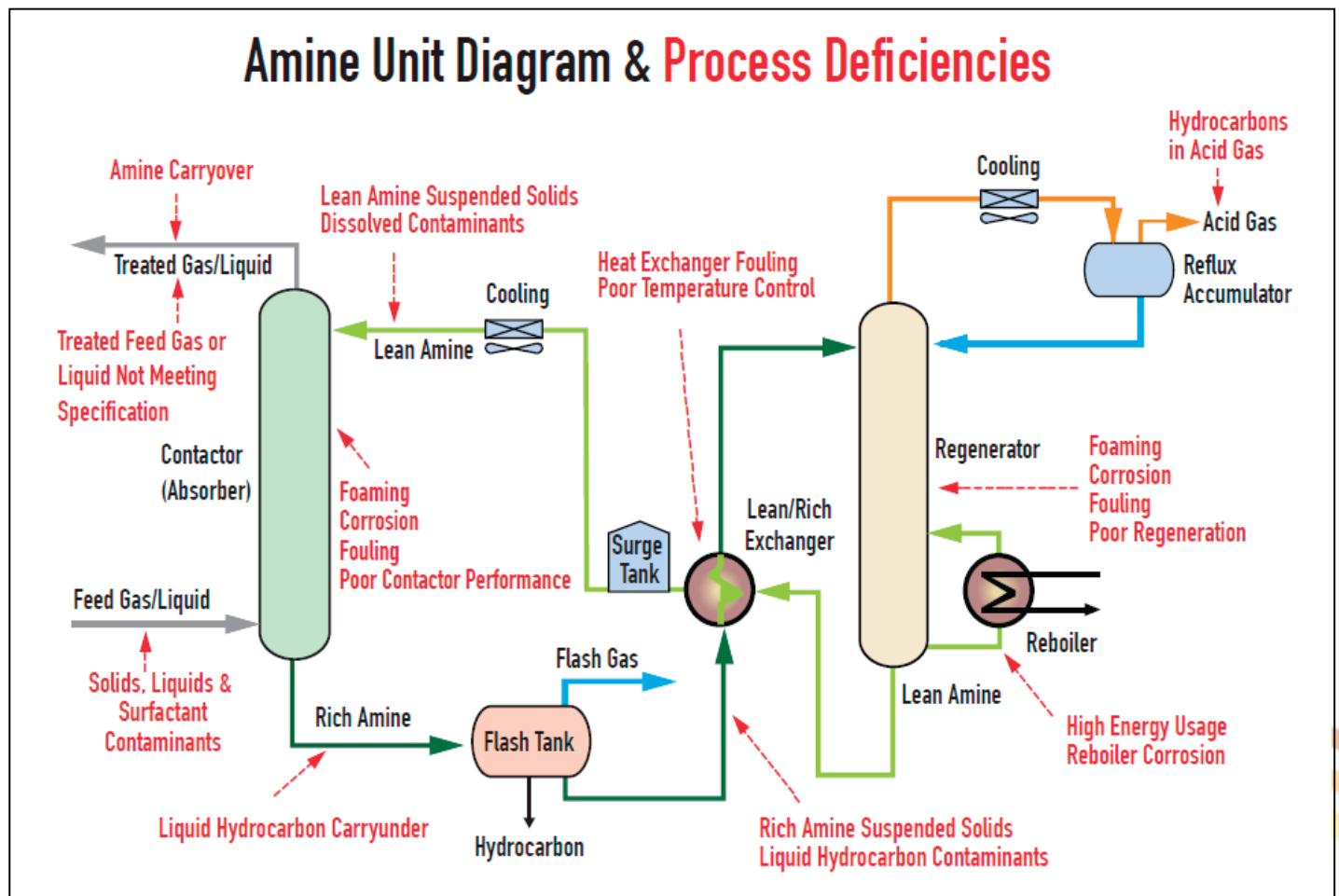
www.AmineOptimization.com

Amine Optimization Company

Improving performance of amine units is our mission

Foaming, corrosion, fouling, low performance, unable to meet specifications, high filtration costs, amine losses, these are just some of the problems that plague amine systems. Amine Optimization is the only company in the world that focuses exclusively on technologies and services for amine units with respect to total unit performance. We offer the most comprehensive line of products and technical services for amine units. All products and services are matched to individual amine units.

Optimizing the performance of your amine unit can involve fine tuning multiple variables. This involves detailed analysis of individual components, their relation to each other as well as the overall process. Our holistic approach to amine systems use process simulators, laboratory analysis, field testing data and the correctly matched products to operate systems at design capacity and beyond with high reliability, consistent stability (low foam formation), and lower operational costs.





Inlet Separation

Improper or deficient inlet filtration and liquids separation upstream of the amine unit can often lead to foaming, fouling, or corrosion among other detrimental effects. To address the separation of solids and liquids in both liquid and gas feed streams entering the amine unit, the technology of choice is not only important but how it's applied is just as critical. For over 50 years plants have been installing separators and newer coalescers but they still fail to meet expected performance. Amine Optimization Company can determine why your system is lacking in performance and provide improvement solutions.

Liquid contaminants found in gas streams

Compressor Lube Oils • Hydrocarbon Condensates
Amines • Glycols • Corrosion Inhibitors • Brine
Completion Fluids • Produced Water • Solvents
Organic Acids • H₂S Scavengers

Solid contaminants found in gas streams

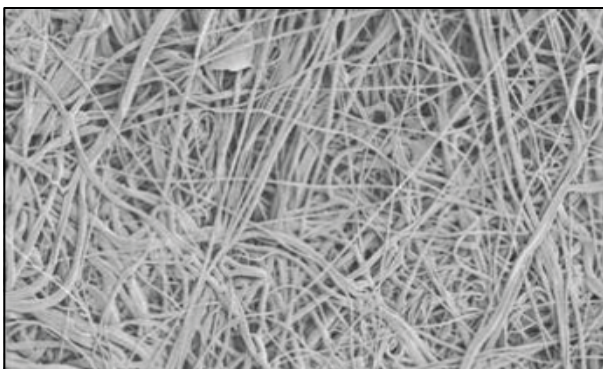
Iron Sulfides • Iron Oxides • Corrosion Products • Scale • Black Powder • Dirt (Silica, Clay)
Desiccant Fines • Sand • Salts • Solid Hydrocarbon Agglomerations (gels) • General Derbies



Coalescing, Filtration and Complete Systems

Proper coalescing and filtration involves many variables and it's challenging to create a system that is cost effective, requires minimal operator intervention, and efficient. Amine Optimization has the knowledge and experience in designing, building and testing capabilities to implement coalescing and filtration systems delivering the necessary performance for amine unit protection. We offer:

- Gas coalescer vessels and complete systems for inlet separation
- Filter vessels and complete systems for amine solvent filtration (rich/lean)
- Filter and coalescer elements (internal replacement elements)
- Vessel reconfigurations for improving existing vessel performance
- Rich amine hydrocarbon coalescers and amine solvent recovery systems



Media Technology

There are many types of filtration and coalescing media materials available, the skill is in knowing how to choose the right media and efficiency that is cost effective and compatible with the amine solvent. Improper materials selection leads to chemical incompatibility contaminating the amine solvent and incorrect separation efficiency of contaminants.

Complete Systems

Amine Optimization designs and fabricates the most efficient and advanced coalescing, filtration and activated carbon vessels and systems. We also engineer complete skidded systems for plug and play installation in addition to installation and operation support.



Liquid Coalescers



Gas Coalescers



Gas and Liquid Filters



Activated Carbon Beds

Vessel Reconfigurations

Amine Optimization Company has the capabilities and expertise for reconfiguring your current coalescer and filter vessels to utilize the most efficient and cost effective coalescing or filtration media materials for each specific amine unit individually.



Vessel reconfigurations also address additional issues such as design deficiencies, chemical compatibility aspects, maintenance shortcomings and improved on-line lifetime.



Amine Solvent Carryover Losses

Amine unit solvent losses are a prevalent problem in most plants that treat liquid streams such as LPG (liquefied petroleum gas) or NGLs (natural gas liquids) among others. In liquid streams, amine solvent losses are typically caused by solubility of the amine solvent in the treated liquid hydrocarbon stream. Losses are also caused by emulsification of the amine solvent with the liquid hydrocarbon resulting in carryover downstream. In gas treating, amine solvent losses can be caused by foaming episodes, system upsets, mechanical entrainment or high gas velocities into the absorber or contactor.

The cost associated with amine solvent losses can be significant and can reach millions of dollars per year. In addition there can be several negative downstream effects. The impacts of amine losses can be:

- Amine solvent costs (up to USD 5/lb for formulated amines)
- Amine inventory, storage and replenishment maintenance
- Downstream impacts in fuel gas lines, burners, compressors and turbines
- Downstream impacts in mercaptans removal, alkylation and caustic units
- Downstream effects in caustic treating units or mercaptans removal units
- Failed copper strip corrosion tests or failed sulfur content specifications



Amine Solvent Losses Minimization and Amine Solvent Recovery Technology

Amine solvent losses minimization program at Amine Optimization is a multi-component approach that includes on-site testing, engineering evaluations and simulations. The program starts with no capital cost. The program includes:

- Amine absorber simulations and design evaluation
- Process set points adjustments for amine loss minimization
- Instrumentation verification
- Suspended solids evaluation at lean amine stream
- Contaminant profiles at inlet gas and liquid streams
- Amine loss quantification in gas and liquid streams
- Surfactant and hydrocarbon analysis
- Separation system evaluation (filters, coalescers and activated carbon beds)



Amine Solvent Recovery Technology

For cases when amine solvent losses can't be solved or controlled using simple process changes it is necessary to install an Amine Solvent Recovery Technology. The system can recover up to 99% of the amine solvent lost in a way that the recovered amine solvent can be added back to the amine unit. This process eliminates the detrimental downstream effects caused by amine carryover. Each system is fully automated, instrumented and fabricated as a complete skidded system.



Amine Solvent Foaming Control Assurance

Amine solvent foaming is perhaps the highest cost upset an amine unit can experience. Most foaming incidents can be attributed to contaminants such as suspended solids, surfactants, or certain dissolved contaminants. Despite having inlet separators, filters and coalescers, units can still foam. Understanding why and the root cause is key to minimizing foaming. Ask for an evaluation if you are experience foaming.



Amine Foam Test Kit

The amine foam test kit designed and manufactured by Amine Optimization Company allows the user to test foaming conditions immediately, consistently, and begin building a history of comparable data of foaming events. The foam test kit is also designed to help optimize the antifoam selection and effectiveness. Every kit comes packed in a heavy duty case for easy transportation. Assembly time takes less than five minutes. The foam test kit can also be used to determine the effectiveness of a carbon bed on foam promoting contaminants and foam tendency of new amine entering the plant.

Each foam test kit includes

- Operation manual, instructional videos for assembly, operation and cleaning
- Foam test columns, air pump, flowmeter, connections, tubing and clamps
- Heavy duty case with foam inserts for safe transportation
- Antifoam library (7 different non-silicone antifoam types)
- Consumables and spare parts



Chemical Additives

All chemical additive products developed by Amine Optimization are designed and matched to individual amine units with the objective of targeting specific problems such as corrosion, foaming, emulsification or fouling. The Amine Optimization chemical additive products are designed to be compatible with the whole amine system.

Types of chemical additives

- Antifoams for gas treating, polyolglycol or silicone-based
- Emulsion breakers for liquid treating, polyol or phenol resins-based
- Corrosion inhibitors for amine units, with no foam or emulsion formation
- Activated carbon, multiple types for liquid and gas processing
- Adsorbents for surfactants removal from liquid streams
- O₂ scavengers for feed stream contamination and amine solvents
- Cleaning agents, formulations and surfactants for amine unit cleaning
- Antifoulants and dispersants for minimizing solids deposition on surfaces
- Chelants and complexing agents for solubilizing solid iron sulfides





Activated Carbon Beds

Activated carbon beds are often a neglected and misunderstood piece of equipment in an amine unit. An optimized activated carbon bed is a key component to good amine unit operation as it removes a variety of soluble contaminants in the amine solvent.

A carbon bed provides adsorption of soluble contaminants in a process stream. It is not a filter. Carbon beds should not build differential pressure over time. They should always be protected with a suitable pre-filter and should always be used in combination with a suitable post-filter.

Applications

Lean amine purification • Rich amine purification • Vent gas • Amine storage tank • Inlet feed gas
General organic contamination removal • Residual H₂S/mercaptans removal

A well-designed activated carbon bed has many uses

Protects absorber from foaming • Reduces need for antifoam additives • Reduces amine make-up
Reduces corrosion • Improves absorber efficiency



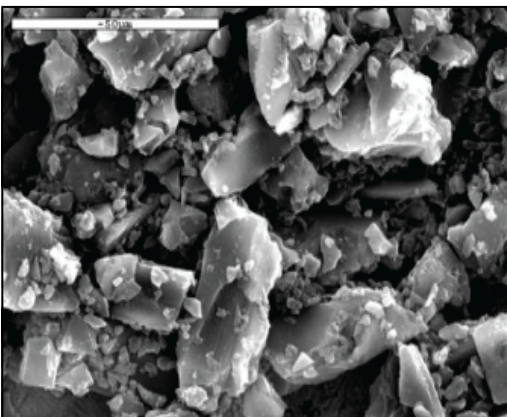
Pre-Filter

Activated Carbon Bed

Post-Filter

Activated Carbons

Activated carbon is a powerful molecular separation material. It is capable of removing several dissolved contaminants in amine solvents and is a critical component of the amine units.



Activated carbon can remove:

- Soluble contaminants that cause amine solvent foaming
- Soluble amine degradation products
- Soluble hydrocarbons in the amine solvent
- Gas phase contaminants in the inlet feed gas stream

Configurations: Canisters or Bulk Supersacks

Types: Powder, Granular, Pelletized, and Extruded

Sources: Lignite, Peat, Wood, Bituminous and mixed types

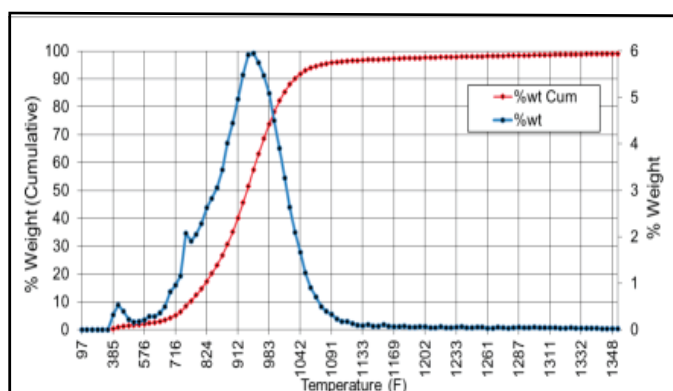
Technical Services, Consulting and Onsite Troubleshooting

Expertise, experience and knowing how to combine the right technologies is key to amine unit performance. Amine Optimization Company has the knowledge, testing capabilities, products and services to match to individual amine units and optimize their operations. We have process simulators, onsite testing and troubleshooting services.



Analytical Services and Materials Testing

Amine Optimization Company uses chromatography, microscopy, spectroscopy, and a variety of chemical and materials analysis in addition to advanced techniques to determine the root-causes of the problems in amine units. Scheduled testing on a regular basis can be performed at specific locations to stay ahead of big process upsets, avoid unscheduled shutdowns and minimize any production losses.



Technical Seminars and Training

Amine Optimization Company offers a series of on-site technical seminars and training on a variety of topics related to amine units. Every course is tailored toward specific company needs utilizing case studies taken from current and previous projects. Areas covered in the technical seminars are: general amine process unit operation, equipment details, filtration and coalescing, inlet separation, activated carbon, foaming, fouling, corrosion, failure modes and troubleshooting.